ROCK QUARRIES AND THE MANUFACTURE, TRADE, AND USES
OF STONE TOOLS AND SYMBOLIC STONES
IN THE CENTRAL HIGHLANDS OF IRIAN JAYA, INDONESIA:
ETHNOARCHAEOLOGICAL PERSPECTIVES

Volume I

A Dissertation

by

ORVILLE WINSTON HAMPTON

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of
DOCTOR OF PHILOSOPHY

May 1997

Major Subject: Anthropology
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May 1997

Major Subject: Anthropology
ABSTRACT

Rock Quarries and the Manufacture, Trade, and Uses of Stone Tools and Symbolic Stones in the Central Highlands of Irian Jaya, Indonesia: Ethnoarchaeological Perspectives. (May 1997)

Orville Winston Hampton, B.A., University of Colorado; M.S., University of Colorado; M.A., University of Colorado
Co-Chairs of Advisory Committee: Dr. Vaughn M. Bryant, Jr. Dr. Harry J. Shafer

From both ethnoarchaeological and ethnogenesis perspectives, the complete cycle of quarrying, manufacture, trade, and uses of stone tools and symbolic stones, and the creation of other kinds of material goods and associated behavior within cultural systems of different language-speaking groups are documented and analyzed. Two adjacent stone tool use and trade regions are defined by the distribution and uses of mutually exclusive kinds and styles of profane ground stone tool blades. In the Grand Valley and West region, ground stone axe and adze blades, knives, and chisels are manufactured and traded outward along complex trade linkages from two internal independently operated and geographically separated quarry and manufacturing centers, to the exclusion of adze blades and knives of distinctly different styles that are manufactured and traded within the adjoining Yali and East region. Tool blades trade freely across language boundaries within the two regions. Profane symbolic stones trade across the regional boundary from west to east. Slightly differing types of quarry ownership, operational technology (including uses of fire), and production techniques are discussed and shown at the different quarry-manufacturing centers.

As much as 25-40 percent of axe, adze blades, and chisels were removed by users from secular use and converted to spiritually powerful sacred symbolic ancestor stones and to empowered sacred tools, all hierophanies of great cultural importance. Adze blades and chisels were of particular importance in their uses as power objects in shamans' religio-medical kits.

Profane display-exchange stones and sacred ancestor stones were the cultural binders without which the cultures would have ceased to exist as they did. These symbolic stones were combined with perishable organic materials as decoration to visually transmit important cultural information. In addition, the uses of fiber string, stems of grass, a few leaves, and a certain root were essential to maintain the continuum of supernatural power from unknown places in the domain of the unseen into those durable stone objects that had been selected to be made sacred.

The sociopolitical, and to a lesser extent the socioeconomic implications of the above factors for these inhabitants of Highlands Irian Jaya also are discussed and analyzed systematically.
DEDICATION

I dedicate this work to:

The Explorers Club, "a multi-disciplinary professional society, dedicated to the advancement of field research, scientific exploration, and the ideal that it is vital to preserve the instinct to explore."

The memory of my father, Orville William Hampton, and my mother, Marion Louise.

The memory of Lawrence A. Warner, Professor Emeritus Geology, University of Colorado.

Patmosukismo Suyitno, a dear Indonesian friend, who helped me in so many ways while I lived in Indonesia in 1981-1984.

The memory of Sjamsuarni Sjam, a self-made female explorer-anthropologist from Sumatra, Indonesia.

Wali (Um’ue) Wilil and the memories of his uncle, Isabaga, and daughter, Nina, as a three-generation symbol of the last members of the Stone Age in the Highlands of Irian Jaya.
ACKNOWLEDGMENTS

This dissertation is based on data collected over a 12-year period from 1982 through 1993. First, I express sincere thanks to President Suharto and the Indonesian Government for granting me the privilege of living in Indonesia during the years 1981-84 and allowing me to return on an annual basis for extended field seasons of anthropological research after I moved out of Indonesia. I want to thank Governor Hindom of Irian Jaya, his successors, and the heads of the Army and the Police for their early and continued support. After I moved from Indonesia, it was, at times, arduous to obtain surat jalan (police papers) for certain remote areas in the Highlands, but I well appreciate the complex responsibility that the police have for both the safety of visitors as well as the integrity and rights of the indigenous people.

Like anthropologist Karl Heider (1970, p. ix), I would like to pay sincere tribute to the Christian missionaries of Irian Jaya. I want to thank Don and Alice Gibbons of the Christian and Missionary Alliance for their friendship and consultation on various aspects of my work in the Highlands. I acknowledge others of the Christian and Missionary Alliance who furnished assistance in different ways. After I moved back to the United States in 1984, Helen Ellenberger and Nina Fowler of the CMA headquarters in the States facilitated a communication network in Irian Jaya including the Rev. Pat Worsley, field director for CMA at the Christian Fellowships in Jayapura, Rev. Ted and Judith Heglund, and Eddy Susanto. I am also grateful to Eddy Susanto for always being available at the Christian Fellowships in Jayapura to receive emergency messages on my behalf when I was in the study area. I thank Rev. James O. and Carol McDonald of the CMA for being available with a friendly smile and conversation as I passed through Wamena on my way to and from different remote locales in the Highlands. Jim went out of his way to coordinate my meeting Rev. H. Myron Bromley (Ph.D. anthropology) in the field for consultation regarding the Dani languages. My appreciation is extended to Dr. Bromley for his help in this matter.

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I thank Rev. James F. Larkin, Field Director for U.F.M. (U-nevangelized Fields Mission) for his many courtesies and always making me feel welcome in his home in Sentani, Irian Jaya. My thanks also to Char Murdock of U.F.M. for her briefings about the Duvle people at Dagai and the Wano at Yeineri. I will always be thankful to Rev. Leon Dillenger of the U.F.M. at Mulia for his timely information about a route to the Yeineri quarries from the lowlands to the north versus the more difficult route from Mulia to the south.
I thank Dick and Margaret Kroneman of the Summer Institute of Linguistics and also the Netherlands Reformation Church for allowing me to use the church's guest facility at Langda while I was conducting research there.

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Year after year Rudy Willem of Sentani was able to handle logistics and make arrangements to get me into some pretty difficult spots of my choice. I want to acknowledge this assistance and thank Rudy for his continuing help. Our indigenous team of Winoco, Libarek, Obet, Elly, Mathews, Julius, others, and in the latter two years Hengke have patiently listened to my questions over and over again and still respond without irritation and join me willingly to hike into some unusual situations. They have suffered some falls and illnesses on my behalf and have my everlasting gratitude.

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Professor James L. Munoz, Ph.D. Geology, University of Colorado; R. Jeffrey Swope, Ph.D. candidate in geology; and Elizabeth Medlin, graduate student in geology at the University of Colorado, are thanked and acknowledged for their petrographic analyses of various tool blades, symbolic stones, and rock
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Last, and perhaps most important, what does one say about the indigenous inhabitants of Irian Jaya who had the patience to deal with inquisitiveness and invasion of their private lives—I cannot thank them enough.
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CHAPTER I
INTRODUCTION

The purpose of this dissertation is to document the complete cycle of the quarrying, manufacture, trade, uses of stone tools and symbolic stones, and the creation of other kinds of material goods and associated behavior within the cultural systemic framework of several nonliterate, different language-speaking groups in the Highlands of Irian Jaya, Indonesia, before acculturation into a contemporary Indonesian society obliterated the traditional aspects of the user populations (Figure 1). Cultural aspects of the people will be discussed to provide a holistic understanding of the systems within which the stone and other material goods are used. Through an ethnoarchaeological approach, paradigms of information are furnished that can be used now and in the future by archaeologists who are working worldwide with only remnants of archaeological data from extinct cultures. Behavior within the subject cultural systems will be related from one type of cultural artifact to the next, so that the relationship of stone goods to other kinds of material goods can be ascertained, where the user populations have choices. The highly visual data (photographs) and narrative are presented to not only provide analogies to assist with object identification in the archaeological record, but to provide the researcher with the kind of detail that is desirable for comparative studies and theoretical manipulation.

It is hoped that the data are formatted so that they will be useful not only to archaeologists but also to other researchers who are examining ethnogenic processes. Grand syntheses like the Cavalli-Sforza and collaborators work (1994); Renfrew (1987); Sokal et al. (1991); and others, currently attempt to use cladistic models to show worldwide congruencies among linguistic, genetic, and archaeological data (Moore 1994). "On the horizon are at least three volumes of papers explaining the idea of ethnogenesis, criticizing cladistic notions, and presenting ethnoarchaeological examples for critical analyses" (Moore 1994:11). Regardless of the outcome of this impending debate and of the ethnogenic process and the degree of coevolution of language and cultural systems, what we can see and measure today in ethnologies are the cultural results. The archaeologist must still reconstruct cultural systems and interpret behavior from material remains. Just how these data are then correlated with other prehistoric cultural systems and extrapolated across geography and through time becomes part of the ethnogenic debate and the multidisciplinary process. With these things in mind, the data provided herein not only follows an ethnoarchaeological theme but also are set forth in a framework that will be amenable to both use and scrutiny from an ethnogenesis perspective.

This dissertation follows the style and format of American Antiquity.
Figure 1. The study area within the province of Irian Jaya, Indonesia.
What stimulates tool blade production? Who own the quarries and have the right to quarry stones? How are tool and symbolic stones shaped and for what purposes? How long does it take to make one tool? Who establishes the value of different finished stones? How do the processed stones get from the quarries to users? What kinds of trade mechanisms are at work? Do stone trade networks function across language, political, and religious boundaries? Within production and user systems are there any predictable relationships between tool blades and symbolic stones? Are there circumstances when tool blades and/or symbolic stones are valid geographic markers of cultural systems? These questions confound us every day in some of our archaeological endeavors. These are the kinds of questions that I address in this dissertation which have not, to my knowledge, been discussed as a unified topic in previous research in the Highlands of Irian Jaya.

From the outset of field work in 1982 I wanted to develop a broad data base of information from which I could treat various, specific subjects. Because of my background as a geologist, I wanted to put together a book entitled, "Stone In the Stone Age of the Highlands of Irian Jaya." This would include stone tools, both profane and sacred symbolic stones, building stones, and miscellaneous stones in an ethnoarchaeological study that would relate through a systems analysis all uses of stone and its relationship to other kinds of material goods and behavior within the Highland cultural situation. In 1987, Peter W. Van Arsdale, anthropologist at Denver University, fellow scientific explorer in Irian Jaya, and friend, encouraged me along these lines. He alerted me to a key article on the subject by his deceased acquaintance, geographer R.D. Mitton (1972). By 1988, I was starting to search out the stone quarries that furnished the stone for tools and symbolic stones within the study area. The stone tool and symbolic stone tool project as herein defined took shape. From 1988, research efforts each field season regarding the origins, trade, and uses of stone tools and symbolic stones were a priority, although I did continue my holistic approach which I feel is justified by the results.

The Opportunity and the Problem

During my first visit to Wamena and the Dani people in May of 1982 and then to other more remote Highlands areas, I realized that it was possible to observe people who utilized ground stone, small chert (flint) flake, wood, bone, bamboo, and fiber tools and who relied on traditional products for their daily lives (Figure 1). Scattered pockets of contemporary Stone Age people merged almost imperceptibly with neighbors who were in more advanced stages of acculturation into a contemporary Indonesian society. Remnant cultural facets of the Stone Age could be seen almost everywhere, but in varying degrees of acculturation, relative to scattered points of influence from government and Christian missionary activity.
Time was of the essence if traditional facets of a stone-using culture were to be documented from an ethnoarchaeological perspective.

The ruggedness of the east-west trending Highland mountains with peaks rising abruptly as high as 5,000 m and the broad expanses of nearly impassable three-tier jungle swampland on both the north and south flanks of the mountains protected the inhabitants from the incursion of modern outsiders until after World War II. Pre-war, the Dutch colonial rulers scarcely explored the Highlands. Soon after World War II, however, Roman Catholic and Protestant missionaries began their "missions" to the Stone Age Kapauku (Ekagi), Moni, Damal, Western Dani, Wano, Dani, Yali, Kimyal, Una and other language-speaking groups of the Highlands. In 1963, the Indonesians assumed the responsibilities for governing the area. Today the Indonesian government is constructing a road network in this part of Irian Jaya that will soon render inaccessible areas available to ever-increasing numbers of outsiders. Soon the opportunity to study even isolated pockets of aboriginals in their natural ecological setting will be gone.

Methods

From the outset, I knew that I wanted to use a descriptive holistic approach, pay attention to detail, and stress visual anthropology with the medium of still colored slide photography. Who could possibly know in advance which aspects of the cultures would prove most significant for retrospective analyses? Therefore, I used a combined mixture of Boasian "detailism" and Malinowski's "holism." It was Malinowski who advocated holism in the Foreword to his first monograph on the Trobriand Islands when he stated that:

One of the first conditions of acceptable Ethnographic work certainly is that it should deal with the totality of all social, cultural, and psychological aspects of the community, for they are so interwoven that not one can be understood without taking into consideration all the others [1922:xvi].

As an ethnoarchaeologist, I wanted to understand the material goods and behavior within the cultural systems within which I would work from an insider's viewpoint (emic) and be able to analyze and apply the data from both an emic and etic perspective. In hindsight, I find that this approach falls in line with, among others, Richard Gould's philosophy (Gould 1990:66-67).

Regarding photography as one of my three mediums of documentation (photography and field sketches, sound recordings, and written notes) and a key element of communication in this treatise, John-Steiner (1985) brings out the important role of visual thinking in the course of scientific and artistic study. In a quoted passage by Albert Einstein written in 1945, John-Steiner (1985:85) observes that to Einstein:

The words of the language, as they are written or spoken, do not seem to play any role in my mechanisms of thought. The physical entities which seem to serve as
elements in thought are certain signs and more or less clear images which can be
'voluntarily' reproduced or combined.

Most of the individuals who Jacques Hadamaard queried in a study on this subject stressed a reliance on
visual symbolism in their thinking, as had Einstein (John-Steiner 1985:85). British scientist Grey Walter
reported that 15 percent of the population thought exclusively in visual terms, an equal percent in verbal
terms, and the remaining majority used a mixture of these approaches (John-Steiner 1985:212).

At the outset of the field work I felt much like Robert Gardner when he first entered the Grand
Valley, in that a part of the motivation was in the spirit of a conservator of a passing age (Gardner and
Heider 1969:XII). Each field season I went back to an area where the indigenous people already knew me,
and also explored new territory. This approach worked well. Each year I was able to recheck data with
the same people and build a solid base of information. I was learning from those people who were
beginning to understand what I was trying to do. Thus, for example, when a local inhabitant said that he
did not know where a particular stone came from, other than that he had gotten it from a family member
in the next village, I could say, "Let's go see that family member in the next village." and thus backtrack
the trail of information. This led to dead ends and logistic nightmares, but it was the way that I made
many of the discoveries that allowed me to understand, in the context of their culture, the stone industry
of the Wano, Western Dani, Nduga, Walak, Dani, Silimo, Hupla, Yali, Kimyal, and Una people.

Field techniques included still photography (over 20,000 slides), sound recordings, personal
observations, the use of informants in formal as well as informal situations, and spontaneous interviews.
Data were gathered by being both an unobtrusive observer and sometimes a participant. Besides
interviewing the indigenous people in their ecological settings. I conducted other important interviews with
my own team of indigenous helpers put together over the years, Indonesian government officials including
the provincial governor, foreign and native Christian missionaries, and colleagues who have worked
elsewhere in Irian Jaya. From time to time, questionnaires were used to guide discussions. The overall
plan worked well.

At the root of my approach was the building of friendly relations with all. With the indigenous
people, since the control of information is an important part of their system of social control, I had to
proceed carefully with each new group. By returning each year with gifts of photographs to contacts
previously made, my own regular local helpers and other chief informants soon realized that I was
trustworthy and did care about the people.

As I extended my research into new geographical areas, I followed a simple but time-consuming
format: (1) spread the word by local couriers to community leaders in advance of my arrival; (2) call on
local headmen before questioning or photographing; (3) present a thoughtful gift to the headman of each
hamlet in which I desired to stay; and (4) be willing to spend the time to visit, be concerned with local
problems, become known to the people, and, most importantly, move at the headman’s pace. I made it a practice to always carry my camera, show it, talk about it, and let those interested look through the viewfinder. Usually the headman, his council of advisers, and various relatives and close friends would become quite interested in me and what I was doing. The headman and his council, as the controllers of information, usually became my informants in each area. I always obtained permission from a headman well in advance of talking to local women. Through the added process of being careful to keep the men informed of my discussions with the women, I was sometimes even able to work with women as my primary informants.

I would validate information with follow-up queries with more than one independent informant. Often I would attempt verification of data from people with different political and geographic perspectives. Reliable informants could, in this way, usually be identified.

I was amazed at the burgeoning amount of data obtained by the overall process. For example, in 1988, I had meaningful interviews with about 20 different indigenous people; whereas, in 1992, I had copious notes from over 40 different local informants of four different language-speaking groups. During the field work from March to June, 1993, I interviewed approximately 50 such indigenous inhabitants.

To get from area to area, sometimes Mission Aviation Fellowship small aircraft were chartered to fly me to remote landing strips at missionary outposts. From those outposts, I trekked through areas of interest to reach specific habitation centers to explore for caves and rock quarries and to follow hypothetical trade routes. Logistics were rarely simple as we often had to arrange for porters who spoke different languages and to trade off porters as we passed from one territory into the next, where the indigenous people were sometimes unfriendly to outside porters. Much pre-planning and sometimes some real worry was involved. Always there were unforeseen circumstances.

For several years, I had done reconnaissance and research to determine just how to get into one area to search for a particular rock quarry. Finally, with the advice of missionary Leon Dillinger (Unevangelized Field Missions, Mulia), I decided that my route would be to fly in a small Cessna plane out of the Highlands from Wamena to the remote village of Dagai in the lowlands, then to trek back up into the Highlands to search for the rock quarry. There was only one MAF pilot with experience of the area who the operations officer would assign to the job. For him, flying his plane low over rugged terrain and then dropping onto a tiny landing strip was the problem. For me, my three assistants, carrying only two-thirds the weight of items I thought absolutely necessary was the problem. At the last minute, I was advised we would have to unload 22.7 kg of cargo. Camera equipment? No. Tents? No. The pilot suggested that we leave the salt that we were taking to be distributed as gifts. Finally, we unloaded all staple food stuffs and some clothing; not the salt, which turned out to have been the right choice as the salt was our entree into two different language groups of strangers. We were successful in making the
journey, but the trip took its toll. My three helpers became ill and I had to be treated for a curable rash that I had contracted from fleas while sleeping in the crowded men’s hut at the rock quarry.

During the entire Irian Jaya project, I usually worked alone or with my own teams of helpers. I wanted to be a nonentity to the indigenous inhabitants; the fewer outsiders, the better. Also, at times there were unreasonable physical hardships as well as physical and psychological dangers and hazards. To be cognizant of these potential problems and yet flexible enough to explore even in unmapped areas for such things as caves and rock quarries, to follow hypothetical trade routes, continuously questioning informants, and sometimes to attempt to be a human nonentity to document ritual wars required a willingness to be exposed to danger and loneliness and to be willing to do the unusual.

I learned quickly from the subjects of my study that in their culture it is quite acceptable for men to cry—and the indigenous people do this in a profuse manner. In retrospect it was my own crying on those rare instances which turned out to be an effective research method. I asked a key informant once why I had been invited to attend and even allowed to photograph a very special ceremony to "bless the stones." My informant simply replied, "We saw you cry for Wali (Um’ue)." (Wali is their headman and one of my chief informants who has also become a good friend.) I then understood. My very genuine emotions so expressed turned out to be my entree to private aboriginal matters, especially certain sacred rituals.

**Communication with the Local Inhabitants**

During the course of the project I traversed across, or conducted research within, 12 different adjacent-living language groups within the overall study area. From east to west these groups consist of the Una, Kimyal (two dialects), Yali (three dialects), Hupla, Silimo, Dani (three dialects), Walak, Western Dani, Nduga, Wano, Duvle, and Damal (Figure 2). By Western and European standards these are not easy languages to learn. My problem was how to develop a team of indigenous co-workers who could move about within this maze of languages and be able to communicate satisfactorily to get the job done.

Communication with my team of helpers in Irian Jaya and the indigenous people whom we encountered had to be the single most difficult and pervasive problem of the entire project. Other difficulties, such as contending with local political situations, sometimes serious health and accident problems, difficult terrain situations like climbing or traversing steep, mud-slick slopes with interspersed cliffs in torrential downpours, and crossing raging rivers that roared down steep-walled canyons where there were no traditional hanging bridges, would catch my focused attention only from time to time. Once a flimsy bridge had to be built across the Heluk River in Yali territory—true Stone Age style—with the massive help of indigenous inhabitants from both sides of the river. I thought the crossing rather heroic
Figure 2. Language groups within the Irian Jaya study area.
as we rushed to beat an impending rainstorm but once on the other side, the drama and difficulty of the problems were soon forgotten: not so the problem of verbal communication which was continuous.

For help along these lines, Rudy Willem of Sentani annually put together a team of five-seven Irianese assistants, some of whom could communicate not only in their own local language but, with varying degrees of ability, also in one or more other indigenous languages or dialects, as well as Bahasa Indonesia. This team was the core that would help with local translations on a day-to-day basis. Over the years, I built word lists and at times enlisted help with language from missionary linguists.

Many headmen did not want certain of my team members around during private discussions and would designate who, if any, of my people, could be present at private or "secret" conversations. When none were welcome I was dependent on the headmen to provide local young people with language ability for the translation chore. It was always the young, for they are looking ahead to a new life in front of them and are making the effort to learn new languages.

We came to know certain people of language ability (either trained by the Indonesian government, Christian missionaries, or through their own initiative) who were acceptable both to us as translators and in the presence of important headmen. It always amazed me how many indigenous people of bilingual or trilingual ability there are scattered around the Highlands.

Many of my primary informants, including Wali (Um'ue) Wilil, Hanomuaq, Kusa, and Pua of the Dugum Neighborhood (mid Grand Valley dialect of Dani), always thought that I was completely conversant in their language. They would individually come to me with information that they thought of great importance or just something that they wanted to pass on or talk about and speak as if I were understanding every word. Unfortunately I was not. If the subject matter seemed to warrant, I would have to defer until we could have a translator in our presence. Even under the best circumstances of communication, I would often feel disposed to check the same material with another source or again at a later date with the same informant. Such conversations might even be repeated over a time span of three years. Repetition led to clarity and greater elucidation, as well as to the laborious correction of field notes because either I, an informant, or sometimes an in-between translator, had misunderstood part of a conversation. Because aural comprehension exceeds speaking ability, I was sometimes able to catch mistakes of fact being made by my translators, and at times to even use this phenomenon advantageously when I was alone with indigenous inhabitants who thought I did not understand what they were saying.

New Guinea and History of Contact

New Guinea lies immediately to the north of Australia. It is the second largest island in the world, after Greenland. Politically, the island is divided into two parts; the western half which is the Indonesian
province of Irian Jaya, and the eastern half which is the country of Papua New Guinea. The part of the Central Highlands where most of the Highland people live is about 1,120 km long by 160 km wide, four to seven degrees south of the equator, and about equally divided between Irian Jaya and Papua New Guinea. Paula Brown, in her book *Highland Peoples of New Guinea* (1978:4) estimates that in the mid-1970s, 400,000 or more indigenous people resided in the Irian Jaya Highlands and probably more than 900,000 in the Papua New Guinea Highlands. Prior to World War II only intrepid explorers, primarily on major mountaineering expeditions crossed the broad aprons of near-impenetrable jungle swamplands to penetrate the rugged mountains of the Central Irian Jaya Highlands. Apparently, only seven of those entered the study area. Some had ethnographers in their groups who reported on items of language and other aspects of culture. C.C.F.M. Le Roux gives a comprehensive review of this and other exploration in his three volume work (1948:1-18).

In 1909-1910, the Lorentz Expedition contacted the first Highland Papuan group within the study area on the south slopes of Wilhemina Top (Osoa Trikora, Figure 3), which the Expedition had reached from the south coastline of New Guinea. In four days of contact with the Dani-speaking, self-named, Pesegem, Heider feels that a record for instant ethnography both in quantity and quality must have been set (1970:302).

In 1911, according to Margaret and Dick Kroneman, missionary linguists with the Summer Institute of Linguistics (S.I.L.) who reside at Langda (Figure 3) as guests of the Netherlands Reformation Church, a Dutch Expedition passed through Langda (Dick Kroneman, personal communication 1992).

In 1912 and 1913, Captain A. Franssen Herderschee retraced the Lorentz Expedition route to Osoa Trikora and again made contact, initiating a brief study of the Pesegem Dani (Snell, 1913).

In 1920, van Overeem's expedition came southward along the Mamberamo from the north coast and reached the Western Dani of the Swart Valley (west of Bokondini, Figure 3) (Le Roux 1948:7; Heider 1970:302; O'Brien 1969:6-7). O'Brien (1969:7) reports that, "No scraps of cloth or metal were present among the groups visited by the 1920 expedition (Bijlmer 1923:357), which indicates the lack of contact between the inhabitants of the Swart Valley and the people living in the lowlands around the Idenberg and Mamberamo." (Modern Indonesian name for the Idenberg River is Taritatu.)

In 1921, the Kremer Expedition, which reached Osoa Trikora (Figure 3) from the north coast and up the Mamberamo River, included in its entourage 10 Dutch members, an impressive military escort and 300 Malay and Dyak carriers (O'Brien 1969:7). For the first time a trained ethnologist, Paul Wirz, studied a Dani group in the Swart Valley (Wirz 1924, 1925).

In 1926, M.W. Sterling led a Netherlands-American expedition into the Nogolo Basin in the western part of the study area (Le Roux, 1948).
Figure 3. Geographic reference points in Irian Jaya, Indonesia.
On June 23, 1938, while flying an amphibious plane from Hollandia (now Jayapura) to Lake Habbema in the Highlands west of Wamena, members of the Archbold Biological Expedition from The Museum of Natural History, New York, discovered the Grand Valley of the Bariem (Wamena, Figure 3) and its Stone Age inhabitants. Looking down from the airplane, Richard Archbold was quite surprised at the beautiful mosaic of sweet potato gardens interwoven with green algae-filled drainage ditches within the Bariem Valley. The Archbold group trekked back down to the Bariem Valley from a campsite at a higher elevation west of Wamena at Lake Habbema to discover the Dani (Archbold et al. 1942).

Following the Archbold Expedition only a few missionaries made contact prior to World War II throughout the Greater Highlands area. Otherwise the Dani and their Stone Age brethren remained undisturbed. Throughout the Second World War, when no one paid much attention to that part of the Island of New Guinea, the Dutch Colonial rulers scarcely explored the Highlands. Around the coasts and to the east in what is now Papua New Guinea, it was another matter. They were involved in the war.

In 1945, a U.S. military aircraft from General Douglas Mac Arthur’s headquarters at Lake Sentani crashed at the eastern end of Pass Valley (Figure 3). For a short time the area received international recognition when Philippine troops were parachuted in, a glider strip built at the mouth of Pass Valley within the Grand Valley, and the survivors of the crash and the Philippine troops flown out (Hastings 1945; Elsmore 1945).

It is noted that in 1986, the author applied for but was denied a permit from the Indonesian government to conduct an anthropological traverse from Mataboor on the north coast, up the Mamberamo River, across the Highlands, passing out of the Highlands south through the Bariem Gorge on foot and then by boat across the wide expanse of southern lowlands to the village of Agats on the Arafura Sea (Figure 3). Among other things this ecological traverse would have provided information regarding some of my hypotheses for pre-contact trade and migration routes between the north and south coastlines of New Guinea and the Central Highlands.

**After the War, Research by Others**

Soon after World War II, Roman Catholic and Protestant Christian missionaries began their "missions" to the Stone Age Highlands. Some made first contact and stayed to do evangelical missionary work. Of the Christian missionaries, some like Bromley (1960, 1962, 1967, 1972, 1981), Larson (1962, 1987), and Ellenberger (1962), in addition to their duties as missionaries, published anthropological studies. Bromley (1972) and Larson (1987) got their Ph.D.’s in anthropology from data gathered while working as missionaries. In addition to these anthropological works, anthropological research previous to mine in the Central Highlands focused on a wide variety of ethnographical problems but none included a
comprehensive analysis of the role of stone from its point of origin at quarry sites through trading mechanisms into the user populations. Mitton's brief work of 1972 stands out as the only published data that indicates an anthropological interest in stone in a similar context to my research. Mitton (1972:4, 5) made a request that thought be given to the prehistory of the area. His own approach indicated that stone artifacts, including stone used for construction purposes, be examined in a holistic fashion. Mitton's comments and all previous studies in the Highlands of Irian Jaya furnished me with a valuable network of geographically scattered grounded information that, along with my own work, established the cultural matrix within which my analysis of stone tools and symbolic stones as a factor of culture could emerge. In addition, this network of information furnished scattered geographical control points against which I could measure the correctness of my own observations and data from indigenous people regarding the origins, trade, and uses of stone artifacts.

During a 12 month period from November of 1954, Leopold J. Pospisil of Yale University conducted field studies for his doctoral dissertation in a remote area of the Highlands not far from the Wissel Lakes (Enarotali, Figure 3) (Pospisil 1956). Although his location of study was outside of my research area, it was at the west end of the primary east-west trending topographic trade corridor from Enarotali into the population heartland (Grand Valley. Wamena on Figure 3) of the Central Highlands of Irian Jaya and therefore of importance to me. Pospisil's topic was Law Among the Kapauku of Netherlands New Guinea (1956). Klaus F. Koch conducted Ph.D. research in 1960-1961 at Pasikni, a small village near Anggunuk (Figure 3). This research culminated in his dissertation, Conflict and Its Management Among the Jale People of West New Guinea (Koch 1967). Koch's work is a valuable control point of data located in the center of my study area. In the early 1960s, Denise O'Brien, also from Yale University, concentrated her doctoral dissertation efforts in the Kondo Valley, located between Wamena and the important (to my study) Yeineri Quarries. The Kondo Valley is west of Bokondini in Figure 3. O'Brien's dissertation is entitled, The Economics of Dani Marriage (1969). In 1987, Gorden F. Larson of the Un evangelized Fields Mission post at Ilaga (Figure 3) completed his Ph.D. dissertation entitled, The Structure and Demography of the Cycle of Warfare Among the Ilaga Dani of Irian Jaya.

The Grand Valley (outward from Wamena on Figure 2) was the site of the Harvard-Peabody Museum Expedition of February-August 1961. Jan Brockhuisjes, an anthropologist in the Netherlands New Guinea Government, introduced the Peabody group to the Dani, and later published his own Ph.D. dissertation back in the Netherlands (Brockhuisje 1967). After the Expedition broke up Robert Gardner, leader of the expedition, produced the classical anthropological film, Dead Birds (1972). Together with Karl Heider, another member of the expedition, he also wrote the book entitled, Gardens of War (Gardner and Heider 1969). Heider stayed on to work (for the periods 1961-1963, and part of 1968) in a small corner of the Baliem Valley, which he named the Dugum Neighborhood. His dissertation, The Dugum
Dani was published in 1970. Peter Matthiessen who had previously been a member of expeditions to remote regions of five continents, was also a member of the Harvard Peabody Museum Expedition. He returned home to write his own book, Under the Mountain Wall, which was published in 1962. Matthiessen is credited by Heider for much of the data on ecology used by Heider in his dissertation (1970:x).

H. L. Peters concentrated much of his work with the Dani living around the government and missionary headquarters town of Wamena in the Grand Valley and published a valuable work entitled Some Observations on the Social and Religious Life of a Dani Group in 1975 (Figure 2). D. J. Hayward, worked as a missionary with the Unevangelized Fields Mission group at Mulia (1967-1987), and as a part-time instructor (1987-1989) and later associate professor of anthropology in California (1989-1992), while completing his doctoral dissertation Christianity and the Traditional Beliefs of the Mulia Dani: An Ethnography of Religious Beliefs Among the Western Dani of Irian Jaya, Indonesia (1992).
CHAPTER II
SETTING THE STAGE: THE EARLY MIGRANTS

In an epic colonization, the people became sea voyageurs and made landfall during the Late Pleistocene in New Guinea. They were hunters and gatherers who soon learned to manipulate the forest canopy to let sunlight through to encourage the growth of plants like taro tubers and Pandanus nuts. Then, they became successful horticulturists and engineers who laced the valley floors and hillsides with a mosaic of mound sweet potato gardens and drainage ditches interwoven with sturdy fences and stone walls. They cultivated an interesting array of food plants and always had their vegetal healing medicines. The raw materials employed in their technology included stone, wood, bamboo, bone, rattan, vegetal fiber, bark, grass, gourds, banana and Pandanus leaves, reeds, orchid and palm fibers, shell, seeds, cocoons, and feathers. They never developed basketry nor pottery. Nor did they use metal until it was introduced in relatively recent times by modern outsiders.

Relative to genetic population structure in Oceania, Cavalli-Sforza et al. (1964:351) say:

Australia and New Guinea are of unique interest in having been at first European contact, at economic stages of development that had been replaced thousands of years ago in other parts of the world. Although Australians were, in a way, contemporary examples of Paleolithic hunter-gatherers, New Guineans had been through a Neolithic revolution but had not yet reached the age of metals. They represented (and still do, in part of the island) modern examples of Neolithic horticulturists. To the extent that their organization has not been overly changed, they thus are extremely interesting from a genetic and anthropological point of view. . . . In no other place can one find almost intact ways of life that disappeared from Europe and most of Asia thousands of years ago, and from Africa centuries ago.

To best understand the totality of relationships of stone tools and symbolic stones (their acquisition, trade, and uses) in the ethnographic present of the contemporary stone tool-users of the Central Highlands of Irian Jaya, it helps to first set the stage by examining their prehistory. To do this we must look at the archaeological record.

Allen (1972:180) estimates that after World War II and prior to 1959 approximately seventy professional archaeologists undertook work in Papua New Guinea. For the same time period, my own research indicates no archaeological work in the area now called Irian Jaya. Prior to archaeological work by Susan Bulmer, commenced in the Highlands of Papua New Guinea in 1959, speculations on the arrival of humankind on the Island of New Guinea rested on linguistics, art style analyses, and "observed or imagined social characteristics" (Allen 1972:180). In the 1960s, twelve professional archaeologists began projects in Papua New Guinea. Work continued in Papua New Guinea, but still the Highlands of Irian Jaya remain blank on the archaeological map, with only one small rock shelter surface site dated from charcoal as 5,000 ya on the north flanks of the Carstensz Mountains (Jaya Crest, Figure 3) (Hope 1977).
Initial Settlement of New Guinea and Australia

Humankind first colonized New Guinea and Australia about 55,000 ya according to Stringer and Gamble (1993:141) and probably "from 40,000 ya" according to Klein (1989:395). Groube et al. (1986) give a date of 40,000 ya for the earliest human occupation in Papua New Guinea, as evidenced by several waisted axes sealed beneath volcanic ashes dated to ca. 40,000. J. H. and G. S. Hope (1976) cite the dating of a fossil bone in the Southern Papuan Highlands to about 40,000 ya.

A set of geological circumstances provided just the right combination for the early epic movement of anatomical moderns from continental eastern Asia to New Guinea and Australia. Worldwide sea levels fluctuated as much as 150 m when large quantities of sea water were fixed in glacial ice masses during ice advances of the Pleistocene. Of the six oscillations between 120,000 ya and 10,000 ya when sea level was considerably lower than at other times, Chappell (1976) reports that there were two intervals, "one centering on the time span about 53,000 ya, and the other about 20,000 ya when water levels dropped considerably below the average, possibly reaching depths 120-150 m below the present surface." Allen (1972:181) depicts a minus 145 m sea level for the Wisconsin maximum between 40,000 and 100,000 ya and a minus 125 m sea level for the final Wisconsin maximum between 18,000 and 20,000 ya. During at least these two periods of maximum low sea levels, the southeastern Asian coastline extended eastward from Thailand and Malaysia to include the present islands of Sumatra, Java, Bali, and Borneo into one land mass called Sundaland--an eastward extension of the Sunda Shelf to the north-south trending Wallacea Trench (Figure 4). To the north, the Philippine Islands, including Palawan, formed one land mass which almost touched the north end of Borneo. Just east of Sundaland and across the Wallacea Line, Australia, New Guinea, and Tasmania formed a single land mass called Sahuland. New Guinea and Australia remained connected by a land bridge across the Torres Strait until about 6,000 ya.

Two logical routes for humankind’s migration across the Wallacea Trench from the east side of the extended Sunda Shelf to Sahuland were (1) through Sulawesi (former Celebes) and the Moluccas into northwest New Guinea, and (2) from Java on the Sunda shelf through Timor onto the enlarged northern coastline of Australia (Birdsell, 1977) (Figure 4). Island hopping with about eight over-water stages and distances up to a maximum of 90 km would have been required on either route. A traveler on most of the over-water legs would have been within view of distant landfall or at least of smoke from possible intermittent naturally-caused fires.
Figure 4. Sunda and Sahul.
Fossil Remains of the Early Settlers

The two oldest Australian human remains found at Lake Mungo in South Australia, 25,000 ya and 30,000 ya, as well as a find at Keilor, yet farther to the south near the coastline, dated ca. 15,000 ya, have crania that are described as "rather gracile" (Nelson and Jurmain 1991:539). "While between these two sites at Kow Swamp, dated 10 ky, 40 individuals are noted for their robustness: sloping forehead, thick bones, heavy supraorbital torus, and so on" (Nelson and Jurmain 1991:539). Nelson and Jurmain also point out that the anomaly of the more robust fossils, being 20,000 years younger than the more gracile, derived forms, might be due to intrapopulation variation that was not observed in the older samples of only two crania at Lake Mungo.

No early human fossils have been found on the Island of New Guinea.

Cultural Periods during First Settlement

The Rest of the World

According to Nelson and Jurmain (1991:600), the Mousterian / Middle Paleolithic had its beginning 125,000 ya and ended 40,000 ya. Klein (1989:293) states that the various Mousterian/Middle Paleolithic industrial sequences almost certainly ended at different times, depending on the place: Africa and Near East before 40,000-35,000 ya, western Europe 35,000 ya, and, in central and eastern Europe, between 35,000 and 40,000 ya. Artifact assemblages throughout this time period were predominately stone; usually no wood or bone. Assemblages included flakes, some unretouched with damaged edges showing that they too, were "tools," and other basic tool types such as scrapers, points, and denticulates (Bordes 1961).

Major changes in the cultural artifact record occur in the Upper Paleolithic from 40,000-10,000 ya. Whereas prior to that time, lithic typology had changed little over time increments of tens of thousands of years, during the Upper Paleolithic more advanced and variable forms of flaked and chipped lithics began to appear. During the period from approximately 34,000-21,000 ya, bone points and awls are present (Klein 1989:360). The effects of the evolved neurological capacity for culture, which had begun sometime as late as 50,000-40,000 ya, were becoming measurable in the archaeological record.

In a time scale shown by Klein (1989:354), the Upper Paleolithic (called Late Paleolithic by some) came to a close 12,000 ya, heralding a time of European Cultural Stratigraphy called Neolithic by some, and Mesolithic by others. Nelson and Jurmain (1991:600) show that the Upper Paleolithic came to a close 10,000 ya at the beginning of what they call the Neolithic cultural stage. I will henceforth use the term Neolithic for the purpose of this dissertation.
In a book concerned with Neolithic society in Europe entitled *Neolithic Europe: A Survey*, Whittle (1985:35) states that the establishment of agricultural communities in southeast Europe began during the period 6,000 - 4,000 B.C. Whittle (1985:38-39) notes that in Greece, stratigraphic continuity between the Mesolithic and Neolithic periods are documented in the Franchthi Cave where:

The beginning of the Neolithic period is defined artefactually by the addition of polished stone axes, stone grinders and a variety of bone awls and shell and stone beads to assemblages in which blade tools continue uninterrupted, and by the appearance of simple monochrome pottery, in the form of globular bowls and footed cups.

As a part of the New Studies in Archaeology series, Bradley and Edmonds (1993:18), in a book entitled *Interpreting the Axe Trade, Production and Exchange in Neolithic Britain*, point out:

The middle phase of the Stone Age, the Mesolithic, has come to characterize the activities of hunter-gatherers, and the Neolithic those of the earliest farmers at the same time, the Neolithic has also been defined in terms of its material culture, for it saw the first widespread use of polished stone tools and pottery.

**Sahul: New Guinea-Australia-Tasmania**

The first settlers were hunter-gatherers who apparently brought with them typical Middle Paleolithic flake tool assemblages. In present day Australia, descendants of those earliest humans are represented by Australian aborigines, who, until recent times when modern acculturation finally upset their way of life, were still hunter-gatherers using both ground and flake-and-chipped stone tools.

Before I further discuss the stone lithics that were identified with the early settlers of Australia and New Guinea, let us first look at a simplified terminology that I hope will preclude misunderstandings as I refer to descriptions of tools in the literature by others as well as my own in the ethnographic present in Australia and New Guinea. The subject will be treated in detail in Chapter V. The stone chopping tools discussed in this dissertation vary from the handheld, flaked stones which are characteristic of the Paleolithic and which are called axes by most archaeologists worldwide and the hafted, ground stone tools that are characteristic of the Neolithic in many areas and which are called axes or adzes. Customarily archaeologists distinguish between these latter two kinds of tools by calling them axes when the cutting edge of the stone is parallel to the median line of the axe handle and adzes when the cutting edge of the shaped stone is transverse to the adze handle. Generally speaking the ground and shaped cutting stones are called blades by archaeologists. When known which type of tool a blade is to be used for, a blade may be identified as either an axe or an adze blade. When the kind of tool the blade is to be used for is not known, the blade is referred to as either an axe/adze or an adze/axe blade by other authors. I will henceforth use the term adze/axe blade in these situations. Thus, when describing cutting blades found in
surface finds or in archaeological context, unless known otherwise, the blades will be referred to as adze/axe blades. If a blade is thought, because of archaeological context, to have been a handheld axe, it will be referred to as a handheld axe blade.

In addition to the flaked stone lithics of middle and lower Late Paleolithic typology generally known throughout Australia, White (1967) excavated an early assemblage in Arheim Land dated by C\(^{14}\) to ca. 20,000 B.P. which included some ground-edge axes. In New South Wales (southeastern Australia), Binns and McBryde (1972) described numerous ground-edge artifacts from surface finds, and also a lesser number in archaeological context dating from A.D. 200 to 1,000 B.C. In the nineteenth century, Frederick Bonney collected hafted ground-edge axes from aboriginals in that same area (Binns and McBryde 1972:xii). From my review of photographs of examples in the Binns-McBryde collection, I would propose that these blades might be prototypes in the evolution of the more symmetrical, finely ground, highly polished blades that we once felt typified the Neolithic.

Of the montane sites in Papua New Guinea, Bulmer (1977) describes notched blades and "axe-like" tools from assemblages that range in age (by radiocarbon dates) from 25,000 ya to about 6,000 ya. At Kosipe, the earliest dated human settlement site in Papua New Guinea, six radiocarbon dates in one soil profile established a range of ages for different layers from over 25,000 ya to about 4,000 ya (Figure 5). At Kosipe, White et al. (1970) described a variety of stone tools that included 11 notched blades, 10 'axe/adzes', 15 flakes and 5 other stone artifacts. White et al. (1970) interpreted this occupation site located close to a permanent swamp as a "seasonal camp," used during the collecting of nuts from Pandanus palms. In a second profile dated to some time between 9,000 and 16,000 ya, similar artifact types were found, with the "difference being the presence of a polished axe/adze in the upper soil, with no polished axe/adzes occurring in the lower soil" (White et al. 1970). During the construction of mission buildings at Kosipe, a wider range of artifacts were found, including stone mortars and polished 'axe/adzes'. Their stratigraphic origins are not certain (Bulmer 1977).

From Foraging to Agriculture and Neolithic in the Highlands of New Guinea

Abundant Botanical Environment Greets the First Settlers

Carl Sauer (1952) predicted that the tropics of Southeast Asia and the Malay Peninsula would eventually prove to be an independent and perhaps even the oldest center of plant domestication. Rhys Jones, at the 13th Pacific Science Congress held in Vancouver, Canada, in August of 1975, stated in the preface to the published symposium volume that, "firstly, there is the tropical Indo-Malayan rain forest—the world's richest reservoir of edible plants, large pristine remnants of which can still be studied in New Guinea and in the highlands of Southeast Asia" (1977:4). Les Groube (1989) reiterated what he and others
Figure 5. Archaeological sites in Papua New Guinea.
(Groube et al. 1986) had already said that, "In what must surely be among Pleistocene man's greatest achievements, the large island continent of Sahuland (New Guinea, Australia, and Tasmania) was colonized from Southeast Asia over 40,000 years ago and these humans found a continent which had already been invaded by many floristic elements from their tropical humid-forest homeland, at least along its northern boundaries." Groube felt that the floristic history of northern Sahuland (New Guinea) with botanical elements inherited both from the breakup of Gondwanaland over 100 million ya and representatives of later acquired Malaysian flora played an important role in human colonization (Groube et al. 1986). "Coming from comparable tropical humid forests, it must be assumed that the new immigrants were already familiar with appropriate methods of preparation of many of the food plants with contained toxins or inedible tissues. Many varieties of forest yams (Dioscorea spp.), the giant swamp taro (Cyrtosperma sp.) and sago (Metroxylon sp.) as well as many nut trees would have offered immediately available food resources" (Groube et al., 1986). At least one of the Pandanus palm nut species still lives only on the Island of New Guinea (B. J. Stone, personal communication 1994).

In an article entitled, Hunting and Gathering in Tropical Rain Forests: Is It Possible?, Bailey et al. (1989) point out the difficulties of foraging in tropical rain forests. In their review of Pleistocene geography of Sunda and Sahul, they point out by referencing Medway (1972:71), that prior to the rise of sea level between approximately 15,000 and 8,000 ya the overall picture was that of a cooler climate, supporting a "mosaic of forest, scrubs, and grasslands." Tropical rain forest was limited to the foothills and mountain slopes below 300 m. By about 8,000 ya, the glaciers had melted and swampland and tropical rain forest spread over areas that were formerly savannah and open forest. This, in conjunction with the suggestion that the extinction of the large marsupials 9,000 ya led to a greater dependence on plant resources, might relate to the development of early agriculture (Hope, G.S., and J. H. Hope 1976:70).

**From Foraging to Horticulture**

Based on White's (White et al. 1970) discovery of axe blades suitable for forest manipulation dating to 26,000 ya at Kosipe, in eastern Papua New Guinea Highlands, Hope's (1982) evidence for forest disturbance and charcoal in pollen cores dated to 30,000 ya, and evidence for possible deliberate splitting of timber in mid-montane forests at Yuku in the eastern Papuan Highlands dated to 40,000 ya, Groube (1989:294-295) concludes that humans were already modifying the inland forests of Papua New Guinea by Late Pleistocene (Figure 5). Groube et al. (1986) describe a probable function of the 40,000 year-old notched blades of Huon peninsula for, "ring-barking and otherwise modifying the vegetation--thus breaking the tree canopy and allowing the penetration of sunlight down to the ground plants. Such an ecological manipulation would lead to the enhanced growth of wild food plants such as yams, banana, sugar-cane, perhaps taro, tree fruits, Pandanus, etc." (Jones:1989). Jack Golson (1989:678-687) argues evidence for
agricultural management water control ditch systems at Kuk swamp in the Papua New Guinea Highlands as early as 9,000 ya (Figure 5). By about 5,000 ya, the mountain forest of Papua New Guinea had been extensively cleared of trees (Powell 1982) and pig-husbandry had begun. It was thought that taro was the main staple crop during these early stages of evolution of Highlands farming until the sweet potato replaced it in importance as recently as 1,000-300 ya.

Susan Bulmer (1976:129-131) argues that the flaked, notched blade evolved into a polished notched axe during the final period of its use in the Central Highlands Province of Papua New Guinea in the face of new trade in fine quality ‘axe/adzes’ from the quarries of Wahgi and Jimi Valleys farther west in the Papua Highlands (Chappell. 1966) (see Mt. Hagen, Figure 5). At Kosipe, a high altitude (2000 m) seasonal hunting camp, a variety of stone tools, including 11 notched blades, 10 adze/axes, 15 flakes and 5 other stone artifacts were excavated (White et al. 1970) (Figure 5). Six radiocarbon dates ranging from 25,000 B.P. to 4,000 B.P. have been obtained. In one profile dated between approximately 16,000 and 9,000 ya, the only difference in the artifact types found in two humus soil zones is the presence of a polished ‘axe/adze’ in the upper soil and no polished blades in the lower soil. In the most recent layer of early occupation at Yuku, the first flakes of polished ‘axe/adze’ blades are present in a layer over 10,000 years old. It would appear that the less efficient tools were replaced with functionally improved implements to meet the technological challenges of change from primarily a hunter-gatherer form of subsistence to horticultural and animal husbandry.

Now the stage was set for a rapid phase of cultural evolution in the Highlands when man would express himself as engineer and builder, ultimately lacing the entire New Guinea Highlands with suspension bridges, fences, well constructed buildings in compounds and open clusters, irrigation ditches, and tuber gardens that would become highly productive.

Conclusions

_Homo sapiens_ arrived in Sahul from southeast Asia ca. 40,000 ya or sooner as a hunter-gatherer with a Middle-Upper Paleolithic tool kit. On the present-day continent of Australia, he remained a hunter-gatherer while beginning to make "Neolithic-style" ground-edge stone tool blades. From archaeological evidence in Papua New Guinea (the eastern half of the island of New Guinea), it seems likely that, upon his arrival there ca. 40,000 ya, _Homo sapiens_ had begun to manipulate his surroundings prior to evolving through the stages of nurturing, to replanting, to intensive horticultural activity with an accompanying evolution of a flaked blade Paleolithic type tool to a "Neolithic" tradition with finely ground and polished blades.
CHAPTER III
THE STUDY AREA

Getting to the Central Highlands of Irian Jaya

We know very little of the movement of the first voyagers after they landed on Sahul. We do not even know where they made landfall. It could have been in the present western Birds Head area of New Guinea on the north, or southward along the broad Sahul Shelf that separated New Guinea-Australia from the eastern end of the Indonesian archipelago. (Figure 4)—or even at multiple spots at different times. We do know that the early inhabitants spread out to occupy most parts of Australia and Tasmania, and that they were in the Highlands of the eastern part of New Guinea ca. 40,000 ya.

In addition to overland travel from points of landfall, I strongly suspect that once on Sahul, those early voyagers moved around the coastline of the Sahul continent rapidly and with relative facility, picking their spots for exploration into the interior up and/or along rivers. For the maritime people who had recently arrived from the Sunda Shelf by one or more voyages, travel outside the surf zone from river mouth to river mouth, around tidal mangrove swamps and into estuaries with accommodating sand beaches would have been much easier than moving directly overland, through mangrove and other coastal swamps and dense tropical rainforests. It is by this circum-Sahul coastal exploration that I suspect the early travelers found the river routes of ingress from the coastline into the interior of New Guinea, as well as a route from eastern New Guinea across two expanses of water to reach the island of New Ireland by 33,000 ya (Figure 4).

Early prehistoric humans could have entered the study area in the Central Highlands of Irian Jaya from any or all of the four cardinal directions: from the west, from both the north and south coasts of the present-day configuration of the Island of New Guinea, or from the east, working their way through the central mountain core, even all the way from the early-dated habitation sites at the east end of the island. All are very arduous routes today but accomplishable. At least some became trade routes between the Highlands and the north and south coasts, along which goods slowly filtered from hand to hand; not transmitted by single, round-trip journeys by regional traders. From either of the two plausible early landfalls west of Enarotali on the Birds Head of the island the area could have been accessed by overland routes to Enarotali and then eastward (Figures 1 and 4; Birdsell 1977). Two workable routes near the west end of the Central Highlands that transect the difficult Highlands-lowlands interface are (1) from Uta (alternate spelling Oeta) to Tigi Lake and on upward to Paniai Lake, and (2) from the modern town of Nabire on the north coast to Paniai Lake and then eastward into the heart of the Highlands (Figure 3). Interestingly, an east-west trending route in the higher part of the Highlands extends from Enarotali
eastward into the study area to Mulia, and from there routes, all arduous, may be taken into the Grand Valley, which is the present-day population center for the Central Highlands of Irian Jaya (Figure 3).

Moving eastward along the north coast, the Mamberamo River furnishes the next ingress across the broad, forest-covered swampland that separates the Central Highlands from the coastal area (Figure 1). The mouth of the Mamberamo is at about the same geographic position relative to the present day shoreline as it has been during ice stages of the last 120,000 years (Figure 4). The island drops off abruptly below sea level to oceanic depths off the north coast along a tectonic plate juncture. Changes in sea level during this period of the Pleistocene Ice Stages moved the shoreline laterally only short distances. Early humans exploring the coastline would have found this route of access. From my ethnographic work along a north transect from the lowlands into the Highlands in 1991, I concluded that the upper tributaries into the Mamberamo from the Highlands and then the Mamberamo itself provided a possible trade artery between the Central Highlands and the north coast (Hampton 1992a).

From the present day south coast, in addition to the route from Uta, two routes have been used in historic times into the study area which, presumably, were used as trade pathways for prehistoric people. Both routes follow rivers, one from just north of Agats and the other from south of Agats to the Highland mountain base where overland routes follow the approximate fall lines of two rivers into the Highlands (Figure 3). Via the northerly route, the Baliem Gorge can be traversed along steep-walled canyons into the Baliem Valley while the southerly route follows the Brazza River on land to Dekai and then on land following the river to the Sela area (Figure 2).

From Papua New Guinea east of Irian Jaya, both the Sepik River on the north and the Fly River on the south furnish river routes to the mountain core of the Central Highlands (Figure 5). Overland routes must be followed for the steep climbs into the Highlands.

I believe that over time, all of these routes were ultimately explored by prehistoric people and that some became avenues of trade between coastal areas and the Highlands. This might be considered a working hypothesis that should be pursued in our endeavors to understand both the regional migration of people and the diffusion of goods and ideas within Irian Jaya.

The Natural Environment

The Grand Valley is a northwest-southeast oriented, oblate-shaped flood plain (Figure 6). (Note: The Grand Valley of the Baliem is sometimes referred to by others as the Baliem Valley. Hereinafter, I will continue to refer to it as the Grand Valley.) Marshy in many spots, the valley floor is a mosaic of sweet potato fields and irrigation ditches interrupted by a few low-lying hills of limestone and sandstone (Figures 7 and 8). Surrounding mountains rise from the valley floor, elevation 1,600 m above sea level,
Figure 6. The Grand Valley.
Figure 7. Grand Valley mosaic of sweet potato gardens and irrigation ditches.
Figure 8. Aerial view of sweet potato gardens in the Grand Valley.
to heights of 2,500 to 3,000 m, while farther mountains rise to heights of 4,000 m and more. Snow can often be seen to the southwest atop the Trikora Crest (Wilhelmina Top) 4,750 m (Figure 3). A remnant Pleistocene glacier and snow is present on the Jaya Crest at the western end of the study area (Figure 9). Swift tributaries of the Baliem River spill out of the surrounding mountains, abruptly slowing down as they reach the valley floor and wind through the maze of sweet potato fields and networks of ditches to the centrally located Baliem River which meanders the length of the valley with a deep, swift-flowing current. Promontories and topographic ridges around the edges of the valley often accommodate caves at or near the junctures of steep slope faces with the valley floor (Figure 10).

Along the southeastern fringe of the valley from Pugima southward, past Seinma, to the head of the Baliem Gorge, where limestone rock erratics abound, an artful pattern of rock walls attest to the horticultural practice of the indigenous inhabitants (Figures 6 and 11). Here a karsted topography is also present on a limestone substratum with numerous sinkholes (Figure 12). Elsewhere around the margins of the valley a few scattered sinkholes in limestone terrain are indicative of underground streams which commonly emerge and disappear, and sometimes issue forth from caves at the valley floor. Scattered pools with no visible inlets or outlets give further testimony to an underground system of water movement. Upriver, west of the Grand Valley, even the Baliem River itself disappears only to emerge out of the subterranean from what must be an extremely large, cavernous system.

West of the Grand Valley, the East Baliem River originates at Lake Habbema at an elevation of 3,225 m in mountainous terrain, well above the 2,950 m upper limit of most habitation sites (Figure 6). The East Baliem flows westward before swinging north in an arc which joins the West Baliem River near its headwaters. The West Baliem then becomes the North Baliem as it flows through the Western Dani territory of narrow, steep-walled valleys where small, scattered settlements cling to the sides of valley slopes. As the North Baliem River flows eastward it gathers volume and becomes the Grand River. After approximately another 50 km it loses its gradient and flows into the Grand Valley.

At the southeast end of the valley, the Baliem River enters the steep-walled Baliem Gorge, where it rushes in white water torrents through narrow canyons as it descends out of the Central Highlands through territories of the Silimo, Hupla, and Momuna language speaking groups onto the flat jungle swampland of southern New Guinea (Figures 6 and 13).

The study area west of the Baliem River system, starting at Mulia on its east end, is bisected north-south by a relatively flat east-west travel route that approximately follows topographic contours at elevations of about 2,050 m from Mulia to Beoga before the route loses elevation west of the study area into the Enarotali-Paniai Lake area (Figure 3). At Mulia the people live on lower hillsides and valley floors at elevations which vary from 1,160 to 1,980 m. Rugged, high mountain peaks rise north and south of this route to elevations up to 4,040 m to the north and 5,030 m on the south at the Jaya Crest (Carstenz
Figure 9. Snow and a remnant Pleistocene glacier on the Jaya Crest.
Figure 10. Caves are sacred places of mystery from which water often flows.
Figure 11. An artful pattern of rock walls indicates agriculture.
Figure 12. Attracted gardens within a karst sinkhole.
Pyramid) which is the highest point on the Island of New Guinea. The route lets down in elevation from the west end of the study area, north of the Jaya Crest to Enarotali at Paniai Lake. Here at the population center for the Kapauku people, the elevation of the swampy, flat Kamu Valley floor is 1,500 m. almost the same as the 1,600 m for the Grand Valley floor to the east. The surrounding mountain peaks in the Paniai area rise to well over 3,000 m.

East of the Grand Valley, the east-west trending Highlands core follows the Snow Mountains into Papua New Guinea. Koch in his dissertation (1967:1) states that this area is composed of "the most formidable terrain in the whole Central Range and that because of the virtual absence of foreign influence in most of its valleys, the eastern Central Highlands offer unexcelled opportunities for the kind of ethnological research that seeks to investigate the indigenous culture of a people before it is affected by exogenous change caused through contact with Western civilization."

Even at this date, 33 years after Koch wrote his dissertation, small isolated groups of indigenous people, still relatively untouched by outsiders, can be found by careful search. The problem is not so much that small groups might not be found, but once spotted from the air, that of planning routes of access and then traversing narrow, steep walled V-shaped valleys, with torrents of white water at their bottoms. Rain-slick steep valley sides and cliffs, sometimes with relief up to 1,500 m and slope angles varying from 35-75°, must be traversed. In comparison to the Grand Valley with its fringe of slopes primarily composed of limestone, many of the outcrops along streams and valley walls east of the Baliem are composed of shales and siltstones that become gumbo-like clay in spots on eroded, usually slippery surfaces. There are few routes, even for short distances, that are easily traversed; there are no broad valley floors to accommodate the inhabitants. Residences are located along ridges and on flat interruptions of steep mountain slopes (Figure 14).

Climate

The study area is characterized by the absence of perceived seasonal weather variations by the local inhabitants, nearly equal hours of darkness and daylight per day on an annual basis, moderate temperatures within the habitation zone (1,000-2,950 m) and abundant rainfall.

In the Grand Valley, the inhabitants enjoy a year-round moderate climate. The absolute temperature range at Wamena is from 29.5° C (85° F) to 6° C (42° F), with a mean daily range from 14° C at 6:00 a.m. to 24° C at noon. The mean relative humidity at Wamena is 98 percent at 6:00 a.m., 60 percent at noon, and 80 percent at 6:00 p.m. Up the hillslopes from the valley floor the temperature ranges drop with increasing elevation. Frosts are not unusual at elevations above 3,000 m. On the higher mountain peaks snowfall occurs from time to time (Figure 9). Rainfall per year, as measured at Wamena, is 2,100 mm. Rainy days (6.0 mm or more) are 245 per year.
Figure 14. Residences on flat interruptions of steep mountain slopes.
At sunrise, fog often fills the topographic lows in and around the Grand Valley as well as in the narrower valleys away from the Biliem. As the sun rises this fog is burnt off, but higher on mountain slopes and around mountain peaks, skirts of clouds usually persist and build up during the afternoons and evenings.

Northwest of Wamena (west of Bokondini near Karubaga, Figure 3) O'Brien did her research in the geographically restricted Konda valley at an elevation of 1,500 m. She describes the climate as having little seasonal variation, where, "Night temperatures seldom fall below 50 degrees fahrenheit and daytime temperatures usually reach the high 70s or low 80s by early afternoon. Early morning fog is common" (1969:19). O'Brien found November to April to be the wettest months, just as I found them to be in the Grand Valley and elsewhere throughout the study area. The average annual rainfall is 2,540 mm.

West of the study area in the Kamu Valley near Enarotali, at the same elevation as the Grand Valley, Pospisil (1956:9; Figure 1) reported that valley temperature reaches "about 28° C at noon, between two and three in the afternoon with the arrival of a short tropical storm it drops to about 20° C, and then is followed by a warm, mild evening. During the night the air cools off, and toward the morning the temperature may drop to 6° C."

Other Natural Aspects of the Environment

Thunderstorms with accompanying lightning are events which the people are used to seeing. Rainbows and heat lightning are also common occurrences.

Floods are not uncommon in the steep-walled canyons of the Central Highlands. Hayward (1992:53) reports that west of the Grand Valley, in the upper reaches of the Biliem River, unusually heavy periodic flooding occurs during the wet season in low-lying areas because of the limited number of outlets through which the water leaves the ‘plateau’ as it flows through underground limestone caves. In the Grand Valley, after periods of heavy rainfall to the west, the river sometimes floods large expanses of adjoining potato fields.

Flora

Flora of the tropical rain-forest which borders the lower edge of the Central Highlands, merges upward with the mountain flora of the foothills and lower mountain slopes. The giant swamp taro (Cyrtosperma sp.) and sago (Metroxylon sp.) of this lower environment is a food source for lowland dwellers. Coming up the slopes out of the lowlands, ridge crests are covered with dense growths of trees of the rain forest that merge upward into the midmountain forest.

From botanical work done on their discovery visit to the Grand Valley in 1938, Archbold, Rand, and Brass concluded that the midmountain forest was the most important floral zone on the higher portions
of the Baliem (Grand) Valley floor and was dominated by oak (*Quercus* sp.) with some of the large coniferous araucaria (*Araucaria* sp.) (1942:282). Savannah grasses, more typical of lowland treeless areas, had taken over abandoned garden areas and burned off slopes (Brass 1941:338).

From about the 2,000 m level on the mountain slopes surrounding the Grand Valley, the beech forest zone with its moss-draped trees extends up to the subalpine forest zone which flourishes between 3,000 and 4,000 m (Archbold et al. 1942:282-283). Subalpine merges upward into alpine above 4,000 m on the taller peaks. Arctic desert exists on the Pleistocene glacial cap remnant atop the Jaya Crest (5,030 m) in the southwest corner of the study area (Figures 3 and 9).

Within the spread of the vegetation zones occupied, or at least harvested, by the indigenous people of the Highlands, virgin forests contain a great variety of tall hardwood evergreens, scattered softwood trees, different species of *Pandanus* palms, other palms, bamboo, rattan, shrubbery, vines, bromeliads, and many varieties of flowers, weeds and grasses.

Throughout the Highlands study area, many fallow slopes, extending to ridge crests and mountain peaks, are in various stages of regrowth and covered with shrubbery and grasses (Figure 15).

**Fauna**

New Guinea, like Australia and Tasmania, was separated by oceanic stretches of water from Asia at the time when placental mammals evolved and dispersed throughout the Asian continent. It was not until the eastward extension of the Sunda Shelf from Asia, and the combining of Australia, New Guinea, and Tasmania into one continent (at periods of maximum lowering of sea level during the Pleistocene) that humankind, dogs, pigs, bats, flying foxes, and rodents are thought to have found their ways to New Guinea as representatives of placental mammals. Although the first entry of pigs into New Guinea is still debated, it is pointed out that pigs might not have entered New Guinea until "by 6,000 B.P. or possibly earlier" (Spriggs 1984). "According to Bellwood (personal communication) a date of 2,000 B.P. would fit the linguistics data better" (Cavalli-Sforza et al. 1994:346). Along with these mammals, the more primitive marsupials also abound in New Guinea.

Throughout the study area the native mammals and reptiles present at the times of first modern contacts consisted of several species of marsupials, including the tree kangaroo and bandicoots, plus both wild and feral pig, the rare New Guinea "singing dog" and other species of dog, both small and large rats, as well as smaller rodents, bats and flying foxes, a few lizards, frogs and some non-poisonous snakes, including at least one variety of python.
Figure 15. Many fallow slopes extend to ridge crests and mountain peaks.
Birds abound, including the large ground-running cassowary, numerous species of birds of paradise, parrots, cockatoos, the large New Guinea pigeons, hawks and a few other soaring birds of prey like sea eagles, two kinds of heron (one blue-gray, another white), cormorants, and a variety of ducks and assorted song birds. In the sub-alpine and alpine zones some grouse are present.

As one would expect, insects are numerous. Flies can be thick, especially around occupied areas where there is an abundance of pig scat. Bees and wasps are present as well as fleas which are transported by pigs and infest both local dwellings and individuals' hair. Beeswax is culturally important, used as a glue for multiple purposes. Moths and butterflies of various sizes are present which account for the numerous cocoons which are culturally used, both as decorative objects and wrapping material. Many kinds of spiders are present. Some, like the Cryptophora moluccensis are quite large (identified courtesy Edwin Licht, University of Colorado Museum, Boulder, 1991) (Figure 16). Their webs are culturally important and are used to make necklaces, which, after empowerment through ritual, are thought to be supernaturally powerful and used to protect the body from ghosts.

Lakes and rivers, prior to the arrival of modern outsiders, were without fish but many were and still are teeming with crawfish, and I suspect that the very large crawfish of the Buriem River might even be misidentified and actually be a fresh water lobster.

The larger marsupials, such as the tree kangaroo and bandicoot; plus wild and feral pigs; and certain highly desirable birds, such as the ground-running cassowary and most birds of paradise, have long since been hunted out of the Grand Valley and other densely populated areas by the indigenous inhabitants.

Geology

The central mountain chain that extends the length of the island of New Guinea is a 150 km-wide band of jumbled peaks and valleys that rise abruptly from near-sea-level elevations to peak crests of elevations that often exceed 4,000 m and locally exceed 5,000 m in the study area (Figure 1). Rock strata that are often severely folded, faulted and crumpled are of diverse ages and lithologies.

This composite of diverse stratigraphy and complex tectonics comprise the geologic terrain to which the indigenous people adapted. From the rock outcrops, the people located and identified those kinds of rocks that were best suited for their tools and symbolic stones. Within the terrain of mostly steep hillsides and narrow valleys, they adapted to their horticultural lifestyle as they evolved from a hunting and gathering culture to a predominately sedentary and horticultural subsistence, practicing both animal and plant husbandry.

Most of the geology that has been described in the literature in the Central Highlands mountain chain has been to the west of the study area in the Vogelkop (Birds Head) of Irian Jaya and to the east of the study area in Papua New Guinea. From publications in these areas, my own geological field work
Figure 16. *Cryptophora moluccensis*, a culturally important spider.
within the study area, and from petrological analyses of rock samples, tool blades, and symbolic stones which I collected in the study area and which were analyzed as a courtesy by Elizabeth A. Medlin, James Munoz, and R. Jeffrey Swope at the University of Colorado, Boulder and R. N. Guillemette at Texas A&M University, College Station. I have put together the following summary of the geology.

**Stratigraphy.** The central mountain chain was formed during the late Cenozoic by the convergence of the Australian Plate from the south with the Pacific Plate from the north. The southern part of the extensive east-west trending central Highlands of the study area consists largely of sedimentary rocks ranging in age from middle Jurassic to middle Miocene and deposited on a north-facing continental shelf now raised high and deformed. At the top and youngest of this part of the sequence in the Highlands is the New Guinea Limestone group of Tertiary age and possibly uppermost Cretaceous (Visser and Hermes 1962:79). The New Guinea Limestone consists primarily of shallow water limestones deposited on a shallow carbonate platform. These limestones have been heaved upward to form the great mountain wall that surrounds the Grand Valley and some of the peaks and other topographic features of the extensive chains of mountains and valleys that extend the length of the Irian Jaya Highlands from the border of Papua New Guinea on the east to past Paniai Lake (Enarotali) on the west (Figure 1). The sequence may be as thick in the study area as 1,600 m from its measurement at the type locality to the west (Visser and Hermes 1982:79). Bryozaea, algae, corals, echinoid fragments, molluscs and foraminifera are present. The limestone typically weathers gray and erodes to form pinnacle and karst topography. It is within the New Guinea Limestone that most of the sacred caves and rock shelters of indigenous inhabitants are located. Chert nodules from within the New Guinea Limestone, and of importance to the inhabitants for tool chips, are sparse and small, generally no more than 2-4 cm in longest dimension.

The New Guinea Limestone grades conformably downward into the underlying Kembelangan formation which ranges from Paleocene to Cretaceous in age. West of the study area, the Kembelangan is estimated in one locale to be 2,000 m thick; in another, 2,900 m thick (Visser and Hermes 1962:73). Although I do not know how thick the Kembelangan is in the study area, I estimate that a thickness in the range of 2,000 m is reasonable.

The Kembelangan consists of four members, with lithologies of claystones, shales, argillites, siltstones, and some interbeds of quartzitic sandstones (Visser and Hermes 1962:70). A limestone is at the base of the oldest member. Metamorphism of the Kembelangan seems to increase generally from west to east in Irian Jaya. In lower units of the Kembelangan, claystones in the west change to shales, meta-argillites, and even some slates, phyllites, and finally mica schists and talc schists eastward. When wet, the narrow trails that wind through the Highlands topography are treacherously slick in places where they cross outcrop slopes of Kembelangan claystones or clayey siltstones. Colors range primarily from gray-
black claystones, shales, and argillites to buff-white sandstones. Minor red and yellow interbeds of claystone are locally present.

Belemnites, ammonites, and foraminifera are present. Ammonite content at some localities is extensive. Ammonites collected from river detritus of tumbled boulders and pebbles are often preserved as sacred objects by the indigenous inhabitants. River-rounded claystone and argillite pebbles, with and without fossils, are also favored as sacred symbolic stones (detail in Chapter VII). In one locale, meta-argillite boulders recognized for their qualities of hardness and durability are selected as source stones for tools as well as to be shaped into tabular symbolic stones.

In the southwest corner of the study area Jean Jacques Dozy, a Dutch petroleum geologist, reports a very hard, dense, blue gray quartzite or hornfels-like rock composed of chlorite and finely divided magnetite (Dozy 1939). It is possible that these rocks belong to the Kembelangan formation (Dozy 1939). Intruded up into the Kembelangan(?) in this region is a dome-shaped, black igneous mass that rises to an elevation of nearly 3,660 m, more than 150 m above the floor of a narrow valley. In 1936 this mass was named "Eertsberg" (Dutch for "Ore Mountain") by its discoverer, Dozy (Wilson 1981:6). The history of the discovery and later development of the Eertsberg for its base metal content is noteworthy and one of the great engineering feats of modern time. Forbes Wilson documents the story in a dramatic book entitled The Conquest of Copper Mountain (1981) in which he also comments on the ways that the mining operation impacted the local, indigenous population.

West of the study area on the Vogelkop (Birds Head) of Irian Jaya, a basement sequence has been documented of Paleozoic age rocks of low-grade metasedimentary slates, quartzites, and graywackes (Hamilton 1979:233-234). To the east but also in the Vogelkop on the Birds Head, rocks of higher metamorphic grade, up to kyanite schist, are common. To the southeast, in Papua New Guinea, east of the study area, a Paleozoic sequence (and also Triassic) forms the basement terrain upon which the shelf deposits of the later Mesozoic and Paleocene were deposited (Hamilton 1979:234). At other locales in Papua New Guinea, rocks of late Triassic and Jurassic have been reported with one Jurassic sedimentary sequence containing widespread basaltic and agglomerate flows. Lower Cretaceous volcanic rocks overlie Upper Jurassic shale in a sequence also described in Hamilton (1979:238). Quaternary volcanic rocks are present in central Papua New Guinea as reported by Hamilton (1979:241) and presumably crop out in unmapped areas to the west in Irian Jaya.

Within the southern half of the study area, Paleozoic rocks have not been described, either by other geologists or by me, but a linear, east-west trending slice of undescribed Paleozoic rocks is shown to crop out along the southern boundary of the study area on the Tectonic Map of the Indonesian Region by Warren Hamilton (Hamilton 1979).
Volcanic rocks have not been reported to exist within the study area by outsiders, but andesite-basaltic rocks have been petrographically identified by Medlin, Munoz, and Swope (unpublished report) from rock samples taken by me in the Sela-Langda area, southeast of the Grand Valley (Figure 3). It is from select fine-grained, homogenous rock of this sequence that the Una and Kimyal people make their adzes and stone knives. Based on regional extrapolation from known volcanic rock sequences to the east in Papua New Guinea, these volcanics could be anywhere from Jurassic to Quaternary in age.

Whereas the south half of the east-west trending central mountain chain that makes up the Highlands of central New Guinea consists primarily of Cretaceous to Miocene age Kembelangan and New Guinea Limestone formations within the study area; the north half of the mountain chain consists of a Tertiary melange, in which deeper water equivalents of the shelf strata were jumbled with ophiolite slices and metamorphic rocks, including glaucohpane-epidote schists, blueschist, greenschist, phyllites, and amphibolites. High pressure metamorphic rocks of slate and marble are also present. Along linear strike of the ophiolite-melange belt, some rocks at certain locales contain hornblende, garnet, epidote, and kyanite. The entire ophiolite-melange belt of the study area is known only from sketchy reconnaissance (Duncan B. Dow and Gary Minke, verbal communications 1983); extrapolations across the area from work reported at the Indonesian Petroleum Association Thirteenth Annual Convention (1984), Warren Hamilton (1979), Visser and Hermes (1962); and by my own excursions into or across the ophiolite-melange belt as I followed hypothetical trade routes or while searching for rock quarries.

In the Yeineri area, the indigenous people found just the right combination of rocks cropping out within the melange-ophiolite belt to establish a stone quarrying operation which is discussed in Chapter VIII.

Tectonics. The great central mountain chain that extends for most of the length of the island of New Guinea makes up the entire central Highlands of New Guinea (Figure 1). This mountain chain was formed in Cenozoic time by the convergence of the Australian Plate from the south with the Pacific Plate from the north. Dow and Hartono (1984:145) "feel that the main mechanism of convergence over most of the region has been by southward underthrusting of the Pacific Plate along thrust zones at right angles to the regional stress accompanied by very major lateral offsets parallel to the regional stress." Based on both Dow and Hartono’s interpretation (1984:145) and Hamilton’s (1979), the approximate 50 km wide ophiolite-melange belt of the northern half of the Highlands mountain chain is seen to be faulted against the continental rocks that make up the southern part. Davies (1971) regards this ophiolite-melange belt as the upturned southern end of oceanic crust mantle of the Pacific Plate. The earth movements that commenced in the latest Miocene or earliest Pliocene according to Dow and Hartono (1984:145) are still continuing today. Although most seismicity earthquake epicenters fall outside of the area of study, to the north, northeast, east, and west, two epicenters are located within the study area (Dow and Hartono
Minor earth tremors occur every month or so, some strong enough to visibly shake houses. Major earthquakes are rare but often tremors are strong enough to cause mudslides carrying dense vegetal material down steep slopes. It does not take much shaking to initiate slides of water-soaked soil and shallow-rooted forest material on slopes near the angle of repose. In 1989, soon after I left the Kurima area, an earthquake initiated landslides that buried villages at great loss of life to the local inhabitants.

Brine Pools (Salt)

Salt (NaCl) is precious to the Irian Jaya Highlanders; its consumption is a luxury. A special treat is to eat bits of salt with raw ginger and cooked sweet potato. Salt is a valuable trade item, with its value increasing the farther away from the salt sources. Within the study area I know of only two major supply points. Three other small brine pools only satisfy the hunger for salt of the closest inhabitants and a few travelers when they pass by.

In the Grand Valley near Jiwika, the Ileukaima brine pool is a major source of salt for not only most of the Dani in the Grand Valley but also as a valuable trade item (Figure 6). Much farther west, near Ilaga in the western part of the study area, another major brine pool furnishes salt via trade linkages all the way eastward to the Dani in the Swart Valley region (west of the Grand Valley) and as far to the west as the Enarotali area at Paniai Lake (Figure 3). At the head of the Baliem Gorge, southeast of Tangma, small brine pools bubbling forth out of a slumped hillside area just above the Baliem River are visited by local inhabitants (Figure 17). I have heard of two other minor salt sources, one near the Yeti River between Hetaquima and Kurima (Figure 6) and one in Yali territory near Angguruk, both of which I was never able to locate.

At Ileukaima the brine pool, about 10 m in diameter and less than a meter deep, lies beside a fresh water stream. In 1983 I sampled the water and found its salt content to be almost pure sodium chloride (NaCl) which worldwide we use as table salt. As far as a source for the salt water, I can only hypothesize that this and the other salt water springs are sourced by percolating underground water flows that dissolve salt (NaCl) from bedded salt, probably within the New Guinea Limestone formation, before emerging at the surface.

The brine at Ileukaima is extracted by using strips of dried banana trunk which have been prepared at habitation sites before transport to the brine pool to be immersed in the salt water (Figures 18, 19, 20, and 21). These thin strips of banana trunk, their porous cellular structure now filled with brine water, are then bundled up and carried back to the hamlets. Hard ashy salt cakes are produced first by evaporating the water out of the banana trunk strips, leaving a salt residue in each organic strip. Then, the strips are burned, leaving a salty ash residue which is molded into a salt cake with droplets of water and wrapped in a banana leaf to harden. The salt ball is then ready to be transported for trade or stored for use. At the
Figure 17. Small brine pool at head of Baliem Gorge.
Figure 18. At Ileukaima, thin strips of banana trunk soak up the brine.
Figure 19. After drying, the strips are burned, leaving a salty ash.
Figure 20. The salty ash is molded into a salt cake.
Figure 21. The salt cake, a prized commodity for domestic use and trade.
brine pool near llaga, the local people generally prefer to use the banana leaves to soak up the salt brine. The leaves are then stacked and burned to produce the salt cakes.

Control of the brine pools was an important factor of Highlands life. This subject is discussed in Chapters VII and XI.

The Cultural Landscape

Understanding the cultural landscape within the study area is difficult but desirable before building ethnoarchaeological paradigms of behavior regarding stone tools and symbolic stones, both profane and sacred, within the Highlands' cultures. The difficulty is identifying and understanding the hierophanies (things wholly different from the profane that manifest themselves to be sacred) within a complex environment of seen and unseen entities. Eliade is well known for his works in this subject area of research (Eliade 1957, 1958, 1974, 1987a). He was probably the first to introduce the term "hierophany" which he believed was a fitting term because it is implicit in its etymological content i.e. that something sacred shows itself to us (Eliade 1987a:11-12). I will continue to use the term as I believe it has application to a description of the complex cultural landscapes of the Irian Jaya Highlands.

In recent years scholars of non-Western belief systems have been trying to advance beyond antiquated terms such as "animism" and "animatism" when speaking of the conceptual relations between indigenous peoples and their cultural landscapes. Larry Loendorf (personal communication 1994) believes that Irving Hallowell, the Algonquian anthropologist, made a well-known conceptual leap when he used the term "other-than-human-person" to characterize how Canadian Ojibway behaviorally interacted with entities in their non-built environment, with which they transacted for their material and psychological benefit.

Earnest S. Burch, Jr., an anthropologist-ecologist, described the extensive domain as perceived by the traditional Arctic Alaskan Eskimos as the "the nonempirical environment," with numerous and diverse phenomena (1971:148, 151). At one extreme were nonempirical qualities attributed to quite empirical phenomena such as human beings, with individuals who have magical powers to be able:

to fly to the moon or to suck pain from a person's body through a drumstick. At the other extreme were nonempirical phenomena which can best be described as 'qualities' or 'states.' An example would be a mountain called sinigtarniayaq ('Don't sleep here'), where if a person were to sit down anywhere on its slopes, he is supposed to go to sleep and never wake up. Other entities are regarded as being 'alive' in the sense of being units capable of goal-directed action [Burch 1971:151].
The entities which the Eskimos regard as being 'alive' range all the way from phenomena that are human-like creatures, to animal-like, to completely invisible. In the study area of the Highlands of Irian Jaya such entities are ghosts, spirits and demons of the spirit world. By occupying both living and non-living material objects they may take on quite an array of appearances.

Recently, David L. Carmichael, an archaeologist-consultant regarding Native American issues, has characterized Indian religions as "cosmotheistic," by which he means, "they believe that all natural parts of the world have a humanlike force. In such a belief system, plants, animals, rocks, and other natural entities are conscious and willful and must be treated with proper respect. The source areas for plants, animals, and earth materials may be considered powerful or sacred..." (L. Loendorf and D. L. Carmichael, unpublished paper 1994:6). By comparison, plants, animals, rocks, and other natural entities (other than human beings) in the landscape of the Highlands of Irian Jaya are not conscious and willful in themselves but they may be the hosts for spirits that are. Additionally, any of them and/or their source areas may be imbued with supernatural power which makes them sacred and worthy of respect.

Eliade (1987a:11-13) succinctly describes what I believe serves well as a prologue to my further review of an interpretation of the cultural landscapes within the Highlands of Irian Jaya—a prologue that really provides an archetypal framework for paradigms that I will later develop from data in Irian Jaya:

> The modern Occidental experiences a certain uneasiness before many manifestations of the sacred. He finds it difficult to accept the fact that, for many human beings, the sacred can be manifested in stones or trees, for example. But as we shall soon see, what is involved is not a veneration of the stone in itself, a cult of the tree in itself. The sacred tree, the sacred stone are not adored as stone or tree; they are worshipped precisely because they are hierophanies, because they show something that is no longer stone or tree but the sacred, the ganz andre.

> It is impossible to overemphasize the paradox represented by every hierophany, even the most elementary. By manifesting the sacred, any object becomes something else, yet it continues to remain itself, for it continues to participate in its surrounding cosmic milieu. A sacred stone remains a stone; apparently (or, more precisely, from the profane point of view), nothing distinguishes it from all other stones. But for those to whom a stone reveals itself as sacred, its immediate reality is transmuted into a supernatural reality. In other words, for those who have a religious experience all nature is capable of revealing itself as cosmic sacrality. The cosmos in its entirety can become a hierophany.

> The man of the archaic societies tends to live as much as possible in the sacred or in close proximity to consecrated objects. The tendency is perfectly understandable, because, for primitives as for the man of all pre-modern societies, the sacred is equivalent to a power, and, in the last analysis, to reality. The sacred is saturated with being. Sacred power means reality and at the same time enduringness and efficacity.

It was Thomas who expressed a famous insight years ago that, "If men define situations as real, they are real in their consequences" (Madge 1962:76).
When I first visited the Grand Valley in the Highlands of Irian Jaya in 1982 I had no idea of the complexity of the nonempirical environment I was entering, nor of the importance of the role played by the landscape in shaping not only cosmic views of these same inhabitants, but their daily lives. Now I have an inkling of what is going on in the "nonempirical environment" and how this affects the lives of the Highlands' inhabitants—but only an inkling. There is a pervasive diversity and hierarchy of spirits and ghosts dwelling in the Highlands, all of which must be treated with great respect, discussed only in whispered tones between the "initiated" (all adult indigenous males), and continually appeased by both formal and informal action.

I have found both a great commonality among the different language-speaking groups in the Highlands in outlook and function of their "nonempirical" and supernatural domains but also, certainly, differences in details. The commonality is understandable because all the cultural systems of the different Highlander groups are but variations of the same Papuan theme.

Prior to entering the Grand Valley in the spring of 1982 both Sjamsuarni Sjam, our trekking guide, and Tom Bozeman, an early Protestant missionary in the Grand Valley, told our group that many areas in the landscape as well as subjects for discussion were taboo. Taboo objects, not to be seen by outsiders; sacred places, not to be entered; and taboo subjects, not to be discussed, would be referred to as wusa or wesu by the Dani. That was our signal to pursue the subject no more or to look the other way. Not knowing what was being said by the Dani I was impressed with the profundity of places and subjects which were wusa, and how often Dani men would whisper together in hushed tones before answering our many questions. Later, I would learn that the Dani whisper among themselves and often put cupped hands to a person's ear and whisper directly into the ear when a subject is being discussed which is wusa and which the ghosts should not know about. According to Heider (1970:136-137):

Wusa corresponds to the taboo and mana of anthropological literature. Wusa is the attribute of sacredness, the association of an object or class of object or act with the supernatural world. Wusa is used in one sense to mean "prohibited for sacred reasons." such things as the eating of certain foods by certain people, or performing certain acts such as defecation or collecting firewood in certain areas; or the area belonging to a man who has marked it out with knotted grass signs. Wusa also refers to the power inherent in certain things of ritual significance - a power in itself inimical if limited to the ritual context. But wusa must be ceremonially negated when the ritual is over; for example, men who have handled a corpse in the course of preparing it for the pyre or men who have worked on the building of a watchtower have come into contact with wusa, which must be removed from the men by a feather (a process called duesi balin, feather cutting) before they resume normal activity.

The antonym of wusa is weligat, profane. In other contexts weligat is also used to mean "it is just there, it has no particular meaning," or "it is given free, there is no obligation to repay."
Wusa (Sacred) Places. Wusa as sacredness or potentially dangerous power may be associated with places in certain ways. There is the permanent wusa attached to the araucariagrove, Homuak, and the single lone-standing araucaria tree called Mobile near the compound of Mobilatma. These are areas which have been declared wusa by placement of the knotted grass sign, the siro.

... Various norms which restrict certain kinds of human behavior have supernatural sanctions. The word wusa is used to describe the restricted behavior, meaning behavior restricted or prohibited on pain of punishment by ghosts. Many of these norms are exclusive, restricting certain behavior only for members of a particular sib or moiety. In particular, members of a sib are restricted from eating the bird of their sib; a number of foods are restricted for members of the Waja moiety, and a few are restricted for members of the Wida moiety. Sexually exclusive restrictions are those prohibiting women from entering men’s houses or from working in gardens after rain ceremonies.

... In all cases of wusa restrictions, the sanctions derive from generalized fear of the ghosts who enforce them.

The average Highlander does not understand all of the protocol that must be used to deal with ghosts and other "nonempirical" aspects of his/her world: only the big men (leaders) and other shamans do. Certainly no outsiders can be experts on the subject.

Origin Myths

Through their known mythology, the inhabitants of the Highlands have accounted for the origin of the physical world around them as well as all life, both seen and unseen therein. The people’s stories are narrations of historical events, not told in chronological order like our histories. Often the single events in the narrations that relate the totality of creation, as passed on by different storytellers throughout the Highlands, have commonality of substance, but just as often singular differences. Most of the stories of origins are cloaked in secrecy from the uninitiated (all females, young boys, and outsiders). They are perpetuated and told as parts of the education process when young boys enter manhood through rites of passage. Some are discussed among the men, and may include new initiates, in the confines of the men’s houses. Thus, an understanding of the cultural landscape emerges within the indigenous populations. An in-depth knowledge and the right to speak of the origins and the environment within which the people live, however, is reserved for a special group of leaders and shamans who add to their ability to influence the people by controlling this knowledge.

According to Highlands’ mythology, the original ancestors of all people emerged from caves, crevices, or holes in the ground, followed by all life forms. All that is within the cosmos of the inhabitants of the Highlands was created within the short time span of 3 to 12 generations.

Mid Grand Valley Dani informants around Wamena and Pugima believe that originally life came from deep within the earth and issued forth from the Huwam Cave near Pugima (Figure 10). The beautiful
clear waters of the Huwam River flow forth from the mouth of the cave and into the Aikhe River, which itself is considered to be sacred at certain locales. All caves, not just the Huwam, are thought of as passages to the very sacred area of ancestor origin, deep within the earth. All caves are therefore wusa, sacred and very secret. Some caves and rock shelters are maintained in their pristine state. Others are used for ritual purposes, known only to the shamans and religious groups that use them.

Wali (other name Um’ue) of the mid Grand Valley Dani says that the first ancestor was created from earth and rock. "Rock is hard and is for man. Earth (or soil) is soft and adds flexibility." Wali does not know whether the original ancestor was human or animal, but he and his close-knit group of advisors did relate that the unnamed (to me) Creator Spirit split the Dani ancestor down the middle, creating the two Dani moieties, the Waija and Wida. The Waija and Wida spread out and multiplied to occupy the entire Grand Valley. It is the interplay and relationships of membership in the two moieties which form the basis for spouse selection, participation in certain ceremonies, the sanctity of certain spots within the landscape, the composition of advisory groups to leaders, and the order in which men might go into battle.

Wali believes that the earth was flat at the time of origin of the first ancestor. Then, without explanation, Wali says that the mountains grew to their present size, becoming the habitat for humans, animals (including mammals, birds, reptiles and insects), plants and invisible spirit beings. Individual mountains were given by Nakmatugi, the first man, to individual sibs that had their origins from Huwam Cave at about the same time that the moieties were created. When life first emerged from the cave, people and animals were one and the same. People were divided from animals (including mammals, reptiles, birds, and insects), into individual patrilineages maintaining relationships with different species of non-human living creatures.

Wali relates that each patrilineage has an original ancestor. After careful thought, Wali (of the Wilil patrilineage), who belongs to the Wida moiety, ventured that his lineage goes back for seven generations to the original Dani ancestor. The subject of ancestral lineage is discussed in Chapters VI and VII.

In 1988 when I was in the southeast end of the Grand Valley on the south side of the Baliem River at Kurima, I was told a similar origin myth. At Kurima, the underlying theme of origin is the same with the exception that the people believe that humankind issued forth from a crack at Seinma on the north side of the river, rather than from the Huwam cave near Pugima (Figure 6). Interestingly, Larson (1987:38) learned while living at Ilaga, among the Damal, a long way west of the Grand Valley, that: "According to Dani mythology, the original ancestors of all people emerged from a crevice in a rock near Seinma on the north side of the Baliem River in the Lower Grand Valley" (Figure 6). If Larson was speaking about the belief system of those he lived among at Ilaga it is very interesting that they believed in emergence from a crevice near Seinma and not from emergence either from the Huwam Cave near Pugima and much
nearer to Ilaga, or yet another cave or place of emergence even nearer to Ilaga. Since Larson did not specifically say that the Damal or other people in the Ilaga area believed that the original ancestors emerged from Seinma. I presume that he is speaking of the Dani of the southern Grand Valley rather than those in the Ilaga area. Certainly Larson had missionary colleagues and friends who would know of the Seinma myth of origin.

Another version of the origin myth was told to me in 1987 by people who live along a tributary of the Baliem River, outside of the north end of the Grand Valley. The myth tells of the origin of the ancestors to those who now inhabit that local area. In this tributary valley, there is a hole in the ground that can be seen from a nearby cave entrance up on a valleyside cliff. In the beginning, a pregnant woman emerged from the hole accompanied by a white dog. She and the dog climbed up the hill to the cave, and there gave birth to a child who was the ancestor of all people. People multiplied. They originally lived in various caves scattered around the area. They did not make houses because they did not know how. Then came a big sickness and people in all the caves started to die. So the living people moved from the caves to lower ground on the valley floor. They learned to build houses and grouped the houses in hamlets. Finally, the dead bodies in the caves became skeletons some of which still remain in the caves. All caves in that area are sacred and wusa--they contain the bones of the people's ancestors.

Throughout the Grand Valley and to the northwest there are slightly different versions told of guardian spirit brothers named Tinok and Tinak, who reportedly emerged from the Seinma crevice. Tinok is personified within a rock face, about 20 m high, located southeast of Seinma and north of Tangma (Figure 6). Tinok, the older of the brothers, faces the Dani of the Lower Grand Valley and is said to guard against misdeeds committed against each other by the Dani in this area, as well as to prevent travelers from afar to the north from traveling into the area. The younger brother, Tinak, stands to the west of Mulia, with his back to the Dani, all of whom live to the east, and, according to Larson (1987:52), devotes his energy to overseeing the evil spirits of the high mountain forests. "He urges them to inspire men to murderousness and lust, and gloats with them over the victims they kill through the influenza they bring each December" (Larson 1987:52).

All of the Highlanders have a myth about 'sky people' which indicates their early belief, like some in today's Western civilization, in alien beings from elsewhere. One of the versions I heard was told around the village of Belokme in the northwestern end of the Grand Valley. This is a story of a people who came down from the sky on a rope. Where they touched the ground, a spring sprang up from one of the footprints so the sky people were called Enggawn (spring people). The people mixed with the local earth inhabitants making them stronger in battle. Other nearby tribes did not like that and became afraid. So when the sky people were away from their rope one day, the people who were afraid sneaked over and
cut the rope. The sky people could neither go up nor down. Many were caught on the ground and died there.

In answer to my request to see this place where the sky people came down their rope I was taken to a nearby cliff. After crawling through dense vegetation, we came to a crevice which held some human cranial fragments and what looked like femora. My guides said that the bones were from a sky person. We then went downslope to a shaded pool in a dense thicket. I was told that this was the spring which had sprung up from one of the footprints of a sky person.

The sky people myth reported here is similar to one reported by Karl Heider (1970:145) in his doctoral dissertation on the Dugum Dani where he was told the sky people were like humans "who often stole pigs and wives ran away with them. Finally in great anger a man on earth cut the sky rope and the Sinegen-Munegen have stayed in the sky ever since."

Souls, Ghosts, and Spirits in the Cultural Landscape

The Highlanders' world (or cultural landscape) consists of the seen and the unseen. Humans, animals (including four-legged mammals, bats, flying foxes, reptiles, birds, and insects), plants, the sun, moon, stars and planets are "the seen" and have personality. Other phenomena, like rainbows, clouds, and fog are also part of the seen world but do not necessarily possess personality. Souls, ghosts, spirits and other powerful beings of the spirit world are "the unseen." Ghosts and spirits are both ancestral and nonancestral. Ancestral ghosts and spirits are derived from the souls of human beings. Quite an array of nonancestral kinds of spirits and powerful beings of this segment of the world are accounted for in separate stories of the origin myth or just exist because it is known that they are there. The Highlanders do not separate the seen natural from the unseen supernatural phenomena, so that to an outsider not attuned to their world of added living entities (or "other-than-human-persons" of Hallowell as discussed with L. Loendorf, personal communication, 1994), Highlander life is complicated.

Ghosts and spirits abound everywhere in the landscape and nearly always must be placated. Living human beings must be protected from the ghosts'/spirits' malevolent actions. It takes the leadership and shamanic powers of the big men, with their in-depth knowledge of the unseen living entities to keep the Highlanders' societies from falling into states of chaos. Along with the living but unseen entities of the ghost and spirit world that must be properly controlled, there are also numerous places within the landscape that are imbued with induced supernatural power—all of which adds to an already truly complex cultural landscape.

An examination of souls (ynenga or edai-egen, the "singing seeds of life"), ghosts (mogat, alternate spellings moghat and mokat, and to some Highlanders, kugi), and spirits [kugi to most Highlanders (see Larson 1987:70)] provide a good introduction to the cultural complexity. Every living human being, except
the newborn, has a soul inside the body. My Dani and Yali informants indicated by pointing with their fingers (or a closed fist) that souls reside in the region of the upper chest. According to O'Brien's informants, the souls of the Konda Valley Dani are either inside the chest near the heart or just behind the forehead (O'Brien 1969:88). The Dugum Dani, with whom Karl Heider worked in a small corner of the Grand Valley, introduced Heider to the concept of *edai-egen* (1970:226-227). The *edai-egen* has a broad implication of "soul, seat of personality, and spirit" (Heider 1970:226-227). It is when the *edai-egen* becomes weak, for whatever reason—a battle wound, natural injury, illness, or during periods of mourning—that a person is most vulnerable to ghostly attack and must be protected. In states of weakness, the *edai-egen* becomes small and slips from its normal position, just below the sternum or in the forehead, toward the back. It is because of ghostly attacks that the *edai-egen* becomes weak in the first place and then, already weakened, becomes susceptible to further deleterious attacks by malevolent ghosts. Larson (1987:69), residing west of the Grand Valley as a missionary at Ilaga (Figure 3), learned that when one suffers from prolonged illness, or in the cases of a witch (when he/she is out performing his/her deadly craft), that the functions of feeling and thinking (said to be in the heart) are transferred temporarily to the ghost which departs from the top of the head and then returns. All language speaking groups that I visited agreed with Larson's informants. However, they added that when a soul departs the body of a deceased as a ghost it does not return again to the body.

According to some versions concerning the departure of ghosts from the bodies of the deceased, the ghosts, *mogat* in mid Grand Valley dialect, first observe their own funeral and cremation to make certain they are properly atoned, then they immediately take up residence in the ghost bundle (*wagun*) that was prepared at their funerals and which is ritually treated according to strict protocol before being deposited in a nearby cemetery for ghosts (*wagun ai*). All *wagun ai* (or *mogat honea*, ghost houses) are *wusa*—very sacred. They are built, and in mid Grand Valley Dani dialect, cared for by a specially formed *mogat ai* group of men who are both the caretakers and those responsible for protocol for any ritual related to the *wagan ai* (or *mogat ai*) sacred place. The two ghost houses which I observed (only after years of gaining entree with local inhabitants and then with magical ritual preparation) were special places in the landscape. One was built within a fenced-in enclosure under a rock cliff-overhang on a sacred part of a hillslope and the other inside a small room-size cavity beneath a large stone erratic, the entrance to which is concealed by dense growth near the base of a hill. Both spots are the focus of important rituals, and physically difficult to access and find. Other *wagan ai* hidden about the hills in the southeastern part of the Grand Valley mark particularly *wusa* places in the landscape. These include the following six named *wagun ai* and their locations:

1. Jelimo—near the Yetni River
2. Soroma—up a small stream from Kurima
3. Wesaloma--near the village of Lotia
4. Anjelmo--near Siroma
5. Sitem--near the village of Wenem, and
6. Name kept secret--near Tangma village.

Heider (1970:152) relates an instance when, on the day of a funeral-cremation of a boy killed by an enemy raid, a group of boys accompanied by an adult raced from the back of the funeral compound and out the entrance while hurling rocks wildly at houses and fences and shouting at the deceased boy's ghost to leave as they ran. This was explained to Heider as mugoko, or "driving out the ghost." From my own experiences with mugoko I believe that the boys likely were driving out all ghosts (including or not including the ghost of the recently cremated) from the compound at a time when all of the mourners and others at the funeral were in a state of vulnerability to ghostly attack. Once when I was photographing the ritually orchestrated castration of two piglets within a Dani compound, a group of young boys were directed by the surgeon specialist to run through the compound hurling a barrage of rocks against the fence while shouting to drive the ghosts out of the compound. After the castration when I asked about the event, I was told in a rather matter-of-fact way and with a note of some disparagement that, of course, as I should already know, the pigs had to be protected during their time of vulnerability from the penetration of their bodies by potentially malevolent ghosts. (Note: Throats, anuses, and vaginas are the most vulnerable spots for the entrance of ghosts and in humans must always be protected by some object that has been imbued with supernatural power. While the pigs were up-ended and being cut, like humans, they were also considered extremely vulnerable.)

The wagun ai is apparently a residence from which ghosts and spirits freely come and go. Although men of the religious groups who are responsible for the care of a wagun ai pay homage to ghosts/spirits there, the knowledge and fear of the people is that the ghosts and spirits are rarely at this place of residence but are more often wandering about and generally up to no good. To appease these ghost/spirit members of the Highlands' cultural system there is a great continuum of pig festivals and rituals in the ghosts' and spirits' honor. Pigs are ritually killed in a proper way learned from the ancestors to insure that the ghosts and spirits will be placated. At numerous rituals, sweet potatoes are set out so that the essence will satisfy the ghosts and show them that they are being honored. At funerals, while the dead are being properly cremated, the ghost of the deceased is purportedly especially pleased by loud wailing of the mourners and by the exchange of death payments (including large je stones). Sometimes, in certain localities, fingers are amputated and ears mutilated in sacrifices to both relieve genuine grief and to placate the ghost of a deceased. The ghosts of men slain in battle or murdered are the most feared, although the ghosts of all the dead--men, women, and children--are believed dangerous and reportedly most feared immediately after death (O'Brien 1969:89).
While in the Highlands of Irian Jaya doing field work I continuously contemplated the subject of ghosts. My life was being affected by the fact that the local inhabitants believe in ghosts and my research prompted me to attempt to understand them. What do ghosts look like? Do people see them, other than in dreams and visions? Very few men or women interviewed ever admitted to having seen a ghost. Most women would say that only the men had seen ghosts. Most men would just shrug their shoulders and say nothing when asked. In 1987, Dina, Wali's daughter, related that when she was a young girl she saw and talked with the ghosts of her grandmother and her grandmother's friend. Others in her village confirmed that they, too, had seen the dead women. It seems that one day Dina was playing away from the village and purportedly met the two women. They were carrying cooked pig meat. Her grandmother had a small nogen (carrying net) in her right hand, a stick in the left. The two women stopped in front of Dina. Both were crying. Her grandmother rubbed clay from the ground on Dina's body. Both women promised to come to Hupaima (alternate name Opagima); both women had been dead for some time. Dina ran home and told her mother what had happened. Her mother cried and then, on the next day, the dead women appeared (as they had promised) at the village entrance and were seen by several villagers before they disappeared. Dina related that she and other women in the village had put food out for the ghosts (mogat) on banana leaves in the women's cookhouse.

In 1988 there was a strange story about a man named Pua being seen in two different places at the same time. I first heard the story in Suroba (the hamlet of Pua's older brother Siba, next to where Pua lived in the Dugum Dani Neighborhood) and then again in Wamena from another informant. It seems that Pua's mogat (ghost) left his body to be seen at a distant locale while Pua was also seen in yet another place. No one could explain this incident--not even Pua. He confirmed privately that this was probably an out-of-body experience that he did not understand. He was not a person with supernatural power, although my Melanesian assistant thought that he was an epileptic which, if true, could account for people thinking that there was something unusual about him.

One Yali man described how he had been hurled off a swinging bridge into a river by a ghost but that he did not actually see the ghost. A Wano man at the Yeineri rock quarries told how a ghost had throttled a traveling companion while they were away from home on a trading mission.

Nobody lives at Lake Habbema because it is too high and cold. But people downhill from the lake say that if you camp there at night, you will hear the sounds from a ghost village: men chopping wood, crying, and other normal village noises. At Ciluk hamlet on the edge of the Grand Valley, I was told that there is a hole in the side of the hill less than a quarter of a mile from the village. Late every afternoon, some people reportedly hear a sound "rolling" down the hillside from the hole. They describe the sounds of people screaming and crying.
Although the above-described examples of ghost theory were revealed to me as a result of query, some of my own field experiences elucidate the simple, routine ways that the people deal with the ghosts in which they so strongly believe. One incident occurred when I came down off a steep slope in a state of heat exhaustion while in Yali territory. I was carrying my 12 kilo camera bag after I had investigated a small Yali hamlet that I had spotted from a twisting spiral of smoke high up on the hillside. The team of accompanying explorers and porters, who had come by another route to the bridge, had already crossed and were waiting on the other side. As I approached the bridge I could hear both Yali and Dani chanting above the roar of the river below. I set my camera bag down to facilitate my own crossing, thinking the Yali man accompanying me would bring the heavy bag across the river, but neither he nor any other Yali would do it. They were afraid that a malevolent ghost under the bridge would plunge them into the torrent below. Finally, one of the Dani translator-porters crossed back over the bridge and brought my camera bag to me. All the while the Yali and the Dani kept up the chanting to protect us by driving off the ghosts. All were relieved when a safe crossing had been completed. Another time a dead mouse, ritually killed, was hung with special twigs by a bridge to pacify the ghosts before we could cross. In 1993, after Pua had died, one of my translator-porters burned grass stems before crossing a bridge at Pua's former domicile. This was an act to drive off Pua's ghost that reportedly might be lurking under the bridge. Pua was the swineherd "little boy" called Tukum in Robert Gardner's film Dead Birds (1963) and Tukum in Matthiessens's book Under the Mountain Wall (1962:266).

In 1988, I had spent part of a day photographing women weeding a potato field on a hillslope garden in the Dugum Dani Neighborhood. Coming down out of the field, along its edge, I was almost running, camera in hand, when my left foot snagged in a ghost snare (taut liana cording stretched along the edge of the field and hidden by potato leaves) set to protect the potato field. I spread-eagled face downhill into the potato patch. The women howled with laughter. I will always wonder about the stories they must have told about the long-legged "ghost" they caught that day.

Statements by informants seem to confirm that the life of each ghost makes a social transition through which the ghost ceases to be regarded as a ghost and becomes a spirit. Larson (1987:70), working with the Damal and Dani in the Ilaga area, has this to say:

"Ghost of the recent dead are said to appear in dreams or be seen roaming around at dusk or in the dark. In time, as the departed are remembered less for what they were in life and more for how they have responded to ritual appeal after death, they are identified by the generic term kugi which refers to any spiritual being of the unseen world. Spirits of the recent dead, then, are most frequently referred to as ghosts (ogoma); those who died long ago as spirits (kugi).

The kugi by this interpretation are thought of as ancestor spirits which fall into two groups: remote ancestors, the most venerated of all spirits who are held in great awe, and the less remote spirits of the more recent ancestors. It is pointed out that within other contexts and by different Highlands' groups the
term kugi is often used to refer also to ghosts recently departed from bodies of the deceased, as well as to spirits derived from other than human souls. The distinction between ghosts and ancestor spirits is discussed in Chapter VII where the role of sacred stones is discussed.

**Animals and Plants**

Animals (with the exception of pigs that are thought to have souls like humans) are thought to be living bodies but without souls of their own. They may, however, host ghosts and spirits. An animal may even develop a personified relationship with humans when it is occupied by the spirit of a specific human being. More often, a certain species of evil spirits, nonancestral, including demons of the spirit world, may reside inside a certain species of animal. Thus, for example, a representative of a certain kind of forest spirit may live in the body of a species of hawk; a water demon spirit may live within the body of a certain kind of snake; or a kind of spirit of the mid-mountain forest may dwell within the bodies of tree rats.

Plants, like animals, are living and without souls but which arguably (by indigenous inhabitants) host both human spirits as well as representatives from species of other-than-human spirits.

**Other-than-Human-Originated Spirits**

In addition to ghosts and ancestral spirits that are known to have their origins from the souls of human beings, there are other distinct classes of nonancestral spirits that dwell in various parts of the landscape and which profoundly affect the activities and movements of humans. It seems that some of these spirits can be accounted for by the origin myths. It was apparent while living with the people in their habitat that there are hundreds, maybe thousands, of such other-than-human-originated individual spirits from numerous different species of spirits. Both male and female spirits abound and all are evil.

Dani and other-language-speaking women of the Highlands seem to most fear the entrance by both ghosts and other-than-human originated evil spirits through their vaginas, anuses or throats. This is one reason why the lower area must be concealed at all times by short skirts and why protective devices of strands of string and/or simple but supernaturally powerful necklaces are worn about the necks. Larson (1987:56) added insight when he learned from the Dani and Damal in the Ilaga area that certain of the female demons of the forest:

- possess women by entering them through the vagina, thereby causing insanity or enabling them to kill by witchcraft. Women so possessed bewitch by leaving their own bodies in spirit (in the person of their own ghost ogoma), either gradually consuming the spirit of a living victim (his iniki) or dramatically doing away with him through such calamity as drowning, crushing him with a falling tree, or through otherwise unexplainable misfortune.

Many female evil spirits are known to live in the lower forest, especially in stands of bamboo, having the ability to move out of their dwelling places to cause illness and death.
The numerous male evil spirits, called *kembu* by the Yali, Kimyal, and Una and *aap endak* by the Damal and many of the Dani, prefer groves of evergreens of the higher forest to scattered stands of bamboo below. The male spirits cause all sorts of ailments, aches and pains, as well as death by illnesses such as influenza. Perhaps, *aap endak* (or *kembu*) are most feared by travelers because they are known to attack those who travel through their domain. Larson (1987:57-58) states that "a lone traveler or hunter, for example, who dies of exposure on the high plateau is often said to have been killed by *aap endak*. Inexperienced travelers can become so fearful of the high forest demons they may even desert a lagging, sick member of their party to die in the cold for fear the demon killing him may also get them."

When I was exploring the headwaters of the Tagi River for rock quarries in 1988, I got to a point in the terrain above which the local people said they did not venture; hence my porters became reluctant to travel. The area was not *wusa* but it was locally known that the evil spirits of the forest killed all people who entered the forest there and proceeded to higher elevations. Looking at my topographic sheets with elevations of 3,360 m and more in the high end of the forest and across a mountain divide that I wanted to reach, I could easily imagine the adverse affects of the cold weather on near-naked travelers, which easily could have been the cause of hyperthermia and death from the cold. Although my team carried jackets for such high elevation work, I honored their wishes and we proceeded no farther.

In 1991 while with the Wano people at the Yeineri quarries, I was told a legend about Wano male ancestors who had been killed by evil spirits in the high forests southeast of Wano territory on the high *Kembu* Mountain (3,871 m). According to the legend, the Wano were laden with stone goods en route to trade with the Dani to the southeast. The evil spirits of the high forests killed the Wano traders. Since then all travelers, including the Wano and those of other language speaking groups, skirt the high *Kembu* Mountain, which they hold in awe and fear.

To the east of the Wano, Damal and Dani, three other groups, the Yali, Kimyal, and Una, would also use magical rites to enlist the spirits of the high mountain forests to assist them in killing enemies. Yali warriors in crisis would often call upon these evil spirits of the forest, known to them as *kembu*, to commit heroic acts and to enable the Yali to even leave their bodies as ghosts and fly through the sky to attack enemies.

In addition to acts such as this, the evil spirits of both the upper and lower forests are known to cause fatal accidents, and death-dealing illnesses like influenza. These forest spirits are also sometimes considered responsible for headaches; chest, stomach, arm, and leg aches; and cuts and abrasions. Because accidents and illnesses occurred while we were out doing field research I was able to observe the use of magical procedures, some including the use of stones with supernatural power, to ward off the evil spirits and to effect cures on members of my exploration research team.
Sun, Moon, Stars, and Planets

The most powerful of the "seen" sky beings are the sun and moon. Mother sun, called Mo by the mid Grand Valley Dani, although seen only part of each day, is the single most powerful sky entity. Her supernatural power is awesome, that of her husband (or brother by some groups living within the study area) moon is of significance but of less importance. Although the annual movement of the sun is not calendrically mapped in detail as it is in many cultural systems farther from the equator, where the sun's position is important relative to growing seasons and associated rituals, its annual movement from summer to winter solstices is still recognized by its geographic positions on the horizons at sunrise and sunset. Its position at June solstice activates the evil female spirits of the lower forests to move uphill to cause illness and death. Similarly, its December solstice position on the mountain skyline activates the numerous male evil spirits of the upper forests to move down out of the high mountains to spread illness and death in the more densely populated regions below. This symbiotic relationship between the "seen-sun" and the unseen evil spirits of the forest has consequences of importance to the lives of the Highlanders.

During the winter months (from September through approximately February) Mother Sun is thought to spend her nights, when she is out of the sky, in her winter home somewhere in the Jalemo to the east of the Grand Valley and south of Pass Valley (Figure 6). During the summer months (approximately between March and September) the sun spends the nighttime in her summer home in the Wadangku (alt. Wadlagu) compounds near the Grand Valley end of Pass Valley (Figure 6). Interestingly, to a viewer from certain positions in the Grand Valley it does appear during March to October that the sun is traversing the sky from east-to-west the length of Pass Valley, to finally go out of sight on the horizon on the west side of the Grand Valley each night (Heider 1970:210). Some informants say that after sunset she rapidly returns across the upper, invisible side of the sky to her house near the Grand Valley each night. Apparently little is known of this sun house or of the ritual or symbolism surrounding the powerful entity of the sun (Heider 1970:210; Larson 1987:45-46; Hayward 1992:52-53, 98-99). Additional information is presented from my own field research in Chapter VII.

The moon, by most accounts the husband of the sun, guards the earth by night which his wife, the sun, has warmed by day. One Dani informant and two Yali informants whispered at two separate meetings that the moon secretly reports back to his wife, the sun, the misdeeds of humans that he has observed during the night. The inference was that, as previously discussed, through control of the demonic spirit world, the sun would make retributions for wrong-doing. Heider reports (1970:211) that the monthly phases of the moon represent the aging cycle of a single man. The new crescent moon is described as young or new and the last quarter as old. The transition from old to young was never explained to Heider. Among Heider's informants there was disagreement over the relationship between the sun and moon.
whether they are husband and wife or brother and sister. Some informants feel that times of eclipse are
times of sexual intercourse between the sun and moon.

Other Sky Phenomena

Some Highlanders attribute rainfall to the play of ghosts in the clouds who splash water with their
feet onto those below. Others think of rainfall as the urine from spirits dwelling in the clouds, and yet
others just say that "rain is." Magical rituals are sometimes performed, and protective vegetal and feathered
devices are erected to keep rain from falling during periods of crop planting. There are likewise
appropriate ceremonies to stop the rain when too much has been falling and crops become flooded. At
other times specific rituals are conducted to simply make the rain go away before fields become flooded.
Wali one afternoon showed us that he had the supernatural power (wusahun) to divert an impending
afternoon thunderstorm and to keep rain from falling on the hamlet. As we watched from the center of
the courtyard, Wali moved around the perimeter yelling at the moving thunderstorm and muttering to
himself as the clouds and rain skirted one end of the hamlet. Wali kept up his barrage of verbosity and
obviously was a very pleased man when not one drop of rain fell on us. I never knew whether the
shouting by Wali and other shamans was at the thunderstorms themselves or at spirit makers of the rain
who dwelled in the clouds. Heider (1970:215) states that thunderstorms often pass across the Dugum Dani
neighborhood and that thunder, called pokot ane, is merely thought of as sky noise and that lightning,
called ojabok, is just an accompaniment of rain and thunderstorms.

Heat lightning, called dokagup or ab amok, is considered to be the blood of recently killed men
or the blood of a dying man rising to the sky in the smoke where grass is being burned to remove traces
of the dying man's blood from the ground. According to Heider (1970:215), some feel that rainbows are
reflections of snakes. One informant told me that rainbows were a species of sky-living spirits, while
several other Dani mid valley informants merely said without explanation that rainbows were "divinations."
Pospisil (1956:19-20), working with the Highland Kapauku people in the Paniai Lake area west of my
study area, says that to the Kapauku the clouds are believed to be a special habitat for spirits. rain is caused
by an evil female spirit who urinates down on people, stars are the lighted ends of cigarettes smoked by
spirits in the sky, thunder is the flatus of spirits, and earthquakes are caused by a mythical "beast animal-
spirit" that beats the earth with its tail.

Yali men and other informants scattered in the Highlands did not seem to attach much significance
to stars in the sky but some felt that quartz crystals were fallen stars and often kept them among their
sacred objects.
Caves, Rock Shelters, and Crevices

All caves, major holes in the ground, and many crevices are sacred—*wusa*. They are hierophanies, and entrance is prohibited to the uninitiated. These are the places of emergence of all life, both the seen and the unseen. It is within certain caves and rock shelters that the secrets of supernatural powers are discussed by men’s groups, human skeletons are maintained, and certain sacred paraphernalia are kept for ritual purposes (Figures 22 and 23).

The leaders or big men of hamlets or groups of hamlets often have their own sacred caves where they conduct ritual and go for private guidance. I have been taken by two different big men on secret one-day journeys to their caves. One leader related how he had experienced a divination years ago from within his sacred cave when he spotted the sign of a black cross on the upper wall of the cave. This became his personal symbol for life. After crawling through a small, moss-covered opening of his cave, I saw what I thought was a manganese oxide-stained area in the shape of a cross on the upper arch of a wall. Some time after the leader had experienced the divination, he collected a piece of dried wood in the shape of a cross from the forest, which he maintains with other sacred objects in the *ganekhe* cabinet (for sacred objects) within his house.

While visiting the hamlet of Wolo in 1988 (Figure 24), after two nights of rituals at a nearby cave entrance (to which I was not party), the headman and his advising elders announced early one morning that the time was propitious for me to visit the cave. An interesting pictograph was present above the entrance. After incantations and cleansing by waving a *wusa* wand (small feathered object) we entered the cave. There is a legend about this cave. Once, long ago, the valley was filled with water. People ran up the valley slopes to survive. A man and his wife ran up the slopes and into the cave. They had broken a sacred taboo and were turned to stone. The large pedestal on the floor is what remains of them (Figure 25).

As conversion to Christianity and modernization occurs, sacred objects are moved from accessible caves to those more inaccessible and hidden. Some caves and rock shelters along the edges of the Grand Valley have been opened to outsiders and three are now touted as tourist attractions. One rock shelter near Jiwika has been converted by its foreign and indigenous Catholic constituency to a shrine in honor of the Virgin Mother Mary (Figure 6). Here, original traditional sacred objects are maintained along with modern portrayals of Mary and an altar at the base of a cliff, near a route to the important Ileukaima brine pool.

With the agreement of traditional “cave-keepers,” and local head men and their constituencies, I have entered 12 caves and shelters and viewed from the outside the entrances of many more. In addition to caves which house sacred paraphernalia, I have found living caves of rare beauty with rooms of stalagmites and stalactites (Figure 26), two with pictographs (Figures 27 and 28), and one which is used as a place to hunt bats (Figure 29). These caves are *wusa* and should not be disturbed for archaeological
Figure 22. Human skulls and skeletal remains in ritual configuration.
Figure 23. Sacred ammonite fossils rim sacredized pool of water.
Figure 24. Geographic reference points.
Figure 25. A cave floor rock formation that is the legendary remnant of two humans.
Figure 26. Stalagmites and stalactites adorn different caves.
Figure 27. A mysterious cave room with pictographs.
Figure 28. Shape of cave wall enhanced to create human face.
Figure 29. A "Stone Age" bat hunt within a cave.
purposes until the people themselves want excavations and understand the purpose of the work. I have identified sites which are archaeologically attractive for at least exploratory trenches, when the time is right.

**Unusual Rock Formations and Stones**

The hardness, ruggedness, and permanence of matter was in itself a hierophany in the religious consciousness of the primitive. And nothing was more direct and autonomous in the completeness of its strength, nothing more noble or more awe-inspiring, than a majestic rock, or a boldly-standing block of granite. Above all stone *is*. It always remains itself, and exists of itself; and more important still it *strikes*. . . . In its grandeur, its hardness, its shape and its colour, man is faced with a reality and a force that belongs to some world other than the profane world of which he is himself a part [Eliade 1958:216].

Most unusual rock formations are perceived as places where spirits reside, or for other reasons, are considered to be *wusa* and are, therefore, hierophanies and accorded due respect. Two such areas with which I am familiar contain sacred pictographs on cliff faces and are activated with special ritual every four or five years along with the Waija boys’ initiation ceremony.

Small rocks and river-worn pebbles of unusual shapes and/or colors are often picked up to be saved as stones with potential for supernatural power. Some will later be selected to be treated through ritual and imbued with supernatural power to be maintained and used for special purposes. These kinds of sacred objects are discussed in Chapter VII.

**Conclusions**

There is no place that the Highlanders can go to get away from the supernatural beings that inhabit their cultural landscape: ghosts and spirits are pervasive. In the sense that any profane appearing objects and places either are, or at any time may become hierophanies, the entire landscape of the study area in the Highlands of Irian Jaya must be treated with due respect. If there is an archetypal paradigm here to help us interpret the archaeological record of the Stone Age, it is that the entire cosmos can be a hierophany and that all archaeological objects and places should be scrutinized from this perspective.
CHAPTER IV
THE PEOPLE: THEIR CULTURAL TRAITS AND MATERIAL GOODS

Not many decades ago, when modern outsiders first entered the isolated land of the indigenous inhabitants of the central mountain chain of Irian Jaya, the people were living in their own local variations of a Neolithic Cultural Stage (Cavalli-Sforza et al. 1994:351). The people were experienced horticulturists, knowledgeable swineherds, and warriors who lived with a profane tool kit of ground stone, small chert flake, wood, bamboo, bone, fiber string, grass, feather, shell. Pandanus leaf, banana leaf and trunk, reed, gourd, orchid fiber, palm fiber, beeswax, and seed tools. Their sacred tool kit, designed to deal with problems caused by ghosts and spirits of the unseen world, consisted primarily of stone objects with string, wood, feathers, leaves, and grass. The people had never developed basketry (except hand-plaited thin rattan strip and other fiber stem armlets), pottery, or metal. But hand-wove a variety of fiber-string nets and used string pervasively for other utilitarian purposes.

Before we look at the composite of the various aspects of the Highlanders’ cultural systems, focused around their material goods, belief systems, and relationships to the cultural landscape, it is helpful to briefly survey what has been ascribed to the Neolithic from archaeological records worldwide (also, refer to The Rest of The World, Chapter II).

The term Neolithic does not define a precise time period during the evolution of humankind with an associated specific set of cultural traits and a single set of identifying material goods. Instead, it defines a period of transition worldwide between the Upper Paleolithic-Mesolithic (generally characterized by hunter-gatherers utilizing flaked stone tools, and sometimes including copper tools) and one of the metal ages (copper, bronze, or iron) with more evolved sets of cultural characteristics and material goods. It was Childe (1969:70), in a European oriented book, entitled What Happened in History who said that:

There is no ‘neolithic culture,’ but a limitless multitude of plants cultivated or of animals bred, by a different balance between cultivation and stock-breeding, by divergences in the location of settlements, in the plan and construction of houses, the shape and material of axes and other tools, the form and decoration of the pots, and by still greater disparities in burial rites, fashions in amulets, and styles of art. Each culture represents an approximate adaptation to a specific environment with an ideology more or less adequate thereto. The diversity results from a multiplicity of minor discoveries or inventions, at first purely local and conditioned by geological or climatic or botanical peculiarities, or from arbitrary, i.e., unexplained, idiosyncrasies.

In an earlier work, Man Makes Himself, Childe (1963:75) describes the ground stone tool that was once thought to herald the advent of "Neolithic":

At the time when the neolithic revolution makes itself manifest, when cultivation first becomes perceptible, North Africa and Hither Asia were still enjoying a higher rainfall than today; trees still grew in regions now treeless. At the same time, in Europe, forests had replaced the tundras and steppes of the Ice Age. Man was obliged to deal with timber. The response to this stimulus was the creation of the "polished stone celt" (axe or adze), which to the older
archaeologists was the distinctive mark of "neolithic times." The implement is a large slice or pebble of fine-grained stone, one end of which has been ground down to form a sharp cutting edge. It was hafted into the end of a stick or an antler to form an axe or an adze.

In James Mellaart's book (1975:9), the Neolithic of The Near East, Mellaart says:

Even before the beginning of the Holocene, c. 8,000 B.C., some of these groups had started to experiment with the planting of crops - the first steps toward agriculture, and the domestication of some animals. The Neolithic, i.e. the period of early farming, had begun. Over the next millennium the new techniques spread far and wide along new trade routes, and by c. 7000 C.B. (6000 B.C. in radiocarbon terms) Neolithic communities were established from southwestern Europe to the desert edge of Central Asia, and from the Caucasus to southern Palestine. The next two millennia saw the consolidation of the Neolithic, further expansion into Europe and the rise of metalurgy in the highlands area of the Near East, but its most characteristic product was painted pottery, in which was expressed a sense of individuality, artistry and abstraction lacking among many of the earlier, purely artificial household assemblages.

Throughout Asia and the Far East many Neolithic sites (as well as in Europe) are described as containing pottery. That is certainly true in archaeological excavations described by Sarah Nelson (1990) in an article entitled The Neolithic of Northeastern China and Korea. Wen-ming Yan (1992:113) states that according to the most recent data, the Chinese Neolithic period can be traced back to 11,000 ya. Carbon 14 dating of human bones confirms this at Liuzhou and Guangxi where the artifacts include mainly chipped stone, with a small amount of ground stone and pottery fragments. Yan identifies these sites as early Neolithic with economics based mainly on hunting and gathering and no obvious traces of agriculture or animal husbandry. At Zengpiyan, however, Yan notes that pig bones have been discovered and that the rearing of pigs would have required the support of agriculture. "By the middle Neolithic period, agriculture was already fairly well developed" (Yan 1992:113).

Xing-ban Shih (1992:125-132) states that the ability to trace agriculture in the Yellow River Valley represents an important breakthrough in the archaeology of Neolithic China. Pottery vessels, stone sickles, and stone mortar and pestles are described from the Neolithic Peiligang culture. "The uneven development of societies from the north to the south, and the rich and diverse ways of life of the whole, are the primary characteristics of the Neolithic tradition in Northeast China (Wang et al. 1982: Tong 1960, 1982. 1985)" (Wa 1992:139).

Rather than reacting to the environment, humankind learned to manage the environment and became a producer. Significant sociopolitical and socio-religious changes occurred. For the purpose of this work the Neolithic is considered a cultural stage in the evolution of humans and their cultural systems, during which humans generally became sedentary horticulturists and many of whom practiced animal husbandry. The Neolithic, then, defines the stage which marks the end of hunting and gathering as the primary subsistence strategy and during which horticultural practices (and, in some cases, animal husbandry) evolved as the primary strategy.
In most places worldwide, this basic evolutionary change to plant and animal husbandry in subsistence strategy took place prior to the so-called metal ages (copper, bronze, iron), but sometimes penecontemporaneously, especially with copper. In timbered areas, where cropland replaced virgin forest on a grand scale (and related to the kinds of rock materials available), this was the time in cultural "systems" change that was marked by the advent of large quantities of ground stone versus a preponderance of flaked stone tools. During scattered local variations of the Neolithic Cultural Stage, humankind expressed the ability to transform radically different physical environments to horticultural systems. This evolutionary adaptation of humans to ecology in different physical environments manifests itself with an archaeological and ethnographic trail of different kinds of artifacts, dependent both on the physical environments in which the cultural systems evolved and traded and on human differences within regional and local cultural variations. The narrative overview, with an accompanying photographic essay of the people with whom this text deals, presents in this chapter certain aspects of the trail in the Highlands of Irian Jaya, before stone-good artifacts are examined in more detail in later chapters. Artifacts made of rock are still the least destructible and, therefore, the most often preserved artifacts with which archaeologists and others work in making prehistoric cultural interpretations. Language differences form the geographic boundaries for fieldwork and are the population attribute against which the distribution of artifacts of culture and associated paradigms of behavior are analyzed.

If artifacts of culture made from the more destructible materials like feathers, fiber, wood, bamboo, and bone were equally as well preserved in the prehistoric record as stone goods, there are few modern archaeologists who would deny that we might not have ever had a "Stone Age" in our classificatory system, but more probably something like, first, a "Wood Age," then possibly a "Wood, Fiber, and Stone Age," and in areas where bamboo was plentiful, possibly a "Wood, Bamboo, Fiber, and Stone Age." Here is an opportunity to examine the interplay of artifacts of culture made from all of these kinds of materials, within cultural systems which used tools made primarily of wood, ground stone, small chert (flint) flakes, bone, fiber, and bamboo. Pottery, present during what has been described as the "Neolithic" throughout other parts of Indonesia and at many archaeological sights in mainland Asia (and elsewhere in the world), is still not used in the Highlands of Irian Jaya, even though, according to Cavalli-Sforza et al. (1994:346-347), a major eastward expansion from insular Southeast Asia began around 3,600 ya, which carried the earliest decorated Lapita ceramics, with very characteristic motifs, first to Melanesia and then to the entire Pacific Ocean.
The People in the Study Area

The numerous, adjacent-living cultural groups with their many languages are but variations of the same Papuan cultural theme and yet, they have significant differences. Does the distribution of stone tools and symbolic stones coincide with language boundaries and/or the boundaries of the cultural systems as defined by a totality of their separate material goods and social traits? Can we use stone goods found in the archaeological record to define the boundaries of adjacent-living different cultural systems and language groups that have long since disappeared? These are some of the problems that will be discussed here, but to do this effectively, it is necessary to examine language boundaries and the distribution of material goods within the cultural systems of the Irian Jaya Highlands.

Languages and Linguistic Boundaries

The Highlanders' languages, like their cultural landscapes briefly described in the last chapter, are complex (Figure 2). Through the early years of the twentieth century, the great number of separate languages in all of New Guinea, not just the Highlands of Irian Jaya, which was unknown then, bewildered scholars. Even as recently as 1992, Welsch et al. (1992:569) state that:

Today it is almost hackneyed to say that hundreds of mutually unintelligible languages spoken in Melanesia indicate that the southwestern Pacific is both linguistically and culturally one of the most diverse areas on earth [Chowoning 1982; May and Nelson 1982] and that further, "The North Coast of New Guinea is one of the most linguistically differentiated parts of Melanesia. Fifty-five languages belonging to at least eight major language families (and perhaps as many as 27 important subfamily groupings), are spoken today along the 700 km of coastline between Jayapura in Irian Jaya [Author's note: north-northeast of my study area, Figure 2] and Madong in Papua New Guinea. These many languages are assigned by linguists to at least five unrelated language groups: Austronesian and four non-Austronesian, or "Papua," phyla [Lacock 1973; Wurm 1982; Wurm and Hattori 1981; cf. Foley 1986, who disputes these higher level groups].

The Melanesian coastal languages which were classified as Austronesian were related historically to Malayan, Polynesian, and Micronesian languages. It was believed that the Melanesian groups probably appeared in New Guinea subsequent to the settlement of the interior by speakers of the predominantly Papuan languages (Brown 1978:26). The great variety of Papuan or non-Austronesian languages have now been classified in the Central New Guinea Macro-Phylum.

Of this group, the East New Guinea Highlands Language Phylum in Papua New Guinea was one of the first to be recognized (Brown 1978:26-27). Now, some scholars would include most of the New Guinea Highlands languages in the Central New Guinea Language Macro-Phylum. However, the Macro-Phylum includes people of other cultural groups, not only those living in the Highlands.
According to Heider (1970):

following Bromley (1967), there appears in Irian Jaya to be a single West New Guinea (Micro) Phylum which consists of four families: (1) Wissel Lakes-Kemandoga Language Family (including Kapauku or Ekagi, Woda, and Moni); (2) Uhunduni-Amung Language Family; (3) Dem Language Family; and (4) Greater Dani Language Family.

Within the Trans-New Guinea Phylum, Silzer and Clouse (1991) have compiled an index of languages of Irian Jaya. The population figures shown with some of the language groups are approximate, but should always at least indicate relative population sizes between groups. Adjoining the study area to the west, Silzer and Clouse (1991) list the "Wissel Lakes-Kemandoga Stock" which is comparable to Bromley’s (1967) "Wissel-Lakes-Kemandoga Language Family." Silzer and Clouse’s Stock contains: (1) the Ekagi-Wodani-Moni Family of the: a. Ekari (100,000), b. Wolani (3,000), c. Moni (20,000), d. Auye (375), and e. Dao (250). The Ekari and Moni merge eastward into the west end of the study area with the Damal, Nduga, and Wano. Silzer and Clouse (1991) show the Damal (14,000) as the Uhunduni (Damal) Family-Level Isolate within the Wissel Lakes-Kemandoga Stock.

In the area of research covered by this dissertation, including the Wano rock quarry of Yeineri on the west, to and around the Una operated rock quarries on the east, Silzer and Clouse (1991:25-30) itemize the following language groups (Figure 2):

I. Trans-New Guinea Phylum
   1. Great Dani Family
      C. Dani-Kwerba Stock
         a. Dani Sub-Family
            i. Western Dani (129,000)
            ii. Grand Valley Dani (100,000)
               a. Upper GVD Dialect
               b. Mid GVD Dialect
               c. Lower GVD Dialect
            iii. Hupla (3,000)
            iv. Walak (3,000)
            v. Nggem (3,000)
         b. Adjoining the Dani Sub-Families to the east is the Ngalik-Nguda Sub-Family consisting of
            i. Yali (30,000)
               a. Angguruk Dialect
               b. Ninia Dialect
               c. Pass Valley Dialect
            ii. Silimo (5,000)
            iii. Nduga (10,000)
         c. Wano-Sub-Family-Level Isolate (3,000-3,500)

R. Mek Sub-Phylum-Level Family
   1. Western Group
      a. Yale (2,300)
      b. Nipsan (1,500-5,000)
c. Nalca (9,000)
d. Kimyal (6,500)
   i. Korupun Dialect
   ii. Sela Dialect
e. Una (4,600)
f. Eipomek (3,000)

2. Eastern Group
   a. Ketengban (11,000)
   W. Dem Stock-Level Isolate (1,000)

Of the groups listed above within the study area, my work in the field was primarily with the Wano.
Western Dani, Grand Valley Dani, Yali, Kimyal, and Una; although in searching for rock quarries and
following hypothetical trade routes, I spent time with the Duveli and trekked across parts of the Damal,
Nduga, Walak, Silimo, and Hupla territories. Most of my time in the field was spent with the Grand
Valley Dani and the Western Dani.

Among the Dani speakers, as O'Brien says, "there is a tremendous range of dialect diversity" (1969:3).
Bromley (1967) divided his greater Dani language family into three sub-families: (1) the central Dani sub-
family, consisting of the Western Dani language and the Grand Valley Dani language; (2) the Ngali-k-
Nduga sub-family; and (3) the Wano sub-family (Figure 2). Larson (1970) noted that within the 50,000-
70,000 Western Dani language speakers there are at least four sub-dialects. Bromley (1967:24-27) defined
three dialects within the Grand Valley Dani language (Figure 2).

I have noted in some detail the language diversity just within the various groups of Dani language
speakers as an example of the complexity of language barriers that had to be contended with by the
indigenous inhabitants of the Highlands in social and political relationships and when conducting trade, and
that we, as interpreters of cultural systems, face when trying to define cultural boundaries by biology,
language boundaries, or by the distributions of material goods.

Physical Characteristics and Health

Tools and weapons; clothing and items of adornment; and houses, habitation, and multiple use sites,
all relate to the physical size and strength of individuals within the user populations. In both practical and
theoretical studies of the mechanics of tool use, the size and physical abilities of the users are important.
As archaeologists, when we are challenged with the endeavor of identifying objects from the prehistoric
record and interpreting the sizes, numbers and behavior of their human users, relationships which we
establish in ethnographies provide our baselines of reference. Human size relative to nutrition from a given
subsistence pattern and the genetic overprint are also important factors not only for archaeologists, but for
a multidisciplinary group of researchers who might be using these data.
Size and Physique

All of the people of the just-defined language groups in the research are small in stature (Figures 30 and 31: Table 1). The Yali, Una, and others have even been referred to as pygmies, a term best reserved for the people so-named in Central Africa. According to Cavalli-Sforza et al. (1994:167), the smallest Pygmy tribe has an average height of 145 cm in males and 137 cm in females (Mbuti, Ituri forest in northeast Zaire), which compares to the heights of the Highlanders in Irian Jaya. Both groups have adapted to a humid, tropical forest environment. Whether or not the Highlanders' small stature is an evolutionary adaptation to a humid, tropical forest environment and/or malnutrition is outside the scope of this research. I believe, however, that their small size is at least in part the result of malnutrition. A basic starch diet of sweet potatoes (and greens) and, for the average person, have only meat protein from bits of pig meat on the average of once every week or two. Jelliffe, in 1966, points out that growth retardation is "the first sign of protein-caloric malnutrition" (Rappaport 1984:468). Both men and women of the Highlands are muscular. More children and women than men have protruding abdomens, which might be caused by a high starch intake from the sweet potato diet, a protein deficiency, and/or the normal intestinal presence of worms.

Skin and Hair Color

Skin color is brown, with a variance from light brown to black. To my knowledge scientifically motivated skin color measurements have not been made. Babies are born light skinned and most stay that way until they are exposed on a regular basis (ages one to three) to sunlight (Figure 32).

The normal dark brown to black color hair of an adult is further blackened by the routine beautifying application of soot-blackened pig grease. Hair color, especially among young children is often reddish. Possibly indicative of a deficiency in protein. Young children get less pig meat to eat than adults. Living in smoke-filled houses, treating the hair with soot-blackened pig grease, and practically never washing the hair makes it difficult to appraise its true natural color and degree of natural curliness.

Physical Abilities

Physical abilities seem normal and the Highlanders generally appear healthy. The people, especially the men, possess excellent eye-hand-foot coordination. They use their feet for gripping and manipulating objects, and exhibit demonstrable agility in climbing steep-face rocks, cliffs, and in harvesting wood in tree tops. When watching men maneuver with dexterity across water-slickened, single pole bridges and climbing steep rock faces, it looks as if some men have the ability to grip laterally with the outer edges of their feet, as well as with their toes. In Chapter X, the dynamic action of quarrymen using their feet
Figure 30. The author (1.87 m, 6 ft 2in) with a Yali woman in central Yali territory.
Figure 31. The author (1.87 m, 6 ft 2 in) with three Una quarrymen at Langda.
<table>
<thead>
<tr>
<th></th>
<th>Shortest</th>
<th>Mean</th>
<th>Tallest</th>
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<tbody>
<tr>
<td><strong>Grand Valley Dani</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(Heider 1970:220)</td>
<td>147 cm</td>
<td>160 cm</td>
<td>179 cm</td>
</tr>
<tr>
<td>Male</td>
<td>(4’10&quot;)</td>
<td>(5’3&quot;)</td>
<td>(5’10½&quot;)</td>
</tr>
<tr>
<td>Female</td>
<td>-</td>
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</tbody>
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| **Konda Valley Dani**|          |        |           |
| (O’Brien 1969:23)   |          |        |           |
| Male                 | -        | 150 cm | 170 cm    |
|                      | -        | (4’11") | (5’7")   |
| Female               | -        | 145 cm | 152 cm    |
|                      | -        | (4’9") | (5’)      |

| **Una, Langda**      |          |        |           |
| Male                 | 137 cm   | 142 cm | 152 cm    |
|                      | (4’6")   | (4’8") | (5’)      |
| Female               | 137 cm   | 142 cm | 150 cm    |
|                      | (4’6")   | (4’8") | (4’11")  |

| **Yali, Angguruk**   |          |        |           |
| Male                 | 140 cm   | 145 cm | 150 cm    |
|                      | (4’7")   | (4’9") | (4’11")  |
| Female               | 124 cm   | 140 cm | 150 cm    |
|                      | (4’1")   | (4’7") | (4’11)    |
Figure 32. Yamake tends to her baby in a head-back carrying net.
almost as another set of hands is shown. Women often use their feet as a functional component of a hand-foot loom when weaving head-back nets.

Males of all ages, from young boys to the elderly, rest for long periods of time in a squatting position, where, with the buttocks resting on the ground (rock or tree limb), an individual can maneuver laterally with speed and spring into an upright position with great agility.

Young boys climb and play in trees from an early age. In Figures 33 and 34, boys can be seen climbing and at rest relatively high off the ground. Note in both photographs that tree limbs have previously been harvested for firewood by adult males who used stone adzes for the job. Young boys, ages about 7-11, hearing a cicada or detecting the odor of a stink bug in a nearby tree, will often quickly disappear to climb into the tree to find the insect and have it for play or to eat. When eaten, both kinds of insects are more often roasted on a cooking house fire than eaten raw.

Eye-sight is generally good. The absence of certain eye problems has been attributed to a high intake of vitamin A from potato greens, which the people eat as a regular part of their diet (Wamena hospital staff, personal communication).

Left handed males and females are present across the entire research area. I did not generally make handedness estimates, although it would be interesting to relate adze blade cutting edge hafting angle and edge use-wear to handedness. In the only restricted sample of 92 Dani adult males that I did examine, I found three were left handed, or 3.3% of the group. Heider (1970:224) found that among 148 Dani adults in the Dugun Dani Neighborhood, "some half-dozen were observed to be left-handed," or about four percent.

Abnormalities

Both physical and mental abnormalities are accepted by the indigenous people without attaching either beneficial or adverse cultural response to individual cases. Regarding albinism, which occurs at least among the Western Dani, Grand Valley Dani, Yali, and Una people, the individuals afflicted and those around them understand the adverse effects of sun exposure and treat albinos accordingly. Among all but the Una speaking people, the albinos whom I saw are male. In Figure 35, an albino Una woman at Langda carries her child in a typical head-back net. This woman is not as light complected as other male albinos whom I saw across the research area during the period 1982-1993.

Goiter and fatty tumors (lipoma) were observed in females but not in males. Their cause is not known; although when numerous, it is thought the condition might be genetic (S. B. Tucker, M.D., personal communication 1995). The man in the top photograph of Figure 36 is big man Obaharok's younger brother Huliak. Huliak's entire body is covered with painless nodes, a condition identified from
Figure 33. Young boys playing in the trees.
Figure 34. A young boy climbs high. Limbs chopped for firewood.
Figure 35. An albino Una woman with her baby at Langda.
Figure 36. A body covered with fatty nodes. A splayed toe on another man.
this photograph as neurolination (S. B. Tucker, M.D., personal communication 1995). The condition is thought to occur worldwide in 1:2,000–4,000 people. It can be spontaneous mutation or autosomal recessive. Hulak, who is 138 cm (4.5 ft) tall, says that he has not been afflicted with other medical symptoms. Splayed big toes, as shown in Figure 36, occur among the Grand Valley Dani. Three men with this condition all said they were unrelated. This physical abnormality is not known among other language groups in the Highlands, which does not mean that it does not occur, but just that I have not observed it or read of it in reports by others.

I have observed one club-footed man and one deaf and dumb girl among the mid Grand Valley Dani. Interestingly, the deaf and dumb girl and her playmates had learned to communicate by a kind of "signing," but over a period of two years I was not able to discern what kind of a vocabulary or the degree to which their special symbolic language had been developed.

Health and Medical Practices

After birth, life expectancy for Dani females is approximately 38 years: for males 40 years (medical staff, Wamena Hospital, personal communications 1989, 1991). Females, on a sustained basis, work physically harder and longer hours and eat less meat protein (pig meat) than males. Creditable persons on the Wamena hospital staff further point out that, although their life expectancy estimate should be accepted with an understood average absolute percentage error of 15%, the statistic is thought to also be reasonably valid for the precontact era. Offsetting the decrease in war-related deaths is the current increase in deaths caused by contact transmitted diseases recently introduced. Moore et al. (1980:77) point out that the life expectancy for the Tsembaga, a Papuan group of the Maring, studied by Rappaport (1984) to the east, in eastern Papua New Guinea, is estimated to be 28.0 years. To put the Grand Valley and Papua New Guinea figures into a very general prehistoric perspective it is pointed out by Moore et al. (1980:78) that a general life expectancy during the prehistoric Neolithic stage was 26.9 years.

Pneumonia and other smoke induced respiratory diseases are known to be the number one cause of natural deaths since the contact era. Runny noses from constant exposure to smoke are chronic. The Highlanders live in small houses with only one low doorway and no other ventilation to allow fireplace and tobacco smoke to escape. Downslope, in the lowlands to both the north and south, malaria has been the number one cause of natural death. Malaria is not thought to have been present in the Highlands until after the advent of modern outsiders.

Until ca. 1970, warfare accounted for a substantial number of wounds and deaths, mostly among men. Women were wounded by warfare activities only during ambush or infrequent periods of all-out warfare. Although the number one natural killer within the indigenous populations was related to smoke ingestion
illnesses, warfare was the number one cause of violent deaths. Scars from arrow, spear, and, among the
Yali, adze wounds are a common sight on middle-to-older age men (Figure 37).

At the time of contact with modern outsiders (Chapter I), people suffered from yaws (framboesia, a
spirochete skin ulcer), particularly children. The disease usually disappears by the time a victim becomes
a teenager. Partially due to the hot, humid climate, relatively minor abrasions and cuts often become
chronic, infected open sores. In addition to bacterial infections, fungal infections are present in some open
sores.

As tough as the peoples’ feet are (they go barefoot), puncture wounds from thorns and sticks are a
constant source of irritation, with some puncture wounds causing temporary debilitation.

The Highlanders’ commonly suffer burns, most often during childhood, from crawling and playing
too near an indoor fireplace. Burn scars acquired while young are common among adults. Broken bones
are rare.

Traditional Concepts of Life

It is my opinion that Karl Heider’s description of the Dani concept of life, health, and sickness is
reasonably applicable to all of the diverse language groups within the entire research area. Heider (1970:
226-227) states:

The Dugum Dani conceptualize health and sickness in terms of edai-egen, which is more
psychical than physical. Minor and sometimes relatively major physical wounds or ailments are
practically ignored until they threaten an individual’s edai-egen.

The strength of an individual lies in his edai-egen, and the state of his physical and
psychical health is indicated by the state of his edai-egen.

In one sense, the edai-egen is an actual physical organ, the heart. Although the Dani have
little knowledge of internal human anatomy, they do know the innards of pigs in detail, consider
that human organs are analogous to those of pigs, and point out the pig heart as the pig’s edai-
egen. But in humans the edai-egen has the broader implications of soul, seat of the personality,
spirit. The term may be literally translated as “seed of singing.” The edai is a ceremony, the
first day of singing and dancing after killing an enemy that announces the death of the enemy
to the ghosts. Edai is also the special song sung at this ceremony. Egen is used in various
contexts to mean seed, pith, core, egg, or essence.

When the individual is in a physically and emotionally normal, healthy state, his edai-egen
is about the size of his fist and is situated forward in the body just under the base of the sternum,
where it may be seen pulsing. But when a person is seriously ill or wounded, or is mourning
for a dead relative, the edai-egen becomes small and slips back toward the vertebral column. In
this condition the edai-egeni is described as wejak, bad, or hamalukai, small. Frequently the
words are accompanied by the gesture of fist held near base of sternum, rotated down and toward
the sternum.
Figure 37. Arrow wound scars on a Dani man’s back and buttocks.
The unfavorable condition of the *edai-egen* is caused by ghosts, and while the *edai-egen* is small the individual is particularly vulnerable to further damage from the ghosts. The individual is in a weakened state. He is out of joint with the world.

There is an analogy between the sick and the very young that is not explicitly elaborated by the Dani. When a child is born, he has no *edai-egen*. During the first two years the *edai-egen* appears near the backbone, grows in size, and moves forward to its normal position at the sternum. The development of the *edai-egen* parallels the development of rational speech, and by the time a child is three or four years old he has a full *edai-egen* can take part in conversations, and is ready to be initiated at the next *ebe akho* ceremony.

In addition to *edai-egen*, the term *akotakun* is used to refer to some soul-like entity. The *akotakun* may be the same as the *edai-egen*, but it is probably a separate entity. There is some suggestion that when a person dies the *akotakun* becomes the *mogai*, or ghost, and leaves the body. Under stress the *edai-egen* diminishes and retreats into the body while the *akotakun* is in danger of flying out of the body. People sometimes cry, "*Hakotakma!*" (h-, your; *akotakun*: -ma, place of), "Your *akotakun* stay in place!" to a person who falls on a path.

It must be stressed throughout this discussion of the Dani that most of this conceptualization is done with anthropological license. The Dani do not use explicit concepts of health, or the state of normal, well-being, such as those which permeate casual American conversation: "How are you?" "Fine, thank you, how are you?" Yet, the abnormal physical and mental states of sickness, wounds, grieving, or the *sinukmuk* seizure are noted by the Dani. Both cause and effect of all such abnormal states are described in the same terms, the action of the ghosts on the *edai-egen*.

Specific diagnoses by both the people in general and curing specialists account for these adverse condition against the *edai-egen* (or life-giving-soul-matter, *akotakun*) by a multitude of causative, often not mutually exclusive factors: 1) intrusion of malevolent ghosts or spirits, 2) breach of taboo, 3) soul-like (*akotakun*) loss, and 4) sorcery induced intrusion of potentially death dealing objects. Additionally, for certain illnesses and injuries the role of naturalistic causes is recognized and accounted for in both diagnoses and treatment.

In the field of medical anthropology, Moore et al. (1980:194) point out the pertinent early work in 1932, by Forrest Clements in which Clements "focused on tracing similar traits—beliefs, practices, rituals, and artifacts—cross culturally both spatially and temporally." From his worldwide work, Clements divided disease causation concepts among nonliterate groups into five categories: sorcery, breach of taboo, intrusion of a disease object, intrusion by a spirit, and social loss (Moore et al. 1980:194 after Clements 1932). Later, Rogers (1976), in another worldwide study of nonliterature cultures, provided examples of how Clements' (1932) classification related to the treatments of disease (Moore et al. 1980:194-195). From the information obtained from my informants and observations in the Irian Jaya Highlands, it is pointed out that the Highlanders and their healer specialists think, identify, and act upon disease causes the same way that Clements (1932) and Rogers (1976) classified causes and cures. Since the medical system of the Highlanders fits the universal cause-and-treatment patterning shown to exist by Clements (1932) and
Rogers (1976), it is plausible that the paraphernalia (artifacts)—at least symbolically—and behavior used by the Highlanders to heal diseases has advantageous degrees of predictable similarities to medical systems of extinct cultures that are being interpreted from archaeological data.

Traditional Healers

The traditional healers of the Highlands are part-time specialists who are adept at diagnoses and at conducting healing treatments. Some are the male sociopolitical-and-religious leaders of the society (big men) who have the ability to manipulate supernatural power and to go into trance (refer to Leadership, Chapter IV). They both have the power (wusahun, alt. wesahun) and are the power. In addition, the big men can delegate the power to other select people (male or female), who then learn medical techniques and become healing specialists. These healers are medical specialists, without social and political influence (refer to Supernaturally Powered Objects for Social Uses, Chapter VII). Based on the ability of all healers (big men and specialists) to manipulate supernatural power, and to go into trance, I refer to these healers as shamans, although within the Highlands’ cultural systems these healers all lead normal lives with routine responsibilities.

Different levels and kinds of healing expertise among known healers are recognized by the healers themselves and by those around them. Some of the healers, by a natural interest and inclination, become particularly adept at using a diversity of plants in healing procedures. Others are known for varying degrees of ability and "power" to counteract powerful sorcery that has been diagnosed and utilized against a patient.

The house of a healer, whether a men’s house or a woman’s family house, is usually recognizable by the addition of a small spirit house that is attached against the backside of the healer’s house (Figure 38). This enclosure (or house) is to facilitate the participation of healing spirits to act as assistants in curing procedures being conducted inside the healer’s house. The healing spirits may comfortably live in this small house or freely come and go passing through the adjoining wall of the healer’s house to assist a "healing" going on inside.

Medical Practices

The patients and the healers both feel that if diseases are basically caused, in one way or another, by supernatural powers then, therefore, they must be treated by the manipulation and application of other supernatural powers. To effect countermeasures and cures, an endless assortment of religio-medical kits with their included power stones and assorted other paraphernalia are used (refer to Supernaturally Powered Objects for Social Uses, Chapter VII). Trancing is sometimes practiced, heat treatments are often effected.
Figure 38. An enclosure for healing spirits, attached to a healer's house.
and blood-letting used, plus a variety of applications of medicinal plants. The emic philosophy of Highlands medical practice is broad and detailed, the choice of material objects to effect cures assorted.

Trancing

Trancing is sometimes used as one part of an all-night healing ritual, when the healer (occasionally accompanied by an assistant) attempts to go in-and-out of trance during the fervor of extended physical activity, to the accompaniment of a chanted-sung beat (and sometimes clapping of hands), furnished by volunteer participants. When successful in achieving a trance state, the healer presumably (to the audience and patient in attendance) enters the world of the unseen, to interface with supernatural entities on behalf of the patient. From my limited observations, female healers (he phatale) are more successful at achieving this altered state of consciousness than men. Inside the small houses, women of particularly small stature (relative to ceiling height), can jump continuously from a stooped position; whereas men more often bounce vertically from a typical hunkered position, with the buttocks touching the floor between each leap. Only once did I observe during an all night healing ritual, a situation where the patient, encouraged by the healer, attempted to maintain the physical exertion prerequisite to going into trance. This was on the fourth day of an arduous healing treatment. It appeared to me that rather than go into trance, the patient finally lapsed into a state of unconsciousness. The photograph of Figure 39 shows this patient, to the right side of the healer, just before he slumped into unconsciousness (or perhaps, a deep sleep).

Heat and Smoke Treatments

The beneficial use of warmed grasses as the receiving "blanket" for the newborn is a common practice at the birth of a new life. Healers also spend time massaging out common adult aches and pains with handfuls of heated and empowered grasses and leaves--often exposing a "disease object" that has been worked out of the affected area. Five other kinds of specific heat treatments are known. Not all are used throughout the entire research area.

Yali Enehumange. The Yali practice a rather complex curing procedure using heat and smoke as the primary natural curing elements. This treatment in central Yali dialect is called enehumange. Although informants of other language groups do not deny using this treatment, I have not observed its practice outside of Yali territory. The treatment is always performed by shaman healing specialists. Since the presence of a beneficial healing spirit that dwells in turbulent water is a prerequisite to the hopeful success of the procedure, it is only executed on the bank of a river or on a small island. The treatment is used as a counteraction against sickness-causing ghosts/spirits that produce poor-health symptoms in a patient. Some shaman healers state a preference to reserve such a treatment until two or three patients can be treated at the same time.
Figure 39: Trancing during an all-night healing ritual.
A curing platform (pelangge) about 45 cm high x 60 cm wide x 160 cm long is constructed at the time of treatment (Figure 40). The patient lies on the platform of small poles cut especially for the purpose and is covered with fresh branches and leaves to protect him/her from the hot sun and to lay hidden from malevolent ghosts that might be hovering about at this time of vulnerability. The important curing fire must be started near the water’s edge so the fuel can absorb healing power from the water spirits. In the upper right photograph of Figure 40, a roll of rattan fire-starting thong (Yali, pinting) can be seen on a rock near to a just-used forked fire-starting stick. Grass and leaves called ulsangge and small sticks are used to fuel the fire before it is moved under the healing platform. The lower two photographs show one of the shamans with a special bundle of leaves called a ahumangge that was made from specific curing leaves (called simpaloingila) collected for the purpose. Along with the utterance of verbal formulae, the shamans rub the patient’s body with the leaves after they have been heated in the special fire. The combination of the spirit power enveloping the patient in the smoke from below and rubbing the patient with the smoke-treated leaves are thought to effect a cure for this patient by driving the sickness causing spirits out of the patient’s anus. In the treatment shown in Figure 40, the patient was a teenage boy who suffered from a bloated “bad” stomach. After the treatment the bundle of curing leaves were unceremoniously discarded in the river. The success of the treatment is not known. Sometimes, I was told, this treatment is reinforced by the concurrent burning of empowered hotali beneath the curing platform.

Dani Hotali Treatment. Among the Dani, a special tree resin called hotali is burned on a small rock or piece of wood, while the patient (male or female) squats low over the burning hotali, sometimes to the point of singeing pubic hair (Figure 41). The empowered dense black smoke from the burning resin is thought to drive off disease and effect a cure, especially for hemorrhoids and diarrhea.

Lisaniken Burn Treatment. For many illnesses, the lisaniken burn treatment is very popular and is applied by the afflicted person, without the assistance of a healing specialist (Figure 42). Small sticks are broken into short pieces, the bark stripped off one end of each stick, the sticks wetted with saliva, and stuck in a line on the affected area. Each stick is lighted (usually with a cigarette) and then allowed to burn down to the skin. Resultant burn scars are visible on the forearms, upper arms, shoulders, and backs of men and women alike. When applied to the back, an assistant is required.

Wano Boyabay. In the northwest corner of the research area, the Wano people say that they learned the boyabay heat treatment from their lowland Duvle neighbors to the north. In this treatment a glowing piece of charcoal is moved slowly by an assistant close to a painful area, while the person administering the treatment continues to fan the charcoal by blowing across it to the painful spot. The burning charcoal is moved closer and closer until the heat from the charcoal feels more severe than the pain itself. If this does not happen until the charcoal touches the skin, the skin is ultimately burned by the charcoal.
Figure 40. The Yali *enelumange* heat and smoke treatment.
Figure 41. Tree resin (*hotali*) heat and smoke treatment.
Figure 42. The *lisaniken* burn treatment.
In the same geographic area, for malaise and symptoms that effect the overall body rather than localized parts of it, tiny bits of burning charcoal are sometimes sprinkled onto selected parts of the body, causing an array of tiny burns and usually leaving visible scars.

Bloodletting and Surgery

... I wanted to find out why our forefathers, almost to a man, believed that the proper way to treat most diseases was to remove blood from the patient.

Peter Brain Galen On Bloodletting (1986:IX)

For bloodletting and surgery, the cutting tools are made of bamboo, wood, and for one lancing procedure, a blade of grass. Stone tools are not considered as alternatives. Of the six known procedures (four, bloodletting and two, other kinds of surgery), three are practiced by specialists, one with an assistant, not needing to be a specialist, and two by the patients themselves. Other than the four kinds of bloodletting, the other two circumstances for which surgery are generally practiced on humans are to remove arrows and to pierce the nasal septum to receive nose ornamentation. Surgeon specialists also castrate pigs.

A prevailing thought among Highlanders is that many illnesses are caused by evil spirits in the blood. "Bleeding off the bad blood," or, as it is sometimes called, "the black blood" is remedial. Even those people seriously wounded by arrows, spears, or adzes must be treated by bleeding.

A common cure for headaches is to bleed blood from a nasal passage. In the siluk procedure, the patient treats him/herself by taking a needle-sharp spear of purple tipped siluk grass, carefully inserting it up one nostril to mid-eye level, and then sensitively lancing the nasal membrane. This is usually done while the patient is slightly bent forward from a sitting position. The dripping blood is accumulated on a properly placed leaf, later to be burned to prevent blood contamination of the ground.

In a moli sike treatment, a venesection (bloodletting by opening a vein) is performed on a large vein in the lower part of a leg. This treatment may be prescribed by a healer shaman or requested by a patient. The treatment itself derives its name in mid Grand Valley Dani dialect from the instruments used to cause the bloodletting: a very short arrow (about 38 cm long) with a special tiny bamboo tip which is called a moli (sharp) and a miniature bow (about 94 cm long) that powers the arrow to puncture a selected large vein. The archer's assistant places a small (about 3.5-4 cm long) trough-like piece of reed against the vein to guide the moli precisely to the vein. The tip of the moli (sharp miniature bamboo arrow tip) is only about 1.3 cm away from the vein when it is released. Almost immediately a jet of blood spurts from the wound (Figure 43). At this point in the photographed procedure, the patient's facial expression was one of tenseness and strain, rather than of pain (Figure 44). During this treatment (Figures 43 and 44), bloodflow was encouraged from time-to-time by sticking the round, basal tip of a stem of grass into the
Figure 43. *Moli sike* bloodletting healing procedure.
Figure 44. The patient's facial expression.
wound and agitating it. When it was decided that enough bad blood had been "let," one of the two shaman healers applied pressure with his fingers against the wound and finally applied a conventional leaf bandage which was bound tightly over the wound. After the bleeding had stopped, two onlookers sloshed water from the adjacent stream onto the bloodied ground and meticulously wiped it clean with grass, to alleviate the fear of its presence enraging nearby ghosts. More often during a *moli sike*, the blood is collected in a split section of bamboo placed on the ground next to a patient's leg. Later uses of the blood or disposal procedures are not known. The patient always stands during a *moli sike*. If quite ill, helpers will hold the sick person in an upright position, while the surgeon specialists (two-man team) perform the procedure. I have not known of women healers to ever be surgeons. This procedure is known to be practiced at least among the Western Dani, Dani, and Yali.

Another kind of bloodletting procedure is bleeding caused by slicing a small fold of skin and irritating the wound. The surgical tools are a short bamboo knife and a double-edged, dagger-like bamboo cutting instrument. A specialist performs the procedure. It is a practice used to counteract any number of illness symptoms and is pervasively used to "bleed off the bad blood" when a warrior has been wounded with an arrow, spear, or adze. In the two photographs of Figure 45a, such a procedure is shown which was initiated to alleviate a woman's back pains. In the upper photograph, a fold of skin is held out from the patient's lower back by the surgeon specialist and the patient herself, while the surgeon incises the fold with a bamboo knife. While this is being accomplished, a sharp, double-edged bamboo implement is seen held in the surgeon's mouth. After the incision is made, the small bamboo dagger-like tool is inserted into the wound and twisted to promote bleeding (lower photograph, Figure 45a).

In Figure 45b, three scars are seen along the edge of the rib cage and on the abdomen of a Dani warrior. Such scars are the result of the same kind of treatment, initiated on a wounded warrior to "bleed off the bad blood," and restore the *edai egen*, or "singing seeds of life." For war wounds, this bleeding procedure is initiated as soon as practical after the injury has been received, even while out on the battlefield itself, but at a safe distance behind the battle lines. For an unknown reason, when dealing with war wounds, the surgeons prefer to make three cuts around the lower edge of the rib cage. The specialist who performs a bloodletting at a battle site might be the same specialist who is called upon to remove arrows. His tools for cutting, probing, and pulling, usually consist of a bamboo knife, bone awls, fingers, and sometimes his own teeth.

A rather casual-appearing bloodletting procedure that is practiced from time to time and across language boundaries, is what I call "slicing." Usually it is the patient him/herself who administers this form of bloodletting with self-inflicted slicing of one, or up to three cuts with a bamboo knife on a selected part of the body. A favorite spot for such slicing is on the forehead, sometimes another part of the face, or on a shoulder, the chest, or an arm. This is not scarification for beautification or identification purposes,
Figure 45a. Bloodletting by incising and wound agitation.
Figure 45b. Bloodletting scars on a Dani warrior.
but a simple cut/cuts to "bleed off the bad blood" for therapeutic purposes. Without attempting to argue any point as to where or why such a procedure fits into the scheme of the evolutionary practice of medicine, it is pointed out that within the Alexandrian school of medicine (about 350 B.C.-A.D. 50):

To know when one should cut the vein in the forehead, and when the veins next to the corner of the eyes or the ones under the tongue or the so-called "shoulder vein" . . . or the vein behind the thigh and the knee or along the ankle . . . was the kind of precise knowledge, says Galen, that Herophilus displayed when he drew blood for therapeutic proposes [Von Staden 1989:403].

For cosmetic purposes to be able to wear boar tusks and other ornamentation in the nose, holes are created in the nasal septums of almost all boys and some females (Figure 45c). First, a hole is punctured with a bone awl. Then the hole is enlarged over a period of time that may last as long as a month. Tightly rolled wads of leaves or sticks of different diameters are placed into the hole so that it heals with the desired large opening.

The Highlanders understand and use the principles of tourniquets, suturing, compresses, and tightly bound wounds to stop bleeding. Although I have not observed suturing practiced on humans, I have seen pigs sutured with grass stems. and incised openings held closed with the use of awls and stick "pins" at pig castrations.

**Birth to Death**

**Children, Birthing, and Polygyny**

Within the research area, women desire and birth usually one to three children (Figure 46). This general analysis fits with Heider's statistics among the mid Grand Valley Dani in the Dugum Dani Neighborhood, where Heider reports that of child-bearing-age married females, 55 percent have one child, 36 percent have two children, 8 percent have three children, and less than 1 percent have four children (1970:73). Some women state that to achieve this birth rate, they practice sexual abstinence for up to six years after the birth of a child. Heider, "estimates the period of postpartum sexual abstinence to be about four to six years" (1970:74). According to Heider, a period of postpartum sexual abstinence is common worldwide, but the time period practiced in the Irian Jaya Highlands is unusually long. Abortions by mechanical manipulation, the physical stress of making repeated trips with unusually heavy loads of sweet potatoes, and the uses of contraceptive plants is reported by local inhabitants but the effect of such practices on area-wide statistics is considered problematic. Women wet-nurse the newborn for at least 10-12 months to as long as two years, during which time the babies basically live in their mothers' head-back nets throughout most of the daylight hours. During this period, a baby is in constant physical contact with its
Figure 45c. A bone awl is used to puncture the nasal septum.
Figure 46. Mothers and their nursing-age children.
mother since a mother carries her child in this fashion while going about her daily routine and even while working in the sweet potato gardens and carrying other loads in yet another net on the back. From an etic viewpoint, it is thought that this closeness is beneficial to early development of the child. Possible adverse psychological effects of being raised in near-darkness during these formative months have not, to my knowledge, been analyzed.

Polygyny is common in all language groups within the research area. Limited interviews area-wide indicate that about half of the adult males have one wife at any given time (divorce is rare), the other half, from two to seven wives at a given time, with the lifetime total for those who ever lived in a polygynous situation to range from two to about nine wives. Male wealth and political status relates to an increasing number of wives with increased wealth and power. Heider points out that in the Dugum Dani Neighborhood, the 49th's figure which he presents for adult males who have only one wife is low because some of the men in the statistic are young and will acquire at least another wife later in life.

Birth is usually indoors, in a woman's house. Among the Dani and Western Dani, birth is most often accomplished from the upright standing position with the expectant mother leaning forward with outstretched hands grasping one of the horizontal bracing poles that rim the interior wall of a house. The child is birthed onto a bed of soft, warmed grasses as the mother slides to her knees around the child. Midwives in attendance, often including the new mother's mother, rub the baby's body with hands just-warmed at the fire and with warm grasses to give the child a good start in life. Some Yali and Una women report that most of their births are similar, but with the birthing mother in a low squatting position supported by the midwives as the baby is dropped onto warmed grasses below. When interviewed on the subject, all women, regardless of language group, thought that the modern Western method of birthing, while in a basically prone position, laying on the back (which I had explained to them), was wrong. Most laughed at such an idea.

Mothers, fathers, and nearly everyone else around babies and young children are affectionate and demonstrative. Until the ages of five to seven, the children basically live and sleep with the mothers. Although, even while this young, children sometimes play and nap in the men's house. From the five-to-seven age period, both boys and girls adventure out and often spend periods of several days in nearby compounds with relatives. They learn through example and imitation. From 7-13, both boys and girls assume responsibilities, caring for younger brothers, sisters, and pigs. Both girls and boys learn to make string and girls to weave it into net bags. A girl helps her mother weed a garden and may even have a garden of her own. Between the ages of approximately 11 and 13, a daughter is considered marriageable. Commencing at about four years, a boy of the waija moiety is considered ready for the boys' initiation ceremony, and at ages 11-12, a boy commences to eat and sleep in the men's house. Soon he will become a warrior. He is learning to design and will eventually become an engineer and a builder. A girl is
learning the intricacies of a woman's nurturing and binding role in a family and, as she reaches adulthood, she will become a producer.

Rites of Passage

The Highlanders in the research area recognize the human life cycle—from birth to death—with both its positive and negative effects on individuals and community. Their cultural response is an evolved system of rites of passage.

Perhaps the first plausible archaeological evidence for humankind's earliest practice of a rite of passage was uncovered in Shanidar Cave (northern Iraq) in 1960 by Ralph S. Solecki (1971). Here, at the apparent gravesite of a single Homo sapiens neanderthalensis male, Arlette Leroi-Gourhan identified pollen and flower fragments from at least eight species of "mainly small, brightly colored flowers" as well as very small pieces of wood in the soil in close proximity to the skeleton (Shanidar IV) (Solecki 1971:246-248). "At least seven of the species of flowers are represented by clusters of pollen," rather than by random or isolated pollens, leading Leroi-Gourhan to deduce that no accident of nature could have deposited such remains deep in the cave (Solecki 1971:247). Leroi-Gourhan (1975:563) concludes that "... the placement of Neanderthal man, Shanidar IV at Shanidar cave on a bed of ramose branches and flowers occurred more than 50,000 years ago between the end of May and July." Solecki estimates—and he cautions that this is only an estimate—that Shanidar IV may be as old as 60,000-65,000 years (Ralph S. Solecki, personal communication 1995). According to Solecki (1971:246), "Here were the first "Flower People," a discovery wholly unprecedented in archaeology, as well as unexpected." Perhaps the wood fragments and flowers are both relic remains of early funerary practices that are associated with a rite of passage. Although the true meaning of these particular artifacts are still academically debated, as we come forward (younger) in prehistoric time, there is increasing uses of numerous artifacts in different rites of passage, especially as funerary items accompanying the deceased. The examples of such cases since about 10,000 ya is overwhelming.

A French anthropologist, Arnold Van Gennep, undertook a detailed survey of the literature to categorize rites of passage that he regarded as "ceremonies whose essential purpose is to enable the individual to pass from one defined position to another which is equally well defined" (1960:2, 33). Van Gennep's analysis includes "rites that help individuals through life crises such as birth, puberty, marriage, parenthood, advancement into a higher class, occupational specialization and death" (Haviland 1993:358). Van Gennep found it useful to divide ceremonies for all of these crises into three stages which he called: 1) separation, 2) transition, and 3) incorporation (Haviland 1993:358). For analyses of process (related ceremonies) of rites of passage, other anthropologists have generally agreed to this format, although some prefer a different tripartite nomenclature: 1) separation, 2) margin, and 3) aggregation (Kottak 1991:336).
Kottak further elucidates that period of time which he calls "margin" (Van Gennep’s "transition") as a period of liminality. When the individuals undergoing a particular life-crisis are existing in a circumstance of ambiguous social positions. "They exist apart from ordinary distinctions and expectations, living in and out of time" (Kottak 1991:336).

It is not a purpose of this research to analyze the rites of passage practiced by the indigenous Irian Jaya Highlanders, but to identify them within an evolutionary cultural framework for a ready reference when certain material goods are being identified and the behavior that surrounds them is discussed.

Of Van Gennep’s rather comprehensive group of rites of passage just-listed, the Highlanders respond personally and as an organized systematic group to: 1) puberty (adulthood), 2) marriage, and 3) death with significant ritual. Birth is noted, but mostly on a personal basis. For girls, menarche is also discreetly handled, but without formal ritual—only by watchful, loving, personal attention of close female relatives at the time of menarche. Sometimes bloodied grasses are inconspicuously burned, with the drift of the smoke divining the direction or place from which a spouse might come. But for the boys, the transition from youth to adulthood is a major rite of passage. In the Grand Valley, for youngsters who will be inducted (birthright on father’s side) into the waija moiety, the celebration is held about once every five years in conjunction with the alliancewide ebe akho period of many ceremonies. For boys who are born of wida fathers (the other moiety group), the transition from boyhood to adulthood is handled with less auspicious ceremony. Rites of passage to adulthood are held for boys outside of the Grand Valley, but with local procedural variations. Marriage is a grand rite of passage, looked forward to and enjoyed throughout the entire Highlands area: pigs are sacrificed, feasting takes place, wealth exchanges hands, and families are united in rather complex obligatory relationships. But the most complex and perhaps the most important rite of passage, to the individuals and the cultural system, is the funeral. It lasts through several stages, over a period of years and serves to placate the ghosts and spirits, purge grief, and contribute, through wealth exchange, to a viable economy. The funeral display-exchange stones are extremely important. Details are discussed in Chapter VI.

In addition to rites of passage that are such a significant part of the cultural system of the Highlands, certain rites of intensification are also important. These include rituals at wartime to protect the warriors and improve the likelihood of success, rituals to stop the rain when there is too much of it, rituals to encourage good crop yields when production is off, and rituals to improve the health of a community. As Haviland defines these kinds of rituals, "These are rites that make occasions of the crisis of a group, rather than an individual" (1993:359). Although there are "rites of intensification" that can be differentiated from "rites of passage," such as those mentioned above, it is pointed out that among the Irian Jaya Highlanders, the rites of marriage and death, especially of death, are rites that also "mark the crises of a group" just as of an individual (refer to Chapter VI).
Old Age

For those who reach old age (estimated more than 50 years), an established cultural pattern is in place for continued community participation, as responsibilities for arduous physical activities dwindle. Old men (estimated 50-75 years) usually continue to live in their customary men’s houses, where their advice is still heard as they participate in men’s discussions of daily and community affairs. The old Yali man (estimated 60 years) in Figure 47 lives in the men’s house shown behind him. This man says that he can still walk long distances but now needs the assistance of a walking staff. He will not stand or sit in direct midday sunlight and only travels about during early morning or late afternoon. Even at his age, he can still sit and rise with agility from the fully hunkered position with his buttocks on the ground, just as he has done all of his life. This man says that he is too old to kill another man in battle, and that even when he was younger, although he did fight, he did not really enjoy warfare, but rather took his pleasures from hunting cassowary birds and gathering insects and Pandanus nuts.

Elderly women, like men, stay basically self-sufficient as long as possible and usually remain in their customary woman’s house until death. When widowed in old age, however, a woman might move from one compound or house cluster to another to be nearer to a daughter or grandchild. If widowed while younger, it is normal to move from one habitation to another site and remarry. While older men continue to play a role (and fulfill a personal need) in shaping community affairs by participating in the discussions of men’s groups, older women continue their roles as “producers” in the society by whiling away the hours making much needed bark fiber string (Figure 48).

Children and grandchildren learn by observation to be respectful and to care for the elderly. I have observed both female and male grandchildren assisting aged grandparents with their dress and adornment. The grandparents are loving and indulgent of grandchildren.

About the only artifact of culture that is characteristic of old age is the walking staff that is used by all old people (Figures 49 and 50). In Figure 49, one sees Isabaga leaning heavily on a walking staff as he rests enroute to a spring to get a drink of water. Isabaga was Wali’s uncle (now deceased), whom Wali often called “father.” Isabaga was attentively cared for by Wali’s son, Wimoba, during Isabaga’s later years.

In Figure 50, an elderly white-haired woman (approximately 65-75 years) in the Baliem Gorge demonstrates that she can still climb over the fence-gate in and out of her compound. A walking stick is in her right hand, and a second, which the woman conveniently keeps next to the fence overwalk, is seen just to the right.

In some nonliterate cultural systems, surviving into old age is considered evidence for the possession of supernatural power and the practice of sorcery. This does not seem to be true among the Highlanders
Figure 47. Old Yali man hunkers on a hill.
Figure 48. Old Yali woman making string.
Figure 49. Old Isabaga leans heavily on his walking staff.
Figure 50. An elderly white-haired woman in the Baliem Gorge.
of Irian Jaya, although I have observed such fears about certain of the elderly in the Lake Sentani culture in the lowlands to the north (Figure 1).

Living a lifetime near-naked under the equatorial sun produces a high degree of skin-wrinkling, but seemingly with fewer skin blemishes and significantly fewer skin cancers than would be produced on fairer-skinned people (Figures 51 and 52). The bronze colored finger nubbins of the elderly woman seen in Figures 51 and 52 communicate a former time when finger phalanges were amputated as sacrifices to placate the ghosts.

Death

As previously reviewed in this chapter (Traditional Concepts of Life), the essence of life is the edai-egen. The health of an individual fluctuates in response to the state of the edai-egen. When the edai-egen is at a particularly low ebb and the people around a seriously or critically ill individual (whether in a poor state of health from a war wound, accident, natural illness, or old age) conclude that the edai-egen is gone they may abandon the individual, recognizing cultural death actually before physiological death has occurred. In fact, such acts of abandonment and withholding food and water may actually be the cause for physiological death which soon follows. At the cultural-physiological "time" of death, the edai-egen has shrunk to nothingness and is gone. Within an unspecified time frame, but thought by the indigenous inhabitants to probably occur during the funeral and before actual cremation, the soul-matter akotakun (in mid Grand Valley dialect) departs the body to become a ghost. Both cultural and physiological death has now been recognized, the ghost entity has departed, and the body can now be cremated.

Funeral and Body Treatment

Death, whatever the cause, initiates immediate action. The news is shouted from hamlet to hamlet and carried by messenger to distant-living kinsmen. Plans are set in motion for the first of a series of funeral rites that extend over several years, the first of which usually commences the day after a death. The immediate goals are to dispose of the body, purge the grief of kinsmen and loving friends, placate the ghosts of the deceased as well as ghosts in general, and reinforce ties of kinship. The funeral process with the accompaniment of the exchange of a great amount of goods is discussed in Chapter VI.

Within all of the Highlands part of the study area, bodies of the dead are disposed of by cremation. Among the adjacent lowland Duvle, just north of the Wano and the Yeineri quarries (Figure 2), however, corpses are disposed of by burial on tree house platforms (Hampton 1992b:90). Hitt (1962:139) also reports tree house burial and corpse destruction by natural elements for the Highland Moni language group, who live just west of the study area toward Enarotali (Figure 2). Hitt further points out that in the cases of a
Figure 51. The wrinkling effect in old age from an equatorial sun.
Figure 52. Sun wrinkled old hands with amputated finger joints.
headman or prominent tribesman among the Moni that a favorite wife is executed and her corpse placed with that of her husband.

Cremation

Although the practice of cremation is well known within cultural systems around the world today and in recent prehistory, we have little evidence as to when, where, and why the practice originated in earlier prehistoric times. Cultural accounting for such a practice is usually illuminated only by mythical stories. The archaeological impact of the practice of cremation is significant. Physical data from human skeletons of the cultures that practice cremation is sparse to non-existent. Cremation itself, as a behavioral practice, in an extinct cultural system is usually difficult to interpret, unless ashes and bone remnants are preserved in indestructible containers.

Physical data from human skeletal remains in the Highlands cultural systems as we know them today are sparse for this reason and few skeletal remains are being relegated to the archaeological record. Because of the Highlanders' practice of cremation (Figure 53), only ashes and remaining small burned bone fragments make their way to ghost/spirit enclosures (wuro leget) (Figure 54) and other places for abandonment. Such fragile materials are then easily destroyed by organisms, weathering, and erosion processes. The likelihood of a Highlands' funeral pyre being preserved archaeologically is nil. In Figure 53, a female corpse is being consumed by flames on the second layer of a three-layer cremation pyre. Special logs, particularly high in flammable resin, are used to insure the pyres will continue burning even in heavy rains and reduce a skeleton to ash and small burned bone fragments. The photograph shown was taken during a heavy downpour with a 200 mm lens from a nearby house. It was because of the heavy rain that the courtyard around the pyre is clear of people, all of whom had retreated to courtyard houses. One can see that the flames are burning vigorously, in spite of the heavy rain. The Highlanders profess to not know why they cremate or when the practice started, but it is presumed to have commenced after the hunter-gatherer ancestors became horticulturists.

Some few body parts of departed influential leaders are maintained by their descendants as sacred objects. An ethnological example of this practice is presented in the discussion of big man Gutelu's sacred belongings in Chapter VII. Due to the sacred and very secret nature of this practice of preserving body parts for religious purposes, little else is known of other examples and the practice cannot be quantitatively assessed.

Mummification

In addition to the apparently rare custom of the preservation of body parts for religious purposes, the presence of three soot-blackened, pig-grease-rubbed mummies are known within the Grand Valley, one in
Figure 53. A cremation pyre at a Dani funeral near Tagime.
Figure 54. Isabaga’s bone and ash remnants months after cremation.
the southeastern part of the valley, one at Aikima, and one at the compound known as Sompaima on the west side of Jiwika (Figure 6). Of the three, I have seen and photographed two: the mummy of Aikima and the mummy at Sompaima (Figures 55 and 56). I suspect, however, the hidden presence of more but still consider them to be cultural oddities. The three known mummies are maintained as sacred objects, and at least until recent times, all three were treated as "spirit bones," being the bodies of personified ancestral spirits that had been "installed" by religious ritual.

The shiny-black mummy of Aikima maintains its high luster (Figure 55) by being anointed with sacred pig grease at somewhat regular power renewal rituals. The grass stem *dibat* tied to the mummy’s left arm is a symbol of power renewal and protection of the sacred spirit within. It was attached at a sacred ritual not long before the photograph was taken in the spring of 1982. (*Dibat* worn by humans are discussed in The Profane and Sacred Uses of Fiber String in Chapter IV and when installed on sacred objects in *Ganekhe Hakasin Ceremony* in Chapter VII). Several fiber string *dibat* about the mummy’s neck are hidden from view in Figure 55 by an overlying traditional necklace of one large and several smaller cut sections of a bailer shell that are tied to a woven string neck band. The mummy’s head is covered with a traditional man’s hand-woven net cap and adorned with bird feather plumage. The two Dani guardians of the mummy also wear the important string necklace (*dibat*). Three dried banana-leaf-wrapped funeral display-exchange stones (*je*) are maintained in a normal upright position against the house wall behind the mummy. During my visits to the mummy in 1982 and 1983, the age of the mummy was unknown, but thought not to be older than about 100 years. In response to the economic rewards of tourism, I understand that the mummy is now (1994) maintained in a small museum facility.

In 1989, Konono Mabel, the big man at Sompaima compound told me that the Sompaima mummy was 360 years old (Figure 56). I doubt this antiquity but was not allowed to attempt a dating procedure. The mummy is reportedly that of Wamendo Mabel, a former "big man" war general who died in battle. According to legend, Wamendo Mabel had told those around him that when he died, he would like to be "mummified" rather than cremated. Reportedly, Mabel was found dead on the edge of a battlefield with a spear in his back and the stark expression of an agonized scream frozen on his face by rigor mortis.

In accord with Mabel’s wishes, his remains were preserved by desiccation rather than cremation. His body was compressed into the normal Dani seated or "hunkered" position for the procedure. If found in the archaeological record, this might be called the "fetal" position. Mabel’s penis gourd, rattan headband, and net-string hat were supposedly maintained as found at death in the position seen today in the photograph.

To create a mummy the Mabel elders said that first the internal organs are removed through the anus without the use of tools and that no incisions are made in the abdominal area. Then, the body is supported over a house fireplace from the wood rack, where it is smoked and dried by heating for about three weeks.
Figure 55. The sacred mummy of Aikima, not far from Wamena.
Figure 56. The Sompaima mummy, one of Gutelu’s ancestors.
The brains are worked out through the eye sockets during the smoking/cooking process. During and after the process, the body is rubbed, from time to time, with pig grease. Once a mummy has been created, it is maintained in a box or net bag against the ceiling of a men's house where it continues to dry and be smoked. During periods of spiritual power renewal (like the ganekhe hakasin ceremony discussed in Chapter VII) and perhaps for other religious purposes, the mummy is taken down from its ceiling position and anointed with sacred pig grease and empowered with the addition of a new sacred string necklace (dibat). The many dibat on the Sompaima mummy attest to this ritual attention (Figure 56). Mummification is not known in the Yali and East region.

**Human Skeletons**

The meaning of the few human skeletal remains that are known in scattered crevices, rock shelters, and caves is unassessed (Figure 57). Wali tells me that at least some are the remains of murder victims, hidden secretly in caves so they will not be discovered. Traditional traders and other travelers account for skeletal remains found in crevices and large cracks in the rocks by saying that when on trading expeditions or long distance trips to gather natural resources, if a party member dies, his body is put in a rock crevice or crack, rather than abandon the expedition and carry the body home for cremation. Other indigenous informants relate human skeletal remains in caves to cannibalism that was practiced by the ancestors. I believe that any or all three explanations might account for the presence of such skeletons. Mythical explanations for the presence of human remains in certain caves, although interesting, do not clarify the issue of skeletal origins.

**Summary and Conclusions**

In the natural process, the biomass of most living entities is reduced from death via the food chain, weathering, and erosional process to minute particles and chemistry that are inauspicious in the landscape. In fewer cases, the bodies of humans and parts of bodies are preserved by special natural processes of fossilization, desiccation, chemical action (such as in peat bogs), and freezing. Every so often, treasures-troves of cultural information are found in the prehistoric record in the form of mummies that were so-formed and protected by the natural process. Recent examples of such finds that are of particular interest and value to the archaeologist are the "Neolithic hunter who died some 5,300 years ago" and was found in 1991 in the Ötztaler Alps on the Australian-Italian border (Spindler 1994) and the 100 well-preserved "4,000-year-old Caucasians" found in Xinjiang, China (Hadingham et al. 1994).

Once humankind began to think abstractly and reflect on life after death, the matter of the destruction or preservation of deceased humans was not just left to nature. Radically different burial patterns and
Figure 57. Human skull with brow scar, possibly caused by stone adze.
methods of treatment of deceased humans emerged. Cultural treatment of dead bodies became related to different belief systems.

The fact that the Highlanders cremate may be a manifestation of the general practice of the Highlanders to clean their environment of dead and unneeded organic debris. They are meticulous around their habitation sites on this point, with the single exception of leaving pig scat where it naturally falls. That there are a few human mummies within the cultural system I consider an oddity. The Highlanders do not have, within their belief system, a need to preserve corporeality of any individuals.

The presence of three kinds of body treatment at death (cremation, mummification, and "untreated" skeletons) within the Irian Jaya Highlands is an example of the kind of diversity that might be anticipated in the archaeological record. Evidence for more than one type of body treatment at death at an archaeological site should not be considered as evidence per se for the presence of people from more than one culture.

Belief System

Ghosts and Spirits

According to the peoples' world view, all space is occupied with entities in two separate but commingled worlds: 1) the world of the seen and 2) the world of the unseen. Living entities like humans, animals, and plants occupy the world of the seen along with inanimate objects like rocks, earth, water, the sun, the moon, and stars. The world of the unseen is occupied by ghosts and spirits. Ghosts and spirits are everywhere and their presence is pervasive throughout the cosmos. From an emic viewpoint, the living entities of both the seen and the unseen worlds cohabit the same geographic place and space, creating observable behavioral complexities by people that are often not understood by an outside researcher.

In an emic classificatory system of ghosts and spirits, there is one general category of ghosts and two broad categories of spirits. Ghosts originate, one at a time, from the life-soul matter at the death of each human. Ancestral spirits comprise one category of "spirits". Their origins are, interestingly, from the human-originated ghosts. The second category of spirits comprise a multitude of "other-than-human" originated spirits which fill the landscape (Chapter III). After variable periods of elapsed time, the durations of which are only understood esoterically, certain ghosts are selected by the religious men’s groups for a rapid metamorphosis (installation ritual, Chapter VII), to become one of many ancestral spirits that are propitiated and manipulated during culturally endemic rituals.

Both ghosts and spirits of the unseen world are feared. Ghosts are thought to be malevolent and must be constantly placated, diverted, and avoided. At the birth of each ghost, with the death of a human being, placation commences immediately with a complex funerary celebration that shows the ghosts that the living
humans really do care about them. Great emotional displays of grief are choreographed along with live, bloody sacrifices of appeasement. Items of wealth are ostentatiously displayed and exchanged in the ghost's honor. Efforts by humans are continuously taken to appease, pacify and divert ghosts away from habitation sites, gardens, and places of other cultural activities. Among objects so-used, are ritually empowered ghost barrier bundles and rat arches (Figures 58 and 59).

In Totem and Taboo (1913), Sigmund Freud postulates that the belief in some cultural systems that the living can be harmed by the dead serves to reduce guilt experienced toward the dead (Eliade 1987a:264). Freud goes on to state that repressed hostility projected onto the dead, in spite of kinship relations characterized by conscious affection, takes the form of a belief that the dead are malevolent and can harm the living (Eliade 1987a:264). Whether or not Freud's interpretative psychological principle correctly describes the conscious-subconscious motivation that causes the Irian Jaya Highlanders to feel that ghosts are malevolent per se and should be feared is problematic, but when thinking about the cognition and psychological motivation of people within early-formed cultures like those addressed in this text, it is felt noteworthy to point out Freud's principle. It was elucidated long before the people within the current study area were even known to modern outsiders.

Complex Ancestral Worship

The ancestor worship of the Irian Jaya Highlanders is but one part, although I believe the core, of the religious aspects of a complex belief system (Chapter VII). Across all language boundaries within the research area, the people fear and go to extremes to placate the ghosts, which, in general, they feel are malevolent. The people fear but respect ancestral spirits which are propitiated and manipulated in numerous rituals on behalf of all manner of social causes (Chapter VII). Both live, bloody sacrifices and bloodless sacrifices are offered to ancestral spirits in a continuum of deeply-rooted cultural rituals. The people also go to varying degrees of effort to pacify and avoid the multitude of other-than-human originated spirits (Chapter III). In addition, some of the Highlanders, in at least a large part of the Grand Valley and West region, conduct religious ritual to propitiate and manipulate the spirit of the sun (and some, the moon spirit) just as they do to propitiate and manipulate their own ancestral spirits (Chapter VII).

Females are included in funerary rituals for deceased humans but are excluded from rituals celebrated for ancestral spirits. The ancestor worship is, in one sense, a very tangible linkage of patrilineage relations between the male elders and their male juniors. The juniors learn from observation and finally participation about how to install their ancestors' spirits into tangible "spirit bones" and to preserve them as viable entities in the spirit world of the unseen. The patrilineage-formed-socio-religious ganekhe groups that gather at rituals to honor, propitiate, and manipulate their ancestors, in an emic sense, are considered
Figure 58. Empowered no-trespassing signs for ghosts and humans alike.
Figure 59. Empowered rat arch to protect a new bridge.
communities composed of both the living and the dead (Chapter VII). Within these groups, the transmission of the knowledge and practice of the religious ritual of ancestor worship is vertical.

Sacrifice

As attested by the history of religions, a broad range of specific practices and multiple kinds of objects are used in sacrifice to supernatural beings. Sacrifices of blood offerings of human beings and animals as the gifts and the bloodless offerings of flowers (or of sweet fragrance from certain flowers, woods, and incense), vegetative materials from cultivators, plus a multitude of inanimate objects are well documented. Practices of headhunting and cannibalism are sometimes included as variations of kinds of blood sacrifices. It is in blood sacrifices, especially where human beings are offered, that "part-for-the-whole" sacrifices, like the offerings of fingers, hair, or blood drawn through self-inflicted wounds are sometimes used as replacements (Eliade 1987b:546).

From a theoretical viewpoint, Eliade (1987a:101) expresses the opinion that for . . . "palaeo-agricultural peoples, what is essential is periodically to evoke the primordial event that established the present condition of humanity" [Author's note: "A human blood sacrifice"]). It is Volhardt who Eliade credits with first demonstrating the religious meaning of cannibalism. Eliade (1987a:182) combines his own thoughts with those of Volhardt when he says:

... the killing and devouring of sows at festivals, eating the first fruits when tubers are harvested, are an eating of the divine body, exactly as it is eaten at cannibal feasts. Sacrifice of sows, headhunting, cannibalism are symbolically the same as harvesting tubers or coconuts.

Within the realms of this provocative and (to this research) pertinent issue which is elucidated above by Mircea Eliade, I would offer, but not argue at this time, my theory that within the cultural systems of the research area, even the well known practice of "ritual warfare" (Broekhuijse 1967; Gardner 1972; Gardner and Heider 1969; Heider 1970; and Larson 1987) is but a complex variation of better known scenarios of human sacrifice.

In addition to this possibly problematic theory of sacrifice by ritual warfare within the repertoire of Highlander practices, other more straightforward forms of sacrifice which are embedded in the cultural systems will now be discussed. Both blood and bloodless sacrifice are integral parts of Highlander religious practice.

Blood Sacrifice

Cannibalism. There was cannibalism in the Highlands before the arrival of modern outsiders and subsequent to that time. What happened to the bones of people who were cannibalized I do not know, but
I suspect that some of the skulls and other human bones present in caves might be the remainder that was saved for ritual practice from cannibalistic activity. It is only a supposition but I suspect that other bones from such activities were burned to destruction just as are bones at human cremation and the unused bones of a pig after a pig feast.

Tom Bozeman’s story as Hitt (1962:126, 131) reports in a book entitled *Cannibal Valley* and Hitt’s amplification of the subject seem to confirm the practice of cannibalism by at least some of the Dani:

The Danis around Hetigima [Author’s note: Figure 6] told me that there was hardly a person in our area that had not tasted human flesh at one time or another. Yet, it’s funny when you talk to the Danis on our side of the Biliem, they say, ‘Oh, no, we don’t eat people; they do it on the other side of the river.’ But when you question the residents of the opposite side of the valley, they deny the charge and accuse the Danis in our area . . . Bozeman’s investigations into cannibalism check with the findings of Myron Bromley. The Danis do not consume human flesh primarily to satisfy their hunger, although they have some pleasure in eating it. It tastes like pork, they say. Their chief reason for cannibalism is to show contempt for their foes.

Hitt further reports on a “cannibal feast” which he states that "missionaries Tom Bozeman and Edward Maxey witnessed with horror” and which Hitt photographed (1962:127-129). In this incident, Hitt reports, “Now another Dani came up with some bamboo knives. These knives, by the way, are as sharp as any steel blade known to civilized man. The man with the bamboo knife began to cut meat from the dead man’s calves. I became nauseated” (1962:129).

In 1982, I met and conversed with Bozeman about the Dani. Bozeman had nothing to offer about the theoretical reason for cannibalism among the Dani. In addition to the above reported views by Hitt of Bozeman and Bromley for the reasons of cannibalism, some indigenous informants state that another reason for cannibalism among at least the Grand Valley Dani and the Western Dani was to eat some of an admired deceased person’s body to show the ghost of the deceased how much the participant “cared” and to attempt to assume some of the power from the deceased. This fits religious theory regarding propitiation of ancestral spirits through select acts of cannibalism and also a theoretical conclusion reached by Money-Kyrle (1965:162) from his worldwide studies on the meaning of sacrifice: “If part of the slain man, or something representing him, is eaten he is perhaps converted from a dangerous enemy into a powerful part of the self, and this is certainly one motive of cannibalism.”

Throughout the Yali and East region (Figure 7), Yali, Kimyal, and Una informants state that their ancestors’ practiced cannibalism but few other comments from indigenous informants are forthcoming. In 1987, while following the Heluk River northward, upriver into Yali territory from Holuwon, near the southeastern edge of the Hupla speaking people (Figure 2), and deep within the geographic setting for Don Richardson’s book *Lords of The Earth* (1977), the Yali were not hesitant to answer in the affirmative that their recent ancestors had been cannibals. Richardson (1977:11) opens his rather vivid historical account
of the first Christian missionaries in the area with an introductory phrase, "The Yali. Cannibals with a
difference."

Koch, in his work with the Yali in the Angguruk area (Figure 2), is rather explicit about the Yali
practice of cannibalism (1967, 1970). In July 1963, Koch says that 11 people from the Jaxolé Valley
(Angguruk area) had been killed and eaten in a massacre at Pliam in the Sélé Valley (1967:12). Koch
further mentions "a cannibalistic feast which took place on the airstrip" at Angguruk in the late summer

Although the practice of cannibalism among the Highlanders is well known, the emic reasons for its
practice are shrouded with indigenous taboos and the very understandable fear of converting honestly on
the subject with modern outsiders, who have reacted so violently against the practice. I believe that
cannibalism was one facet of the religious regimen of human sacrifice and that people or people parts were
not eaten for nutritional reasons.

**Finger and Joint Amputation ("Part-for-the-Whole").** Heider (1970:237-239) reports that in the
Dugum Neighborhood northeast of Wamena (Hupainma, Figure 6):

Chopping off fingers is particularly common, and nearly every female above the age of about ten
has lost four or six fingers. The thumbs are never removed, nor or at least the first two fingers
on at least one hand. Fingers are removed from girls, usually when they are between the ages
of three and six, in connection with funerals. This is a part of . . . efforts to impress, placate,
and drive away the ghost of the deceased . . . One explanation the Dani give of finger chopping
is in terms of these goods [Author's note: meaning "funeral goods" of pigs, symbolic exchange
stones, cowrie shell funeral bands, ceremonial nets, and sometimes other wealth items that are
presented at funerals]. . . . in a sense the fingers may be called sacrifices, but there is no specific
act of presenting the severed fingers to the ghost . . . The Dani treat finger chopping as normal
. . . The loss of fingers does not drastically limit a women's activities. With both thumbs and
two fingers on at least one hand, and in most cases usable stumps on the other the women are
able to manipulate their digging sticks, roll string, make nets, and do other fine work . . .
Activities that require ten fingers, such as shooting with bow and arrow or handling heavy
digging sticks or axes, are generally reserved for men . . . Men may also lose fingers, but this
has quite a different aspect from the finger chopping of women. This seems to be a sign of deep
personal grief . . . rather than a means of placating the ghosts for the benefit of the group.

Amputations are usually made by cutting the tip off a finger or severing phalanges between finger
joints. Only rarely are entire fingers "chopped" during a single procedure. Repetitive amputations on a
single finger over a period of time, commencing with severing the end of the digit, or cutting between the
second and third joint, and then at another time chopping the phalange next to the hand may result in the
ultimate elimination of an entire finger. Most of the mutilated hands that are observed today reflect the
loss of joints but much less often the loss of entire fingers.

Throughout the Grand Valley and within areas inhabited by the Western Dani to the west, I, like
Heider, found a high incidence of finger joint amputation among the females (Figures 60, 61, 62, and 63).
Figure 60. The tell-tale banana leaf bandage over amputated finger joints.
Figure 61. A mutilated hand used as a paint palette.
Figure 62. This woman has sacrificed four fingers on one hand.
Figure 63. A marred Dan woman with missing finger joints.
In Figure 60, a seated woman displays the telltale-leaf-bound hand and forearm of a woman who has just had joints of fingers amputated. Beneath the banana leaf outer wrapping is an unseen cover of medicinal leaves to prevent infection of the wound (manuscript in progress). An outer edge of this woman’s ear has been sliced off at a previous funeral ritual as another grief-purging and sacrificial gesture. The woman’s left hand in Figure 61 shows the healed fingers where four end-joints were amputated some years previously. At the time of the photograph, the woman was using her hand as a paint pot holding the red seeds of the jue fruit which are used as a red decorative, facial cosmetic by both women and men. Figure 62 shows a woman’s left hand where four complete fingers have been sacrificed. Figure 63 shows the right hand of a right-handed married Dani woman who has preserved her first and index fingers but has sacrificed the ends of the first joint of her other two fingers.

Also, like Heider, I found that males as well as females amputate joints and sometimes entire fingers (Figures 64 and 65). I found no location where there had previously been a practice of amputating young boys’ finger joints. Like there was region-wide with girls. Regionally, men with missing finger joints or entire fingers are unusual, although the percentage of male adults with finger-joint amputations relative to male adult population varies considerably from group to group. Near Tagime (Figure 20), a survey of 22 male adults over about 35 years revealed that nine had missing finger joints. Figure 64 shows a Dugum Dani man with missing end joints on four fingers of his right hand. His mutilated hand is displayed against a neck bib (walimo) that is made of numerous small nassa shells sewn onto a hand woven fiber string backing. In Figure 65, two quarrymen at Tagime display hands with amputated finger joints as they commence the grinding process of two Tagime Style adze blades. The biggest surprise from a verbal and photographic survey of females and males who had sacrificed finger joints was that in the emotion of the “moment,” after the death of a loved one, usually at a funeral, some of the amputees had spontaneously stepped forward to have their fingers chopped right then. One woman, as late as 1989, had cut off her own finger in the privacy of her house. Only in rare instances has the amputation of finger joints and fingers been observed in the Yali and East region.

Although such practice has not been reported elsewhere on the island of New Guinea, its practice is known in Polynesia on the Tonga Islands (Frazer 1968:81-83 [after first publication 1922]):

But more precious than the blood of hogs were often laid at the feet of the angry gods. When a relation of a superior rank was ill, it was a very common practice for one or more of his or her inferior kinfolk to have a little finger, or a joint of a finger, cut off as a sacrifice to induce the offended deity to spare the sick man or woman. So common was the custom in the old days that there was scarcely a person living in the Tonga Islands who had not lost one or both of little fingers, or a considerable portion of both. It does not appear that the operation was very painful. Mariner witnessed more than once little children quarreling for the honor of having it performed on them. The finger was laid flat upon a block of wood: a knife, axe, or sharp stone was placed on the edge of the joint to be severed, and a powerful blow with a hammer or a heavy stone effected the amputation. Sometimes an affectionate relative would perform the operation on his
Figure 64. A Dani man with missing finger joints on one hand.
Figure 65. Two Tagime quarrymen use hands with amputated finger joints.
or her own hand. John Williams questioned a girl of eighteen who had hacked off her own little finger with a sharp shell to induce the gods to spare her sick mother. Generally a joint was taken off at a time; but some persons had smaller portions amputated to admit of the operations being often repeated in case they had many superior relations, who might be sick and require the sacrifice.

The behavioral congruences relative to finger and joint amputations between the Tonga Island and the Irian Jaya cases strengthen a paradigm of behavior that might at least be considered whenever evidence for hand mutilation is discovered in the archaeological record. Archaeologists and rock art enthusiasts often have to account for missing digits on otherwise normal hand imprints that are present in prehistoric rock art. Paleontologists and physical anthropologists are sometimes perplexed by evidence less-often-found for such a practice on human skeletal remains.

**Ear Excision.** Both men and women in the Grand Valley and West region (not observed in the Yali and East region) slice off the upper edges of an ear as acts of grief and to placate ghosts at the loss of a near relative. Heider reports that sometimes this is "done also in grief or disturbance at relatively minor losses, such as the stealing of a boy's favorite pig" (1970:240-241). Big man Wali has sliced both of his ears, once he says when his mother died and once when his father died (Figure 66). Winoco, a mid Grand Valley Dani and one of my exploration team members under the leadership of Rudy Willem, says that when he sliced off pieces of his ears with a bamboo knife it did not hurt at all, but after covering the wounds with mud it hurt considerably while the ears were healing. The Dani say that the only tool they use to excise pieces of ears is a bamboo knife.

**Pig Sacrifices.** In the Highlands of Irian Jaya, like around the world, the most common bloody sacrifice to propitiate or avert the anger of supernatural beings are animals. In Irian Jaya, that animal is the pig. The fundamental significance of the pig to the cultural systems throughout the Highlands is paramount (refer to Animal Husbandry, Chapter IV). From the viewpoint of the Highlanders, the climax of the pigs' lives is their deaths, as they are used as necessary sacrifices at carefully orchestrated ritual events. The continuum of "pig ceremonies" at which the pigs are sacrificed is a cultural binder that in one sense could be considered to give meaning to cultural life as a system.

Many pigs are identified soon after birth to be raised as sacred (wusa) pigs and are marked with ear cuttings, to identify them for later sacrifice to specific ancestral spirits. Others are selected while young to be raised for a dibat isin procedure, when the sacrifice of the proper pig and the accompanying ritual will insure empowerment of the simple but important sacred string necklace (dibat). Others are identified to be raised and reserved for sacrifice when an unexpected need for special pigs might arise. Many of the pigs described above are fed sweet potatoes from time to time that have been blessed at sacred rituals. In this way, the pigs themselves are participating in sacrament while alive. When they are ultimately killed at a religious ritual, they are sacrifices of a supernatural entity to a supernatural entity. As explained in
Figure 66. Wali sliced an ear at the death of his father.
the *Ganekhe Hakasin* Ceremony of Chapter VII, the essence of the animal is partaken by the spirit, while the flesh is consumed by human participants as part of the sacrament. Supernatural beings in the forms of animals, plants, and men that are sacrificed to or for supernatural entities are discussed by Money-Kyrle in the *Meaning of Sacrifice* (1965:147-148). Money-Kyrle elucidates the instance of Australian aboriginals sacrificing their kangaroo totem to participate in an animal sacrament, not only eating some of the kangaroo meat but anointing their bodies with kangaroo fat (Money-Kyrle 1965:148, after Frazer, *Golden Bough*), symbolically just as the Irian Jaya Highlanders sacrifice their pigs, eat the meat, and anoint their bodies with the fat of those pigs.

Whenever human lives are in jeopardy, wars are about to be fought, or a person is sick, pigs are sacrificed to the spirits to appease their anger and propitiate their favorable action on behalf of humans. Thus, there is a continual demand for the appropriate pig for sacrifice at any of the multitude of sacrificial rituals that are deeply embedded in the on-going way of life in the Highlands. The method of sacrifice, which is standard throughout the Grand Valley and West region, is discussed with an explanation of the *Ganekhe Hakasin* Ceremony in Chapter VII.

**Bloodless Sacrifice**

Bloodless sacrifices of sweet potatoes are a common accompaniment of pig sacrifices at a multitude of different kinds of sacrificial rituals. I have not identified these as offerings of "first-fruits" as is a common practice worldwide among agriculturists. Instead, in the Irian Jaya Highlands, "first-fruits" are often purposefully left to rot in the gardens (for the "creator spirits"), rather than be harvested and presented as offerings through ritual procedure. The sweet potatoes that *are* sacrificed are always the largest potatoes that can be found at the time of any given ritual at which sweet potatoes are desired as an offering. This practice of largest-potatoes-available rather than first-potatoes-from-a-harvest would seem to at least be theoretically explainable by the fact that due to the geographic position of the Irian Jaya Highlands near to the Equator, calendrically timed harvest ceremonies are not significant.

Among the Grand Valley Dani, a ritual sweet potato offering is quite a complex affair, which furnishes an important insight to part of the religious mechanism of the Irian Jaya Highlander. The details of such an offering are reviewed as a part of the discussion of the empowerment of sacred stones in the section on the *Ganekhe Hakasin* Ceremony in Chapter VII. In summary, though, a chosen sweet potato is first consecrated by a shaman, exposed to the scrutiny of ancestral spirits purportedly in the stones, cooked with sacralized ferns and sacred pig meat, and fed (the essence thereof) on an altar to the ancestral spirits that reside in the stones. At the same time, the potatoes are being empowered before they are divided up to be offered (fed) to sacred pigs, which are being raised to later be the sacrifices themselves, to the ancestral spirits that both enjoyed and empowered the potatoes before they were fed to the pigs.
Mourning and Mutilation

Although all Dani men, women, and young girls and boys openly display their grief at the death of a loved one, it is the adult women who are the most emotional and obvious in displaying their sorrow. The women, more often than men, coat their bodies with white or yellow clay to display sadness to both the living and to ghosts and spirits in the world of the unseen. Some women informants advised that they may stay in mourning and wear clay for as long as a year or until their own grief has been purged and they feel that the ghosts are satisfied. The woman in mourning in Figure 67 (1982) is the epitome of Dani sadness seen after the second day of a funeral. She has covered her body with white clay and blotched her face with sooty pig grease. Her empty utilitarian carrying nets (an essential item of attire) are draped over her head so that the grass in them will hide her from malevolent ghosts while she is in this particularly vulnerable state. At her side hangs her hand which has been wrapped in banana leaves, because one or more joints of a finger or fingers have been chopped off as a sacrifice to the ghost of the deceased. From her neck hangs several simple string necklaces (dibat), each of which has been empowered at a special ritual to protect her particularly vulnerable throat from the entrance of ghosts and the rest of her body from harm. Her typically braided orchid fiber Dani-Western Dani married woman’s skirt hangs precariously low to protect her vagina and anus (other vulnerable spots) from ghostly attacks. The bodies of the women in mourning in Figure 68 are covered with typical white, gray, and yellow mourning clay. A mother while nursing a child does not clay her breasts. The mutilated hand of one woman is easily seen as is the sliced ear of another of these women in mourning. In Figure 69, the mourning woman is returning from the sweet potato gardens with a load of sweet potatoes in her head-back nets, which nets in addition to serving this utilitarian purpose, are also a necessary item of dress. At any time a scattering about the cultural landscape of these living female mud-colored symbols of death, grief, and ghost-placation (some at work in their sweet potato gardens, some attending to pigs, and others absorbed with female chores and pleasures in the habitation compounds) are a visual attestation to death in the Highlands. To the esoteric groups involved, a detailed story is understood at just the sight of one of these persons in mourning. These colored, living symbols scattered throughout the landscape during daylight hours, attest to the fact that within the cultural system, the people recognize death with routinely practiced funeral rites, feel strongly the emotions of sorrow and grief, and want to put humans and ghosts/spirits alike on notice that they “care” about the ghosts and spirits and are mourning them as they should. In one sense, this period of mourning is a form of sacrifice to the ghosts. It is definitely a symbol of appeasement.

At the funeral ceremonies, usually held on the first full day after a death (from battle or natural causes), dirges are part of the ritual. Both men and women cry and wail. Those women waiting the most vociferously are awarded one or more headnets. Heartfelt sadness is openly displayed in an effort to show the ghosts/spirits that the ritual associated with the passing of life is being properly conducted.
Figure 67. Woman in-mourning with recently mutilated hand.
Figure 68. Nursing women do not clay their breasts while they mourn.
Figure 69. Woman in-mourning with a heavy load of sweet potatoes.
Women often wait for hours on end inside a woman's house as they sit around a female corpse before it is brought outside for cremation. Male corpses are always kept inside of the men's house before cremation, where the men chant dirges from time to time.

When the corpse is on display in a courtyard before being moved onto the cremation pyre, the funeral attendees move into the area. The mourning chants and wailing from the women mourners increase in loudness. Men also cry loudly at these occasions, but, unlike the women, their crying does not continue into the night like the singing dirge of some of the women, which often continues after most people have left the funeral.

Young girls and boys who are especially close to the deceased may walk up and stand before the corpse or the funeral pyre as they loudly cry. After they have vented their feelings, they leave, no longer a part of the "organized" continuous crying and wailing of the women and men.

Sometimes it is during these emotional moments that young girls (other than those already selected) and others spontaneously come forward to want to have joints of fingers chopped or an ear sliced. Often it is not until early morning of the day after cremation that finger joints are sacrificed and ears mutilated. The procedure is often a manifestation of true grief, along with the strong desire, in the case of adult amputees, to placate the ghost of the deceased. The community itself desires the amputations to placate ghosts for the entire group. At Tagime hamlet in 1989, a group of six men with missing finger joints advised that when a male's joints are amputated, the "group" decides what to pay the amputee because the sacrifice is performed for the benefit of the entire group (to placate a specific ghost and ghosts in general). The payment was said to be between 5 and 10 small pigs per finger, a sizeable sum by Dani standards.

Conclusions

Within the Highlander religious systems, the indigenous inhabitants at the time of first-contact and for varying periods of time thereafter, depending on geographic location and cultural variations across the area, practice/practiced blood and bloodless sacrifice to placate and propitiate supernatural beings. Humans, pigs, and sweet potatoes were/are the sacrificial resource. Cannibalism (although its indigenous practice is little understood by outsiders), ritual warfare (although the theory for blood sacrifice as its purpose is still arguable, manuscript in preparation), part-for-the-whole body mutilations (finger joint and whole finger amputations and outer ear excising), and sweet potato offerings (sacralized by ritual procedures) are the mechanisms. In that the subsistence and economy of the Highlanders depend upon their success as horticulturists with sweet potatoes as the primary crop and on their success at animal husbandry with raising pigs, it fits with theory that these two commodities would be the primary sacrificial entities.

Cannibalism, pig sacrifice, and sweet potato offerings are practices that cross language boundaries within the research area. It seems that part-for-the-whole sacrifices of digits from the hands and pieces
of the outer ears of humans was/is restricted to certain areas in the Grand Valley and West; only rarely if ever practiced in the Yali and East.

Dress and Adornment

There is a Dani myth about a race between a bird and a snake. This is quite similar to other stories about immortality told throughout the study area, and also to fragmentary legends reported elsewhere in New Guinea and Melanesia (Heider 1970:144; Wagner 1967:40; Blackwood 1939; Mead 1940:362; Malinowski 1954:127). If the snake were to win, the people, like the snake, would have everlasting life. [It is suggested that the snake is a symbol of immortality because it renews itself by shedding its skin (Heider 1970:144).] But, if the bird were to win, then the people, like the bird, would die. The bird won the race, and ever since, the people have been emulating birds with all manner of adornment.

Grand Valley and West

Male Dress. Although the men often adorn themselves with bright feathers and all manner of paraphernalia to make themselves look like colorful birds, a man’s basic dress is simple: a gourd (holim, pronounced horeem) to cover his penis, a bark fiber string charged with supernatural power called a dibat (pronounced teapot) worn as a necklace to protect his throat from malevolent ghosts/spirits and/or a supernaturally powerful spider web necklace for the same purpose, and a single vegetal strand or string hanging from a waist cord over the buttocks to whisk flies away and to keep marauding ghosts or spirits from entering the anus. The old man in Figure 70 is properly attired with a slightly curved gourd penis sheath, several narrow black empowered spider web necklaces, and under them, two soot blackened, supernaturally powerful fiber string necklaces (dibat). This man also conveniently carries a reed mouth harp (bygon) about his neck, to be played whenever he desires. He wears a fiber string net cap which is a Highland male accessory. His soot blackened, pig grease rubbed nose and face is a normal cosmetic practice. The walking stick is a common companion to the older people in the Highlands. Variations of the potato leaf blackened and often pig grease anointed, matted spider web necklaces that this man wears are present in many of the photographs seen throughout the text. Spider web necklaces, bark cloth strips, and simple fiber string necklaces (dibat) are, after proper empowerment, the three most popular countermeasures worn in the Grand Valley and West region to protect the vulnerable throat against the entrance of malevolent ghosts and spirits. Creating a spider web necklace is labor intensive. For each necklace, several webs of the cryptophora moluccensis spider (Figure 16) are wound round onto the stalk of a banana frond. Then, this mat of web material is rubbed vigorously with potato leaves which blacken the matting. After drying for several days, the tube of web material is pulled off the banana stalk.
Figure 70. Old Dani man, properly attired.
flattened, and cut to a proper length with a bamboo knife. With a string added to secure it, the necklace is ready to be empowered by a shaman, who can instill the supernatural power necessary to repel ghosts (Figures 71 and 72). Sometimes these necklaces are broad and flat, sometimes much narrower, and occasionally cut into numerous thin strips. At times, a single or several cowrie shells, or the much smaller nassa shells are sewn in a single line onto the narrow spider web backing, often just as decoration but sometimes with translatable symbolic meaning. The cryptophora moluccensis spiders are known to be transplanted to human habitation gardens so that their webs will be conveniently located from which to make the important necklaces. In Figure 73, simple strands of vegetal material are seen hanging in position to protect the anus from the entrance of malevolent ghosts, just as the string and spider web necklaces protect the throat.

The gourd penis sheath is worn constantly and any male would be mortified to be seen without one, but the men never give it a thought that their testicles are always exposed. The holim are removed only when having sex, urinating and, on rare occasions, when working in muddy ditches in the potato fields. Even on these occasions, a very short holim is usually worn, rather than none at all. The holim is held in place by a string fastened to holes on each side of the base of the gourd and looped around the wearer’s scrotum or at least one testicle. For the longer holim, a second string around the wearer’s chest holds the penis sheath upright. I have even observed that through the night in the men’s house where both men and boys sleep, the penis sheath is not removed but the string at the base is removed from around the scrotum. Holim come in variable shapes and sizes, ranging from about 10-65 cm in length (Figure 74). Some are short and curled, and others are long and straight. Sometimes a decorative marsupial fur tassel is inserted in the end. Neither Heider (1970:247) nor I could see anything to suggest psychological explanations for the penis gourd. The holim are grown from overhanging gourd arbors and their shape is manipulated by hanging a rock from the end of one that is to be grown long and straight, while curved holim are encouraged to that shape with rocks propped against them as they grow on the ground (Figure 75). An adult male might own a selection of four to six holim at any one time. Boys are naked until the ages of four to six when they start wearing short penis gourds. The Dani are aware that the lowland dwelling male Asmat to the south wear nothing to cover their penises (Van Arsdale 1993) and several Dani have commented that those men are really backward and obviously without a dress code. The objects itemized above for the Dani are simple but they meet the standards set by the dress code and serve to protect individuals’ modesty as well as the body from the untimely entrance of ghosts or spirits.

Male Adornment. In addition to adhering to the dress code mentioned above, the Dani men are very creative in their adornment, especially for ceremonies and warfare. They have an array of feather and fur headdresses, seed decorated forehead bands, fiber string head nets and spider web caps, bailer and cowrie shell necklaces, nassa shell bibs, dog fur arm cuffs, empowered pig testicle arm bracelets, woven orchid
Figure 71. The spider web tube is pulled off the banana stalk.
Figure 72. The important potato juice blackened spider web necklace.
Figure 73. Vegetal strands hang in position to protect the anus.
Figure 74. A variety of penis gourds. Fur end decorations. Scale in inches.
Figure 75. Arbor of penis gourds. A happy shopper.
fiber and thin rattan strip arm and wrist bands, cane belts, and boar tusk nose ornaments. Seed wigs are sometimes worn and feathers are often stuck in the hair or under headbands. In some areas among both the Grand Valley and Western Dani, bamboo ear plugs are worn. Boar tusk nose pieces are worn by many males during battles and for ceremonial occasions. Faces, heads, and bodies are rubbed with soot-blackened pig grease for beautification and are often decorated with white clay. By emulating the pig and the bird in his dress, wearing a creative assortment of sacred paraphernalia, and by anointing his body with pig grease and clay, the male Dani feels that he is beautiful, pleasing the ancestral spirits, and protecting himself from malevolent spirits and ghosts.

In Figure 76, a Dani warrior carrying his killing spear has coated his body with soot-blackened pig grease, high-lighted his eyes and face with white lime paste, decorated his chest with a white nassa shell bib necklace (walimo) and decorated his head with a fur band and “horns” of white and gray feathers. A string of seeds sets off his forehead, while a plume of brightly colored parrot feathers sticks skyward from the back of his headpiece. According to big man Wali, face and body decoration to emulate an owl is the best camouflage for a moonlight night raid into enemy territory. It shows the ghosts that man, too, can be like a bird. In Figure 77, the three kinds of shells that trade into the Highlands from the coastline are exhibited in one Dani necklace: a large section of a bailer shell; the intermediate size, but relatively small cowrie shells; and the quite small nassa shells. All three are used as decorative objects. The cowrie shells are also an important medium of exchange, and a large, uncut bailer shell is quite valuable. The Dani elder in Figure 78 wears a white egret feather headdress and a necklace of sections of a bailer shell with nassa shells, over a protective soot-blackened and pig-grease-rubbed necklace of numerous bark strands and fiber strings. A blue bead visible in the necklace is of a type that is valuable to people of the Lake Sentani culture to the north (Figure 3). The centrally located warrior in Figure 79 wears a tall black marsupial fur headpiece, an unusually broad nassa shell chest bib and carries a cassowary bird (Casuarius casuarius) feather wand. A man carrying a black cassowary bird feather wand is often a war shaman who scurries about a battlefield waving his wand to activate ghosts and spirits on behalf of his warriors. This wand, then, is not a symbol of authority, but a tool to stir up the ghosts and activate benevolent spirits. Refer to Figure 80 for photographs of the commonly used marsupial and a cassowary bird. Both of these photographs were taken in Yali territory. The much-used fur of the marsupials range in color from yellow to brown to white to black. A full grown cassowary bird may reach a large size and weigh about 200 pounds. They are brown-feathered when young, black when adult. Both single and boar tusk pairs are often worn as nose ornaments (Figure 81). It is one of the ways the men feel they can be near—a part of—the life sustaining power of their pigs. Plaited fiber and stem arm and wrist bands are a common decorative object among the Highlanders. In Figure 82, Wali carefully plaits such a band onto his right wrist with the use of a bone awl. Pig testicle (scrotum-con-penis) arm bracelets are commonly worn just
Figure 76. Artistically decorated Dani warrior emulates an owl.
Figure 77. An important necklace with three kinds of shells.
Figure 78. A Dani elder with an egret feather headdress and normal neck attire.
Figure 79. Adorned Dani warriors near Pugima carry their killing spears.
Figure 80. A marsupial (cuscus) and a full-grown cassowary bird.
Figure 81. A pair of boar tusks form a single nose ornament.
Figure 82. Wali plaits a wrist band with a bone awl.
above the elbow by both men and women (Figure 83). Usually a bundle of two or three such items are
dried and then worn as supernaturally powered protective arm bands. Heider reports the use of pig scrotum
arm bands by males in the Dugum Dani area (1970:245). In my research throughout a broader area, I
observed their uses by both males and females. In the Kurima area (Figure 6), the preponderant use as arm
bands is by females rather than males. Many Highlander men, especially the Dani, wear tightly hand-
woven string net caps (Figure 84). Some are dyed a red color with a pulverized hematite and water
solution, and some are left a natural fiber string color, while yet others are dyed a purple-black from the
juice of a specific berry. Some men like to fluff out their caps and give them a bulbous look by stuffing
them with grass or leaves.

The men are considered the beauties of the societies and spend much time grooming themselves. With
the exception of fancy hairdos and ring beards on their faces, the males generally find hair on the rest of
their bodies repulsive and untidy. Hair is diligently removed from the arms, legs, chest, back, and from
around the scrotums by plucking with hands or tweezers made from almost any available twigs (Figure 85).
Sometimes the fingers are made sticky with beeswax to help with the chore.

**Female Dress and Adornment.** A woman's dress, although not as colorful as the male's, serves to
protect her modesty, offer a degree of protection against ghosts and spirits, and provides utilitarian carrying
space. Since the most vulnerable spots for the entrance of malevolent entities from the unseen world are
through a woman's throat, anus, and vagina, she must protect all three openings. To provide this and to
protect her modesty a woman always covers her genitals and buttocks with a brief skirt. One or more head-
back nets hung by straps from the head and down across the back and over the buttocks not only cover the
lower back and buttocks but serve as a functional part of a woman's attire. Henceforth, I will refer to
those as head-back nets. A woman usually wears between one and six of these nets (nogen). In them, she
may carry her baby, piglets, farm produce, and other items. Although the Dani women would be much
embarrassed to have their genitals, lower back, or buttocks exposed, they never give it a thought that their
breasts are always bare. In Figure 86, one can see a group of Dani women properly attired in their head-
back nets (nogen), string necklaces (dibat), and braided orchid fiber cording wedding skirts (yogaf). As
is often the practice, some of the head-back nets are loaded with work materials and food for the day,
while others hang empty. The wedding skirts seem to hang precariously low, but they do maintain their
desired position whether the women are at work, play, or just resting.

The Dani women wear a variety of skirts within the confines of a relatively small geographic area.
Their dress fashions show quite a few choices, just as in modern Western societies. I have observed six
different kinds of skirts: (1) and (2) are varieties of the so-called "grass skirts" which are actually made
from flattened reeds, (3) the bark fiber string skirt, (4) a combination of the "grass" and string skirt, (5)
a string woven looped skirt (which looks much like the woven head-back carrying net (nogen), and (6) in
Figure 83. Pig scrotum-with-penis elbow arm bracelets.
Figure 84. Two men’s net caps, one dyed red with pulverized hematite.
Figure 85. Men diligently groom each other by plucking unwanted hair.
Figure 86. Dani women attired with head-back nets, string necklaces, and wedding skirts.
some areas in the Grand Valley and West, the colorful orchid fiber, braided wedding skirt, which replaces all other kinds of female skirts at marriage and thenceforth in those areas identifies married women. All except the Yali women's brief brush skirt, are worn within the geographic boundaries of the Grand Valley and west, although the women in some areas do not seem to know just what women in nearby communities are wearing, even within the confines of the same language speaking group.

The most pervasive kind of female skirt across the entire research area is the flattened gem (pronounced kem) reed (Eleocharis sp.) skirt that is one of several types worn by Dani girls before they are married and exchange their child's skirt for a woman's braided orchid fiber corded skirt. In the upper photograph of Figure 87, a young Dani girl, dressed in her reed strand skirt, delouses her mother in the courtyard of their living compound; while in the lower photograph, an Una woman and her daughter rest while dressed in the same kind of skirt. In Figure 88, a mid Grand Valley Dani mother fashions a gem reed skirt for her daughter. Similar skirts are pervasively used throughout Melanesia, Micronesia, and Polynesia. In Figure 89, a Dani woman who lives near Kurima (Figure 6) harvests the reed skirtig material from a pond, where growth of the reeds is encouraged by tying the reeds in bundles that are supported by sticks stuck in the mud. The reeds are thusly protected in an upright position, so they do not blow over in wind storms. The fiber string skirt, although not as popular as the flattened reed strand skirt, is also worn in certain local areas within the entire area of research, especially by young girls (Figure 90).

In many Dani and Western Dani areas, marriage is a rite of passage that is marked by a dress-the-bride ritual in which a female child's skirt is exchanged for a woman's bridal skirt. For Dani and Western Dani, regular marriages are but one kind of the many different ceremonies that are held at the time of the "great pig feast" (ebe akho, refer to Chapter VI), which occurs every four to five years (during my research, 1983, 1988, and late 1992-early 1993). The dress-the-bride ritual can take place either in a compound courtyard or within the more private women's communal cookhouse. The bridal skirt is designed and fitted onto the bride at a rather secretive ceremony for women at which any man's presence is discouraged. A long pole is placed across the cookhouse (or a convenient place in the courtyard) at a height comfortable enough to support the bride during what often turns out to be an arduous, all day fitting. New bridal gift head-back nets are piled on the bride so that her back will be covered and she will be properly attired as her skirt is designed onto her body. Approximately four mothers-for-the-day (mother, aunts, older sisters, or cousins) take over to dress the bride. Up to 30 m of beautiful new yellow and red-brown orchid fiber (often with some white palm fiber) braided cording are used by the dressmasters as they design and build the skirt (Figures 91 and 92). The cording is laced to an underlayer of fiber string. An old net or some other piece of available material is placed between her legs so that they will not be bound together by a skirt that is wrapped so tight that it often cuts above the pubic area and on the hips where calluses later form to hold
Figure 87. Reed stem skirts are worn by girls and women.
Figure 88. A Dani mother makes a reed skirt.
Figure 89. A Dani woman at Kurima harvests the reed skirting material.
Figure 90. Fiber string skirts worn by both children and women.
Figure 91. Marriage skirt is designed onto a Dani bride (front view).
Figure 92. Marriage skirt being designed on the bride (back view).
the skirt up. Throughout the procedure, the women who are working on the dress alternately cry or wail loudly and then talk and laugh boisterously.

Not all married women in the Grand Valley and West wear the braided orchid fiber skirt. In 1989 at Muliasom Heselo’s compound, near Kurima (Figure 6), I counted fifteen married women wearing the looped net skirts and three wearing the reed stem strand skirts (Figures 93 and 94). The looped net skirts are fashioned from two or three layers of looped netting that are hand-woven in the same manner as the head-back nets. Figure 94 shows the close-up loop detail of woven fiber string that has been colored red with hematite powder and purple with berry juice. A nassa shell bib from a string around the woman’s neck can be seen hanging between her legs.

In the Grand Valley and West, the women, like the men, usually wear an empowered string necklace (dibai) for protection against evil ghosts and spirits. For the etai (pronounced etai) victory dances and for other celebrations, the woman often bedeck themselves with additional colorful necklaces (like the men), arm bands, and colorful body paint. For the war victory dances, the women are allowed to carry men’s war weapons.

Yali and East

Male Dress and Adornment. Along the borders with the Walak, Grand Valley Dani, and Hupla, Yali men and boys dress similarly to their neighbors in the west, but further inland into Yali territory, the men’s dress is quite distinctive from all other Highlanders. The males conform to pan Highland Papuan custom in that they wear penis gourds, but above their penis gourds they wear rattan hoop skirts made of meters of looped rattan (Figure 95). Young boys start wearing penis gourds and, at times, a rattan loop or two, before they become adults and don the hoop skirts as a part of their daily attire. To the east, the Kimyal, Una, and Eipomek do not wear rattan hoop skirts but do wear penis sheaths. Habitually, Yali males fold parts of carrying nets over their heads, both as protection from the sun and just as an aesthetically pleasing item of accepted attire. Less often, they wear the tight, hand-woven style string net caps that are so common in the Grand Valley and West. Although taro leaf and moss caps are worn across the entire research area, I have seen these worn more often by the Yali than in the Grand Valley and West (Figure 96). In a similar fashion, sewn pandanus leaf raincoats are commonly used by both Yali men and women; less often by the Dani (Figure 97). These raincoats are also worn as protection from the sun. In the Yali and East region, these kinds of raincoats are also used as sleeping mats, just as they are by the Wano at the northwest end of the Grand Valley and West region and in all other areas where grass is not used as a floor covering in habitation houses.

Throughout the Yali and East region, men favor incised bamboo ear plugs as items of adornment, more so than men of language speaking groups to the west (Figure 98). Although tightly plaited fern fiber
Figure 93. Woman in-mourning wearing a looped net skirt.
Figure 94. A beautiful new looped net skirt.
Figure 95. Yali men wear rattan hoop skirts even when working gardens.
Figure 96. Yali man and boy with taro leaf and moss caps.
Figure 97. Yali men and women both wear *Pandanus* leaf rain capes.
Figure 98. Yali incised bamboo ear plug.
strip armlets are seen in the Yali and East region, just as they are to the west, the heavier rattan strip armlets are more in favor (Figure 99).

The Yali, as well as other Yali and East language speaking groups, do not wear the empowered fiber string (*dibat*) or spider web necklaces as do their neighbors to the west.

**Female Dress and Adornment.** Yali women, like the men, are distinguished from all other language groups within the research area by their attire. Like all women throughout the Irian Jaya Highlands, they wear head-back carrying nets to at least symbolically cover their backs and upper buttocks, but, in addition, they wear very distinctive short flattened reed strand skirts, which I have named the "Yali brush skirts" (Hampton 1988) (Figure 100). Yali females of all ages wear these skirts (Figures 101 and 102); although females in other language groups within the Yali and East region do not wear this kind of skirt but instead both the flattened reed and fiber string skirts.

The Yali brush skirts consist of one to seven layers of the flattened reed stem skirts that are fastened one-over-the-other onto a wearer by string waist bands. The skirts are basically made like the universally worn flattened reed strand skirts with the exception that the length of the reeds are cut very short (about 8-14 cm) to create the desired effect (Figure 101). One bunch or "brush" of these short reed skirts is positioned over the pubic-genital area; while a second concentration of the flattened reed stems is positioned over the buttocks (Figure 102). Like other skirts worn throughout the Highlands, they serve to preseve the wearer's modesty and to protect the genital and anal openings from the invasion of malicious ghosts and spirits. On young girls (about four-eight years), a skirt of only one or two layers usually suffices. For teenagers and older women, brush skirts with an average thickness of three-four layers is preferred and sometimes as many as seven layers are desired. Among the Yali, there is no distinctive change in the type of skirt worn by females to mark the rite of passage from childhood to adult marriage as there is within the Dani and Western Dani language groups.

**Leadership**

All the leaders are men. The Highlanders' world is a "man's world" with the area-wide most pervasive taboo being against women entering the men's houses or participating in many of the endless numbers of sacred rituals. The male leaders do not inherit their leadership, nor can they pass it on automatically to a son, although the eldest son of an important leader has many advantages toward being next in line. Leaders are called big men (*ab goktek* in the mid Grand Valley Dani dialect) who rise to their positions of influence by a combination of skill in warfare, accumulated wealth (pigs, wives, certain material goods, and control of gardenland), size of household, political charisma, and general cleverness. To achieve a high level of influence, a big man must not only acquire and maintain items of wealth, but
Figure 99. Rattan strip armlets on a Yali man.
Figure 100. The distinctive Yali female brush skirt.
Figure 101. The Yali female brush skirt is worn by all ages.
Figure 102. Front and back views of an appropriately attired Yali woman.
his leadership stature is also measured by how many pigs he owes and his demonstrated ability to move pigs and other items of wealth within the cultural system. Relative positions of influence are achieved by political maneuvering and, ultimately, public consensus. The big men have no absolute power, just varying degrees of influence. In the final analysis, public action is initiated by leadership, but confirmed by public consensus. Big men who break cultural taboos generally have to suffer adverse consequences from their constituencies.

In one context, all men, except the "worthless ones", who are called gebu by the Dani, influence others and are in different ways considered to be "big men." Relative to the sociopolitical framework in the Grand Valley and West region, big men may rise to any of several measurable levels of leadership (refer to Sociopolitical Organization in Chapter VI). On the lower but still an important level are the big men of the compounds, house clusters, and hamlets. The vast majority of big men on this level do not acquire power and prestige beyond these lower community levels. Other big men, of considerable political and social influence, head up the confederations, and those big men of maximal influence become the leaders of alliances (Chapter VI).

Big men at the compound, house cluster, hamlet, confederacy, and alliance levels of influence are all shamans. that is they have the ability to manipulate supernatural power and to go into trance on behalf of their constituents (Chapter VII). In this sense, to their constituents, they both have the power (wusahun, alt. wesahun) and are the power. With this power, in addition to other sociopolitical responsibilities, the big men are also both healers (Traditional Healers, Chapter IV) and religious leaders (Ownership of the Stones, and Houses for the Stones: Both Profane and Sacred Space, Chapter VII). As the leaders of the men's religious ganekhe groups, the big men wield compelling socio-religious influence. Thus, in the Irian Jaya Highlands' scheme of leadership, both the political and the religious merge under the umbrella of single powerful leaders--big men.

Big men who are--have--wusahun can delegate this power to those around them so that select individuals can carry out responsibilities with a full range of culturally desirable profane and sacred powers to accomplish the delegated task. Further, certain individuals, such as healing specialists are also considered to be shamans (have wusahun) but they do not necessarily have other social influence, even at the lower compound or hamlet levels (Traditional Healers, Chapter IV).

In both general and certain specific realities, the Irian Jaya Highlander men of achieved influence function much like the leaders in some Melanesian societies that Sahlins describes as "big men" who achieved influence rather than inherited power (1963). It is Heider who points out that "Salisbury, in his penetrating analysis of New Guinea leadership (1964), suggests that while most leaders are of the general democratic 'Melanesian big men' pattern, the men at the very top in fact are despots" (1970:88). To put this sociopolitical-religious big man system of leadership into ethnoarchaeological perspective, I will
review in Chapter VII certain material goods (and related behavior) that belonged to individuals of ascribed leadership who function/functioned at the three levels of important sociopolitical influence: 1) Siba Wilil at the compound level, 2) Wali Wilil at the sub-confederacy (temporarily confederacy), and 3) Gutelu Mabel at the alliance. Although I have not considered Gutelu (deceased) to have been one of Salisbury’s “despots” (Heider 1970:88), he had nearly achieved that reputation at the peak of his influence.

Subsistence

Horticulture and Food Plants

**Valley Floor and Hillslope Gardens.** With only simple wooden paddle spades and digging sticks, these horticulturists maintain complex ditched and mounded gardens on both hillslopes and valley floors (Figures 7, 8, and 103 valley floor gardens; Figure 104 hillslope garden). Many Dani living within and on the edges of the Grand Valley maintain both valley floor and hillslope gardens; although it is thought that the valley floor gardens are generally the more productive. The Yali and others who do not have access to land in the Grand Valley cling tenaciously to the ridgecrest and steep hillslope environments, which in many instances they put into production from the bottoms of narrow V-shaped valleys to ridge and mountain crests. Their horticultural practice is generally more extensive than the intensive practice of the Grand Valley. All horticultural practice follows the slash and burn technique. Lower food production in the more rugged terrain areas is often reflected in a poorer life style and generally poorer health of those inhabitants.

Gardens are either elaborately fenced with wooden slats and supportive posts, which are cut with stone adzes and lashed with rattan or vines, or, around the fringes of the Grand Valley, and in other places where rock erratics are a hinderance to horticulture, walled with cobbles and boulders that are derived from the New Guinea Limestone (Figures 105 and 106). The near-continuous networks of fences and walls are built to keep pigs out of active gardens.

The mature gardens that are maintained today with only wooden tools were presumably originally cleared in prehistoric times with stone adzes and also maintained then as they are today with only wooden tools since no stone tool blades that might have been used as hoes or spades have ever been recovered in the Irian Jaya Highlands in modern times. Men are responsible to clear areas and prepare them for planting (Figure 107). With community work parties, they dig the ditches, mud the sides, and throw ditch material back into the gardens where it acts as a fertilizer (Figure 108). The women do most of the planting, weeding, and harvesting (Figure 109).
Figure 104. Hillslope garden above the rock quarries at Langda.
Figure 105. A typical wooden fence that surrounds the potato gardens.
Figure 106. Rock-walled potato gardens.
Figure 107. With a wooden paddle digging stick, a man prepares for planting.
Figure 108. A work crew cleans a garden ditch and muds the walls.
Figure 109. Dani woman prepares a mound and plants a potato cutting.
The people cultivate (or manipulate within the nearby forest) at least 15 different kinds of plants; the staple food is the sweet potato. For a botanical list and brief essay on plant uses, see Appendix I, Crop and Wild Food Plants.

**Food Plants.** The Dani and their Highlands' neighbors cultivate and eat three different kinds of tubers: sweet potato (*Ipomoea batatas*) (Dani: *hibiti*, alt. *hiperi*), yam (*Discorea* sp.) (Dani: *bain*), and taro (*Alcoasia* sp.) (Dani: *hom*). Of the three, it is thought that some varieties of taro might be indigenous and were present upon arrival of the first migrants (Benjamin C. Stone, personal communication 1994). The yam might also be indigenous, or at least it was free growing in greater Malaysia and could have been transported by early settlers. Of the three, the sweet potato is the late arrival, possibly not being present in New Guinea until 300 years ago from South America via the Philippines (Cavalli-Sforza 1994:346).

Because the taro is planted and tended differently than the sweet potato may indicate it is a representative of the evolutionary process from Paleolithic hunter-gathering to the early stages of horticulture, when the taro was first manipulated and then actually domesticated. Today, the taro is scattered throughout the potato fields—a plant here and a plant there, or along and within the irrigation-drainage ditches. Some natural stands of taro are present in marshy areas where the plants thrive in standing water. With some Dani groups, the taro is planted and cared for only by men, whereas the planting, care, and harvesting of potatoes is done by women. My own observation of this horticultural procedure concurs with O'Brien (1969:30-31) who notes that, "Women are responsible for planting, weeding, and harvesting sweet potatoes; the cultivation of bananas, taro, sugar cane, *Pandanus*, and tobacco is men's work." As previously stated, Groube et al. (1986) singled out the yams, banana, sugar cane, perhaps taro, tree fruits, and *Pandanus* as those plants that might have been effected by ring-barking and other manipulation of the forest as early as 40,000 ya in Papua New Guinea to allow sunlight to penetrate the forest.

Within the study area, the yam usually produces smaller tubers than the sweet potato and the vines are nearly always trained up poles. Rarely have I seen sweet potato vines trained up poles. The horticulturists always explain that the yam does not do so well if its vines are bunched on the ground. Like the taro, this differential treatment of the yam from the sweet potato may be an indication that it is a representative of a horticultural process which preceeded the importation of the sweet potato. The yam is roasted or steamed, like the sweet potato, before eating.

When traveling with Highlanders in remote forested areas, I have felt at times that I was with hunter-gatherers rather than horticulturists, as particular indigenous people knew not only where to find edible grubs and other insects but just when to leave the trail, disappear into the forest, and return in the evening to the campsite with a hearty supply of the *Pandanus* nut fruit (*Pandanus julianetti* Mastelli. *Pandanus brosimos* Merrill and Perry) (Figure 110). According to Benjamin C. Stone (deceased) (personal
Figure 110. Important nut fruit (*Pandanus julianetti* Mastelli. *Pandanus brosimos* Merrill and Perry).
communication 1994), these nuts were available at the earliest arrival of humankind in New Guinea (ca. 40,000 ya or earlier) and, along with taro, breadfruit, sago, and yams, may have been among the earliest foods whose growth was encouraged by forest manipulation. This Pandanus nut is found both wild and cultivated in the study area between about 1,900 m and 3,300 m. Each individual tree, even those growing wild in the forest, is either owned, tended, and harvested by a particular man or is within a "nutting" area that is controlled by a specific territorial group. The edible seeds are quite nutritious and enjoyed on a regular basis by the Highlanders. Each nut cluster (fruit) is roasted and individual seeds (drupes) are cracked out of their endocarps with simple river rounded rocks used as hammerstones and anvils (Figures 111 and 112). I believe that this nut is a significant supplement to the staple sweet potato diet of some of the Highlanders. Behavior associated with the Pandanus palm and its fruits today furnish a tangible link of information to interpreting the prehistoric past when the same species of nut may have been one of the most important food staples among the hunter-gatherer ancestors of today's horticulturists.

**Baliem Gorge.** In the upper reaches of the Baliem Gorge at Kurima and to the south, the archaeological skeleton of the horticultural system with its interspersed habitation sites is made of walls and ditches of stone rather than fences of wood and ditches of mud, as it is in the more populated area of the Grand Valley to the northwest. From an archaeological perspective, this is significant because upon abandonment of the sites, it is the stone remnants that would more likely be preserved in the archaeological record than the wooden skeleton which would soon rot and be gone, especially in the present Irian Jaya equatorial climate. What might be lost with time is evidence for the intensely practiced horticultural system at the center of the most populated area in the Irian Jaya Highlands. In this scenario, what would be disproportionately preserved relative to population distribution would be rock ruins within a less populated area.

East across the Baliem River from the hamlet of Kurima (Figure 6), an entire hillslope was deforested by the slash-and-burn technique over what was presumably a long period of time. Indigenous inhabitants living in the area today (1989) do not know when this was done because it was long before their time. Rock rubble collected from the mountain slope and lower broad terrace above the Baliem River was used to build walls to outline rectangular-shaped garden plots (Figures 113 and 114). In upslope-downslope straight lines, rocks were piled to create rock-lined drainage ditches that also served as human walkways. Perpendicular to these ditch-walkways, low walls of rock were built that served as places to get rid of bothersome rock erratics, delineate garden plots, and slow slope erosion (Figure 114). Active gardens were/are rotated on the hillslope. Most of the hillside lies fallow at any one time. By looking carefully in Figures 113 and 114, one can see the relic rectangular outlines of what were once active gardens, and the new gardens that are being planted with sweet potatoes.
Figure 111. A roasted piece of the *Pandanus* shell with nuts.
Figure 112. Cracking *Pandanus* nuts with a hammerstone and anvil.
Figure 113. Rock-outlined, rectangular-shaped, hillslope gardens east of Kurima.
Figure 114. Close-up view of the Kurima rectangular-shaped sweet potato gardens.
In one area within the Baliem Gorge itself, steep hillslope gardens on slopes varying from 30°-60° are protected from erosion by rock walls (Figure 115). Even so, modern hillslope creep can be discerned by vegetation patterns and offset rock walls. The danger of farming on such steep slopes (as is done in many areas in the Highlands of Irian Jaya) is emphasized by the fact that an entire hamlet up-river from this spot was buried in a landslide in mid-1989 with considerable loss of life. Two major walled “thoroughfares” can be seen in Figure 115: one near the top of the photograph and one near the bottom. From the air, the steep, rock walled slope gardens of the Baliem Gorge are similar in appearance to the valley-walled terraced rice fields that are so well known among the Ifugao of the Philippines (Kottak 1991:174); on the island of Bali, Indonesia; in Taiwan; Japan; and different parts of the Asian mainland. But the process of creating and using the steep slope gardens is distinctly different than the creation and uses of flat, terraced fields: although the practical indigenous horticulturists are quick to take advantage of even narrow, naturally formed terraces for their gardening.

Not far from the steep-sloped gardens on the valley wall shown in Figure 115, is a broad area of hillslope gardens with such a jumble of man-manipulated piles of rock, rock walkways, and walls that an outsider could easily become lost in the maze, not only mentally while trying to interpret the meaning and chronology of the different features, but also geographically while just simply trying to cross the area of rock structures (Figures 116, 117, 118, 119, 120, and 121). During the past, the entire area was deforested, as individual garden plots were created. Today, some of this land lies fallow, while other parts of it are in different stages of garden preparation and growth. Low, linear parallel rock walls to mark garden plots and to slow slope creep are easily discernable in some fallow areas; while rock-lined irrigation-drainage ditches in a nearby, newly planted area is also evident (Figure 116). Some elevated walkways are built up with rock, for short distances. In a centrally located hamlet (middle of Figure 116), the counterparts of the typical wooden compound fences that are present in the Baliem Valley just a short distance away, are stone walls (Figure 118). Houses, communal women’s cookhouses, and pig sties, themselves, are nevertheless made characteristically with wood walls and Dani-style grass thatch roofs. Here, low openings that can be blocked with wooden slats have been built through the rock walls to control the passage of pigs from one area to the next. If only individual features were found in the archaeological record, as is so often the situation, many of the stone structures of the Baliem Gorge area could be misunderstood. It is likely that some features would be interpreted as fortifications against enemy attacks, when in fact, the maze and diversity of the stone structures that are scattered throughout the Highlands cultural systems, merely denote the variable adaptation of the culturally same horticulturists to variable materials that are naturally scattered about the landscape. None of the features were built as fortifications.
Figure 116. A horticultural complex where rock is a primary building material.
Figure 117. A jumble of man-placed rocks forms small planting plots.
Figure 118. Compound "fences" at the horticultural center are all stone walls.
Figure 119. Rock-walled potato gardens cover a broad area.
Figure 120. A man with adze-on-shoulder in the Baliem Gorge.
Figure 121. Rock-walled gardens on slopes above the Baliem Gorge.
Animal Husbandry

The only domestic animals are dogs (*Canis familiaris*) and pigs (*Sus scrofa*). According to one origin myth, told by the Highlanders and reported by Larson (1987:48):

There were only two domesticated animals: the dog (a variety of dingo) and the pig. Dogs emerged first, sniffing their way through the Seinma crevice and leading the first people onto earth. Pigs followed the first people... Because dog led man up onto earth, and because it has since then guided him through the forest to find new areas in which to settle, it is not killed or eaten as is the pig. Pigs are the main source of meat and the animal killed to placate the kugi of the spirit world.

Contrary to this quoted origin myth, however, the dog is *not* taboo and is eaten in some Dani areas. In most areas, the dogs’ yellow-buff colored fur is much admired as men’s arm cuffs, as decorations on headdresses, and bits and pieces are used to decorate objects like net purses, cowrie shell exchange bands, and funeral and brideswealth display-exchange stones. Some dogs, having a predisposed inclination, are trained and used for hunting. Although the dog is sometimes revered as having a soul-ghost like humans, it is generally relegated to a position of just *being* in the living hierarchy; whereas the pig’s value is unquestioned. As Heider states (1970:48), “Pigs are basic to Dani culture.”

Indeed, pigs are both the primary wealth item and the living entity raised to be an essential part of a myriad of ancestor worship ceremonies, curing rituals, rites of passage, war preparation, war indemnity, and other ceremonies. It is an endless continuum of pig killing rituals, at which pigs are sacrificed to pacify ghosts and to assure the ancestor spirits that they are properly respected.

In the Highlands, pigs live in proximity to their owners. At night they are kept either in the compound pig sties or in the houses with the people. Regarded as pets by many (some even revered by their owners while they are being raised as sacred animals to be sacrificial victims), pigs are bred carefully. Breeding boars are singled out and protected. Other male pigs are castrated by specialists with bamboo knives to cause them to grow faster. This reasoning is confirmed by modern veterinarian knowledge.

When castrating, surgeons prefer to operate on several pigs at one time. The medical kit they use consists of a bamboo knife, one or two bone awls, one-to-three short sharpened small sticks and sometimes stems of grass for suturing. The operating arena is always outdoors in some part of a compound courtyard in the Grand Valley and West and within a house cluster in the Yali and East. Sometimes one or two men hold a pig, or at other times, a team of both women and men assist, with one person kneeling on the ground being used as the “operating table” holding a small pig, head downward on his/her shoulders, while others above hold the back of the pig upright and assist the surgeon as he operates. First, a cut on the scrotum is made with a bamboo knife, then the testicles are probed out with an awl or sharpened stick before they are severed from the pig with the knife. The wound is sometimes sutured with grass stems, sometimes pinned together with short pieces of sharpened sticks or an awl, and sometimes not sutured or clamped shut at all. The age and size of a pig influences the procedure, with some very young pigs not
being sutured. Sputum is rubbed onto the wound. Then it is smeared with mud, and the pig set onto the ground to go its way. One such operating procedure as it was performed by the mid Grand Valley Dani is shown in Figures 122, 123, 124, and 125.

Any pigs bitten by rats at nighttime or by other pigs are treated with pitch from araucaria trees, ash from fireplaces, or pulverized lime. On humans, similar wounds are treated with plant compresses of medicinal leaves.

As previously mentioned, pig ownership confers wealth and prestige. To be a big man of influence requires not only the ownership of a large herd of pigs but also the ability to move them within the cultural system. According to O'Brien (1969:47), "Anthropologists have suggested that the values centering around pigs and the roles played by pigs in Highlands culture are comparable to the cattle complex in East Africa" (Pospisil 1956:70; Reay 1959:20). According to Cavalli-Sforza et al. (1994:346), "There are contradictory reports about the first time of entry of pigs to New Guinea: they might have been introduced by 6,000 B.P. or possibly earlier (Spriggs 1984). According to Bellwood (personal communication), a date of 2,000 B.P. would fit the linguistic data better."

For a reader interested in delving into the detail of the role of pigs in Highlands cultural systems within, and adjacent to the Irian Jaya study area, I suggest the following references: Heider 1970, O'Brien 1969, Larson 1987, Peters 1975, and Pospisil 1956. For pan-Papuan information from a study conducted in a local area a good distance to the east in Papua New Guinea, I suggest the classical Pigs for Ancestors by Rappaport (1984). Rappaport reached a conclusion in that particular area of Tsembaga Highlanders that the cyclical mass-killing of pigs in social ritual is a mechanism to control pig population, but I contend that this mechanism of social control may not apply to the Irian Jaya area, where pig movement seems to be adequately controlled by the intricate network of fences and walls and where the availability of pigs for required rituals is often in short supply.

Architects, Engineers, and Builders

The Highlanders, especially those in the Grand Valley and West are adept architects, engineers and builders. In their living compounds they construct circular men's and women's houses, rectangular cook houses, pig sties, small after-cremation bone enclosures (oak leget) and ghost houses (wadlo leget) (Figure 126). In the west, a basic architectural unit is a compound with one man's house, a common women's cook house, several women's houses, one to three pig sties, an oak leget, a wadlo leget, and often a second wadlo leget attached to a curing specialist's house (male or female).

The entire complex is fenced or walled outwardly to keep pigs out and to offer a degree of protection against marauders. An inner fence connects the houses and pig sty or sties and provides a well protected
Figure 122. The operating arena and surgical team for a pig castration.
Figure 123. The scrotum is cut and a testicle speared.
Figure 124. The testicles are cut free with a bamboo knife.
Figure 125. The wound is pinned closed and the area mudded.
Figure 126. The men frame a women's communal cookhouse.
interior courtyard as well as a fenced compound garden area located between the two fences. Minor variations in compound design occur, especially in rough terrain where it is difficult to have a centrally located fenced interior courtyard. Each compound is designed, at least in the Grand Valley, so that the men’s house faces the fenced-in compound entrance, so the men who stay there always look out across the central open courtyard to view activities and to see who is coming and going; conversely one entering a compound looks across the open courtyard directly at the mens’ house (Figure 127).

I refer to a hamlet as two or more compounds joined together by a common fence, or at least adjacent to each other (Figure 128). Grand Valley men’s houses vary from two and one half to five meters in inside diameter with most being from four to five meters. Houses in the Yali and East region are approximately the same size. The most powerful big men have slightly larger houses. Details of design and construction of the men’s house are discussed in "Architecture, Contents, and Spatial Relationships," Chapter VII, in conjunction with religious aspects of space as it relates to sacred places and symbolic stones.

Houses and other compound buildings in the Grand Valley and West are easily distinguished from houses and buildings in the Yali and East: in the west, the roofs are thatched with grass; whereas in the east, the roofs are covered with Pandanus leaves or less often, with strips of bark (Figure 129). Another architectural difference between the two areas is community layout: in the west, interior fenced courtyards are the norm; whereas in the Yali and East (and in areas of rugged terrain in the west), interior fenced or walled courtyards are not present. The controlling factor is the rugged terrain, which persistently prevails throughout the Yali and East region, where there are few locales in which such planned communities are feasible.

The multiple designs of intricately fenced, mounded valley gardens with their labyrinths of ditches and of fenced or walled hillslope gardens, with both earthen and rock lined ditches and erosion controls, attest to the land use skills of the horticulturists.

Possibly the most challenging engineering feats are the large suspension bridges built across rivers throughout the entire area (Figures 130 and 131). When Richard Archbold discovered the Grand Valley in 1938, he remarked that he was amazed at the engineering skill of the Highlanders in constructing the suspension bridges. In addition to designing and building the complex bridges which provide the only river crossings, the men are also responsible for building and maintaining temporary bridges plus the numerous single log pole bridges that furnish access across ditches within the sweet potato gardens (Figures 132 and 133).

The Dani watchtowers in the Grand Valley were ingenious creative constructions to allow men to view approaches to their frontiers and potato fields, thus furnishing forward lookouts for ambushes and raids. According to Heider (1970: 114):
Figure 127. Through the entrance, across the courtyard to the men's house.
Figure 128. A hamlet with two adjoining compounds. Baliem River behind.
Figure 129. A Dani grass thatch and a Yali *Pandanus* leaf roof.
Figure 130. A typical hanging bridge across a rushing torrent.
Figure 131. A lacy network of vines supporting bridges creates interesting designs.
Figure 132. Sometimes temporary bridges are built. Yali, Heluk River.
Figure 133. Pua replaces an old single-pole ditch crossing.
the watchtower is made of strong logs, the bases sunk into the ground about one meter and bound tightly together to form a column about 50 cm in diameter. This column supports a narrow platform 5 to 10 meters above the ground which is simply a board seat on which a single man can sit with comfort. Often a framework of thin sticks supports a crude thatch roof which serves as shelter against the elements and, if it is full enough, conceals the presence or absence of a watcher.

The watchtowers are always manned in the early morning hours so when an "all-clear" signal comes from the lookouts, the horticulturists can then move into the gardens to perform their daily chores (Figure 134). Silhouetted against the sky, the man in the lower set of photographs in Figure 134, looks somewhat like a bird in its roost, which may be the impression that the man on the tower might like to create.

Logs, narrow poles, adzed boards, and bundles of liana and ground-growing vines are often accumulated at conveniently placed lumber depots, especially in preparation for a major construction project. The vines have multiple uses, similar to the way our nails and screws are used and also as stringers in bridge construction.

Overall, the Highlander approach to solving architectural and engineering problems, as well as the building process itself, is systematic with a leader ("big man") and his group of advisors furnishing ideas and the ensuing work being accomplished by and with the consensus of those in the community.

**Warriors, Warfare, and Weapons**


War is one of the paramount institutions of Dani life. With agriculture and pig raising, it constitutes one of the few major focuses of all people's interest and energy. Without it, the culture would be entirely different; indeed, perhaps, it could not find sufficient meaning to survive except parasitically as the novelty of missionaries and policemen [Gardner and Heider 1969:144].

Dani warfare proceeds through a cycle involving two rather different sorts of events. There is a long period of relatively low-key fighting between two alliances, in which the main emphasis is on the ritual aspects of war. But each alliance is a basically unstable grouping of confederations. After several years, perhaps ten or twenty, the alliance explodes in a major battle, new alliances are formed, and the ritual warfare is resumed along the new frontiers [Heider 1970:105].

Warfare in Ilaga entails two levels of violence: less violent, restrained, ritual warfare, and more-violent, unrestrained total warfare. Ritual warfare is characterized by (1) an appeal for ancestral assistance through the performance of rituals by parties responsible for the conflict..., (2) supervised fighting on selected battlefields, (3) total valley involvement as either 'owners' or allies to 'owners' of the war, and (4) near-continuous fighting until a balance or near-balance in battle losses is reached between sides [Larson 1987:245].
Figure 134. The watchtowers of the Grand Valley.
Berndt (1964:183) considered warfare in both Papua New Guinea and Irian Jaya to have been "chronic" and "incessant." Reports within the Dani area of the Central Highlands of Irian Jaya by Gardner and Heider (1969), Heider (1970), and Larson (1987) support this conclusion. Larson (1987:164) says in the Ilaga area, "every man always carried with him his bow and arrows to defend himself should he suddenly be the object of unexpected revenge, or be called upon without notice to assist members of his community in a sudden outbreak of fighting." Since the 1960s the efforts of both the Indonesian government and Christian missionaries to stop Highlands' warfare has certainly caused a decrease in such, but as long as a reasonably large segment of the indigenous population fears retaliation by the ghosts and spirits for not conducting warfare to "even the score" more than they fear the consequences of war from the Indonesian government, warfare will probably continue at least in some degree (Hampton unpublished reports: Soba war 1989, Wamena ritual revenge war 1992a, Ilaga-Sinak 1993).

Although it is not difficult to visualize the influence that traditional warfare might have had on trade and the continuous need for rituals led by war shamans (often using sacred stones) to incite the spirits to favorable action on the warriors' behalf, the behavior of the complex system of warfare as practiced in pre-contact times by the Irian Jaya Highlanders could not be interpreted from its remnant artifacts of culture. The warring fields will leave no boundaries or tell-tale markers, unlike the horticultural skeletons of rock walls, fences, and patterns of irrigation-drainage ditches.

A brief description of weapons provides insight relevant to the evolution of weaponry, choices of materials used for weapons construction, and the cognition of individuals within the cultural systems toward the uses of their weapons. In the Grand Valley and West, the weapons of war are the long jabbing spear, shorter throwing spears, bows and arrows, and on occasion, adzes. In the Yali and East region, the most common weapons are bows and arrows and adzes. The long jabbing spears are approximately two to three m long and made primarily of myrtle or laurel wood, and are the real killing weapons for warfare (Figures 135 and 136).

The bows are approximately 1.5 m long with bowstrings made of thin strips of bamboo or sometimes rattan (Figure 137). Arrows are made with unfletched reed shafts and several different styles of hardwood, bamboo, and bone tips. The primary fighting arrows have barbed hardwood tips of different designs; although bamboo-tipped arrows are also often used. Bone-tipped arrows are rare in the Highlands; more common to the north in the lowlands. Different simple designs are often incised onto the arrow tips; sometimes onto the shafts. The variation in design of fighting arrow-tips relative to "barb patterns, notches, and decoration of tip and shaft is particularly striking" (Heider 1970:285). Whether hunting or in warfare, arrows are carried loose (or tied in a simple bundle with a string or piece of narrow rattan) in the same hand as the bow. During ritual or all-out warfare, arrows are fired singly by individual warriors; never in coordinated volleys. On the battlefield, arrow wounds are common, but rarely fatal. Most deaths from
Figure 135. Facing a killing spear.
Figure 136. A warrior adorned for combat carries his dark myrtle wood spear.
Figure 137. An older warrior displays his new "weaponed" bow with arrows.
arrows occur later off the battlefield from infections or other complications. In ambush, and occasionally on a battlefield, a warrior is shot in a vulnerable spot at very close range. Normal firing range on a battlefield or in an ambush situation is between five and 20 m. A maximum range of about 75 to 100 m varies from bow to bow, but any arrows fired at anything approaching the maximum range must be fired in an arched line of flight. Spent arrows are immediately picked up by the nearest person. Because of the dispersion of arrows in this manner through warfare it is difficult to identify any warrior's supply of arrows at any given time relative to the maker or a particular group of people. Arrows are also dispersed from one group of people to another by trade throughout both the Highlands and lowlands and between the two areas.

The short throwing spears are actually just short, sharpened sticks. They are used often in controlled mock warfare that is associated with certain rituals as in other types of warfare.

The choice of weapons for ritual warfare, ambush, or "unrestrained total warfare" (Larson 1987:245) is an individual matter. Some warriors prefer a bow and arrows; others a spear. In local areas in the Grand Valley and West, some informants even prefer an adze. Many Yali state the same preference, especially for surprise attacks and ambush where hand-to-hand fighting is anticipated.

Stone Tools and Profane Display-Exchange Stones

The Highlanders are well endowed with a general tool kit of hafted ground stone adze and axe blades, ground stone knives and chisels, river rounded hammerstones and anvils, and small chert (± 2 cm) cutting flakes. These tools and their uses are discussed in Chapter V; the quarrying, manufacture, and trade of them in Chapters VIII, IX, X, and XI.

Culturally important profane ground wealth display-exchange stones, derived from some of the same quarries as the stone tools, are discussed in Chapters VI, VIII, IX, and XI.

Stone Quarries

The majority of the abundant selection of stone tools and certain kinds of other stone goods that are used within the study area originate at three quarry areas: Yeineri, Tagime, and Langda-Sela (Figure 3). A small proportion of the stone goods in use come from what I am calling "sources of opportunity". The quarrying systems and trade therefrom are discussed in Chapters VIII, IX, X, and XI.
Tools from Other-than-Rock Materials

The raw materials used in Highlands technology include rock, wood, bamboo, rattan, bone, grass, feathers, shell, Pandanus palm leaves, banana leaves and banana trunks, reeds, gourds, orchid fiber, palm fiber, beeswax, and seeds. The variety of tools made from other-than-rock materials is impressive. Those of wood and bamboo are culturally the most important. Their visualization and development was an important—maybe even essential—part of the evolutionary step that the Highlanders made some millennia ago from a hunter-gatherer cultural stage to a plant and animal husbandry stage. By extending the shaft of stone adze/axe blades from the length of their own arms and hands to a more powerful and mechanically efficient chopping tool by adding extended wooden shafts, fixed at advantageous angles to the cutting edges of the stone blades, the people were able to deforest large areas in which to concentrate the growth of food plants. With fire-hardened digging sticks which vary in length from about one to two and one-half meters, the horticulturists were able to manipulate the soil within the newly deforested areas and to create a complex of gardens with irrigation and drainage ditches (Figures 107 and 138). With the introduction of pigs to the island of New Guinea some 6,000–2,000 ya (Cavalli-Sforza et al. 1994:346), the horticulturists, who were probably already growing taro and yams, included pig husbandry into their strategy of subsistence. The women, who never carry bows and arrows like most men routinely do, both as weapons against sudden raids or to be ready for spontaneous hunting opportunities, have the digging sticks as their near-constant companions. They are used by the women not only in the daily routine of planting, weeding, aerating the soil, and harvesting, but also as formidable weapons of defense against surprise attacks. With the new, improved wooden handled, stone chopping and adzing tool, the people were able to cut and adze very large quantities of lumber with which to build their efficiently designed houses and to fence living communities and gardens to control their domestic pigs. The surgical sharpness of their bamboo knives were advantageous, if not essential, to the castration, disarticulation, and butchering of pigs as their animal husbandry practices became a featured aspect of this new-found way of life.

Fiber string became another featured item of use in the Highlanders life style. Since I do not classify string in most of its many daily uses as a “tool,” I discuss it in the sub-section of Chapter IV entitled The Profane and Sacred Uses of Fiber String.

The many other kinds of non-stone tools, in addition to those mentioned above, reflect in totality some measure of the cognition of these Highlands horticulturists and the diversity of their tool selection at a cultural stage when they also had an impressive assortment of stone tools.
Figure 138. A female horticulturist plants potato cuttings with her digging stick.
Wood

In addition to the stone adze and axe blade handles and the all-important digging sticks, probably the next most used and important wooden tool are the large wooden tongs that both men and women use to carry heated rocks from the "open furnaces" to the outdoor steam bundles, where pig meat, sweet potatoes, and other vegetables are cooked with reasonable regularity (Figure 139). The routine use of such split pole tongs that vary in length from 1.2 to 1.8 m are discussed and shown with photographs in Chapter VII. under the sub-heading "Ganekhe Hakasin Ceremony." Smaller wooden tongs from a split branch of the same general appearance are routinely used by women in communal cookhouses to move sweet potatoes, charcoal, hot rocks, sweet potatoes, and other food items about in the fireplaces.

All living compounds (Grand Valley and West) and house clusters (Yali and East) possess at least one hollowed out wooden bowl or platter-type bowl (shaped from the bark of the casuarina tree) which is maintained for kneading the Pandanus conoideus red fruit into a soupy pulp (Figure 140). The pulp is most commonly used as a sauce for roasted or steamed tubers. Scattered groves of conoideus are individually owned and are often present within or near to habitation sites.

Another type of cooking utensil that is sometimes used (across the entire research area) is the wooden fork. In Figure 141, a group of Wano men are using wooden forks to eat steamed greens inside of the men's house.

Although bows and arrows are discussed in a previous section on warfare as weapons, they are also routinely used for hunting. A special three or four-pronged hardwood tip is the choice for bird hunting. One such tipped arrow is present in the bundle of arrows carried by a Yali hunter in Figure 142. During pre-contact time, whether during wartime or not, it was a habit of most Highlander adult men to carry at all times a hafted adze in its characteristic position on the shoulder and a bow and bundle of arrows (6-12) in one hand.

Wooden tweezers for plucking unwanted hair on men are shown in Figure 85. Twigs of similar small size are often used by men to set mouse and rat snares while traveling in the forest. Perhaps this practice originated with the ancestors when they lived in a hunting-and-gathering cultural system.

Bamboo

The sharpest cutting blades known in the prehistoric (or in modern times) are obsidian knives made by an Upper Paleolithic blade technique (Haviland 1993:79). These knives are superior in almost every way to modern surgical scalpels (Haviland 1993:80). The next sharpest prehistoric knives are flaked blades made from a variety of cherts (flint, agate, silicified wood, and chaledony) and certain orthoquartzites. Although none of the latter come up to obsidian blades for sharpness, such knives along with those of
Figure 139. Wooden tongs for moving heated rocks while cooking outdoors.
Figure 140. Wooden bowl for pulping the *Pandanus conoideus* fruit into a sauce.
Figure 141. Wooden fork for eating greens.
Figure 142. Yali hunter with bow and arrows.
obsidian have served prehistoric humankind quite well over a long span of time and in many parts of the world.

The Irian Jaya Highlanders, however, have no supply of obsidian, orthoquartzite, nor even an adequate supply of large enough chert nodules from which to make stone flake knives of the sharpness desired for butchering, surgical procedures, and certain other specific cutting chores. In a creative adaptation to the raw materials available within their environment, the Highlanders or their ancestors, added the bamboo knife to their tool kit of ground stone and bone knives, which are not as sharp as the bamboo knife.

Bamboo knives are longitudinal strips of bamboo cut with small chert flakes. They vary in length from approximately 10-20 cm and from one to one and one-half cm in width. For some tasks, the knives are longer. From 43 measurements, the mean length of bamboo knives used for surgical and butchering procedures was found to be 14 cm. Except for a certain few sacred purposes, when a section of a longer bamboo knife is wrapped with vegetal material to make a handle, the entire knife consists of just a thin length of bamboo. The thin, sharp cutting surface of a bamboo knife is the freshly exposed narrow edge (about .29-.32 mm thick) of the outer surface of the epidermis of the piece of bamboo stem that is being used for a knife. When the edge becomes dulled by use, the knife is quickly resharpened by merely stripping off the dulled strip of epidermis from the cutting edge of the knife with one's teeth (Figure 143), thereby exposing a fresh sharp cutting surface. Interestingly, the cutting edge of a bamboo knife is about the same thickness as that of a modern razor blade (.29 mm for a Wilkinson Sword razor blade made in England) and within the variance of thicknesses of modern American paring knives at their cutting edges (.28-.30 mm).

The sharpness and hardness of the bamboo knives are thought to be enhanced by the biogenic silica in the form of silicon dioxide (SiO₂) phytoliths within the epidermal tissue of the stems of the bamboo. The abundant presence of these phytoliths are well known in the grass family (Poaceae) and in the bamboo sub-family Bambusoidea (Vaughn M. Bryant, Jr. and John G. Jones, personal communication 1995 and unpublished article Pearsall and Piperno 1995). Although the morphology and distribution of the silica phytoliths in the stems of the Bambusoidea may affect the cutting quality and hardness of the bamboo knives, research on those topics is outside the scope of this paper.

Silicon dioxide (SiO₂) is an extremely hard and durable substance, and its presence in many minerals and rocks that were favored as cutting tool material throughout prehistory is well known. On the Mohs' hardness scale, quartz (SiO₂) has a hardness of seven, Chert (SiO₂) (flint, agate, silicified wood, chalcedony) a hardness of seven, and obsidian (SiO₂) and window glass (SiO₂) about five. John G. Jones, Ph.D., Research Fellow, Smithsonian Tropical Research Institute (personal communication 1995), feels that biogenetically formed silica dioxide in the form of phytoliths is somewhat softer than quartz and chert and perhaps approximately six on the Mohs' scale.
Figure 143. Sharpening a bamboo knife.
Bamboo knives are the only kind of knives used by the Highlanders for surgical procedures used on both human beings and pigs (Figures 45a, 123, and 124) and for butchering the large cassowary bird and pigs. In the research area, thousands of pigs are killed and eaten each year at the on-going pig ceremonies. The pigs are always killed in a procedure using a very sharp bamboo-tipped arrow, skinned with bamboo knives, disarticulated with a stone adze and bamboo knives (sometimes with just bamboo knives), and the meat cut up with only the use of bamboo knives. (For discussion and photographs see The Ganekhe Hakasin Ceremony, Chapter VII.) In the Highlands, for surgical procedures and meat butchering, the bamboo knife has taken the place of chert (flint, agate, silicified wood, and chalcedony), orthoquartzite, and obsidian knives found so pervasively in the archaeological record in other parts of the world and often interpreted to have been used for surgical and/or animal butchering procedures.

Bamboo knives are energy efficient tools for the Highlanders on the island of New Guinea. The source material is abundant, and the knives are lightweight to carry. They can be made easily in a matter of minutes or less with little skill, and dulled blades are sharpened in a matter of seconds. The inclusion of the bamboo knife into the Highlanders' knife tool kit certainly makes a strong statement about the cognition of the implementors who recognized the capability of the organic knife in the absence of the right kinds of rock materials. The impact of the possible uses of bamboo knives for surgical procedures and the disarticulation and butchering of medium and large size animals must be included in our interpretations of the archaeological past. Further research on the silicification of the epidermal tissues of the Irian Jaya bamboo knives is needed as well as identification of the genera (and/or species) of specific plants that are selected by the indigenous inhabitants for their knives.

Fire-Starting Tools

To me, one of the more intriguing missing archaeological links in the evolution of cognition and technology is tangible information relative to the times, places, and methods by which humankind first purposefully started fire. It is one thing to conclude from speculation that fire was first started by humankind by accidentally striking the right kind of rock against another right kind of rock and producing sparks. Then, in pursuing this very exciting event, to visualize and develop a way to capture a spark or sparks and ignite some sort of tinder. But for others who did not have the right kinds of rocks to go through this hypothetical scenario (or to learn from those who already had), some invented other fire-starting techniques. From ethnographic studies and the relatively recent archaeological record, several kinds of fire-starting kits and techniques are known.

In the Irian Jaya Highlands research area, there are two techniques and two distinctly different kinds of fire-starting kits (Figures 144, 145, 146, 147, and 148; Hampton 1992b:95-96). All language-speaking
Figure 144. A bamboo "matchbox" and rattan-thong-stick fire starters.
Figure 145. Thong-stick friction ignites tinder.
Figure 146. Flame is encouraged by gently blowing.
Figure 147. Tingen Geri displays a "Wano bamboo matchbox".
Figure 148. The tinder and bits of charcoal burn.
groups across the research area use the rattan-thong-stick-fire-starting kit shown in the lower photograph of Figure 144. A roll of unsplit rattan, along with a split wooden stick that is held open near one end with a small rock, a short piece of another stick, or even a piece of bone, make up the two permanent elements of this kind of fire-starting tool kit. The necessary tinder is not usually maintained as a part of the kit, but is collected (leaves, grasses, or strips of bark fiber) whenever a fire is to be started. In Figure 145, the thong is briskly pulled back and forth against the foot-held resistance of the split stick, until heat created by the friction ignites the tinder. The bundle of tinder that had been secured in the open fork of the stick is then carefully picked up and the flames encouraged by gently blowing on the tinder (Figure 146).

The second kind of fire-starting tool I named the "Wano bamboo matchbox" after the Wano people who I discovered using it while working in the Yenneri rock quarry area (upper photograph in Figure 144 and Hampton 1992c:95-96). This is a most intriguing tool, and I must admit my elation upon discovering its use because it is not even known throughout most of the different language-speaking groups within the Highlands research area. In addition to its use by the Wano in the Yenneri quarry area, I found that it is used by the Duvle speaking lowland neighbors of the Wano to the north (Figure 2). A key coastal Melanesian informant reports that this same kind of fire-starting kit may be used by Melanesians who live in the interior of the "Birds Head" area in the extreme western part of the island of New Guinea (Figure 1).

The "bamboo matchbox" consists of single internodal sections of bamboo stems that vary from about 28-36 cm in length for each fire-starting kit. The bottom of the tube is normally closed off by a natural bamboo septum, but, if broken in use, the hole is plugged with a wax (identification not known) which the Wano call ijuk. At the bottom of the tube, dried, shredded leaf tinder is packed on top of a wad (or layers) of dried fiber hairs that are carefully harvested from new palm leaves of a specific palm. The hairs or "fuzz" tinder, the Wano users call gabuk and trivits. The palm tree, they call nibung. I have identified neither. Sprinkled in with this special, highly inflammable material are tiny bits of charcoal made from the roots of breadfruit or Pandanus trees. A layer of tiny bits of the charcoal is usually accumulated before a small (about 3-4 cm), river-smoothed, usually linear striking stone called a yugum is included. The type of rock material is apparently unimportant. The entire contents are capped with a wad of shredded leaf tinder.

In the upper photograph of Figure 144, some of the palm fuzz tinder protrudes from the left side of the container. Below the container, on the right, is a small pile of the palm fuzz tinder, below that the yugum striking stone, to the left, a pile of the charcoal bits, and still further to the left, the shredded leaf tender "cap" for the bamboo matchbox.
To start a fire, the striking stone is held in one hand with bits of palm fuzz, charcoal, and leaf tinder which ignite from heat-caused friction on about the third or fourth strike of the stone striker against the bamboo tube (Figures 147 and 148). The internodal section of bamboo that is both a container and a striking surface must be brittle from dryness to function successfully as the striking surface. It is presumed that the silicon dioxide ($SiO_2$) phytoliths within the bamboo play an important role in creating a hard, brittle surface against which a stone striker can produce either a spark or heat-induced friction to ignite the special tinder.

**Bone**

The Highlanders make and use a large assortment of bone implements: boar tusk scraping tools, knives, awls, needles, and sometimes spoons.

**Boar Tusk Scaping Tool.** This tool is used to smooth down spears, bows, adze hafts, axe handles, digging sticks, and sometimes the hardwood tips of arrows. Both edges of the inner, concave surface of a boar tusk are sharpened with small chert flakes, the outer surface of another boar tusk, or grinding stones to create two quite sharp cutting surfaces. With the two cutting edges, the tool can be used as a scraper in both the to-and-fro motions, but more often, a user will only scrape in one direction. When the edges become dull, they are easily resharpenned with a chert flake or another boar tusk, which are kept in the same bark cloth or net bag with the scraper. In Figure 149, three different men are seen sharpening their boar tusk scrapers. Note the bone dust on the man’s hand in the upper photograph which accumulated as he quickly honed two sharp edges on this scraper with a small chert flake. The two men sharpening their boar tusk tools in the lower photograph have excised finger joints.

**Knives.** Bone knives are made primarily from the tibia of a pig and the cassowary bird, or sometimes from a dog bone. The cutting edges are honed down on grindstones and over time with resharpennsing and age become polished and a burnished brown color. The pig bone knives are primarily used to scrape and divide tubers (Figure 150). In the Grand Valley and West, both men and women seem to prefer the pig bone knife for this task rather than their stone knives, which they also have in their tool kit. Perhaps these bone knives are more available from the many pig killings within their own compound communities and are sharper than the ground stone knives that are traded in from a long distance. However, in the Yali and East, the people prefer their Langda-Sela ground stone knives, versus the bone knives for this same task (Chapter V).

People in both the Grand Valley and West and the Yali and East prefer the longer and stronger, dagger-like cassowary bone knives for dividing the pulpy red fruit of *Pandanus conoideus* (Figure 151). In addition to its use as a tool, the cassowary knives are used as weapons and also as decorated sacred objects. Because the cassowary birds have been hunted out of the Grand Valley, there are fewer of them
Figure 149. Concave cutting edge is sharpened on two boar tusk scrapers.
Figure 150. Pig bone knife to scrape and cut taro tubers.
Figure 151. A *Pandanus* fruit is split with a cassowary leg bone knife.
there than among people of the Yali and East who trade both cassowary bone knives and cassowary feathers to the Grand Valley Dani.

**Awls and Needles.** Awls and needles are made from the bones of marsupials, rodents, bats, and pigs. Whole marsupial, rodent, and bat wing bones are ground to shape and honed to sharp points on both portable and bedrock sandstone grinding surfaces; whereas, the femurs and rib bones of pigs are first splintered, then select pieces honed and polished by grinding. With aging and repeated sharpening and polishing, all but the bat wing awls and needles become a burnished brown in color. A needle for sewing is created by drilling a small hole in the unsharpened end of an awl with the point on an unretouched chert flake.

The variety of tools created provides users with a broad choice of implements for multiple purposes. Awls are used by men to plait fiber arm bands onto themselves (Figure 82), weave the fiber string cowrie shell exchange bands, probe arrow tips from wounded warriors, as instruments to probe both splinters and thorns from bare feet, and as surgical tools during pig castrations (Figures 123 and 125). Needles and awls made from bat wing bones are thin, strong, and somewhat flexible, and can be honed to a very sharp point. As needles, they are usually the instruments of choice for sewing, and as awls for the often-difficult job of probing out splinters and thorns from feet (Figures 152, 153, and 154).

The more durable archaeological remainders for the presence of bone awls and/or needles within the cultural systems are not the implements themselves, but the traces they leave on grindstones when they are shaped and sharpened. This subject is addressed and photographs shown in Chapter V on "Profane Stone Tools and Their Uses."

In addition to awls and needles, another small but important bone tool is the marsupial and rodent jawbone-tooth graver (Figure 155). These mandible halves-with-tooth are used to incise hardwood arrow tips, as shown in Figure 155, arrow shafts, bamboo earplugs and both bamboo and gourd water containers. For incision work on most of these kinds of objects, chert flakes are also sometimes used.

**Beeswax**

Beeswax is used as a multiple purpose glue, sometimes to assist in holding fixed arrow tips into reed shafts and to help "set" stone adze blades onto the wooden sockets of their hafts. In Figure 156, a ball of beeswax from a tool kit is shown in the lower photograph with a bamboo-tipped arrow in which beeswax was used. In the upper photograph is a typical Grand Valley and West adze in which beeswax was used as a sealer at the distal end of the haft socket.
Figure 152. Bats for wing bone needles and awls, food, and medicine.
Figure 153. Bat bone needle for sewing *Pandanus* rain cape and sleeping mat.
Figure 154. Probing out a thorn with a bat bone awl.
Figure 155. Rodent and marsupial mandible gravers are used to incise arrow tip.
Figure 156. Beeswax, a many purpose glue.
Profane and Sacred Uses of Fiber String

The most pervasively used natural product in the Highlands is rolled fiber string. In fact, Karl Heider felt so strongly on this point that while among the Dugum Dani he observes that although, "The Dani are technically a stone-age culture . . . they could be called a String Culture" (1970:58). String secures the essential items of attire on all adults and forms the fabric of many items of dress and adornment themselves. In addition to contributing to the compositions of the variety of female skirts that are used among the diverse language-speaking groups in the Highlands, the women’s important head-back carrying nets are all made of string. Several sizes of smaller net bags are used by males in which to carry small tools, sacred objects, cigarette making materials, and miscellaneous items. The sociopolitically important cowrie shell decorated display and exchange bands (jerak), as well as the strapless ceremonial nets, both of which are of basic importance to many ceremonial functions, are all made of string. A list of other miscellaneous uses of string within the adjacent Highlands cultural systems is encyclopedic in nature and, although not herein listed, many of these uses can be observed in the photographs that are scattered throughout the text.

In addition to these profane uses of string, the ritually empowered fiber string necklaces, called dibat by the Dani, are worn by both sexes in the Grand Valley and West to protect an individual from harm. Such necklaces are also attached in ritual to sacred objects at installation and renewal ceremonies for similar reasons (refer to Chapter VII). The empowered string necklaces (dibat) for human use are further discussed later in this section.

The inner bark of certain kinds of trees and the shrub Urticaceae are the raw materials for the string. As with many other forest materials, the better quality of bark comes from trees that are located away from the more densely populated Grand Valley and must be traded into the valley from the Yali to the east, or from less densely settled areas to the west. In some cases, regardless of the language group area, small gathering parties of three to six go off for several days on collecting trips. The gatherers collect tree bark, using stone adzes to cut pieces of bark about one meter in length or longer from the selected species of trees. Bundles of the bark are brought home for processing. The outer bark is scraped away from the inner core with bamboo knife scrapers, creating pieces of bark cloth which are dried in the sun and within the women’s communal cook houses. After drying, the pieces of bark cloth are beaten on a rock with wooden mallets (short pieces of tree limbs) to loosen the fibers, which are then accumulated into bundles for use without being rolled, or more often, for later use by rolling the fibers into lengths of fiber string. Both women and men roll fibers on their thighs to twist them into lengths of string. The photographs in Figure 48 show an elderly Yali woman making rolled bark fiber string. Figure 157 shows an elderly Dani
Figure 157. An elderly woman in the Baliem Gorge makes bark fiber string.
woman (estimated 65-75 years) in the Upper Baliem Gorge making rolled string from a typical bundle of already-pounded tree bark fibers, both as their primary cultural contributions.

Many weavers make string as they weave. Such a sequence is shown in the three photographs in Figures 158a and 158b, where an Una woman extends the length of working string by rolling loose ends on her thigh with shrub fibers, to splice and thereby extend the workable string. In the upper photograph of Figure 158b, the weaver has already peeled the outer bark away from the inner bark of a bush stem and pulled away several fibers from the inner core. In the lower photograph she is able to splice by rolling the loose ends of her working string with the newly-created plant fibers.

In Figure 159, a married Dani woman on Sekan Ridge outside of the Grand Valley basks in the early morning sun as she uses the typical Dani-style hand-foot loom technique to weave a head-back net. The weaver’s left hand has been mutilated at funeral sacrifices. Perhaps it is the loss of fingers that prompted the Dani and Western Dani to develop their hand-foot technique of weaving. In her right hand, she holds two pieces of a broken bush stem from which she will pull fibers and splice into her rolled working string as she weaves.

Another Dani woman with missing finger joints on her left hand displays the technique by which she uses her mutilated left hand to hold a net tumpline, while she works with dexterity with her right hand (Figure 160). The net band will hold her head-back net from around the front of her forehead.

The Yali women seldom use the hand-foot loom technique of the Grand Valley and West, which is probably due to the fact that they have not amputated their fingers. Instead, they stand or sit while weaving, holding and working the nets with both hands. The present-day Yali, or their ancestors, innovated a technique which makes their head-back carrying nets a desirable trade item to adjacent-living, different language-speaking groups. The Yali use thin plant strip spacers which allow them to create loops of various but uniform sizes in each of their nets (Figures 161 and 162).

Women of all language-speaking groups across the Highlands carry their babies, piglets, and loads of food plants in their combination "dress" and utilitarian head-back nets. The heavy loads of food plants being carried by a Dani woman in the photograph on the left and by a Yali woman in the photograph on the right in Figure 163 are typical examples of the kinds and quantities of food that are moved each afternoon by the women from the gardens to habitation sites. From a behavioral perspective, women so-loaded and on the move on a daily basis, are symbolic of one aspect of division of labor between the sexes and of the quantities and types of plants that are carried and eaten. The pervasive use of string nets to transport and store (by hanging in cookhouses) these kinds of foodstuffs compared to the uses of basketry and pottery for similar purposes in areas where grains are the staple food products, makes a statement about adaptation to cultural needs and the environment. Direct evidence for the uses of large quantities of head-
Figure 158a. Una woman hand-weaves a carrying net.
Figure 158b. The weaver concurrently makes the string as she weaves the net.
Figure 159. A Dani weaver at work with her hand-foot loom.
Figure 160. With mutilated hands the woman weaves a tumpline.
Figure 161. A Yali woman uses spacers to weave a quality net.
Figure 162. The Yali spaced-loop nets trade at a premium.
Figure 163. Loads of food plants are curried in the head-buck nets.
back nets would likely be absent, however, in the archaeological record because of the decaying effects of the wet climate.

Relative to the division of labor, men, in addition to being responsible for the tasks of bridge, fence, rock wall and house construction; preparing new gardens; and ditch maintenance; also do some of the more detailed weaving and braiding. They plait the fiber armlets, weave the cowrie shell display and exchange bands, and, within the Dani and Western Dani language speaking groups, make all of the braided string-orchid-fiber cording that is used for the women's wedding skirts. In Figure 164, Pua is seen in apparent concentration as he braids about seven strands of unrolled fiber string with two strands of yellow orchid fiber into a piece of cording, which at some point in time will be used in a woman's wedding skirt. From the outer, exposed sides of the cording in the skirts, a viewer would not suspect that this "orchid fiber cording" is made primarily of bark fiber string (Figure 165).

An essential item of attire for most Dani and some Western Dani, both men and women, is a ritually empowered fiber string necklace called, in mid Grand Valley dialect, a dibat. A dibat may consist of a single, or several natural string fibers, or one or more fibers that have been rolled into a piece of string. On some wearers, the dibat are just the natural colors of the string, while on others they have been colored with soot-blackened pig grease and are black. All dibat are generally thought to protect the wearer from harm and sickness. They are installed in ritual as a supernaturally powered counter-measure against the entrance of malevolent ghosts and spirits through the particularly vulnerable sternum area.

Dibat are empowered by a shaman, at any of several sacred rituals where at least one pig has been sacrificed to encourage beneficent ghosts/spirits to empower the necklace. Sometimes the dibat are installed at near-private ceremonies where an individual has raised a specific pig for the sacrifice and made arrangements with a shaman for the installation ritual. In addition, dibat installations are routinely carried out in conjunction with boys initiation ceremonies, weddings, gamekte hakasin ceremonies (refer to Chapter VII), wim gamekte hakasin ceremonies or as a part of some shaman-directed healing procedures. Regardless of the ceremony at which the dibat is installed on a single person or on a group of individuals, this act is called in mid Grand Valley Dani dialect a dibat isin (dibat, string; isin, to put on).

The dibat are worn as cumulative neck attire by some individuals. Other necklaces and some protective amulets may be removed and exchanged frequently with other necklaces but if a dibat is removed, its power is gone. When a dibat becomes tattered and worn it may be ritually replaced. In certain cases a person, particularly a shaman, may wear a single or a few empowered cowrie shells on a dibat. In such instances, if the dibat (string) itself becomes worn out, its power may be transferred to another dibat by preserving and reattaching the cowrie shell to a newly made dibat without the normal pig sacrifice.
Figure 164. Braided orchid fiber cording includes about seven strands of string.
Figure 165. The finished cording is colorful and strong.
Figure 166 is a composite of four Dani men and one Dani woman from widely scattered sectors of Dani territory. A reader will note that each of these adults wears a single or an accumulation of dibat. In Figure 167, a young Dani girl with a bandaged hand and arm wears several dibat from a single string around her neck. Figure 168 shows a close-up photograph of an accumulation of different dibat on the Sompaima mummy (also in Figure 56). These dibat were installed at various spirit installation and empowerment rituals of the kind that is described in the sub-section entitled The Ganekhe Hakasin Ceremony in Chapter VII. The various dibat installed on the mummy are to both protect and re-empower the ancestral spirit that is thought to be within. Perhaps one of the dibat might even have been put in place when a personified ancestral spirit was initially installed into the mummy. At that time, it is presumed, but I do not know from informants, that the specific spirit of installation was that of the original "life-soul" matter of the person who died and was mummified.

Sacred Places and Sacred Objects

All caves are sacred and are off-limits to females. These are the places from which it is thought locally that life originally emerged. Rituals are practiced by male religious groups in certain caves but most are left in pristine condition and held in awe by beholders. The caves and other natural sacred places scattered about the landscape are discussed in Chapter III.

The sacred aspects of men's houses and houses built solely for sacred purposes are present in each community. Some sacred houses are secreted within the landscape away from habitation sites. All sacred houses are discussed in Chapter VII.

The Highlanders recognize numerous kinds of sacred objects which focus their beliefs, many of which are utilized to manipulate supernatural power on the people's behalf. Many of these sacred objects are present in the landscape but most are natural items or material goods of everyday use that are converted through ritual into sacred paraphernalia. This is done by withdrawing from secular use items such as profane display-exchange stones, adze and axe blades, stone knives, art objects, natural objects of organic material, and even pigs that are converted to become sacred. Most of these items are discussed and shown in photographs in Chapter VII.

A list of sacred objects used by the Highlanders would be truly encyclopedic in nature, but through a study of the objects an intriguing dichotomy emerges. The people want to make material goods sacred, to instill them with supernatural power, and to possess "things" that are tangible through which they can manipulate a power. The dichotomy of this is in the specifics: the people use the most indestructible kinds of materials for their power objects, but at the same time they also use the most destructible. The details of sacred objects and this dichotomy are amplified in Chapter VII. By way of summary, here is a simple
Figure 166. Sacred string necklaces (*dibat*) are worn by men and women.
Figure 167. A girl with a bandaged hand and arm wears empowered string necklaces.
Figure 168. Sacred string necklaces on the mummy protect an ancestral spirit.
photograph of a small adze blade, a piece of string, and a feather (Figure 169). The adze blade is a sacred stone that was instilled with spirit power by a shaman big man on Sekan Ridge, which borders the Grand Valley. The big man inherited the stone from his father, nurtured it at ritual times with new power, and carried it with him in battle for spiritual protection. The fiber string is a dibat, just explained in the previous section. and the feather is a sacred tool (totok) with supernatural power which is used to cleanse a person's hands and arms after he has worked with a sacred object so that he does not contaminate the next activity or object that is touched. As discussed and shown in Chapter VII, my visual example of the indestructible and the destructible used for sacred objects (Figure 169) might be better expanded from "a stone, a piece of string, and a feather" to "a stone, a piece of string, a feather, a stick, a few leaves, and some stems of grass."

**Graphic and Plastic Art**

Human art could not have arisen without a long evolutionary antecedent; indeed human sensitivity to music and color, as well as to the beauty of the human form and face, suggest a prolonged and elaborate evolutionary expertise which, in biological terms indicates their importance in the process of humanization. Nature does not waste such effort for inconsequential activities. Aesthetic sensitivity is therefore likely to be as much a human characteristic as our upright gait.

F. W. Wilson (1981:2)

Art is not an isolated sector of human experience. It is intimately connected with and embedded in other aspects of superstructural components of sociocultural systems.

M. Harris (1980:455)

Alexander Alland (1977:39) defines art as "play with form producing some aesthetically successful transformation-representation." Marvin Harris says that, "To be art, as distinct from other forms of communication, the representation must be transformed into some metaphoric or symbolic statement, movement, image, or object which stands for that which is being represented" (1980:455). Measured against Alland's and Harris' statements about art, the artistic endeavors of the adjacent-living, different Highlands language groups are seen to express some basic themes and patterning for the groups. A brief review of both the fundamental graphic and plastic (three-dimensional) artwork furnishes insights from both ethnoarchaeological and theoretical evolutionary perspectives.

Across all language boundaries simple designs are incised with small chert flakes and marsupial or rodent mandible-tooth-gravers. Some carvers state that their chevron designs symbolically stand for rows of sweet potatoes in the gardens. Others state that such patterns are vulva symbols to remind the people
Figure 169. A stone, a piece of string, and a feather.
of the women they love. Whatever the messages, the designs are always simple and with only minor variations across the Highlands area. In the Yali and East, bamboo ear plugs (Figure 98), bamboo containers, and smoking devices are often incised with similar artful patterns, but such carving is less often seen on similar, locally-made objects in the Grand Valley and West.

Scattered black charcoal drawings on rock erratics, small rock overhangs, and in some locales on both the inside and outside of houses are a form more often drawn by children than adults. Many art critics today would not consider these drawings to be art at all, but only the result of play without any transformational statement.

Heider reports the presence of red pictograph figures in the Dugum Dani Neighborhood (1970:184-189). In my field work subsequent to that of Heider's, I have found several more locales of red pictographs on cliff faces, overhangs, and large boulder erratics, but find that overall, relatively few pictograph paintings are used within the culture. All such sites are sacred (wusa) and protected from outsiders. They are religious in nature, and activated as parts of specific ritual that communicates between humans in the world of the seen with ghost-spirit entities in the world of the unseen. The shapes of anthropomorphs, zoomorphs, and geometric patterns present in these pictographs are common forms used worldwide, but here transmit specific meaning that is not universally known (Hampton manuscript in progress). The red hands present here at different sites (Figure 170) are a universal symbol but with questionable universal archetypical meaning. As Heider reports (1970:185), both positive and negative representations of human hands are displayed. My indigenous informants state that the only "paint" used for these sacred pictographs is a red hematite traded from the Yali. Other red clay used for mudding and body painting is obtained locally.

Other pictographs, that are not red in color, are sparsely present in sacred caves (Figures 27 and 28). Those that I have seen include both simple realistic and abstract symbols; none are done with the complexity and artistic grandeur of many prehistoric rock art paintings that are present in other places around the world.

Two types of graphic artwork that flourish in the Highlands are mudding with white, gray, yellow, and red clays and body finger-painting with those same colors. White-gray and yellow are the predominate colors. Mudding in whites, grays, and yellows is usually done for periods of mourning (Figures 67, 68, and 69), preparing for song-dance activities, and by some men for war. In body painting, basically only seminal individual symbols of dots, lines, and curves are used without much derivation. In addition, stamped patterns from fern leaves and broken ends of certain plants from which the leaves have been plucked are used by some groups of artists. Esoterically, the crosses and circles convey symbolic meaning within some local groups, but that meaning can change, even within the same language group, from one geographic area to the next. An example is a simple cross, which in one area denotes that the people are
Figure 170. Painted hands are a universal rock art symbol.
"followers" of a certain big man, but not far away, similar crosses used in rock pictographs are considered to be a moiety symbol. Although the list is lengthy, symbolic communication of this nature seems to be geographically restrictive, and systematic codification, like that defined by James Faris among the Nuba of Africa (Bernier 1991), seems to have different meanings within local groups.

Mudding is often accomplished by an individual mudding him/herself, but finger painting is almost always done in pairs, with two people taking turns painting each other. The artists verbally collaborate as to the compositions being developed and take full advantage of the three dimensional aspects of the body, available "paint" colors, and plant patterns, in developing their body art. The process is the same for both males and females. I have never seen a male and female working together as a painting pair, except for those times when either parent may be painting a child of the opposite sex. Painting sessions are generally fun occasions and young children especially enjoy it when their mothers or fathers paint their faces.

The following photographic essay visually summarizes the cultural process and resultant "art pieces" created by Dani women at three different locations within the Grand Valley (Figures 171, 172, 173, 174, 175, and 176).

Most anthropologists consider the skilled potter, loom weaver, wood carver, and sandal maker artists, and their wares works of art. In the same context, some of the symmetrical, evenly looped, and colorfully patterned women's head-back nets and the strapless ceremonial nets are works of art in the Irian Jaya Highlands. It would seem that for these people who make no pottery or basketry, netting furnishes the women an alternative medium with which to create and display artistic skills. In a sexual counterpart of art creativity and expression, the men plait fiber arm bands and the tightly hand-woven cowrie-shell-decorated display and exchange bands.

Among the men, many of the carefully thought out items of adornment such as their array of mixed media feather and fur head pieces, colorful head plumes of parrot and birds-of-paradise feathers, matted spider web and shell decorated necklaces, and chest bibs are each an individual three-dimensional art piece.

Sculptured art consists of the tabular and sometimes round symbolic display-exchange stones which are selected, shaped, and usually ground at quarries, before being traded into the use areas where they are further ground and most of them decorated with fanciful bits of fur and/or different kinds of other materials that convey symbolic meaning (Chapters VI and VII). From the widely used sculptured and then decorated symbolic stones, certain ones are selected to be instilled with supernatural power and treated as icons in sacred places (Chapter VII). The fundamental aesthetic qualities of both the profane and the sacred symbolic stones derive from their simple form and natural colors--stones of certain structures and colors being more desirable to individuals in one area and stones of slightly different structures and colors being sought by individuals in other areas.
Figure 171. A mutilated hand is the palette; a pretty face the result.
Figure 172. Young children love to be painted.
Figure 173. Simple patterns are combined with plant stem impressions.
Figure 174. Circles and straight lines create an interesting effect.
Figure 175. Crosses sometimes identify affinity with a certain group.
Figure 176. Circles are a common seminal art symbol.
In the Yali and East (eastern part of the research area), some of these kinds of stones are painted with geometric designs when used for sacred purposes; a fewer number used by the Una people are even incised with simple circular patterns. In this same Yali and East region, tabular rectangular boards are incised with geometric patterns, painted, and used in much the same fashion as the sacred stones. This form of graphic art communicates religious symbolic meaning within the user populations. In one sense they are icons (Chapter VII).

Conclusions

Both profane and sacred graphic and plastic artwork is present within the indigenous cultural systems. The profane graphic art, such as the charcoal drawings, which are found scattered throughout the landscape and sometimes within and on the exterior walls of houses, might be considered the product of play by some outside analysts and not art in a restrictive sense. Even this, however, I classify as art.

The most expressive graphic art form used in the Highlands is finger and plant stem and leaf paintings on human bodies. It is used by both men and women; although in this medium, the women appear to be more creative in their designs than the men. R. Briggs, San Jose State University (personal communication 1991), suggested that I follow up on this tentative conclusion by administering a visual test that he developed to evaluate the ways that people see and use positive and negative space. My first attempt at applying the test failed because of, among other things, the difficulties in communication.

Both cultural themes and individual emotions are well expressed by "mudding." The uses of white-gray and yellow clays to mud the body while in mourning is a well understood symbol throughout the entire Highlands area.

The sacred red rock art of the Dani makes other symbolic statements within the esoteric user groups. Whether or not the choice of only red color for these paintings was originally motivated by the universal physiological process of blood I do not know. Indigenous informants only say that red is the color used by the moiety which makes the paintings and that the practise of making these kinds of religious paintings was handed down from the ancestors.

In the plastic arts, the prolific and profane uses of feathers, furs, shells, and other organic objects of adornment by the men to emulate birds is a well understood cultural theme. Even identification with a particular genus of bird is symbolically communicated by an individual’s careful artistic expression with mixed media.

The meticulous display of profane symbolic display-exchange stones, cowrie shell bands, and ceremonial nets at a continuum of public rituals, as described in Chapter VI, makes a strong, culturally integrating statement for the Highlanders.
By selecting certain of their profane sculptured stone pieces and other aesthetically appealing natural stone objects and instilling them with personified spirits, sacred pieces of artwork are created (Chapter VII). These, then, are the icons of the culture. Spirit power is captured within these tangible artistic objects and can therefore more easily be manipulated by the humans than if the spirits were moving at-large in their world of the unseen. By seeing these objects in their religious settings, young males learn about the belief system of the people.

A variance of artistic expression is seen in the religious art of the Grand Valley and West region versus the religious art that is present in the Yali and East. In the west, sacred red pictographs on rock are used by a particular moiety. Similar uses of this kind of art is not known elsewhere in the Highlands. In the Yali and East region, carved and painted sacred tabular boards (sebahe) are used, objects not present in the Grand Valley and West. Although similar flat-type profane display-exchange stones are converted by ritual to sacred symbolic stones in both the east and west, only in the east are some of these religious objects painted with geometric and other designs (some even incised, Chapter VIII).

Overall, both the graphic and plastic artwork of the Irian Jaya, Highlands is sparse when compared to that of the lowlands in both the north and south and in the highlands to the east in Papua New Guinea. The Highlanders have no wooden sculptured and painted pieces like the lowland Sentani-Jayapura cultures north of the study area; the Sepik River, Wahgi-Mt. Hagen, or Fly River peoples to the east in Papua New Guinea; or the Asmat (Agats area), on the south coast of Irian Jaya, who indeed, produce some very large pieces of carved wooden artwork (Figure 5).

Music and Dance

Music

The Highlanders sing for many occasions—both adults and children. As Gardner and Heider say of the Dani "This may be a cultural universal: just as all cultures have languages, so do all have songs" (1969:66). The people, especially the men, sing when in communal work parties, while in groups moving along trails through the forest, at many of the almost endless numbers of pig-killing ceremonies, to accompany dances, at funerals, at the boy-girl-get-together games, and sometimes when gathered in groups for just the fun of singing. Dirges are sung at funerals by both sexes, and are also commonly sung by men at all-night healing procedures as well as at other sacred rituals within the men's houses. Brief dirges, punctuated with laughter and animated conversation, express the mixed feelings of women relatives as parts of the dress-the-bride ceremony. Chanting is an integral part of edai victory dances and the vigorous "trance dance" that encourages a healing-shaman and sometimes his/her patient to go into trance.
In many of the songs, one man sings a lead, which is then answered by the others in chorus, a classic call-response form. When working in pairs, one man may sing out to the other, and then his companion replies. One example is when I happened upon a wood chopping crew who were harvesting limbs from the upper levels in a three-tier forest. A man on the ground sang a warning, "Be careful or you will fall out of the tree and be killed." The other man high in the tree and hidden from my view by foliage responded, "I will lie flat against a tree limb like a lizard so I will not fall off." This back and forth was repetitive, with the same message sung again and again, punctuated only by the intermittent chopping of limbs with the tree man's adze, until finally the man in the tree climbed safely to the ground. More common than this wood-choppers' call-response is that sung by groups of men moving along a trail, where sexual puns are verbally hurled back and forth at each other.

In one of the several trance-song-dance situations which I observed, two female shamans (wusahun) worked together to get one of them into trance to communicate with unseen spirits. The two jumped vigorously up and down while singing. A group seated around the perimeter of the area, mostly men, would join in a chorus, until the lead wusahun collapsed to the ground in a seemingly unconscious state. She would then soon be attended by her assistant, holding the prostrate female shaman, and reviving her by wafting a smoking feather from the central fireplace under her nostrils. The cycle of dance-sing-and-collapse was repeated several times throughout the night.

The Highlanders' songs do have lyrics, although to outsiders it often sounds as if there is only cacophony. An analysis of the translations included in Karl Heider's dissertation (1970:305-309) and of my own tape recordings of Highlands' music indicate to musicologist Laura Martin (personal communication 1987) that there does seem to be some form to the texts. In the following lyrics (Heider 1970:306), according to Martin, there are two couplets separated by a short, punctuating line consisting of two short phrases or motifs. That punctuating line appears in many of the other lyrics reported by Heider (1970:305-309). It may separate different numbers of couplets. An example of this form follows [lyrics from Heider (1970:306), interpretation from Martin (personal communication 1987)]:

First couplet--

"I don't want to buy Nassa shells,
I don't want to buy cowrie shells."

Punctuating line --

"Giluge girl, Jaige girl."

Second couplet--

"The blue sky up there, your hand grasped it,
The white cloud down there, your foot stepped on it."
Careful listeners can hear rhyming words even if they do not understand the language. A mother’s lullaby, however, is a rather monotonous, "Wa, wa, wa . . . ." Combined with the rhythm of her walk and the proximity of the child cradled in her head-back net or at her breast, this nebulous sound provides a sense of comfort and security for the infant.

The Highlanders do not whistle or hum, but the men produce an interesting, quite audible raking noise by grinding their molars. A man produces this noise at unspecified times, as a person in a modern western culture might hum to satisfy and please himself. I would suspect that abrasive wear would be detectable on molars that have been habitually so used. Now there is a potentially challenging interpretation for an archaeologist or paleontologist.

The Highlanders have no instrumental accompaniment to singing or dancing since the only indigenous musical instrument is what is commonly called by modern outsiders the "bamboo mouth harp." It is actually made from the *pithe* reed. The mouth harp is played by men or boys, never women, for solitary or group enjoyment but never to accompany a group of singers or dancers. At present, the people have no percussion instruments. Artistically carved and painted drums are, however, quite common among the Melanesian lowlanders on both the north and south sides of the central Highlands.

The reed mouth harps, 10-15 cm in overall length, are shaped with a small, sharp, unretouched chert flake or, in a lesser number of circumstances, with a rodent or marsupial mandible-tooth graver. A suitable section of *pithe* reed is cut, split in half, three linear pieces shaped and scraped thin, a hole bored in one end just beyond the septum, and a fiber string passed through, which is held by a knot (Figure 177). The two outside strips which are held in one hand to the player's mouth are longer than the central vibrating strip, which causes pulses of air to resonate within the player's mouth when the mouth harp string is jerked. During manufacture, all three strips are scraped thin, then tested, followed by more delicate scraping and testing until the desired pitch is reached. A degree of anthropomorphism is indicated in the naming of the parts of a mouth harp: the string which is jerked to create the vibration of the middle strip is called a tail, the tip end with the hole through which the string (tail) is attached is called the head, and the central vibrating strip a penis, with each of the two longer outer strips being subdivided into a lower and upper leg. Two kinds of mouth harps are produced: one with a low pitch and the other, higher pitched. At times, one of each tone is tied at opposite ends of a single string and played alternately (as the mood of the musician changes). The Dani musician in Figure 177 carries two such pitched instruments on a single string. At the time of the photograph, he was playing the low pitched instrument.

The medley of tones with any single instrument are basically just low and high, which are created by changing the volume and shape of the mouth resonating chamber and moving the tongue to slightly different positions.
Figure 177. The reed mouth harp is the common indigenous musical instrument.
As with other musical instruments, quite a range of quality of music is produced by different musicians. Some are able to mouth words while playing and introduce interesting word guessing games for listeners with their repertoire of techniques. Whatever the ability of an individual player, a breathing rhythm must be learned. Continuous playing is arduous, as single breaths are held as long as possible between tonal changes.

Reed mouth harps are usually carried in an arm band, stuck through a hole in the earlobe, or within an older man’s carrying purse. These instruments are also usually maintained at convenient positions hanging from the ceiling and fireplace corner posts in the men’s houses.

Dance

Two commonly used dance patterns prevail within the Highlands cultural systems: 1) the common worldwide pattern of a line of female dancers opposing a line of male dancers and 2) groups of mixed males and females, or groups of either sex, running back and forth or around in circles, shouting and singing. The first style, that of the line of female dancers opposing a line of male dancers, is used as a festive part of rituals at certain rites of passage ceremonials, and at other miscellaneous occasions. This festive dance consists of a line of young girls with simple painted patterns on their bodies and often with flowers in their hair or stuck in the tumplines of new, or at least clean, head-back nets and facing a line of adult men. The male dancers decorate themselves with white clay painted on their bodies and other items of male adornment. The dance picks up on the positive psychological mood of the moment for both the dancers and the onlookers. Usually the dance group is led dancing into the area of festivities by a male leader, who is usually adorned differently than the on-line male dancers. Once in place in an informal dance arena, the leader faces the two opposing lines of dancers, with the females to his left and the males to his right (Figure 178). The dance steps are simple, with only up and down movement of the feet. A characteristic sing-chant accompanies the dance. The arms, hands, fingers, and other body parts make no distinctive movements and apparently do not have parts to play in the dancing. Often the men wear a feather back ornament that is made by the Yali and traded across language boundaries in the Highlands. Although this particular item of adornment seems to typify dress for the two-line style of dance, it is also worn to make the wearers look more birdlike on other festive occasions, such as in war. In Figure 178, one can see that the male leader’s body has been mudded for the occasion and that his anal area is properly protected by a stem of leaves. In the leader’s left hand, he carries a net bag of sweet potatoes which are symbolic offerings to particular ghosts and spirits. With his dancing staff he stomps about and makes simple gestures as he leads the dance. To the leader’s left, a young female dancer is seen wearing a head-back net that is artfully decorated with interwoven strands of both yellow orchid and white palm fibers.
Figure 178. A shaman dancer leads the dance.
Although there are variations in this dance for different occasions and by different groups, the basic steps are always the same: simply up and down, with slightly to and fro movements of the feet.

Although the above style of dance has purpose and is enjoyed at many different pig feasts, the one dance style of greatest significance to the cultural systems is the edai (alt. etai) victory dance. [Note: Edai is a Dani term. The style of dance is used but known by other terminology throughout the area of research. Actually edai translates to "singing" but in the context used, it means "singing, shouting, and dancing.".] It was Gardner and Heider who first reported on the etai dance (1969:101) and then Heider who expanded on his own studies of the subject while doing his doctoral research (1970:112). Gardner and Heider report (1969:101):

The etai is celebrated for two days after the killing of an enemy. People come from the entire alliance area, dressed in their finest furs, feathers, and shells and smeared with pig grease and colored mud, to dance and sing. This is a ritual calling the attention of the ghosts to the killing and saying in effect, "Look what we have done for you! Now leave us alone." Singing and shouting, men and boys [Author's note: also women and girls] run in great circles. From noon until dark they dance for two days. It is a celebration less of the death of an enemy than of the knowledge that the malevolent ghosts are placated for the moment.

The edai (a later spelling of Heider by linguists of "etai" quoted above) is a time of exhilaration when the women join, wearing all of their decorative objects, often mudding and decorating their bodies with clay, wearing borrowed male items of adornment, and even sometimes carrying their husbands' weapons of war.

In my continuing field research over a broad area, I found that the edai is not just a song-dance ritual of communication with ghosts and spirits over the victorious death of an enemy, but that the dance is used for many other kinds of occasions when the people want to communicate other acts to the ghost-spirit entities in the unseen world. The edai is used in conjunction with boys' initiation ceremonies, at other times to thank the ghosts and spirits for seemingly miraculous healings, or to communicate other community-felt moments of exhilaration for actions that the humans may have done on behalf of the ghosts and spirits. Even appreciation for beneficent acts of ghosts and spirits is communicated to them by the edai.

The sing-dance ground for the celebration of an edai may be almost anywhere in a compound or house cluster courtyard, or at designated areas away from habitation sites scattered about the landscape. The dance style is always the same: monotonous running as a group back and forth in the dance area or running in a tight circle that is crowded with participants. The accompanying singing is simple and punctuated at rhythmic intervals with group shouts.

In addition to the two predominate types of dance patterns just described, both of which purposefully fulfill needs within community life, there is yet a third style of dance which is rhythmic and energetic and is used to alter states of consciousness of both healing shamans and sometimes their patients. This dance, energetically jumping up and down while in either a standing or from a squat position, to the accompani-
ment of a sung chant-like rhythm, is a part of certain nighttime healing rituals that involve trance and other states of emotion which transcend everyday experience (refer to Figure 39).

Conclusions

Music, simple as it is in the Highlands, is a significant part of community life. It is used to elicit emotions, befitting occasions such as the mournful dirges sung at funerals and the upbeat happiness of certain kinds of songs and chants that are used to signal special events in the lives of individuals or groups. With music, the ghosts and spirits in the unseen world are often alerted as to what is being done on their behalf in the world of the seen. The presence of only simple repetitive lyrics, chantlike recitations with few pitches, and the call-response technique of Highlands singing is characteristic of these cultural systems. Both singing and dancing are done without the accompaniment of instrumental music. The Highlanders have only one indigenous musical instrument: the individually played "bamboo mouth harp." They have no percussion instruments which are so characteristic of most musical systems worldwide.

Dance, like music, is very much a part of community life. Also, like music it is quite simple: only rhythmic up and down steps with the feet, running back and forth or in circles by crowded dance groups, or just energetic jumping up and down. There are no coordinated movements of body parts such as heads, eyes, fingers, hands, wrists, arms, torso, legs, feet, or toes to add evolved style to the dances.

Lomax and Arensberg (1977) would see a correlation between the Highlands' relative low level of subsistence and the peoples' song, music, and dance. These authors and their colleagues have made one of the most ambitious attempts to document the direct ways in which music and dance are a part of human adaptations (Lomax 1968; Lomax and Arensberg 1977). Although Kaeppler (1978) criticizes the studies on technical grounds relative to sampling and coding procedures, Lomax et al. leave us with a provocative thought about the possible evolutionary relationship between the relative low-level-stage of subsistence of the Highlanders with its associated stone tools and digging sticks, to a more definable stage in the evolution of the performing arts.

Summary

This chapter establishes the ethnographic framework, including a summary of the languages and linguistic boundaries, of the people within whose cultural systems subsequent chapters will deal and within and against which various parameters of culture are and can be scrutinized. By a review of the totality of the artifacts of culture and systemic analyses, the stage of cultural evolution of the indigenous inhabitants and their adaptation to the environment has been established. Detailed concerning material goods, other than those made of stone, and related behavior provides an ethnoarchaeological baseline of data against which
interpretations of material goods found in the archaeological record can be analyzed. In the next chapter, the definition of the people's profane stone tools and their uses within the cultural systems is addressed.

The photograph in Figure 179 of a Yali man (estimated age 60 years) high on a ridgecrest at sunset, is presented as a provocative portrait of a man in his twilight years, who has lived his lifetime in the Stone Age, with primary tools of stone, wood, fiber, bone, and bamboo. He has never known basketry or pottery and will likely die with that same state of knowledge. He is a horticulturist who raises pigs and says that he has enjoyed practicing, what I call residual remnants of a hunter-gatherer way of life. He was, in his younger years, a warrior and has battle scars to talk about, but he says now he is too old to kill anymore.
Figure 179. A Yali man from Pasikni.
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CHAPTER V
STONE TOOLS AND PROFANE USES

Within the study area six kinds of ground stone tools are used [adzes, axes, knives, chisels (alternative names drill and gouge), stationary grinding slabs, and handheld grindstones] in addition to unground chert flakes, hammerstones, and anvils. Within one language group even an unusual stone striker-bamboo fire starting kit is present, which is discussed in Chapter IV. Not every kind of ground stone tool is used by each language-speaking group. The adzes, axes, knives, and chisels vary by shape, size, kind of rock, and color relative to quarry source. Of the six kinds of ground stone tools, the adzes and axes are the only percussive cutting implements. Both the adzes and axes are used with a chopping motion and are swung with percussive force to strike a blow with a cutting edge. All of the profane tools are described and grouped morphologically into types in archaeologically useful terms to facilitate comparative studies in both the ethnographic present and with prehistoric assemblages. In the study area some of these tools and stone blades have important sacred uses in addition to their more commonly known profane uses. The sacred uses are discussed in Chapter VII.

The quarrying complexes which are the sources for most of the stone used for both the profane and sacred tools as well as for the symbolic stones are discussed in Chapters VIII, IX, and X.

Two Major Distribution and Stone Tool Use Areas

During my first visit to the Grand Valley in May of 1982, I was with a small group sponsored by the American Women's Association of Jakarta (capital of Indonesia). We donated a wheel chair to the Indonesian Hospital in Wamena. Our guide was Sjamsuarni Sjam, an Indonesian woman from Sumatra. After a presentation of the wheel chair at a semi-formal evening gathering of the appropriate officials in Wamena, Sjam took us first to Hupainma (alternative name Opagina) where Robert Gardner, Karl Heider, Michael Rockefeller, Peter Matthiessen, et al. headquartered while making the film Dead Birds (Gardner 1963) and where Karl Heider stayed on to gather data for his doctoral dissertation (1961-1963, 1968; published 1970). Sjam had first visited the area of Hupainma in 1972 with her photo-journalist American friend Wyn Sargent, where they both lived while Sargent wrote a book entitled People of the Valley (1974). It was through this experience of living with and getting to know many of the same Dani people filmed in Dead Birds (Gardner 1963) and written about and shown with photographs in Gardner and Heider (1969), Heider (1970) and Matthiessen (1962), that Sjam had become just the right anthropologist-adventurer to introduce me and the others in our group to the Dani.
On that first visit I was able to start looking at tools and other artifacts of culture. Sjam was particularly good at getting the indigenous people to talk to us about their artifacts and customs. On that trip we trekked from Wamena to Hupainma, along much the same route that Heider had used while he was doing his research with the Dugum Dani in the Hupainma area, then we walked from Hupainma up to the Illeukaima salt pool, and finally from Hupainma to Pugima (Figure 6). Already I was becoming curious about the adze and axe tools and the different sizes, shapes, colors, and lithologies of the blades.

During my next three visits to various parts of the Grand Valley and Western Dani territory to the west, the adze and axe blades which I saw, measured, and described, could be clustered into three groups by lithology and color differentiation. One group was black, which looked macroscopically like an argillite but because of its hardness I presumed to be a meta-sediment. A second group had a distinctly different color, ranging in individual specimens from predominantly green to blue. Some were dark; others were light. Some were mottled, variegated, or solid in color. I presumed, again from macroscopic analysis, that these were probably similar to a greenschist, with mineral variations causing the color changes. A third group that I called miscellaneous, had individual blades that ranged in colors from black to light-green to tans: none of which looked like either of the other two groups which were distinctively colored. The adze/axe blades that I was seeing were ranging in length for the black from 6.0-24 cm, from 4.5-39 cm for the blue-green, and from 6.0-20 cm for the miscellaneous category. In a dorsal plan view, shapes ranged from ellipsoidal to triangular for all three categories.

There was yet a fourth category of which I had seen only two adzes, but no separate adze blades. The blades were light gray-green, aphanitic, long and narrow, and looked like they might be andesite--distinctly different than the other three categories. The owner was a Yali man who, as a war refugee, had fled from his Yali homeland to Dani territory and was taken in by the mid Grand Valley Dani. He continued to use his Yali adzes. He and Dani informants agreed that his type of adze was the only kind used by the Yali, so I felt that the unique stones were Yali and came from somewhere within Yali territory to the east of the Grand Valley.

As I continued to move among the people and about the study area, I confirmed that the black, dark green and blue variegated, and miscellaneous colored axe and adze blades, most with the same distinctive ellipsoidal to triangular shapes, but also some tubular shaped axe blades, were only used within the Grand Valley and westward. I also reaffirmed that the distinctive blades I had originally called Yali were used only to the east of the Grand Valley by the Yali, and yet farther to the east by other language speaking groups (Figure 2). This same kind of distribution that I was seeing in the ethnographic present could well be the distribution from an archaeological record.
In the rest of the chapter, I will first define tool nomenclature. Tool uses will be discussed and I will present the parameters for replicable typologies of the several types of axe, adze blades, and the other tools that are present within the study area in morphological, color, and lithologic terms. This should provide sufficient data for comparisons of lithic assemblages found in the archaeological record.

Nomenclature

Adze and Adze Blade

The adze is the real workhorse tool—the single most important tool—of all the different language-speaking groups in the study area of Irian Jaya (Figures 180 and 181). For a definition of the implement and nomenclature I rely heavily on Blackwood (1964:13-14), deviating from her nomenclature or adding to it only in deference to clarity and an archaeologically oriented classification. As already pointed out in Chapter III, an adze is a cutting tool, the blade of which is hafted with its cutting edge transverse to the long axis of the shaft. This distinguishes the adze from an axe which has a blade hafted so that the cutting edge is parallel to and in the same plane as the long axis of the shaft (Figure 182).

The haft is that part of the tool which forms the connecting link between the blade and the hand of the person using it (Figures 183 and 184). As shown in Figure 183, the haft is cut from a tree where the branch forms the shaft and a piece of tree trunk, the foot. The bark is removed from the haft and the haft smoothed. The shaft is that part of the haft which is grasped by the hand or, more often, both hands, when chopping with the tool. The foot is that part of the haft which is transverse to the haft. The socket is that part of the foot which is flattened to form a surface against which the proximal end of the adze blade is lashed. The heel is the part of the foot away from the socket which joins the long axis of the shaft. Working with the Kukukuku in eastern Papua New Guinea (near Kosipe on Figure 5), Blackwood (1964:13) shows that the heel is a continuation of the long axis of the shaft and barely projects away from it. In the study area in Irian Jaya, I found that the heel usually projects a measurable length away from the long axis of the shaft and that it generally varies from one-third of to as long as the socket. In a few cases I observed shafts where the heels were nearly as long as the socket ends of the feet of the hafts. The haft angle is the angle between the shaft and the socket end of the foot and is determined by the angle at which the selected branch grows from the tree trunk. My measurements of socket angles throughout the entire study area of 50°–85°, with one unusually curved haft where the socket angle is 95°, and several, also unusually curved hafts, where the socket angles were 33°, 38°, and 41°, correlate nicely with Heider’s findings in the Dugum Dani area where he says that such angles are usually "between 80° and 45°" (Heider 1970:276). The proximal end of the haft is that nearest to the body when the tool is held in position for use. The distal end of the haft is at the socket end of the foot. In Figure 184, a Dani man carries a piece
Figure 180. Dani man on Sekan Ridge with his large adze.
Figure 181. The adze is normally carried resting on the shoulder.
Figure 182. Dani man near Wolo with axe in normal carrying position.
The haft is a piece of wood cut from a tree where a tree limb (the shaft) makes an angle between 50° and 85° with the tree trunk (the foot).

Figure 183. The haft is part tree trunk and part limb.
Figure 184. A Dani carries a newly cut haft to his home.
of tree trunk and a newly cut haft from the forest to his home for further work. He will allow the haft to dry before flattening with an adze the upper surface of at least the socket end of the foot, before attaching a ground stone adze blade.

The adze is the complete tool with the adze blade bound to the socket of the foot of the haft (Figure 185). Lashing the blade to the socket is called "hafting the blade." The lashing material is strips of rattan and/or string cording that secures the blade onto the flattened surface of the socket. The stone blade is secured to the distal part of the haft. The proximal end of the blade is the end bound to the socket. The distal end of the blade is the cutting edge. The dorsal side of the blade is the side away from the shaft (called the "back of blade" by Blackwood (1964:13) and Hiroa (1930:333, 357). The ventral side of the blade is the side facing the shaft (called the "front of blade" by Blackwood (1964:13) and Hiroa (1930:333, 357)).

When adze and axe blades are first shaped and the cutting edge of each blade formed and sharpened and then later, throughout the lifetime of the blade, resharpened, different characteristic morphologies are created at the cutting end of each blade. To facilitate communication and analyses of this important part of each tool, a set of terms is herein defined (refer to Figure 186). In longitudinal side view, the dorsal side of the blade is up, the ventral side down, and the cutting edge to the reader's left. The angle between a horizontal line and a line of a plane most nearly approximating the steepest part of the dorsal side of the blade, as it approaches the cutting edge, is defined as the dorsal bevel angle. The angle similarly described on the ventral side of the blade is the ventral bevel angle. The angle formed by the intersection of the dorsal and ventral sides of the blade at the cutting edge is termed the bit angle. In blades that are symmetrical in longitudinal side-view cross-sections, the dorsal bevel angle equals the ventral bevel angle. The sum of the dorsal and ventral bevel angles equals the bit angle, which measures the bluntness at the cutting edge of the tool.

When, because of a difference in the geometry of the angles just defined, differences in the frontal view cross-sectional shape of the linear dimension of the cutting edge, and differences in sizes of blades. I cannot be definitive in typing loose blades as either adze or axe blades, I have chosen to call the blades adze/axe blades. In a similar situation when working with loose Melanesian blades, Eleanor Crosby simply calls the loose blades "edge-tool blades" (Crosby 1977:83).

Axe and Axe Blade

As Axel Steensberg says, in Man the Manipulator, "The difference between an adze and an axe depends on the way they are hafted, not whether they belong to the European Neolithic or New Guinea prehistory" (1986:11). In an earlier book, New Guinea Gardens, which is the result of three visits to what is now Papua New Guinea in 1968, 1971, 1975, Steensberg differentiates the Papua New Guinea axe from
Adze

Side View

Frontal View

Stone Blade

Rattan Wrapping

Socket

Heel

Blade

Cutting Edge Angle

Shaft

Shaft

Observed adzes in the study area have a cutting edge angle ranging from 67° to 90°

Figure 185. The adze is a complete tool with blade bound to haft.
Figure 186. Nomenclature for angles to the cutting edge of axe and adze blades.
the adze when he shows that the cutting edge of the axe blade is hafted parallel to the longitudinal axis of the haft in the "fashion of the Neolithic Sigerslev axe in a perforated handle" (1980:14). The same definition holds true for the two types of axes that are used in the study area of Irian Jaya, and which are differentiated by the shapes of the distal ends of their handles. In both types, an axe blade is inserted into a hole near the distal end of the haft and held in place either by just a tight fit or with the help of pitch from the araucaria tree. In the most commonly used Highlands axe, or Type A, the distal end of the haft, where the blade is inserted, is bulbous in shape, tapering down to a more manageable handhold near the proximal end of the haft. This type of axe is shown at the top of Figure 187. The second, or Type B axe, is distinguished by a rectangular shaped distal end, which, as previously mentioned in Chapter III, is sometimes used as a wedge when logs are being split. An example of the rectangular-ended Type B axe is shown in the middle drawing of Figure 187. A type-sketch of the European Neolithic Sigerslev axe is shown at the bottom of the same figure.

The nomenclature of the axe blade is the same as that of the adze blade, presented in the previous section.

Knife

Knives are used by each of the language speaking groups in the Irian Jaya study area. They are all ground stone and of differing shapes. None are hafted, so the knife blade is the total tool, and therefore referred to as the knife, rather than the knife blade.

Chisel

The nomenclature of chisels will be treated in a later section when these tools are discussed in more detail.

Methods of Determining Rock Lithologies

Within the study area the majority of ground stone tools originated from four widely scattered quarry areas: Yeineri, Tagine, Sela and Langda (Figure 2), with another rumored quarry area in the vicinity of Korupun west of Sela, possibly producing a questionable number of tool stones (Figure 24). A sixth source which I call sources of opportunity, to be discussed in Chapter X, accounted for only a small number of tools. Langda, Sela, and Korupun (if it produced at all) produced lithics of the same lithologies, blade structure and color, so they cannot be typed separately. I have not located a Korupun quarry on the ground and believe that people in that area may have only been a trading link between the quarries in the Langda and Sela areas and some of the users of blades from those quarries. The sum-total of production from
A. 77 cm long  
Common bulbous-ended axe of the Irian Jaya Highlands.  
Entire axe tool in Dani, jaga bilig.  
Haft in Dani, ogule (alt. okule)

B. 67 cm long  
Less common axe in which distal end is squared off and sometimes used for wedging wood apart that is being split.

C. 53.25 cm long

Figure 187. Two Grand Valley and West axe types (A and B) and the Neolithic Sigerslev axe (C).
individually owned and operated quarries in the Langda area was major; whereas at Sela, relatively few blades were produced. The Yeineri, Tagime, and Langda-Sela produced lithics are distinctly different each from the other by lithologies and color. The Tagime and Yeineri outputs are distinctly different lithologically, but alike morphologically and, in both respects, different from Langda-Sela-Korupun (?) lithics.

I compared macroscopic identifications of the black, blue-green, and miscellaneous clusters of lithics with outcrop geology to help search for the source areas for those groups of lithics. After the quarry sites were located by on-the-ground surveys, through literature research, conversations and letter correspondence with different missionaries, and questioning of indigenous informants and my teams of helpers at numerous locations. I became reasonably satisfied that I had located all of the stone tool source areas, with the exception of a possible Langda-Sela type producer in Yali territory near Korupun. While at the quarry sites I collected representative samples for laboratory rock identification and other petrological analyses. From my collection of lithics I selected representative samples from the four clusters (black, blue-green, light gray-green and tan ‘Yali,’ and miscellaneous) by hand specimen examination. A few "type" examples were also selected from symbolic stones.

I wanted to be able to confirm my conclusions of the relationships of both lithics and symbolic stones found among user populations throughout the study area to the specific source rock areas, determine relative hardnesses of the different "type" lithologies; have the necessary mineralogic, grain size, and textural data available for possible future rock tool durability studies; and to also provide a base of data for comparative analyses of these different "assemblages" to tools and symbolic stones not only throughout New Guinea and Australia, but also to lithics assemblages found worldwide in the archaeological record. Professor James L. Munoz, doctoral candidate R. Jeffrey Swope, and graduate student Elizabeth A. Medlin, Department of Geological Sciences at the University of Colorado, Boulder, agreed to undertake the rather major project of performing various analyses to describe in detail the total collection, with the exception of Langda-Sela style knives which were analyzed by Renald N. Guillemette at the Texas A&M University Department of Geology Electron Microprobe Laboratory.

After considerable macroscopic review of the samples collected in the field, a total of 60 lithics were chosen for laboratory work in Colorado. Initially, the team at the University of Colorado thought that a combination of powder X-ray and hand specimen examination would provide adequate descriptions. Since most of the hand specimens are not easily identifiable because of the extremely fine-grained texture of the rock (a necessary quality for rocks used to fashion durable tools), it was determined that thin section examination would be required in addition to the X-ray work. Powder X-ray data will identify the major phase but it does not give grain size or textural information. The University of Colorado scientists and I jointly selected 25 of the 60 lithics for thin section examination. This was done only after 6 months of
laboratory work had shown the necessity of this step to be able to reach our objectives. I considered all of the lithics important artifacts that should be preserved in entirety if at all possible. Only those specimens that are characteristic of each of the quarry sites were cut for a detailed analysis. Twenty-five samples were selected for thin section. The Colorado team photographed, on grid paper with one-half inch squares, each artifact before it was cut. In summary, the artifacts were examined in hand specimen, in thin section, and by powder X-ray diffraction, with rock type name, mineral content, texture, grain size, and relative hardness noted. At one point in the work, Medlin and the United States Bureau of Standards, located in Boulder, Colorado, unsuccessfully explored the feasibility of determining relative rock hardness of select samples using the Bureau’s equipment. In the final analysis grain-size and textural information obtained from thin-sections proved to be essential in estimating the relative hardness of the individual lithics.

For Guillemette’s work, representative knife blades were selected from the Yali use area as well as from the Langda quarry and use area, including one knife blade from Langda still in the manufacturing process. New chips from a Langda adze blade quarry site were included in the work. Elemental analyses were made with medium power scanning electron microscopy and image analyses. By the use of the EDX system (Energy Dispersive X-ray Spectrometer) and the scanning electron microscope, an elemental analysis of each sample was made. Peaks in the energy dispersive X-ray spectrum were compared to known peaks in a petrology atlas (Welton 1984). The EDS results were compared with crystal structure in the SEM micrographs. A texture analysis was made and elemental analyses checked with thin section work on the SEM.

Grand Valley and West

The large western stone tool manufacturing, distribution, and use region includes at least 10 language speaking groups within the study area: Grand Valley Dani, Silimo, Hupla, Walak, Nggem, Nduga, Western Dani, Wano, Dem, and Damal (Figure 188). The Tagime and Yeineri quarry systems furnished the majority of stone tools for users within the area; sources of opportunity only a small percent. Yeineri and even Tagime sourced blades have been reported outside of the study area all of the way westward to Enarotali (Figure 1). However, to the east, Yeineri and Tagime sourced blades do not trade for profane uses past the Grand Valley Dani-Yali language speaking boundary; with the exception of mixed Langda-Sela style adze tool blades with Yeineri and Tagime blades in the Pass Valley area (and a few other minor points of mixing along the language boundary). Other kinds of material goods trade across this boundary for use on both sides.
Figure 188. Grand Valley and West, and Yali and East stone tool regions and language speaking groups.
Axe and Axe Blades

Axes are used only in the Yeineri-Tagime quarries-sourced western use region; not at all to the east in the Langda-Sela-Korupun (?) quarries-sourced use region (Figure 188). The Dani and others in the western region use both the Tagime and Yeineri manufactured axes for splitting large felled trees, sometimes for splitting smaller wood, and almost never for chopping down trees, for which they simply say they prefer the adze. In Figure 189, a Dani is seen splitting a section of a felled tree trunk in characteristic fashion with a perpendicular type of percussion stroke. When splitting wood with an axe, men often work as two-men teams. One man straddles the log, and with perpendicular overhead vertical strokes, splits the log with the axe, working backward toward his feet, while his helper stands to his front and wedges the wood open with a stick pole. In the photograph where the man works alone, the axe handle is typical of the Type B rectangular-ended axe haft for the area (previously described in Figure 187), into which a Tagime Tubular Style axe blade has been inserted. The axe is a longer handled, normally heavier tool than the adze and one would think its primary purpose originally might have been for felling large trees. However, Steensberg, working in eastern Papua New Guinea, observes (1980:38):

In this area large trees with huge buttress roots were attacked from scaffolds similar to those constructed by the Hiowe, and in both cases adze-hafted tools seemed to have been preferred to tools hafted as axes. The reason for this may have lain in the overhead stroke of the adze in that it cut the tree higher off the ground, and also their predominately vertical movement would cause less vibration of the scaffold. Adzes were certainly the most common tools for felling in most parts of the New Guinea rainforest, and it would be interesting to investigate this further because the composition of primary and secondary woods in the Neolithic of Europe suggests that there was experience here of a similar kind.

Within the study area, Heider, working with the Dugum Dani along the north-central edge of the Grand Valley, states that axes are primarily for splitting wood and does not elucidate other uses (Heider 1970:278). O’Brien, working with the Dani in the Konda Valley near Bokondini (Figure 3), says that in addition to the adze:

The Dani also use a stone axe, made from the same type of stone as the adze and also oval in cross-section, but usually larger and with an edge cut at the same angle on both sides. The axe is less common in the Konda Valley than the adze and is used only for splitting wood and never for cutting or chopping [1969:37].

I could never get a valid estimate of the ratio of adzes to axes but would guess that at contact time there was a minimum of 10 adzes per one axe and one to three axes per living compound. O’Brien states that in the Konda Valley adzes outnumber axes by at least 10 to one (1969:90).

Like Heider (1970:278), I found no restrictions against women using axes but I never observed a woman using one. Twice I saw a woman using an adze to smooth/sharpen her digging stick and informants say that women sometimes use adzes to chop wood.
Figure 189. A Dani uses an axe for its normal purpose.
The mid Grand Valley Dani term for an axe is *jaga bilig* (alt. *jakabiliga*, both pronounced jaka bilik). A large axe blade (more than approximately 25 cm long) is immediately recognized as a *jaga bilig* and not differentiated from a finished axe which also is identified by the same name. A large axe blade with or without the haft, is the most valuable tool stone that the Dani possess. Much effort has gone into the manufacturing process, especially the grinding time on the large blade. The black axe blade from the Tagime Quarries is identified as a *jaga bilig gu*. (*Gu* is a black colored stone pronounced ku.) A large blade (obvious by its size for an axe and not an adze) made at the Yeineri quarries is a *ebe jaga bilig*. The Dani generally favor the Yeineri-made axe blades over the Tagime blades.

Axe blades have three distinguishable structures, each of which are produced at the two quarry areas: asymmetrical ellipsoidal, flat, and tubular. These morphologies combined with the quarry-specific lithologies account for a total of six axe blade styles: Tagime Style, Tagime Flat Style, Tagime Tubular Style; and Yeineri Style, Yeineri Flat Style, and Yeineri Tubular Style.

**Tagime Axe Blades.** Upstream, away from the Grand Valley, the Wurm River forks at the village of Tagi. A short distance up the right fork, the river bed and banks are laden with river-rounded, black argillite pebbles and cobbles of the Kembelangan formation, which contain numerous ammonite fossils. This material is unmetamorphosed or at least little-metamorphosed relative to the meta-argillite from which the best Tagime axe and adze blades are made. Axe/adze blades, chisels, and knives can be made quickly from the argillite, which is soft and does not hold a good tool edge for long. In Dani terminology it is *aike dlek* (has no tooth). Tools of expediency are quickly fashioned from this material but they wear and break quickly. Up the left fork of the river from Tagi, however, just a short distance from the river junction, river worn pebbles, cobbles, and boulders of black metamorphosed argillite are present, mixed with pebbles and boulders of the softer argillite. It is the meta-argillite which constitutes the favored harder material for tool manufacture, and it is in this area that the Tagime quarries are located.

The Tagime axe blades are black and made of meta-argillite pebbles and boulders that have been selected from the Tagime (river). The major minerals found by the University of Colorado team (Medlin, Munoz, and Swope) in the metamorphosed argillite are quartz and siderite, with chlorite being a minor constituent, and muscovite an accessory. The texture is very fine-grained. Based on thin-section observation of grain size and texture the Colorado team attempted to make rough estimates regarding the rock’s relative hardness to the Yeineri blades and the Langda-Sela blades. The team rated the Tagime metamorphosed argillite as "hard" to "very hard," on a scale of "very hard (VH), hard (H), medium (M), and soft (S)."

In plan view, the Tagime Style blade shape is asymmetrical ellipsoidal, with the distal, bit (cutting edge) end being broader than the proximal end. The proximal end is ground to a near-point. In cross section the blade tends to be symmetrical-oblong in frontal (bit end) view and near-symmetrical ellipsoidal
in longitudinal side view. The bevel angles are similar, and it is difficult to determine a dorsal and ventral side to each blade. The cutting edge tends to be straight or with a slight S-curve in frontal, cross-section view and crescent form in dorsal plan view. The dimensions of one average Tagime Style axe blade are 23 cm long, 7.8 cm maximum width, and 4.0 cm maximum thickness.

The Tagime Flat Style axe blade is elongate-rectangular, with both sides of the blade being nearly parallel for most of the length of the blade. In Figure 190, a western Grand Valley Dani user is seen modifying and sharpening a typical Tagime Flat Style axe blade after receiving it from the quarry and prior to inserting it into an axe handle. The sandstone grinding outcrop seen in Figure 190, is one of many similar artifacts of culture that dot the landscape at convenient locations and which are being relegated to the archaeological record as the Dani acculturate away from a stone-using cultural system. For details concerning the structure of the Tagime Flat Style axe blade, which is the same as that of the Yeineri Flat Style axe and adze blades, refer to the discussion of Yeineri Style and Yeineri Flat Style Adze Blades. The Tagime Tubular Style axe blade is as its name suggests, long relative to width and oval in cross section (Figure 191). In plan view, the cutting edge (or bit end) of the blade is crescent-shaped. In cross section, the bevel angles are nearly equal (Figure 186). In plan view, the proximal end of the blade is ground to a near-point. The lengths of the blades which I saw hafted vary from 24-33 cm, maximum widths per stone from 4.5-5.7 cm. and thicknesses from 2.3-3.2 cm.

Yeineri Axe Blades. The Yeineri axe blades vary in color from green to blue, with varying shades of each. Some are of near-uniform color; others variegated, and some mottled. All of the rocks at the quarry site are metamorphic from the ophiolite and melange belt previously described in Chapter III. Those pieces of rock selected by the quarrymen for tool and symbolic stones range from blueschist, to epidote amphibolite, to epidote chlorite schist. The major minerals in the blueschist blades are glaucophane (blue color), plagioclase, and sphen. These minerals are noted in varying amounts. The minor minerals are chlorite, quartz, lawsonite, sphen, and epidote. Accessory minerals that were noted are calcite, epidote, quartz, sphen, pyrite, and opaques. The textures of the blueschist blades range from individual blades exhibiting very poorly developed schistosity to blades with wavy and good schistosity. All samples are fine grained. Other blades and quarry samples range from rocks that are termed epidote amphibolites, to amphibole schists, to epidote chlorite schists. In these rocks major minerals are epidote, amphibole, plagioclase, and chlorite; minor minerals are albite, chlorite, plagioclase, sphen, and calcite. These rocks range from very fine grained to fine grained with matted textures to crenelated layers, to schistose. On the relative hardness scale (VH, H, M, S) the Colorado team subjectively rated the blueschist blades as hard (H) because the blueschist’s dominant foliation seen in both hand specimen and thin-section will lead to fractures along those cleaved planes (glaucophane hardness 5-6 on Mohs' scale). The fine-grained, matted-framework texture of the epidote amphibolite was noted as the hardest with individual samples.
Figure 190. A Dani sharpens a typical Tagime Flat Style axe blade.
Figure 191. A Highlands axe with its Tagime Tubular Style axe blade.
being given ratings of "VH." Interestingly, while I was at the Yeineri quarry complex, a young quarryman took me to an abandoned quarry site within the complex that his deceased father had told him produced the hardest, best axe/adze blade stones of any of the rock outcrops (or boulders) quarried in the entire complex. Macroscopically I could not determine that the rock from this location was any harder than other specific locations that were either being quarried or which I had been told had been quarried in the past. On laboratory analysis, the rock thought to be hardest by the quarryman turned out to be epidote amphibolite, judged by the Colorado geological team to be the hardest/most durable kind of rock produced from the Yeineri quarries.

The structure of the three Yeineri styles of axe blades are like those described in the previous section for the Tagime axe blades. I found a length range for axe blades of 20 cm to 39 cm. The maximum width of the longest blade, which is a Yeineri Style, is 10.5 cm and maximum thickness 4.6 cm (Figure 192). Fitted into a Type A, bulbous-ended axe handle, a heavy tool is created (Figure 193). Twenty-two cm of the blade is exposed; 17 cm within the handle. Blades approaching this size are always hafted into the Type A. bulbous-ended handles, rather than the Type B. rectangular-ended handles. The handle is 77.6 cm long and 42.3 cm in circumference at its widest point. The photograph in Figure 194 shows the blade removed from its handle and a Yeineri chisel of the kind that was used to cut the hole through the handle into which the blade is inserted.

Adze Blades

The adze blade is the most common tool blade produced at any of the quarries—in far greater numbers than axe blades. Whereas axe blades are all relatively large (about 20–40 cm long), without a great range in size, adze blades range in size from very small, length about four cm to quite long, about 30 cm. The adze is the all-purpose chopping and adzing tool of the Irian Jaya Highlands, used for such a variety of tasks as the heavy work of chopping down the largest trees in the forest and splitting wood, to fine finish work on bows and spears and, within a segment of the population in the Tagime-Yeineri use and trade region, for amputating fingers in ritual procedures.

The two type morphologies of the Tagime and Yeineri produced blades are markedly different from the unique (in the Irian Jaya Highlands) Langda-Sela Style adze blade. The colors and lithologies are distinctly different for adze blades from each of the three quarries. The "tubular" shaped axe blade produced at the Tagime and Yeineri quarries is not hafted as an adze blade.

Tagime Style and Tagime Flat Style Adze Blades. Tagime produced adze blades are black metamorphosed argillite, with quartz and siderite being the major mineral constituents, chlorite being a minor constituent, and muscovite an accessory. The texture is very fine grained. The Tagime very fine
Figure 192. The longest axe blade is a Yeineri Style (39 cm).
Figure 193. Large Yeineri Style blade in a bulbous-ended axe handle.
Figure 194. The 39 cm blade, axe handle, and hole-cutting chisel.
grain textured meta-argillite was judged by the Colorado team of geologists (Medlin, Munoz, and Swope) to be one of the two hardest rock types in the set of 60 samples selected for analyses.

The Tagime Style adze blade varies in plan view shape from asymmetric ellipsoidal for the longer blades, to semi-rectangular for some of the intermediate length blades, to triangular for the shorter blades. Figure 195 shows two characteristic asymmetric ellipsoidal blades. The distal, bit (cutting edge) end of the blade is always wider than the proximal, hafting end of the blade. In longitudinal side view, the cross section tends to be asymmetrical ellipsoidal, but with the ventral side often being flat-to-semi-flat to facilitate hafting onto the socket of the haft. The dorsal (or upper) side of the blade in longitudinal side view cross-section is arcuate convex upward. In frontal cross section view the cutting edge of the blade tends to be a straight line or slightly convex upward and, in dorsal plan view, crescent shaped, convex away from the distal (cutting end) of the blade. The dimensions of the longest Tagime Style adze blade viewed in the field is 23.2 cm long, 7.8 cm maximum width, and 4.0 cm maximum thickness. The shortest Tagime Style adze blade collected is 6.0 cm long, 4.0 cm maximum width, and 1.1 cm maximum thickness. For measurements of 14 examples of Tagime Style adze blades, see Table 2.

The Tagime Flat Style adze blade varies from asymmetrical ellipsoidal to elongate-rectangular in plan view. The distinguishing characteristic of this style is that the dorsal and ventral sides of a blade are nearly parallel for most of the blade length (Figure 196).

The photograph in Figure 197 shows a comparison of dorsal plan view shapes of Tagime Style versus Tagime Flat Style adze blades.

Bit damage and fracture patterns are difficult to assess in both the Tagime Style and Tagime Flat Style adze blades because cutting edge damage is rapidly repaired by grinding. Badly broken blades are made useable for other purposes or discarded. The broken Tagime Style adze blade shown in Figure 198 with a use-wear chipped cutting edge had actually been discarded. I dug it up at the edge of a spring between two habitation sites. Whether the cutting edge damage preceded the transverse break across the tool, or whether the blade broke first and then was used as a hand tool and thought not worth the effort to keep in good repair is an interesting question. This is the most use-damaged Tagime blade that I have observed in the Grand Valley and West region.

Yeineri Style and Yeineri Flat Style Adze Blades. From Yeineri source rock, two styles of adze blades are made: (1) Yeineri Style and (2) Yeineri Flat Style. The Yeineri Style adze blades vary in color from green to blue, with varying shades of each. Some are uniform in color, others variegated, and some mottled. The rock types of these adze blades vary from blueschist, to epidote amphibolite, to epidote chlorite schist. The fine-grained chlorite makes the rocks green. For the major, minor, and accessory mineral constituents, textures, and textural considerations of the three different rock types that have been recognized in the Yeineri produced adze blades, refer to the previous section on Yeineri Axe Blades.
Figure 195. Two typical Tagime Style adze blades.
Table 2. Measurements of Tagine Style Adze Blades.

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<th>Dorsal Bevel Angle</th>
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<td>2.4</td>
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*Note:* Maximum width of each blade approximates length of cutting edge; measurements in cm and degrees.
Figure 196. Two Tagime Flat Style adze blades.
Figure 197. Tagime Flat Style adze blades above; Tagime Style below.
Figure 198. Bit damage and transverse snap of Tagime Style adze blade.
For structure refer to the above descriptive material on the Tagime Style adze blade as it describes the same structure as that for the Yeineri Style blade. For blade measurements (maximum lengths, widths, thicknesses and cutting edge angles) of a collection of Yeineri Style adze blades, refer to Table 3. The maximum length from a collection of 33 blades is 13.9 cm, maximum width for that same blade 5.9 cm, and maximum thickness for that blade 5.7 cm. The shortest blade in the collection is 4.7 cm, with a maximum width of 3.2 cm, and a maximum thickness of 1.0 cm. The length-to-width ratios are: for longest blade 2.36; for shortest blade 1.47; and for all blades 1.8.

Regardless of the variance of plan view shapes, as indicated by the different length-to-width ratios, the longitudinal dorsal crestlines in cross section are usually gently arcuate. On the majority of Yeineri Style adze blades, however, a flat area is ground over some part of the central longitudinal line on the ventral side of the blade, to facilitate a secure fit when binding the ventral side of the blade against the upper surface of the haft socket. Sometimes this flat area is not obvious, but upon closer examination it can almost always be defined.

On 14 blades which were available for laboratory angle measurements, the mean ventral bevel angle is twice as large as the mean dorsal bevel angle (refer to Figure 186 for bevel angle definitions). In Figures 199, 200, 201, and 202, it can be seen that on some of the blades, the ventral bevelled surface is ground flat, or faceted, opposed to a more arcuate plane surface which creates the dorsal bevel angle.

In the absence of seeing this Yeineri Style adze/axe blade type, not in an adze haft or axe handle, the relative shapes of the opposing sides of a blade and the disparity of the sizes of the bevel angles (especially the presence of a high angle, flat faceted bevel on one side, near the cutting edge of a tool) would identify a blade as an adze blade rather than an axe blade and fix its orientation were it to be hafted.

When adze/axe blades, or assuredly adze blades as determined by their small size, are first shaped in the Yeineri Quarry, the bevel angles are more nearly symmetrical than most of those found on blades in use areas. This means that with added value by further grinding enroute from the quarry to final users and/or when resharpening by the users themselves, a more blunt bit angle is created and a greater disparity in the sizes of dorsal versus ventral bevel angles is created. Bluntness (bit angle, Figure 186) of the cutting end of the tool relates to both cutting efficiency through sharpness and to durability of the cutting edge. The more blunt, or greater the bit angle, the more durable the cutting end of the tool, but also the less sharp. The sharpest blades are thinner at bit end, and therefore more fragile. Perhaps the best balance between degree of sharpness and durability, is achieved by the user for his specific tool use, rather than by the quarryman at the quarry site. At any rate the blades are sharpened quite often, and their shapes therefore are changed with use through time.

Especially for the kinds of rock used for these Highlands tools, even a small fragment knocked out of a cutting edge weakens the edge and makes it vulnerable to further chipping around the flaw. When
Table 3. Measurements of Yeineri Style Adze Blades.

<table>
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<tr>
<th>Adze Blade</th>
<th>Length</th>
<th>Maximum Width</th>
<th>Maximum Thickness</th>
<th>Length to Width Ratio</th>
<th>Bit Angle</th>
<th>Dorsal Bevel Angle</th>
<th>Ventral Bevel Angle</th>
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*Note: Maximum width of each blade approximates length of cutting edge; measurements in cm and degrees.*
Figure 199. Yeineri Style adze blade with faceted ventral angle.
Figure 200. Five drawn views of the blade shown in Figure 199.
Figure 202. Ventral views of the blades shown in Figure 201.
slightly chipped, a user might proceed immediately to grind the edge of the blade at a convenient, permanently located stationary grinding slab or within his habitation site on either a portable grinding slab or with a handheld grinding stone. Adze blades are sometimes ground while in their hafts; although they are more often quickly removed from the hafts, resharpened, and replaced. In Figure 203, two men are seen resharpening Yeineri Style adze blades at a much-used stationary grinding slab in a streamlet that meanders between their compounds and nearby slash-and-burn gardens. In the upper photograph in Figure 204, one of the workers displays the blade that he has just sharpened, while in the lower two photographs the second man quickly rehafts the blade that he has just sharpened.

When badly damaged, a tool blade might be set aside and later knapped at a convenient time before laboriously regrinding such a blade over a period of several days before rehafting it. Since knapping is a skill not known by all men, a person not wishing to invest so much time grinding a blade, that in the interest of work efficiency really should be knapped first, might have to wait even as long as a week or more for a knapper. Whereas all men are not skilled knappers, all men know how to shape, sharpen, and polish by grinding.

Most unsymmetrical and unusually shaped adze blades are caused by breakage and then damage repair, rather than by original shaping at a quarry source. The two blades shown on the right of the photographs in Figures 201 and 202 are unsymmetrical blades that I believe have been reshaped by grinding away damaged areas.

The line drawings of three Yeineri Style adze blades and the distal end of one Yeineri Style axe blade in Figure 205 show the results of the three most common kinds of use wear fractures of Yeineri Style blades. Drawing (a) shows the remnant half of an adze blade which was fractured longitudinally by a percussive blow in what was described as normal use. The fracture that broke the blade into two pieces follows a rock cleavage plane that parallels the longitudinal dimension of the blade. When I first observed this broken blade, it was hafted and being used as an adze for select tasks. Drawing (b) illustrates a blade with percussive cutting edge use damage, in which no attempt has yet been made to regrind the blade. Drawing (c) is the distal end of a Yeineri Style axe blade that reportedly broke outside of the axe handle while the axe was being used in the normal fashion to split wood. The break appears to be a bending/compressive type fracture that was initiated relatively far from the contact area (Olausson 1982:48-57). The owner of the axe blade smoothed the sharp fractured edges around the perimeter of the break and his wife used this reclaimed tool as a sweet potato scraper.

The Yeineri Flat Style adze blade is elongate-rectangular in plan view (Figure 206). The cutting edge in this view is approximately a straight line, sometimes slightly convex away from the cutting edge end of the blade. The other, or proximal end of the blade is usually rounded rectangular in shape in the same plan view and narrower than the cutting end of the tool. In longitudinal cross-section view, the
Figure 203. Two Dani men resharpen adze blades.
Figure 204. The sharpened blades are rehafted.
Figure 205. Use damage on Yeineri Style blades.
Figure 206. Yeineri Flat Style adze blades.
dorsal and ventral sides of the blade are nearly parallel for most of the length of the blade, narrowing only toward the cutting edge of the blade where the surfaces are ground down with increasing bevel angles approaching the cutting edge to create the cutting edge. In frontal cross-sectional view the cutting edge is a straight or nearly straight line, sometimes slightly convex upward (toward dorsal side), and less often with a very elongated, modified S-shape. This fundamental tool blade shape of a flat, elongate tabular blade style is basically caused by quarrying slabs of blade blank material along the parallel bedding/cleavage planes of the compact, fine-grained metamorphic source rock. Rock such as this can be relatively easily quarried and split into slabs and thin plates. This is the same kind of metamorphic rock series that is often selected for the flat, rectangular shaped je symbolic stones. Most of the Yeineri Flat Style blades are of the same varied green and blue colors as the Yeineri Style blades, but with the additions of a lighter slate green (called pibit pibit) and a black colored blade that from color alone would appear to be a Tagime blade. The black colored Yeineri Flat Style blades, however, are distinct from the Tagime black meta-argillite by lithology. They are a slate which was formed by metamorphism from a black shale in the same overall ophiolite sequence as other Yeineri metamorphosed rock strata. Such black blades might also be made from rock obtained from sources of opportunity elsewhere along the ophiolite-melange rock belt, but not from Tagime. The light green colored blades are an epidote, chlorite schist which is very fine-grained and with a slaty cleavage. At the Yeineri quarry site where this rock is broken out in slabs, the quarrymen call the rock pibit pibit, which is primarily quarried for its use as je display-exchange stones but which is also used for both axe and adze blades. When the pibit pibit is flaked and then ground to an ellipsoidal shape in longitudinal cross section, it falls within the category of Yeineri Style axe/adze blade, but when completed along flat cleavage planes as a flat, tabular axe/adze blade, it is a Yeineri Flat Style (Figure 207). The upper photograph in Figure 207 shows four Yeineri Flat Style adze blades and a Yeineri Flat Style blade blank. The blade blank has been knapped and is ready for grinding. The light colored specks are pyrite crystals. In the lower photograph, two of the flat style finished adze blades are compared to two "typical" Yeineri Style adze blades. The flat style blade that is second from the left in the upper photograph is enlarged in the lower photograph to show the color and shape of a typical pibit pibit flat style adze blade. The Colorado geologic team (Medlin, Munoz, and Swope) rated the epidote, chlorite schist (pibit pibit) as of medium hardness relative to the other adze and axe blade materials which were analyzed. In Figure 208, two Yeineri Flat Style axe blades on the left are compared to a typical Yeineri Flat Style adze blade to show that the only distinguishing characteristic is the longer length of the two axe blades, which are 30 cm and 26.5 cm long, respectively, versus 18.5 cm for the adze blade.
Figure 207. Yeineri Flat Style and Yeineri Style adze blades.
Figure 208. Two Yeineri Flat Style axe blades and one adze blade.
Adzes

To facilitate reading the text in continuity and then making visual comparisons of the different styles of adzes and hafting techniques, all newly presented figures of adzes are presented as a group at the end of the section.

Both Tagime and Yeineri adze blades in the west as well as the Langda-Sela blades in the east are hafted by their respective tool-makers and users in much the same fashion. In both cases the blades are lashed directly to the feet of the wooden hafts, regardless of blade size, with thin strips of rattan; in the case of the Tagime-Yeineri blade users, sometimes with string cording or a combination of string cording and rattan (Figures 77, 99, 100, and 101). This is different than hafting techniques used by some highlander groups to the east in Papua New Guinea, where both adze and axe blades are bound into detached (from the hafts) wooden split sockets which are then bound onto the T-shaped heads of the hafts (Sillitoe 1988:43-44).

In the study area a secure joinder between the blade and the haft is accomplished by a method where a blade is laid onto the distal end of the flat or slightly concave surface of the socket of the foot of the haft in a nested condition in carefully held thin strips of wood, bark, and/or bark cloth as the blade is securely wrapped onto the socket. Sometimes, however, the blade is wrapped directly onto the socket without these other materials. The Tagime-Yeineri users also sometimes use the pitch from the araucaria tree as a resilient glue to help secure the blade into its nest of fiber material at the distal end of the socket.

In the Irian Jaya study area the angle between the chord of the cutting edge of a blade and the longitudinal axis of the shaft is determined by a combination of the angle: 1) the cutting edge of each blade makes with the ventral side of the blade, 2) the angle the hafting surface of the socket is cut relative to the longitudinal axis of the shaft, and 3) the careful use of thin strips of wood between the blade and the socket surface to angle the mounted blade to just the desired angle to the longitudinal axis of the shaft.

I noted that cutting edge angles so-formed for Tagime-Yeineri style hafted blades vary from 70ø-90ø, with a mean angle of 82ø; and for Langda-Sela style hafted blades from 67ø-85ø, with a mean angle of 79ø (Figure 185). The users of the separate socket technique of mounting blades to hafts in Papua New Guinea, create their desired blade angle by rotating the entire socket held blade to the desired position before lashing it to the haft.

The haft is made from a piece cut from the trunk of a tree to include a branch that is growing at a proper angle and of a proper circumference to make a suitable shaft (Figure 184). The part of the tree trunk above the branch forms the socket of the foot. The branch forms the shaft. The stoutness of the shaft, indicated by its circumference, varies considerably from adze to adze, as does the socket-to-shaft angle. For hafted Yeineri Style and Yeineri Flat Style blades, the socket-to-shaft angle was found to vary from 51ø-78ø, with a mean of 67ø. For Tagime hafted blades the socket-to-shaft angle was observed to vary
from 56°-76°, with a mean of 66°. For adzes hafted with Yeineri Style, Yeineri Flat Style, Tagime Style and Tagime Flat Style blades, the handle stoutness was found to be about the same. For these adzes the shaft circumference was observed to vary from 5.1-11.5 cm, with a mean of 6.35 cm. Some shafts are straight. Others are curved, in which the convex curvatures may be toward either the proximal or distal ends of the foot. Sometimes rather large blades are hafted in relatively small hafts; while at other times the size of a blade seems disproportionately small to the large size of a haft. The trade or barter value of an adze tool relates to the size of the blade but not to the size or quality of a haft.

As the hafted adze blade tools evolved, numerous principles of physics and mechanical engineering must have been manifest in tool changes, until the makers and users developed the kinds of adze tools that we see today. When chopping down standing trees with forceful overhand strokes, certainly cutting edge length and shape, angle and force of impact, mass of tool head, and limberness of tool handle (shaft) must fit into a calculus for chopping efficiency. At the moment of blade impact with the object being cut the wooden shaft will bend and then on follow-through, as the blade is removed from the tree trunk surface, the rebound. This spring effect might help flick cut chips away from the cutting surface. The straight or crescent shape and dimensions of the cutting edge of the blade must also play a significant role.

Three adzes that were hafted in the Grand Valley with Yeineri Style blades are shown in Figure 209. The adze on the right is an example of a tool with a curved handle. It looks as if the rattan wrapping material on this adze is of two different ages. With use and aging, the rattan becomes polished and brown in color. The three styles of shafts are shown in Grand Valley and West adzes in Figure 210. Note that rather than use rattan strips for binding, the users of the two tools on the left have bound their blades to the foot of each tool with braided fiber string cording of the same kind that is used to tether pigs. The Yeineri Style adze blades are shown both hafted and unhafted so that a viewer can at least get a subjective idea of the relatively small proportion of the blades that are bound to the socket. The upper and lower blades are displayed with their dorsal sides toward the viewer and the middle blade with the ventral side toward the viewer. Figure 211 shows characteristic binding patterns from an end view of five Grand Valley and West adzes.

Relative to the way that these adzes are constructed and the mechanics of their uses, it is pointed out from an ethnoarchaeological perspective that for adze blades that are of average length or longer, less than one-third to less than one-half of the length of the blade is bound to the socket (Figures 212, 213, 214, and 215). Mechanically a tool so hafted must be used with a straight forward or straight downward motion so that tangential shear will not break the blade sideways out of the socket. Also, haft wear, if present, would only occur on the proximal one-third to one-half of the blade, which could be helpful information when attempting to reconstruct the kind of hafting from only an archaeological remnant blade.
Figure 209. Three Grand Valley and West adzes.
Figure 210. Three different handle styles on Grand Valley and West adzes.
Figure 211. End view binding patterns on five adzes.
Figure 212. Grand Valley and West adze with Yeineri Style blade.
Figure 213. Grand Valley and West adze with Yeineri Flat Style blade.
Figure 214. Adze shown in Figure 213.
Figure 215. Grand Valley and West adze with Tagime Style blade.
In the next series of three figures with seven photographs, Siba works hard to haft a Tagime Style adze blade in 14 minutes (Figures 216, 217, and 218). Prior to hafting, he resharpened the cutting edge of the old blade and flattened the ventral surface to assure a flat plane which would bind tightly against the upper flat surface of the socket. In the upper photograph in Figure 216, he examines the work on the blade from time to time while grinding and allowing the haft and rattan wrapping material to become tough and limber by soaking in the river beside him. Because of the ideal shape of the blade for hafting (symmetrical, arcuate dorsal surface and flat ventral surface), Siba did not feel that he needed to use the normal "nesting" materials previously described.

In Figures 219 and 220, Siba demonstrates how he can create two bow staves by splitting a downed sapling into two equal parts by deft strokes with his adze. The cutting edge of the adze never misses an imaginary line down the longitudinal center of the sapling as Siba quickly moves beside it and completes the job in less than a minute.

The next step in making a bow is adzing the stave to proper size before scraping it smooth with a boar tusk scraper and/or chert flake (Figure 221). As stated earlier, tool size does not always appear to an outsider to be commensurate with the task that it is used for, and it is difficult to guess what size adze will be selected by a particular person for a specific task. In Figure 221, the adze in use appears oversize for the task. At other times the converse is true.

Knives

Knives used by the Grand Valley and West language speakers are made from the same kinds of rock as the Yeineri axe and adze blades, from meta-argillite sourced rock in the Tagime Quarry area and a small percentage as tools of expediency from the quickly worked softer black argillite of the Kembelangan formation. The users tell me that they prefer Yeineri dark blue-green and slate-like blades to the Tagime-made knives. The knives are generally rather small, thin, and irregularly shaped. They may be narrow elongate oblong or rounded rectangular. The average dimensions of knives that I saw are 8.6 cm long, 4.4 cm wide, and 0.35 cm thick. The largest Dani knife that I saw is 33 cm long, 8.5 cm maximum width, and 0.35 cm thick. This knife blade is a light gray-green color and appears to be made from micaceous slate. The smallest blade that I saw owned by a Dani is a dark blue-green blueschist (or amphibolite) blade that is 9.2 cm long, 2.2 cm wide, and 0.2 cm thick. A similar sized blade (10.8 cm long by 3.7 cm wide by 0.1 cm thick) is a silvery micaceous black slate. Its thinness is probably an attribute of the rock’s original fissility.

The smallest dark blue-green knife described above is shown at the top of the photograph in Figure 222, the middle knife is a Yeineri-sourced black slate-like material, and the lower knife is the largest knife (33 cm long), previously described. At the time that I discovered it, the owner had begun to cut it into
Figure 216. The materials for an adze.
Figure 217. Siba hafts a Tagime Style adze blade.
Figure 218. The finished adze.
Figure 219. Siba splits a limb for bow staves.
Figure 220. The bit never misses its mark.
Figure 221. Adzing a bow stave.
Figure 222. Grand Valley and West, Yeineri-sourced knives.
two pieces with a chert flake tool to make two knives. He said that he used this knife primarily to split the Pandanus red fruit and had given up the task of making two knives from the one because cutting the knife in two was taking too long.

The knives are never hafted and are ground and polished smooth. Sometimes just one end is ground to a sharpened edge. Other times an end and an entire side are sharpened. The edges are not honed down to a cutting edge as sharp as the axe and adze blades. They are handled without much danger of cutting a user’s hand.

Stone knives in the Grand Valley and West are a bit of an enigma. They are made at both the Tagime and Yeineri quarry sites, and from rock found at sources of opportunity. They are definitely present within the culture, but they are rarely seen being carried or used. To the east, an observer would describe the Yali, Una, Kimyal and their neighbors as stone knife users, but not the Dani or Western Dani. Whereas the Yali and others in the east use their stone knives to process taro for planting and eating, the Dani and Western Dani prefer bone knives to stone for the same purpose. People of both the western and eastern cultural groups prefer bone knives made from the leg bones of cassowary birds to stone knives for cutting up the red Pandanus fruit. Both cultural groups use adzes and bamboo knives for dismembering pigs for cooking and always bamboo for butchering—never stone knives. Women of the Grand Valley and West use a variety of "sandpaper" grasses, bone knives, and very small flat style adze blades as vegetable scrapers to clean yams, sweet potatoes, and taro. in preference to the conventional stone knives. So where does this leave the stone knife as a tool of importance among the Dani and Western Dani? Perhaps the stone knife in the Grand Valley and West is relatively unimportant in the cultural system—yet available for profane uses by those people who favor it over other options.

Chisels

A small, tubular shaped (circular-to-oval in cross section) ground stone blade, sharpened at one end, is used as a chisel (alt. names drill and gouge) to cut holes in axe handles (okule) in which to insert the axe blades (Figures 223 and 224). This is the chisel’s only profane use. Sacred uses will be discussed in Chapter VII. Since the Yali and East group do not use axes, they have no use for a chisel of this type nor do they possess any (expect perhaps a few that are secreted away as sacred objects). The Dani call this chisel a pulu. For use in chiselling axe handle holes, the pulu is sometimes mounted into a simple straight handle which may simply be a rattan bound notched short stick shown in a sketch by Heider (1970:277). The pulu blades are produced at both the Tagime and Yeineri quarries, and also in lesser quantities, as inferior tools of expedience from the softer argillites of the Kembelangan formation.
Figure 223. Six Grand Valley and West chisels.
Figure 2.24. Four line-drawn Grand Valley and West chisels.
Chert ("Flint") Flakes

In both the western and eastern use regions, small chert nodules from the New Guinea Limestone are broken into small flakes using the bipolar reduction technique. The sharp, unretouched edges of individual flakes called moli (in mid Grand Valley Dani dialect) are used for numerous tasks. In this Highlands area where bamboo is an extremely important resource (Chapter IV), the chert flakes take on a special significance relative to the bamboo technology. These small tools are used for cutting and shaping, smoothing, incising, and boring most of the bamboo artifacts; including bamboo knives, culturally important ritual pig killing arrow tips, small surgical tips that are used for bloodletting (Chapter IV), surgical probes, tuber scrapers, awls and needles, internode water and object carrying tubes, and earplug ornaments. The chert flakes are used for splitting and paring bamboo strips and rattan for bow strings as well as in the final phases of bow manufacture for paring and smoothing bow staves. The blades are used for shaping and smoothing both hardwood and the lesser used bone arrow tips, as well as incising the wooden tips with artful designs. The chert flakes are used, along with adzes, for shaping and smoothing bone knives. Bone and wooden awls are cut, shaped, and smoothed with chert flakes. Chert flake points are used for drilling holes in bone awls to make them needles, bone tusk scrapers so that they can be conveniently tied with a piece of string, and for drilling holes in pieces of shell which are used as pendants or woven onto fiber bands (Figure 225). The flakes are also used for sharpening the inner concave cutting edges of boar tusk scrapers. The only indigenous musical instrument, the reed mouth harp, is carefully cut out and fashioned with a chert flake (Figure 226). The reed selected for a mouth harp is first sliced to furnish an adequate piece and then the three tongs of the instrument are cut and carefully shaved to produce just the right tone before a hole is bored on the other side of the end internode to accommodate a carrying string (Figure 227).

When the cutting edge of a chert flake becomes dull the craftsman simply throws it away and either obtains a fresh flake from his tool kit or removes a chert nodule or already-reduced core from his tool kit and using the bipolar reduction technique knaps off suitable pieces. The tool users demonstrate little control over the size and shape of the flakes they knap off. The process is really a random one. However, it does not take long (seconds to a few minutes) to obtain a flake suitable for a particular purpose. Often to start the process, an unworked nodule is wrapped in a banana leaf to protect the pieces from flying off and being lost when the core is struck randomly with a hammerstone. A whole new series of flake tools is produced this way.

Because no large chert nodules are available, small flakes must suffice. Pieces in which the long dimensions are in the range of only 2.0-3.5 cms are the norm. Larger flakes up to five cm long are rare but sometimes available. The chert nodules which are the source for flakes are sometimes obtained locally, sometimes traded over relatively long distances. The cultural significance of this tiny tool is out of
Figure 225. Chert flake tools are used as borers.
Figure 226. Shaping a reed mouth harp with a chert flake.
Figure 227. Chert flake tools and a reed mouth harp.
proportion to the very small size of the cutting flakes. Put into archaeological context, this may be a point to be remembered. How many millions of tiny razor-sharp chert flakes are scattered unnoticed throughout the archaeological record? Might this small type of simple flake tool be an important adjunct to the bamboo technology that Geoffrey Pope proposes was important as early as 1,500,000-200,000 ya in an easterly direction from the Movius Line and corresponding to the natural range of bamboo in Asia?

In terms of an entire Highlander's tool kit, one or several chert flake tools might be found with the following items: perhaps a chert nodule or two, perhaps none; one to three pig tusk scrapers on which the inner edges have been honed to razor sharpness; one or several bone awls and needles; one to three short bamboo knives; one or more marsupial or rodent lower mandible tooth carvers; a lump of beeswax; a stone chisel; and perhaps a small sacred stone or other small object (may simply be a rounded river pebble or a small adze blade) wrapped in a cocoon cloth to empower the entire kit. If bits of root or leaves are also present with these kinds of tools in the archaeological record, their presence should not be disregarded, as they may hold significance to an archaeological interpretation that will be discussed in Chapter VII.

These kinds of tools are usually wrapped in an inner piece of cocoon cloth, with or without an additional wrapping of bark cloth before they are all enclosed as a tool kit with a piece of dried outer bark of a banana tree, and then tied with a fiber, banana trunk strip, or a piece of rolled fiber string. Such a tool kit is often carried from place to place in a small net shoulder bag. Four examples of these kinds of tool kits, all of which include chert flake tools are shown in Figures 228, 229, 230, and 231. The photograph in Figure 228 shows a chert flake supply kit, which a craftsman would carry along and from which he could select a tool for a specific job or for the replacement of a tool that has been dulled and is being discarded. The mandible graver shown next to the two flake tools outside of the kit has been secured to a piece of aromatic wood and, after empowerment, is maintained with the tools to exude supernatural power and maintain the profane chert tools in good condition (further discussion in Chapter VII). The same flake supply kit is shown at the bottom of Figure 229 to show a broader assortment of the kinds of chert flakes that are maintained within the kit. The upper left photograph in the same figure shows, at the top, a chert core of the types that are carried in tool kits, to be handy to produce new flake tools. A very simple tool kit is shown to its right, with a boar tusk scraper, a mandible tooth graver, and a single chert flake tool. The tool kit shown in Figure 230 reveals five kinds of tools that are wrapped in a very small parcel: boar tusk scraper, unusually large chert flake tool, a stone chisel, a bat bone awl, and three rodent mandible gravers. The two small clumps of 'jivir root are included with the profane tools as an empowering element (Chapter VII). Quite an assortment of chert flakes are present with a single boar tusk scraper in the cocoon and bark cloth kit that is shown in Figure 231.
Figure 228. A chert flake supply kit with a sacred object.
Figure 229. Chert supply core, flake tools, and simple tool kit.
Figure 230. Chert flake tool kit.
Figure 231. Tool kit with chert flakes and a boar tusk scraper.
Hammerstones

River rounded hammerstones are abundantly available along the courses of the many streams and rivers that pick up loads of rock as they wind their ways from the slopes of the highest peaks across the study area, to finally spill out of the Highlands onto the skirting swamplands below. Hammerstones of different shapes and hardness are, of course, used in the tool knapping process and will be discussed with quarrying and tool manufacturing in Chapters VIII, IX, and X. In addition, river rounded hammerstones and anvils are used for various other tool-specific tasks, the most important being to break pig bones to obtain the desirable marrow for eating and cracking the pervasively used Pandanus nuts (previous Figure 112). Hammerstones are often just picked up as tools of convenience when the need arises, but at least one rounded hammerstone and stone anvil pair are always maintained in each men's house near the hearth for cracking pig bones and Pandanus nuts. I have also witnessed the anvil and/or hammerstone used as a base in the men's house on which to burn tree resin (hotuli) used in sacred rituals. In addition, one or often more, hammerstone and anvil pairs are kept in each women's common cookhouse.

Stone-Striker-Bamboo-Fire-Starting Kit

This intriguing fire starting tool is discussed with other bamboo tools in Chapter IV.

Yali and East

East of the Grand Valley, the Langda, Sela, and Yali stone tool use and trade region is inhabited by the following language speaking groups: Yali, Yale, Nipsan, Nalca, Kimyal, Una, Eipomek and Ketengban (Figure 188). The Kopka, Momina and Samboka, and the Momuna, also shown on Figure 188 as being part of this group, technically reside along the steep Highlands-lowlands geographic interface, and in a sense are neither Highlanders nor lowlanders. Trade relations, including stone tools, are definitely maintained between the more formally defined Highlanders and these adjacent living groups, so in that sense they are included with the Highlanders.

East of the Grand Valley in the Yali and East use and trade region only adzes, knives, chert flakes, and hammerstones are used. For percussive cutting work, the Yali and East people are completely dependent on their adzes. They have no axes. Since they have no axes they have no use for the chisel axe hole cutting tools. Their knives are abundant and are more routinely used than knives in the western area. Both Yali and East adze blades and knives are distinguishable from counterpart tools used in the Grand Valley and West by structure and lithology.
Adze Blades

Langda-Sela Style Adze Blades. In the study area of Irian Jaya, as well as throughout the entire New Guinea Highlands, the Langda-Sela Style adze blades are uniquely shaped—they are long and narrow relative to their widths (Figures 232a and 232b). From collections of blades measured, the mean length-to-width ratios for Langda-Sela Style adze blades is 3.3 versus 2.4 for Tagime Style adze blades and 1.6 for Yeineri Style adze blades. Perhaps part of the reason is because for the users, the adze tool (hafted blade) suffices for both the percussive and planing tasks for which both axes and adzes are used by people to both the west in the Grand Valley and West region and to the east in the Papua New Guinea Central Highlands.

The majority of the Langda-Sela adze blades observed throughout the use area are light gray-green in color. A smaller number are a very light brown. Both rocks are aphanitic and uniformly colored. Other than by color, the two cannot be differentiated macroscopically in the field. Diman Baliyo, the head quarryman at Langda, along with two other quarryman from neighboring quarry sites in the Langda area, agreed unanimously that the gray-green rock makes better adze blades than the buff-tan (light brown) rock. The quarrymen all said that the buff-tan rock comes from along the same Ey River, but that it is more difficult to find. Other quarrymen from other quarry villages in the greater Langda area later affirmed both points. In the laboratory, the University of Colorado team (Medlin, Munoz, and Swope) could distinguish, at least subjectively by their visual relative hardness analysis, that the unmetamorphosed light gray-green igneous basalt/andesite blades might be harder/more durable than the same/similar colored highly altered igneous metamorphosed basalt/andesites (which they termed meta-basalt/andesites) and the highly altered metamorphosed tan rock. Macroscopically relative hardness/durability is not a differentiation that can be made by an outsider in the field; although the indigenous tool makers are highly skilled at evaluating hardness.

Those blades in the user areas that appear to be dark brown to sooty black have probably taken on that additional surface color while being used, both from possible minor mineral alteration and from being anointed with pig fat and hung in a smoky environment near the low ceilings of the men’s houses. The color range of used blades is shown in a photograph of the dorsal view of 13 blades that were found in use by the Yali (Figure 233). The subtle color variation from a light gray-green to a very light tan of some of the selected quarry source material boulders occurs within the geographic limits of the Langda Quarry complex and cannot be used to distinguish Langda from Sela blades, which also produces light gray-green and light tan blade quality source boulders. The various blades, depending specifically on where they came from in the quarry sites, are either metamorphic, with a rock name of meta-basalt/andesite (a highly altered igneous rock), or unmetamorphosed igneous with an assigned rock name of basalt/andesite. Major mineral constituents in the light gray-green and some of the light tans are CPX, plagioclase (small euhedral), plagioclase, amphibole (ragged subhedral), and pyroxene (medium sized, anhedral to euhedral). A minor
Figure 232a. Ventral view of a long Langda-Sela Style adze blade.
Figure 232b. Drawing of views of Langda-Sela blade shown in Figure 232a.
Figure 2.33. Thirteen Landga-Sela blades show color range.
constituent of chlorite is present in one macroscopically representative sample from the Sela Quarry. Minor accessory minerals are opaques, chlorite, epidote, and quartz. One blade sample contains an anomalous blue chlorite as an accessory mineral. One brown blade representative of a group that is thought to be naturally colored is classified as metamorphic-igneous (highly altered) with a rock name of metabasalt/andesite. The major mineral constituents are actinolite and fine-grained albite, which differentiate the specimen from others in the collection. Textures of different blades and flakes from the quarry sites are described as fine grained, seriate (igneous texture); interlocking fine-grained equigranular to fine-grained fibrous in and around veins; to subophitic, fine to medium grained (mesh of interwoven fabric appears to be very strong), to subophitic/elongate interlocked. Fine to medium grained; to subophitic, fine to medium grained. With powder X-ray analyses, albite, chlorite amphibole, actinolite, albite, and possibly kaolinite were found.

The structure of the Langda-Sela Style blades clearly distinguish them from all others manufactured and/or used within the overall study area. Figures 234 and 235 show the dorsal and ventral views of a collection of Langda-Sela Style adze blades. In longitudinal dimension the blades are elongate rectangular to elongate triangular. They are narrow relative to their lengths. In both dorsal and ventral plan view, the side edges in a longitudinal direction are parallel to sub-parallel throughout the medial portions of the blade. Near the cutting edge end of the tool the sides may almost imperceptibly flair out away from the blade to accommodate the widest portion of the blade at approximately the chord of the sub-crescent to crescent shaped cutting edge. At some point between the midpoint of the blade, in a longitudinal direction and the proximal hafted end of the blade, the outside blade edges commence to converge to form a narrow slightly rounded or even pointed blade end. In longitudinal side view, the dorsal (upper) surface of the blade is arcuate in shape from the cutting edge to the opposing proximal end of the blade. From the approximate midpoint of the dorsal surface (highest point of the dorsal arc), the arc angle increases as it approaches the cutting edge of the blade to form, at its greatest angle of divergence from the horizontal, the dorsal bevel angle. In a similar fashion the dorsal arc angle increases in magnitude away from the crest of the arc toward the proximal end of the blade. In the same longitudinal side view cross-section, one can see that the ventral side of the blade (side hafted against the foot of the haft) is flat to sub-flat, and nearly parallel to the dorsal side. This forms a practical hafting platform on some portion of the medial part of the blade or toward the proximal, hafted end of the blade. At the distal, or cutting end of the tool, the ventral bevel angle is almost always larger than the dorsal bevel angle. Only in the shorter blades do the shapes of the blades in longitudinal dorsal plan view become sometimes oblong and sometimes even triangular (in the very shortest blades). This change in shape seems to be caused by the fact that apparently the tool makers and users designed blades that would maintain blade cutting edges with a length of at least 4 cm, regardless of how short the blade was originally or had become through use, wear, breakage, and
Figure 234. Dorsal view of 14 Langda-Sela Style adze blades.
Figure 2.5: Ventral view of 14 Langtian-Seta Style adze blades.
resharpening (see Table 4 for important blade measurements and dimension relationships). This approximate minimum cutting edge length seems to hold true also for the Yeineri and Tagime Styles of adze blades. Mechanics studies beyond the scope of this dissertation are required. Within the scope of the subject of cutting efficiency, two features of cutting edge structure may be especially pertinent. From a frontal view of the cutting edge, it is seen that the cutting edge is either a straight line, but more often a convex-up (toward dorsal side) curve. Further, it appears that the left side of the cutting edge of the blade is angled (by flaking and grinding) so that when normally mounted on the socket of the shaft, for a right handed user, from the user's perspective, the right side of the cutting edge of the blade strikes the object lower than the left side. It may also be pertinent to tool efficiency that in frontal view, ventral side down, dorsal side up, that the upward arcuate shape of the cutting edge of the Langda-Sela blade is more pronounced than in either the Tagime or Yeineri Style adze blades. In the most pronounced curvatures, the cutting edges of the Langda-Sela adze blades even approach the shape of a semi-circle.

The textures of the Langda-Sela blades are classed as fine-grained, seriate (igneous texture): subophitic, fine to medium grained, mesh interwoven fabric that appears very strong; subophilitic/elongate interlocked, and fine to medium grained for the light gray-green Langda-Sela blades and quarry stone; and interlocking fine-grained equigranular to fine-grained fibrous in and around veins for the tan blades. The meta-basalt/andesite quarry chips from Sela and meta-basalt/andesite blades are ranked as "hard" on the research scale (VH, H, M, S); whereas the Langda unmetamorphosed basalt/andesite quarry chips and basalt/andesite Langda blades are judged to be "very hard," due to the rocks' fine-grained interlocking texture. Macroscopically the Langda produced and Sela produced blades cannot be differentiated.

The Langda-Sela type blades are distinguishable from both the Tagime and Yeineri produced blades not only by their color, lithologies, and structure but by the patterns of polished and unground surfaces of the blades. On a Tagime and Yeineri blade most of the surface area is ground and polished, with only a few, if any, scattered deep flake scars left rough and unpolished. On the Langda-Sela blades, however, the overall motif is a patchy appearance with highly polished areas interspersed with declivities of untouched flake scars. The Una speaking people in the greater Langda Quarry area call an average Langda-Sela Style blade with scattered rough spots a sabea and a blade that is ground smooth all over a humulu. The details of structure of the complex shaped Langda-Sela blades are more precisely determined by knapping before grinding commences than with either the Tagime or Yeineri blades. On the Langda-Sela Style blades this detailed knapping causes an adjoining continuum of small flake scars on all sides. Grinding and polishing of the flaked blades smooths the rough highlights over most of the surface of each blade and grinds smooth both the dorsal and ventral sides of the blade near the distal (cutting) end to produce the desired shape of the cutting edge and a well-ground sharpness. The dorsal crest is rounded and smoothed by grinding, the lateral edges just "touched" and smoothed. Often the proximal back third
Table 4. Measurements of Langda-Sela Style Adze Blades.

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<td>2.7</td>
<td>2.6</td>
<td>75</td>
<td>20</td>
<td>55</td>
</tr>
<tr>
<td>Mean</td>
<td>14.6</td>
<td>4.3</td>
<td>2.7</td>
<td>3.3</td>
<td>59</td>
<td>19</td>
<td>40</td>
</tr>
</tbody>
</table>

Note: Maximum width of each blade approximates length of cutting edge; measurements in cm and degrees.
of the blade that is covered by rattan strips when hafted is less well ground than the half of the blade toward the cutting end. Surfaces of highly polished areas are usually interspersed with declivities of untouched flake scars.

The Una people sometimes apply pulverized red hematite "paint" to some of the flake scars on hafted blades. On a freshly "painted" blade this creates a bright red and light gray-green mottled appearance (Figure 236). When a blade that has been so painted is removed from its haft, both the red paint and the darker color of the dirtied, exposed part of the blade visibly distinguish the exposed part of the blade from that part that has been bound to the socket. When I first saw blades decorated this way in the Langda area I thought two things: "This is possibly done as a recent decoration to attract modern buyers, and if not for that purpose then it must have some ritual empowerment to protect the blade from breakage or enhance its use quality." The quarrymen informants at Langda said neither was the case. They had always done this—learned from their ancestors—as a mark of beauty and it has no sacred significance. When I was able to re-examine my collection of Langda-Sela blades acquired from scattered locations throughout the use area, I noted that some of them exhibit a dull red look on scattered, unpolished flake scars. This coloring may well be dirtied remnants of hematite powder that was painted onto the blades after hafting. If that is true, and the red coloring is not put on some blades just as a modern marketing ploy, then I suspect that there is probably more to it than just a profane decoration for the indigenous users, as they would have me believe.

Adzes

The Langda-Sela Style adze blades are hafted in much the same fashion by the Yali and East adze manufacturers and users as the manufacturers and users of the Yeineri and Tagime types haft their blades.

Since the Yali and East indigenous inhabitants use no axes, their adzes perform all the same chopping and planing functions that both the axes and adzes do for the people to the west. One might think, therefore, that for the chore of splitting large felled trees, which is done in the Grand Valley and West primarily with sturdy axes that the Yali and East residents might, in some fashion, duplicate the Dani axe, where the cutting edge of the blade is aligned nearly parallel or is parallel with the longitudinal axis of the shaft. Supporting this supposition is the fact that in eastern Papua New Guinea, to the east of the Yali and East region, some groups of people haft their blades in movable hafting sockets so the blades can be rotated to the configuration of an axe if that is desired (Sillitoe 1988:43-44). But within the Yali and East study region of Irian Jaya, this is not so. From my field observations with the Una, Kimyal, and Yali, it appears they haft their adze blades with almost the same adze blade cutting edge to longitudinal axis of the shaft angle (Figure 185 for definition) as is used in the Grand Valley and West. Neither mount their adze blades so that the cutting edge angle even approaches being parallel to the longitudinal axis of the shaft, which
Figure 236. Red hematite painted onto some flake scars.
is a cutting edge angle of 0°, or the precise definition of an axe. The cutting edge angles of adzes in the Yali and East regions are seen to vary from 67°-85°, with a mean angle of about 79°. For Grand Valley and West adzes, the cutting edge angles vary from 70°-90°, with a mean angle of 82°.

The Yali of the central Yali dialect call both the adze blade and the adze a yaha (alt. spellings yaga and yaka). The foot underneath the rattan wrapping is called an akal and the shaft an ambo. The rattan wrapping is called sabeap. The largest yaha that I observed in the Yali area has a shaft 65 cm long, 11.8 cm in shaft circumference, and a foot that measures 44 cm long, with an overall foot plus exposed part of the adze blade of 53 cm. The shortest yaha has a shaft length of 43.8 cm, shaft circumference of 5.6 cm, and a foot that is 33.4 cm long. The mean shaft length of 10 representative adzes is 53.1 cm, mean shaft circumference 7.3 cm, and mean foot length 32.7 cm.

Like the Grand Valley and West, the Yali and East language speaking groups use hafts of different sizes and that vary from straight to quite bowed. Appearances, geometrics, and size variations are similar between the two groups. Una speaking people call an average size adze a metikja (alt. spelling metikya) and a very small adze a manghwarja. Straight shafts are called siriko and curved handles tingento. Both straight and curved handled adzes are used for the same purposes.

In Figures 237 and 238 on photographs of a curved handled adze it is noted by the distribution of the red-painted flake scars and discoloration of the exposed part of the adze blade (as discussed and shown in Figure 236) that slightly less than one-third of the blade is bound to the haft socket. In the line drawing of a straight handled adze in Figure 239, it is also seen that slightly less than one-third of the blade is hafted. Although the blades are not exposed in the two adzes shown in Figure 240, one can visualize, especially in the upper adze, that no more than about one-third of the blades are bound to the sockets of the hafts. The top view of two adzes in Figure 241 not only show the rattan binding patterns, but from the structure of the exposed distal ends of the blades a conservative conclusion that probably less than half of each blade is bound to its haft.

When hafting, the cutting edge angle is determined by the angle that the flattened hafting surface makes with an imaginary plane through the shaft and foot of the adze and then the way that the adze blade is bound to that surface. Sometimes a blade is bound to the haft socket without the use of organic material padding (as previously shown in Figures 216, 217, and 218). More often banana trunk strips, strips of wood, pieces of leaves, and other vegetal materials furnish a choice of nesting materials that are used to haft a blade for added shock absorption and to assist in angling the blade when binding it to the socket to create the desired cutting edge angle. In the next series of photographs (Figures 242, 243, 244, and 245), one sees not only the raw materials that are used by a Yali man to haft a blade, but also how he “nests” the blade into the organic padding and binds the combination to the socket, to produce a shock resistant tool with the desired cutting edge angle. The relatively small percent of the blade that is bound to the
Figure 237. Curved handled Yali and East region adze.
Figure 238. Blade outside of its adze.
Figure 239. Line drawing of Yali adze and its blade.
Figure 240. Two Yali and East region adzes.
Figure 241. Two wrapping patterns.
Figure 242. The raw materials used to haft an adze blade.
Figure 243. Holding the "nested" blade.
Figure 244. Adjusting the blade to socket.
Figure 245. Binding the blade to the foot of the adze.
socket can also be seen in the sequence. This man uses a common procedure that has not been previously explained to prevent the initial loops of rattan strip wrapping material from slipping off the end of the socket. The two loose ends of two short pieces of rattan are held against the blade and then tightly folded back over the first loop of wrapping material and then bound under the wrapping material as the blade is bound to the socket.

Whether at work with other tools, or just walking along a trail, a common way of carrying an adze in the Yali and East is, as it is in the west, over a shoulder. In Figure 246, a Yali male horticulturist is seen carrying his adze in this normal position while he works rapidly with a digging stick to prepare a garden for planting.

When put into use to chop down a tree, the hands are held touching each other on the haft to be able to obtain full momentum on the downward stroke by creating a comfortable pivot point at the wrists (Figure 247). By forward-flexing the wrists just before the blade strikes the tree, both the blade strike angle is controlled and mechanical advantage gained. At times, a woodchopper may work while holding the haft with only one hand; the pivot point principle is still in effect.

Often two men work as a team to chop down a tree (Figure 247). The men calculate the placement of their chopping on opposite sides of the tree and the depth to which each will chop to encourage the tree to fall in the desired direction. The deeper cut is made on the side of the tree away from the direction it is desired for the tree to fall. Often one man will stop working to allow his partner to make the final cuts before the tree falls. When working alone on a medium to large size tree, a woodcutter will change sides on the tree to create the same pattern of opposite side cuts as if there were two men working together.

When chopping a tree down with an adze, the worker chops higher as his blade bites deeper. He wastes no energy chopping away the frayed material at the base of the cut, as is done by axe cutters when cutting down trees as they change the angles and strike points of their blows. Note the neat pile of chips created by the woodchopper at the base of the tree in Figure 248. Perhaps the spring effect of the adze at the end of each stroke assists the woodcutter in flicking chips away from the cut. At the moment of blade impact, the haft shaft bends backwards and then rebounds as the tool is pulled way from the cut.

Knives

Unhafted knives are much used by the Yali and others in the east region. They are primarily used for cutting taro plants for planting and for scraping and cutting all tubers for steaming or roasting (Figure 249). Among the Yali, Una, Kimyal, and others in the eastern area, both men and women use and own stone knives. According to informants an adult person may own one or as many as five knives, but the average is three to five. This is the same number of adzes that are owned per adult man. The women do not own adzes; however, it is very common for a woman to have a knife with her in one of her head-backs.
Figure 246. Yali horticulturist carrying his stone adze.
Figure 247. Two Una men chopping down a tree.
Figure 248. The adze blade marks make parallel grooves.
Figure 249. Two different men scrape and cut taro tubers.
nets as she goes to and from the fields and while doing her daily chores, just as a man routinely carries bows and arrows with him and quite often an adze over his shoulder as he moves about.

The knives vary from oblate to elongate oblong to narrow rectangular in shape (Figure 250). They range in color from light buff to light gray, sometimes light green, sometimes tan, and within a hamlet "assemblage" there are usually a few black knives. Some blades have narrow darker colored bands (from source rock color differences) exposed in interesting patterns on lighter colored blade surfaces. The knives are never hafted and are completely ground and polished smooth. Sometimes just one end is ground to a sharpened edge. Other times an end and an entire side, and in other fewer cases almost the entire circumference of a knife is edge sharpened. Like the knives in the Grand Valley and West region, the sharpened edges are not as sharp as the sharpened edges of adze blades and rarely does a user cut her/himself. The knives are originally shaped and sharpened and later resharpened on portable sandstone grinding slabs and at sandstone bedrock outcrops (Figure 251). Sometimes a handheld grinding stone is used for minor resharpening. In Figure 251, a Yali woman shows me the two Langda style knives that she was carrying in one of her head-back nets while on the way to visit a friend. In the lower photograph, a Yali man sharpens the dulled blade of one of his knives. With the clump of moss. which acts like a sponge, he squeezes drops of water from time to time onto the grinding slab to assist the grinding process. When a knife breaks, if a piece of usable size remains, it continues to be used as is or it may be retouched by grinding the broken edge. Pieces that are considered too small to be usable are merely discarded. When knives break during manufacture or use, the people say the blade is "sick" and not that a malevolent ghost or spirit was involved in breaking the blade or that a knife blade maker was at fault. The breakage is "just something that happens."

In the Yali and East region, the knives are not made from the same source materials as the adzes. Instead, in the Langda quarry area the knife material comes from rock outcrops upslope from adze blade quarry sites. To determine knife lithologies, mineralogical content, and aspects of texture, representative knife blades were selected from the Yali use area and the more restricted Langda quarry and Una use area, including one knife blade from Langda that was still in the manufacturing process. Elemental analyses were made with medium power scanning electron microscopy and image analyses. By the use of the EDX system (Energy Dispersive X-ray Spectrometer) and the scanning electron microscope, an elemental analysis of each sample was made. Peaks in the energy dispersive X-ray spectrum were compared to known peaks in a petrology atlas (Welton 1984). The EDS results were compared with crystal structure in the SEM micrographs. A texture analysis was made and elemental analyses checked with thin section work on the SEM. R. N. Guillemette of Texas A&M University performed the analysis in the geology electron microprobe laboratory.
Figure 250. An assortment of Yali and East region knives.
Figure 251. A Yali knife is resharpened.
The knives were found to consist of the major minerals muscovite, biotite, quartz, and albite feldspar. A titanium-bearing phase is also present as a minor unidentified accessory mineral. The micas, quartz, and albite are thought to be the result of metamorphic recrystallization (greenstone schist facies) and not deposited as detrital grains. The important quartz-albite grains are "wrapped" with the micas and shielded from observation under the SEM when viewed in unground, natural micro-chips taken from the knives. Only after grinding and polishing in the thin section process do the quartz and albite grains become visible in cross section. Without a polished thin section, one might erroneously interpret the rock to be composed almost entirely of the silicate minerals muscovite and albite, missing the quartz and albite fractions, which are interpreted to furnish the hard, abrasive material for the cutting edges of the knives.

The quartz grains make up approximately 15-20 percent of the rock; individual grains are irregularly shaped, with long dimensions ranging from five to 10 microns. The quartz grain edges are deeply embayed and serrated. Visual analysis indicates that at least part of the serration is caused naturally and not from chipping by the thin section grinding process. It is felt that the knives' durability and cutting effectiveness is caused by the bonding of the approximately equally spaced, abrasive sharp-edged quartz and albite in the micro-grained, somewhat flexible muscovite and biotite groundmass. It is estimated that the micro-quartz and micro-albite particles are spaced about 20 micrometers apart along the cutting surfaces and throughout the groundmass of the knives.

The genesis of the kind of metamorphic rock that was interpreted for the knives from laboratory analysis is quite compatible with the presence of the volcanic sequence in the Langda quarry area. The geologic relationship of the Langda area adze and knife blade quarries is discussed in Chapter X.

From hamlet to hamlet it was interesting to look at the knife blades as assemblages, to be treated and thought about as similar collections might be treated from archaeological excavations. One example of just such an "assemblage" was put together and photographed at the Yali hamlet of Pasikni, located not far uphill from Angguruk. (Note: Pasikni is located toward Nisikni from Angguruk on the map but is not Nisikni.) In Figures 252 and 253, blades owned by both the men and women of the hamlet are displayed. The name of the owner of each of the knives was recorded so that interviews could be conducted. Of 36 knives, the longest is 20.3 cm (owner would not allow photographs) with a maximum width of 9.0 cm, and maximum knife thickness of 0.76 cm. The shortest knife in the collection is 9.0 cm long, 3.3 cm wide at its widest point, and 0.3 cm average blade thickness. Not including the longest blade (20.3 cm) which was not photographed but including the next longest blade which is 19.2 cm, the mean length for the collection is 12.6 cm, mean width at the widest point on each blade 4.7 cm, and the average blade thickness 0.39 cm. These knife blade dimensions are comparable to a collection from the Una people at Langda. At Langda the longest blade is 20.0 cm with a width at its widest dimension of 6.0 cm, and with an unusual maximum thickness of 2.2 cm in the center of this differently-shaped blade which is oblong.
Figure 252. Knife blade collection at the Yali hamlet of Pasikni.
Figure 253. A larger scale view of Pasikni knives.
in cross-section rather than with the normal parallel sides. By comparison the next longest blade at Langda, which is of normal proportions, are as follows: 11.0 cm long, 4.6 cm wide, 0.65 cm thick. The shortest blade in the collection is 10.5 cm long by 5.1 cm wide, by 0.6 cm thick. The thinnest blade at Langda is 0.3 cm thick. Not including the unusual long blade at Langda, the mean length for the collection is 13.2 cm, mean "maximum" width 5.0 cm, and mean thickness 0.56 cm. To facilitate comparison of the dimensions for the two collections they are set forth in Table 5.

<table>
<thead>
<tr>
<th></th>
<th>Pasikni (cm)</th>
<th>Langda (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longest</td>
<td>20.3</td>
<td>20.0</td>
</tr>
<tr>
<td>Widest</td>
<td>9.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Thickest</td>
<td>0.76</td>
<td>2.2</td>
</tr>
<tr>
<td>Shortest</td>
<td>9.0</td>
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<tr>
<td>Narrowest</td>
<td>3.3</td>
<td>4.0</td>
</tr>
<tr>
<td>Thinnest</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Mean length</td>
<td>12.6</td>
<td>13.2</td>
</tr>
<tr>
<td>Mean width</td>
<td>4.7</td>
<td>5.0</td>
</tr>
<tr>
<td>Mean thickness</td>
<td>0.53</td>
<td>0.56</td>
</tr>
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Chert ("Flint") Flakes

The Yali and East indigenous inhabitants have a similar supply of chert nodules as the Grand Valley and West inhabitants, and they obtain and use unretouched small chert flakes in the same manner as do the people to the west. For detailed information refer to the previous discussion of Chert ("Flint") Flakes under the Grand Valley and West in this chapter.

Hammerstones

The river tumbled and rounded hammerstones are available and used in the Yali and East region, just as they are to the west. Refer to the previous discussion for details.
Stationary Grinding Slabs and Mobile Handstones

The largest ground stone tools that are present in the Highlands are permanently located grinding slabs (select spots on bedrock outcrops and large erratics) and smaller portable but stationary grinding slabs. Another, although smaller tool of abrasion, is the mobile handheld grindstone. All play a key role as tools of abrasion in lithic reduction. Most are also used, against which to shape, smooth, and sharpen bone knives, bone and wooden awls and needles, and certain hardwood arrow tips.

By way of definition, both the permanently located grinding slabs and the portable grinding slabs are stationary in that they are ground-supported when objects are ground against them while the "mobile handheld grindstones" are just that, handheld while they are used to grind or abrade objects that are either held in the other hand, held with the feet, or supported on the ground or against another rock.

The primary sources for almost all of the grinding stones are outcroppings of sandstone beds within the Kembalangen formation. Sandstone is the lithology of choice for all grindstones and the necessary lithology for heavy grinding and shaping. The distribution of bedrock grinding sites and source locations for supplies of portable grindstones is thusly controlled geologically by the presence of Kembalangen sandstone outcrops and the scattered presence of Kembalangen sandstone erratics. At certain locales, where men gather for purposes other than grinding, silty limestone erratics are sometimes used as grinding slabs of convenience for minor "touch-ups" on stone and other tools.

Within the controls of the geologic distribution of the desired sandstone grinding material, favorite bedrock and large erratic boulder grinding spots are developed near to habitation sites, within rock cuarry areas, at commonly used work or meeting spots (such as the salt pools), habitually used war overlook positions, and at other locales of convenience.

When grinding, water is almost always used to lubricate the grindstones and help create a grinding paste with eroded particles from the grinding rock. For this reason, grinding slabs are located along the banks of rivers and other bodies of water whenever possible. Often the grinding surfaces extend down into rivers on rock outcrops or are on large rock erratics out in small streams or places of water accumulation (Figure 203). At many such locales throughout the Highlands, the grinding area changes size as water levels rise and fall. When away from an adjacent water supply, water is carried to the grinding spots in both bamboo and gourd water containers and in spongy clumps of moss that are gathered for the purpose. Often a worker will have a helper who stands by to drip water from a water-laden sponge of moss onto the grinding surface as a tool is worked.

The bedrock and large erratic boulder grinding areas are the most durable and permanently located artifacts of culture that will remain in the archaeological record to attest to the present ground stone technology. Already these artifacts are becoming archaeological objects because of the increasing disuse
of stone tools. Inactive sites are identifiable by the presence of algae and lichen which quickly cover the grinding surfaces. Some sites are already buried by organic debris and can only be located by inhabitants who know of their uses in the recent past. Within the constraints of the geological distribution of sandstone outcrops, the identification of ground stone tool users and theoretically their use area boundaries could be mapped in the archaeological record by the distribution and interpretation of similar grinding sites in prehistoric cultures.

Two grinding sites "of convenience" to the local inhabitants in one part of the research area are shown in previously presented Figures 190 and 203. Three other permanently located grinding sites, at widely scattered locations, are shown in Figures 254 and 255. These sites as well as numerous others in the Irian Jaya Highlands region are similar in appearance to grinding slabs of Neolithic age that have been photographed in Europe.

The grinding slab on a boulder erratic in Figure 254 is located along the north-central edge of the Grand Valley beside the Ileukaima salt pool (map, Figure 6). There is no evidence for sharpening marks other than from axe and adze blades on this grinding slab. Although barely discernable, however, in the photographs of the two sites shown in Figure 255, linear use wear marks are present that were made by sharpening bone awls and needles, and in the upper photograph probably hardwood arrow tips a well. Such use wear patterns are clearly seen at yet two other sites shown by photographs in Figure 256. Through repeated abrasion the linear V-shaped grooves are worn into the grindstones by bone awls and needles and by the sharpening of certain kinds of hardwood arrow tips. In Figure 257, at yet another permanently located bedrock grinding site, a man interrupted his work of shaping and sharpening a Tagima Flat Style axe blade to demonstrate that the deep V-shaped linear grooves are not made by shaping and sharpening stone axe and adze blades or stone knives, but by shaping and sharpening primarily bone awls and needles.

Two portable sandstone grinding slabs and a handheld grindstone are shown in the two photographs in Figure 258, along with examples of the kinds of tools, which when repeatedly ground, shaped the grinding surfaces of the stationary slabs. It is pointed out that the simple concave grinding surfaces on the slabs are similar in shape to some surfaces that are formed on grinding slabs ("metates") by plant-food processing. In the upper photograph in Figure 258, the grinding surface was shaped by grinding Yineri Style adze blades, a type example of which is shown on the grinding slab. In the lower photograph the concave grinding surface on a Yali slab was formed by grinding Langda-Sela Style adze blades. At the closed end of the Yali grinding slab, a bone needle is laid beside the narrow V-shape groove to show the kind of tool that wore the V-shape groove in the sandstone slab.
Figure 254. A stationary grindstone at the Ileukaima salt pool.
Figure 255. Two stationary grinding sites in the Grand Valley.
Figure 256. Hardwood arrow tips and bone awl grinding patterns.
Figure 257. Deep grinding grooves caused by sharpening bone awls.
Figure 258. Mobile grinding slabs and handheld grindstone.
Conclusions

Two adjacent ground stone tool use and trade regions are geographically defined by the distribution and uses of mutually exclusive kinds and styles of profane ground stone tool blades (Figure 188). In the Grand Valley and West region, ground stone axe and adze blades, knives, and chisels are manufactured and traded outward from the Yeineri and Tagime quarries for profane uses, to the exclusion of adze blades and knives of distinctly different styles that are manufactured and traded within the Yali and East region from the Langda-Sela quarry belt. With the exception of the Pass Valley area in Yali territory, where there is a tool type use mix, the profane ground stone tool types of the two regions conform with language boundaries to form the regional border; although other kinds of material goods trade across this boundary. Ground stone tool blades that are sourced at the Yeineri and Tagime quarries trade freely across language boundaries within the Grand Valley and West region. Similarly, Langda-Sela adze blades and knives trade across language boundaries within the Yali and East region. A visual summary of the five styles of adze blades that are used and traded is shown in Figure 259. From left to right are, first, two typical Langda Style adze blades, then two Tagime Style adze blades and a small Tagime Flat Style adze blade, adjacent to three Yeineri Style adze blades, and on the extreme right two Yeineri Flat Style adze blades.

Undifferentiated stationary grinding slabs, mobile grinding handstones, unground chert flakes, and naturally shaped hammerstones and anvils are used in both the Grand Valley and West and the Yali and East regions. The unretouched chert flake tools are quite important to the Highlanders--out of proportion to their small sizes (most 1.5-2.5 cm long). They are of particular cultural importance in the manufacture of bamboo tools and other bamboo objects.

The ground stone adze is the "workhorse" tool of the Highlands. It is the chopping tool with which the trees are cleared in a slash-and-burn technique of horticultural husbandry. It is the adze, not the axe, which was used to clear the forest while the people were making the major transition from a hunter-gatherer life style to the extensive and intensive horticultural practices of today. Both the axe and adze are designed to obtain optimum cutting efficiency for their different uses. When using the axe in the Grand Valley and West to split logs that are laying on the ground, an overhead, straight-down motion is used (Figure 189). But to use an axe to cut down a vertically-standing tree, a side-on motion is necessary. The users recognize the disadvantages of this side-angle motion with an axe, which for them does not overcome its theoretical advantage of a longer handle and a heavier blade. All language groups opted for the adze for cutting down vertical-standing trees and parts of trees and other objects that present themselves at various angles, where small, more manageable tools than an axe are necessary to be able to use an overhand vertical-down stroke. Both mechanical advantage and a controlled blade strike angle with a
Figure 259. The five styles of Highland adze blades.
forceful swing of the tool is enhanced by such direct overhead-down motion. Baseball pitchers and tennis professionals (when serving the ball) understand the principle well.

The largest ground stone tool artifacts in the Irian Jaya Highlands are the sandstone bedrock and large boulder erratic grinding slabs. Many of these look similar to grinding slabs found in the archaeological record. On both the permanently located and the portable grinding slabs in the Highlands research area, the linear, V-shaped grinding grooves that are often present are caused by the abrasion of shaping and sharpening bone, wood, and bamboo awls/needles and hardwood arrow tips rather than stone adze/axe blades, chisels, or knives, as one might expect. Concave wear surfaces on portable stationary grinding slabs in the research area are of similar structure to wear surfaces present on grinding slabs ("metates") found in archaeological context which have been interpreted to have been formed by plant-food processing. In the Irian Jaya Highlands situations, these surfaces have been formed only by shaping, reshaping, and sharpening stone adze/axe blades.
CHAPTER VI
PROFANE DISPLAY-EXCHANGE STONES

The pattern of life and death of the people within the study area might be thought of metaphorically as a complex tapestry in which the people themselves—the most influential big men, the war generals, the shamans with various specialties, the custodial keepers of sacred places and objects, the men responsible for protocol, specialists with a variety of skills, the common people, and even the gebu (alt. kepul) or "worthless ones"—are the weavers.

Following this metaphorical concept, the loom on which the tapestry of life is woven and which establishes the geographic boundaries within which the cloth takes form and design, is the political and social framework within which the weavers work and all life activities revolve. The geographical boundaries of the loom are set within the cultural landscape by political boundaries, which, at any instant in time, are fixed; yet which sway and move with political intrigue and spasmodic all-out warfare.

The weavers’ yarns are heavily mixed with strong strands of symbolic stones (profane and sacred) and other sacred artifacts of culture. Without the pervasive presence of the stones meticulously woven into the intricate pattern of life, the design of the fabric—the culture of the people—would be weak and possibly disintegrate. The symbolic stones, both the profane and the sacred, give the fabric strength. They are the binders of the cultural system, without which the system would cease to exist as it does now. The profane symbolic stones are discussed in this chapter; the sacred stones in Chapter VII.

It is the hard, durable artifacts of culture, such as those of rock, that are most generously preserved in the archaeological record. Throughout prehistory, the presence of symbolic stones, not just stone tools, in the record has intrigued us. We have thought much about the symbolic stones, understood a few occasionally, and written of them prolifically. It is similar objects of rock that because of their characteristics of durability and strength are generally chosen by the indigenous people of the Highlands of Irian Jaya for both profane uses of great sociological importance and as their most sacred and supernaturally powerful symbolic entities. But a most intriguing paradox exists herein: the most perishable of materials—bits of fur, feathers, and plant remains are used to decorate and imbue both the durable profane and the sacred stones with symbolic meaning and thereby to visually transmit important cultural information. In addition, the uses of a simple fiber string, stems and blades of grass, a few leaves, a certain small root, and a bit of tree bark are absolutely essential to focus and maintain the continuum of supernatural power from unknown places in the domain of the unseen into those durable stone objects which have been selected to be made sacred. The fragile organic materials are often destroyed in the archaeological record so hence no thought can be given to them and their cultural context. At other times bits of fur, feathers, a string, a few blades of grass or leaves are found with prehistoric remains, but usually
they are not understood and little thought is given to them. To us, they are not as dramatic a discovery as the stone objects, most of which have been shaped by human hands. But here in the Irian Jaya Highlands we have the fragile artifacts as well as the durable stone ones. We are just now beginning to see through the veil of mystery to understand something of the relationships between these particularly fragile materials of the natural world and the durable objects which we call symbolic stones. Because of the important relationship of the fragile and the durable—the bits of fur, feathers, the blade of grass, string, or leaf and the symbolic stone—the following ethnoarchaeological essay of this chapter and the next include a discussion of both profane and sacred organic material as well as of the symbolic stones themselves.

The uses of the powerful sacred stones and accompanying vegetal materials within the present cultural systems has evolved through time. Knowledge of their uses has been passed down orally from the ancestors until today quite an astounding assortment of sacred stones are empowered through priestly rituals and maintained within religious groups in sacred domiciles, their specific uses well known and controlled within the designated men's groups by leaders (big men) who belong to those groups. Some stones of a higher, more powerful order than other stones are used only for ritual occasions specified by the most influential leaders of the various sociopolitical groups. These are all implements for dealing with the unknown—some are the personifications of the "god-power" ancestral spirits. Others, of more common usage, are available not only to the initiated males, but also to females who, by social custom, can never be initiated.

Following the original metaphor of a complex patterned picture of cultural life which is woven on an interesting loom that fixes the boundaries of the tapestry, the loom (sociopolitical organization and framework for the cultural system) is first discussed; then the profane symbolic stones that make up some of the yarns, and finally, in Chapter VII the detailed ways in which the sacred stones of the yarns are empowered, maintained and used.

**Sociopolitical Organization**

If at any instant in time we could see all of the symbolic stones, sacred and profane, that are present in the Central Highlands of Irian Jaya, we might be amazed at both the quantity and variety. And yet their uses and physical presence at different places at any one time are quite structured and adhere to a predictable social format. The Highlanders’ sociopolitical organization provides the hierarchy and framework within which the stones move. Certain events, set in motion at specific times and places by the edicts of the most influential leaders (the big men, *gains* of different groups), provide the impetus and need for the uses of certain stones, both profane and sacred, at ceremonial functions. Other stones with well known uses and some with specialized supernatural powers flow through a ceremonial continuum
which is controlled by other leaders of lesser influence. Some shaman specialists have authority to use their stones in ways that are prompted both by the requirements of ceremonial regimen and the unpredictable happenings of daily life. Other stones with special significance and power are utilized in daily routine by the common folk to promote health, happiness, and to help them carry out their individual responsibilities with some measure of success.

Within the social and political organization there are repositories for all of these stones, places where the profane stones are properly stored for the times when they are needed and wusa places where the empowerment of sacred stones is enacted through magical rites. Some of these stones are maintained for secret rituals within the places of storage as well as to be taken out by shamans of authority to conduct special rites at certain events. For the general population there are designated sacred stones that have been duly empowered but which can be maintained and used away from the places of special sanctity, where the supernaturally most powerful stones are maintained.

The interplay of social needs in dealing with the unknown, calling upon the assistance of supernatural power through stones and other objects to accomplish social ends, is indeed complicated. The starting place to gain an understanding of this cultural system within which the use of symbolic stones, profane and sacred, plays its cultural role, is to briefly look at the sociopolitical organization. First of all, the social realms within the different adjacent-living language groups (Figure 2) are generally organized on the basis of kinship. Across the pan-mosaic of Highlands cultures, exogamous, non-territorial patrimoiety groups form the framework for spousal choice and participation in some ceremonies. Kinship is traced through both patrilineages (known male lines of descent back to a common ancestor) and patrilineal lines of descent back to a common traditional mythical ancestor. In some parts of the Highlands, patrilineages are quite well known; in other fewer areas, not so well known where there is a rather pragmatic indifference to genealogies. For my treatment of the subject, I will refer to both patrilineages and groups linked by patrilineal lines of descent as patrilineages. I further point out that what I refer to as patrilineages, Heider calls "sibs" (1970:65-67). Patrilineages are non-territorial, which facilitates the formation of social-kinship trade linkages across both political and language boundaries. Segments of patrilineages are, on the other hand, territorial when they combine to form political units and at the compound and hamlet levels (house cluster and wards in the Yali and East region) to form the men's socio-religious groups that control the sacred stones and are so fundamental to the vibrancy of the Highlands cultures.

Within the overall sociopolitical organization, the Highlanders are organized politically on the basis of territorial units which cooperate in wartime and are formed on the basis of patrilineage combinations. These units, called alliances and confederations in the Grand Valley and West region, partly interfere with the social groups formed at the compound and hamlet levels. It is the blending of the groups of the two levels, even with their disharmonies, that comprise the infrastructure within which the symbolic stones are
traded, maintained, and used. To reveal a model that might be applied for interpretative purposes to the archaeological record in other places it is, of course, necessary first to look briefly at the cultural infrastructure within which the Highland stones are used.

The territorial units in the Grand Valley and West region, from largest to smallest, within which the symbolic stones play their important roles are the alliance, confederation, hamlet, and compound: in the Yali and East area, according to Koch, the district, village (hamlet), and house cluster (1967:43-59). Koch, in his work at the Pasikni village near Angguruk, does not report the presence among the Yali of powerful political leaders at a "confederacy" or "alliance" regional level as are present in the Grand Valley and West. I suspect that Koch might not have known of political alliances and maneuvering that might have been going on at what he calls the "district" geographic level of organization. For discussions beyond the scope of this research on the subject of social and political organizations the reader is referred to: Broekhuijse 1967, Hayward 1992, Heider 1970, Koch 1967, Larson 1987, O'Brien 1969, Peters 1975, Ploeg 1966, and Pospisil 1956.

Alliance

In the Grand Valley and West region (Figure 188), as previously mentioned (Chapter V), the two important political territorial units are what Heider (1970:62) and Larson (1987) call the alliance and the confederation. "The alliance is the maximal unit within which ceremonial, political, and social activity take place" (Heider 1970:77). Within the Grand Valley, people refer to members of alliances other than their own as foreigners or dilamege; those people within their own alliance are called aguni juma-mege, or "people of this place, local people" (Heider 1970:77). Within the Grand Valley (Figure 6 - map), at the time of Heider's initial work (1961-1963) there were about a dozen of these alliances. Alliance boundaries are frontiers where two alliances meet. As Heider points out interalliance frontiers may be war or peace frontiers, depending on the current relations between the two alliances.

Peters (1975:53) in his work in and around Wamena enumerated the five largest war alliances in the Grand Valley. He said that one of these, the Loko-Mabel alliance, was made up of at least 11 combinations and led by the most important man in this group of "confederacies," the gain (big man) Gutelu. (Note: Peter's patrilineage combinations are similar to Heider's "confederacies.") Gutelu, as the big man of his own confederacy and the leader (most influential big man) of the Loko-Mabel alliance had much influence within the entire Grand Valley and even beyond, as we shall see in Chapter VII. Because of Gutelu's high position at or near the apex of the hierarchy of leadership influence within his own cultural system, I will rely on Gutelu and his collection of sacred cultural artifacts as a "role model" for personages of this political position in my attempt to herein construct an ethnoarchaeologically derived
baseline for the use of archaeologists when making cultural interpretations from material goods. In Chapter VII, we will examine in some detail Gutelu’s personal sacred objects.

Two major activities involve an alliance in its entirety: war and the initiating of the ebe akho ceremony. Both are the responsibility of the most influential big man (leader) of the alliance. Both involve ritual and trigger the uses of symbolic stones. All-out warfare is a periodic alliance-wide affair that results from the accumulation of numerous hurts and wrongs from previous conflicts or from the intrigue of a "political takeover"—the unseating of a big man or gain (alt. kain) who is the leader of a particular alliance. Ritual wars, although initiated and fought on the lower confederation level, are still the ultimate responsibility of the leader of the alliance.

It is only the most influential man in the alliance, as stated above, who has the authority to initiate the alliance-wide ebe akho ceremony. The announcement and events leading up to the ebe akho in one alliance might influence other gain, powerful big men of other alliances, to commence their own ebe akho, during which wars are temporarily halted. This is a time among the Grand Valley and Western Dani when all outstanding war indemnities are settled, the final rituals for outstanding funerals are concluded, marriage ceremonies conducted, and the boys important waija moiety initiation ceremonies take place. Although held only once every three-five years (five years during the time period of my personal experience, one in 1987 and the next in 1992), the ebe akho is the commencement of a grand round of ceremonies within the alliance which are held at confederation levels that encompass everyone in the alliance. As the ebe akho approaches, pigs are sometimes made wusa and not killed, so there will be enough when the ceremonies start. Wood is stockpiled at strategic hamlet locales for pig feast ceremonies that will be in the offering. The big men of the confederations and down to compound level are busy planning the activities for their many groups. The important profane je display-exchange stones are traded around and collected by those who will need a sufficient number to take care of their responsibilities when the ebe akho is finally commenced. Men’s groups, whose responsibilities are to empower and maintain the sacred stones, dispatch their responsibilities to assure the spirits who live in the world of the unseen that all is in order and to solicit their help in secular affairs. The ebe akho is the periodic socio-political-religious culmination of pig feast rituals for which the people have been living.

The ebe akho is one aspect in which the sociopolitical systems of the Grand Valley and West and the Yali and East regions vary. Although pig feast rituals in the Yali and East follow some sort of a cycle, there is no periodic culmination in anything so all-encompassing as the ebe akho in the Grand Valley and West. For one thing, there are no massive weddings at periodic time intervals, spaced three to five years apart in the east as there are in the Grand Valley and Western Dani areas at the times of the ebe akho.
Confederation

The confederation is the most important sociopolitical unit within the Grand Valley and West region (Figure 188) (O'Brien 1969:185; Heider 1970:79). According to Heider, in the Grand Valley alone, there are some 30 confederations (1970:79). O'Brien mapped seven "confederacies" in the smaller Konda Valley where she worked near Bokondini (Figure 3) (1969:191). Bromley, who lived in the Grand Valley from 1954 to 1993, estimated that the population included in a single confederacy might range from fewer than 1,000 to perhaps as many as 5,000 (1960:252). Larson (1987:131) states that, "the population of the subconfederacy forms the community in Dani. These are the people who assemble large work crews for land clearing and fence building, sponsor communal feasts, assemble warriors for battle, and...participate in group ritual to counteract illness in the past." As with the Damal and Western Dani of Larson's area of research in the Mulia-lлага area (Figure 3), it is at inter-confederacy level that war prevails throughout the study area between confederacies of opposing alliances. The leaders (big men) of the alliances have an overall responsibility, but it is really the big men at confederacy level who bear the burdens of commencing and stopping wars. One wonders how much consultation and influence goes on between the gains of the alliances and their confederacy war leaders who are involved in war between confederacies across the boundaries of opposing alliances. At confederacy level and within the confederacies, war strategies are discussed and warriors furnished. Rituals involving sacred stones are conducted to manipulate their domiciled spirits to strengthen warriors, keep them safe, and even to go forth and kill enemies.

As people move from compound to compound and hamlet to hamlet they tend to stay within the geographic boundaries of their confederacies. "A tendency of patrilocal residence in terms of confederation boundaries is shown by the fact," according to Heider (1970:79), "that most adult males are native to the confederation." Just as the people in compounds and hamlets, scattered about the countryside within the boundaries of the confederations, make up the living population of each confederation, it seems that the male adults' allegiance is to the confederation rather than to the alliance.

Compound and Hamlet

The compound as described in Chapter IV is the smallest unit of social, political, and economic organization in the Grand Valley and West region. A group of such compounds in the western area, joined together by common fences or stone walls, forms a compound cluster. A large compound cluster or group of compounds forms a hamlet. This definition of a hamlet is admittedly subjective and not definitive.

As previously mentioned in Chapter IV, the Yali live in open clusters of houses, without formally fenced or wall-enclosed interior compounds. Leadership at this level is really about the same in each area, Grand Valley and West and Yali and East, with the most influential man of each compound or cluster being the big man for that group.
In the Yali area, Koch (1967:45) defines a ward as a cluster of houses consisting of a large men's house (jouëi sòumô) with a scatter of smaller family houses (homea) built in its vicinity. Two or more wards compose what I am defining as a Yali (or Una or Kimyal) hamlet. It is pointed out that what I refer to as a hamlet in both the Grand Valley and West and the Yali and East regions might be thought of and referred to by some researchers as "villages".

Compounds, compound clusters, and hamlets in the west and house clusters (wards) and hamlets in the east are composed of several or more often extended polygynous families or parts of families. Sometimes a visitor (for whatever reason), a cripple, or a person who is gebu will live away from his/her nuclear family in another compound or house cluster. It is not uncommon, for example, for a young male adult who is feeling family "stress" to move from one compound (Grand Valley and West) or house cluster (Yali and East) to another to stay with an uncle.

Compounds in the Grand Valley and West range in population from a minimum of one nuclear family (two-seven people) up to a maximum population of about 44. In the Yali and East, the population range within house clusters is about the same. Populations in hamlets in both areas appear to range from about 50 to 250.

It is within the individual compounds of the western area and the house clusters (wards) that comprise geographically separated habitation groups in the eastern area that most activities involving the uses of symbolic stones take place. In compound (western area) and house cluster (eastern area) courtyards and their adjoining structures, weddings, funerals, and curing ceremonies take place. For the larger funeral ceremonies as many as 200-400 people fill a courtyard. Select men's houses in some compounds of the Grand Valley and West and the jouëi sòumô ("big men's house" or usa-évaam, "sacred house") in the Yali and East house clusters (wards) are the specified repositories for both profane and sacred symbolic stones. Within these houses empowerment and renewal rituals for the sacred stones are performed. Appropriate stones that are maintained in these houses are moved with proper protocol to be used in bridewealth, funeral, and some curing rituals, which are held within the compound and house cluster courtyards. The attendance and interaction of most of the people involved in these rituals come not just from the individual compounds or house clusters where the functions take place, but from a larger area or group of compounds and house clusters within which the people are in routine social interaction (usually within a single confederation).

Sometimes certain designated big men will have special sacred houses or villages apart from the normal communal dwelling compounds, where the sacred stones are empowered, maintained, used in ritual, and worshipped.

Within groups of compounds (in the west) or groups of clusters of houses (in the east) that are socially related by virtue of being in geographic proximity and within the same confederation ("district"
within the Yali and East), various important men’s groups are formed. These include, within the Grand Valley, but not much further westward and not at all to the east, the watchtower groups which build and maintain the watchtowers from which men of each group keep lookout across no-man’s-land for attack from known enemies (Chapter IV); the men’s groups that maintain the sacred stones for their members; and the mogat ai groups which construct and maintain, at least in the Grand Valley and West, the Highlanders’ memorial “cemeteries” (Chapter III).

**Profane Display-Exchange Stones**

Although throughout the Highland area, there are numerous stones of many shapes and sizes with instilled supernatural power, which are sacred, there is one style of profane stone which stands out above all other symbolic stones for economic and profane social importance. These stones are called *je* (stone wealth) display-exchange stones by their Dani users (Figures 260 and 261). They are profane or *weligat*. The Western Dani in the Konda Valley call this same profane display-exchange stone *jao*. In the Yali and East region, it is known as *sie* or *siengga*. Other stones of this same style have been selected by their owners to be instilled with supernatural power through ritual and are sacred (*wusa*, alt. *wesa*). The latter stones are secretly maintained by the men and stored in their *ganekhe* cabinets never to be seen by the uninitiated.

Regardless of the ultimate designations (*je*, profane or *wusa*, sacred) by the users, the manufacturers of these stones call them all *je*, profane, because as such they can be openly handled, traded, and seen by the uninitiated. It is up to each user within his own belief system to select those that he wants to use for sacred (*wusa*) purposes.

Along with pigs, *jerak* (long, narrow woven bands adorned with single or more rows of cowrie shells), large stone axe blades, both utilitarian carrying and strapless ceremonial woven nets, and loose cowrie shells (*jera* or *jera*), the *je* are among the most important wealth items (Figures 262 and 263). Within most, if not all, of the language speaking groups within the study area, they are necessities for marriage and funeral presentations and important as usual parts of war indemnity payments. In fact, in the Grand Valley, informants say that a war cannot be stopped without the payment of large numbers of *je*. The exchange of ownership by public display and presentation of the *je* (and other wealth items) not only fuels the economy by the repayment of debts and the establishment of new obligations, but it appeases the ghosts and the ancestral and other spirits in the unseen world that are observing and listening to the proceedings. The many formal displays of these stone items of wealth before distribution also establish social prestige—when both humans and ghosts/spirits are alerted to the donor’s identification by loud pronouncements by ceremonial leaders. It is the presentation of pigs and the exchange of *je* stones (*sie*, alt. *siengga* in the
Figure 260. Three decorated Yeineri-sourced display-exchange stones (je).
Figure 261. A man on Sekan Ridge with a 77.5 cm long *pibit pibit* exchange stone.
Figure 262. A funeral display-exchange band (*jerak*).
Figure 263. An open strapless ceremonial net.
Yali and East) at marriage and funeral rites and for indemnity payments that fashions the continual circulation of wealth items within most of the research area.

**Structure, Dimensions, and Nomenclature**

The normal style and most commonly used *je* are ground and polished, flat to nearly flat, elongate-rectangular or elongate oval in plan view shape, and thin with approximate uniform thickness throughout each stone (Figure 264). The ends and side edges are often ground rounded and one end sometimes sharpened similarly to the cutting edge of an axe or adze blade. From a collection of ten of these normal style *je* and field measurements of 28 others, it was found that absolute lengths vary from 19.5-89.5 cm, maximum widths per stone from 6.0-14 cm, and maximum thicknesses per blade from 0.9-2.0 cm (Table 6). The longest *je* type stone found in my research belonged to the powerful *gain* Gutelu in the Grand Valley. It is 121 cm long. This stone is discussed in Chapter VII as a sacred object. A flat type *je* that is less than about 40 cm in length is generally referred to as *je holi* by the Grand Valley Dani. Although the shorter stones are of less value for exchange, it is from among them that certain stones are more often selected to be instilled with supernatural power and made sacred than from the longer stones. All Highlanders in The Grand Valley and West admire and favor the longer flat type *je* for the funeral display and display-exchange stones, as well as for war indemnity payments. While reading this manuscript, D. Gentry Steele made the observation that "possibly the longer *je* are too economically important to transfer to the sacred world?"

When slightly curved, rather than being flat in longitudinal dimension, the concave surface, according to Heider (1970:288) is the front and is called *elokhegen* (cheekbone or face) and the convex or back side is called *apolikhe*. Each side edge is called *elak*. The narrow end is called *uguloak*, head or skull, and the broader end is called *alokhe*, anus. Numerous informants maintain that this physiological terminology does not indicate that the stones are anthropomorphic but that this vocabulary merely gives the users a common reference language with which they can communicate about the stones.

In addition to the common flat type *je* display-exchange stone, there is another kind of *je*, called the *je puluen* or just *puluen* (Figures 265, 266, and 267). It is less numerous than the flat type display-exchange stones within the cultural exchange system and is rarely seen displayed at funeral or indemnity payments. The *puluen*, instead, has a very special use in association with the sacred stones, (which use is discussed in Chapter VII). The *puluen* is on average much shorter and narrower than the flat type *je* and is rounded in cross section. The nine *puluen* that I have been able to measure vary in length from 30-53 cm, maximum width per stone from 5.3-5.8 cm, and thicknesses from 2.3-3.2 cm. The dimensions of seven of these nine *puluen* are presented in Table 7.
Figure 264. One undecorated and one decorated display-exchange stone.
Table 6. Flat Style Display-Exchange Stones (/e) in the Irian Jaya Highlands.

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Note: Measurements in cm.
Figure 265. Three representative *puluen*. 
Figure 266. View drawings of *puluen* shown in Figure 265.
Figure 267. A big man at Pugima displays a sacred *puluen*.
Table 7. Display-Exchange Stones (*je puluen*) in the Irian Jaya Highlands.

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*Note: Measurements in cm.*

The most unusual *je* that I have seen in all of the Irian Jaya Highlands is one that was brought to me for trade at a small compound in the northern Grand Valley. It is a long, tubular shaped stone (71 cm long by 13 cm mean circumference) (Figure 268). The owner of the stone could not give me any information about the stone so I carried it to trusted informants to learn what they might know about it. All, including Wali of the mid Grand Valley Dani, recognized the stone immediately as a *je omaken* (root *je*). One end has been ground to a rough sharp edge. This *je omaken* is variable dark green, with a bluish cast in spots and looks like rock from the same sequence as the typical good-quality Yeineri Quarry axe and adze blades discussed in Chapter V. This observation was confirmed by a comparison of mineralogical work done on the *je omaken* courtesy of T. T. Teih (mineralogist, Texas A&M University) and the mineralogical work done on samples of Yeineri quarry stone and adze/axe blades and symbolic stones from within the Grand Valley and West region by the University of Colorado group (Chapter V). All of the informants to whom I showed the *je omaken* would have liked to have owned it. It must have been a prized article to its indigenous owner or owners. Wali himself said that although he had never seen one in his lifetime, he had heard of such. He ventured that perhaps two or more of the most influential big men among the Grand Valley Dani and Western Dani may have owned one. Wali thought that perhaps Gutelu had owned a *je oaken*. When I inventoried Gutelu’s belongings at Jiwicka in both 1991 and 1992, I did not see one, nor did Gutelu’s sons make any mention of such an unusual stone; although they acted rather guarded when
Figure 268. A rare *je omaken* next to a flat style (*je*).
I questioned them. We can safely presume that such a stone is indeed a cultural rarity and that in former times the ownership of a je omaken would have only been by the most wealthy and powerful of big men.

Sources, Colors, and Lithologies

The normal flat style display-exchange stones (je, Grand Valley and West; sie and siengga. Yali and East) were manufactured primarily at the Yeineri quarry complex, a much smaller number at the Tagime quarries, and possibly some few from sources of opportunity (Figure 2). None were made at the Langda or Sela quarries. Just as the adze, axe, knife, and chisel tools that came from the Yeineri quarry area vary in color from green, dark green, blue, variegated green and blue, so do most of the flat display-exchange stones. They come from the same ophiolite-melange belt at Yeineri as the profane tool blades. Lithologically, these exchange stones are composed of blue schist, epidote amphibolite; amphibole schist; epidote chlorite schist; and light green, gray, and black slate. Specks of gold colored pyrite are sometimes present on the polished exchange stone surfaces. Some fewer of the flat display-exchange stones that are used across the entire research area are composed of a micaceous schist which also comes from the same source quarries. These stones are a silvery-gray color from the micaceous minerals in the schist. The puluen je or just puluen, as they are usually referred to, consist of a hard dark green to blue-green amphibolite rock that is also produced at Yeineri. All of the display-exchange stones produced at the Tagime quarries are a gray-to-black meta-argillite.

Some display-exchange stones (je) in the Grand Valley have traces of red paint (pulverized hematite or red clay) on them, called bimut (alt. pimut). Informants in the Grand Valley generally profess ignorance of the origin or meaning of the red paint, which indicates that its use has sacred (wusa) connotations. Two informants, one a north Grand Valley Dani and one a Western Dani, did say, however, that a red stripe is put on a display-exchange stone which is then used by the director of each funeral to announce the forthcoming second stage of the funeral, usually four to six weeks after the first stage. This conforms with a report by Heider of the same use of a red stripe on display-exchange stones in the Dugum Dani neighborhood. Remnants of such a stripe could account for the barely visible traces of red seen on a small percentage of the display-exchange stones present in the Grand Valley and West. A Yali, and then a year later, an Una informant told me that in their areas, once a red stripe is put down the back of a stone it becomes sacred. The uses of red, white, and black paint on sacred symbolic stones in the Yali and East region will be discussed in the forthcoming section on sacred stones.

Within the Yali and East region the profane display-exchange stone (sie, alt. siengga) users either knew that the stones came from the Dani to the west or the sources for specific stones were explained by myths which told of locales of nearby source as places mythically divine, or just specific spots of magical happenstance in "the forest," where a traveller or worker would "just find the finished stones." These Yali
who lived near the Yali-Dani language boundary knew with certainty, however, that both the flat display-exchange stones and the *je puluen* came from the Dani and not from sources of opportunity or defined magical spots within their own areas. Koch, working with the Yali in the Angguruk area (Figure 2) says that, "Polished flat, oblongated stones, known as *sie* and traded from Hôvôlama, have no utilitarian use but rather represent valuables chiefly transferred as marriage and death considerations" (1967:115-116). The border between the Yali people and the Dani to the west is known in central Yali dialect as *Hôvôlama* and the people (Dani) to the west as *hôvôla-énap*. Koch, during his work in this central Yali area in the early mid-1960s, discovered what I reaffirmed with field work in the 1980s and early 1990s, that the display-exchange stones used in at least this part of the Yali area were traded in from the *hôvôla-énap* (Dani) area to the west. In contrast, I found that the Yali tool blades (adze blades and stone knives) came from the Langda-Sela quarry belt to the southeast.

**Decorations**

Some of the display-exchange stones are unadorned or naked, but most are decorated with various objects tied around the stone's approximate mid-section (Figures 269, 270, and 271). One or several handcrafted small objects and pieces of different kinds of material constitute the adornment. In mid Grand Valley terminology the decorations on the display-exchange stones are called *etani*. Female skirt attire is a common motif, with some stones wrapped with bands varying from 3.5 to 6.0 cm in width of braided, brightly colored reddish-brown and/or yellow orchid fiber cording to replicate the mid Grand Valley Dani brief wedding skirt (*jogal*). Both the *sali* (alt. *gem dadli*) skirt made of flattened reeds and the fiber string skirts, so common on young girls scattered over broad areas and also worn by adult women in many areas are also much used. Miniature bark strand cloth skirts of two kinds, that are indicative of female attire in yet other areas, are often wrapped onto the display-exchange stones. Often both the miniature *jogal*, symbolic for adult married women in one area, and one or two other kinds of symbolic female skirts are wrapped onto the same stone. Some stones even have three kinds of miniature skirts wrapped onto them, in addition to a few brightly colored feathers and bits of fur. Fur pieces from the cuscus marsupial seem to be most preferred; although often bits of fur from either the tree kangaroo, tree rat, or ground living rodents are used. One or a few feathers, often from the parrot, are quite common. Even dried whole skins and heads of small red birds are used (Figures 272, 273, and 274).

Rarely seen ornamentation on the profane display-exchange stone are boar tusks, pig tails, and the unusual appearing, tiny stick studded cocoon of the case moth called *pumpalep*. These decorations are, however, commonly present on the sacred stones (*ganekhe* in Dani, *owili* in Yali). Some Dani and Western Dani informants have even said that pieces of *jerak* (woven band decorated with cowrie shells), pig tails, boar tusks, and cocoons cannot be used on the profane display-exchange stones (*je*), but that those
Figure 269. Two black unadorned Tagime exchange stones at two locations.
Figure 270. Three undorned exchange stones.
Figure 271. Three decorated Yeineri exchange stones from the Grand Valley.
Figure 272. An adorned green, *pibit pibit* Yeineri-sourced exchange stone.
Figure 273. The detail of decoration on the stone in Figure 272.
Figure 274. Three dimensional views of stone in Figures 272-273.
items are reserved for the sacred stones.

In my experience, almost always when feathers, bits of fur, and/or boar tusks, pig tails and cocoons are used as either profane display-exchange stone or sacred stone (*genekh*) decorations, they are included with one or more symbolic female skirts. It was and is always easy when looking at a stone so attired, with obvious miniature symbolic replicas of female skirts, and often with splashes of color and "softness" added with bright bird feathers and bits of fur, to imagine a female anthropomorphic stone. Heider (1970:289), reports that:

> the terms for size, parts, and decorations of the exchange stones indicate an elaborate anthropomorphic symbolism. There are minor inconsistencies in the fact that it is especially the larger, or male, stones, which 'wear' the decorations, made of female skirt material. And, of course, a Dani female wears either a *jogal* skirt or a *dadli* skirt, while the exchange stones often have both.

This apparent inconsistency is no inconsistency at all. It is just that the interpretation is wrong. All of the objects used to decorate the stones are individually symbolic in themselves, and taken in entirety as a decoration bundle, the items are representative of many of the facets of the Highlanders' life. According to informants, however, individually, or in their normal decorative group associations, the items do not identify the stones as being male or female. The attractive bands of orchid fiber cording and miniature skirts are symbolic for females, both adults and children. The feathers and fur are symbols representing men, used routinely and continuously by men to adorn themselves in their quest to be beautiful and to emulate birds—from the "bird-snake" theme, Chapter IV. The boar tusks and pig tails are also male symbols, indicating the people's closeness to pigs, the most valuable wealth item in the Highlands and of invaluable importance in ceremonial life. The unusual stick studded cocoon (*pumpalep*) of the case moth represents magical beings of the unseen world. As it has been explained to me by informants scattered throughout different parts of the Highlands, there are no "female" and "male" display-exchange stones, just stones.

It was Pua who became known to anthropologists from the film *Dead Birds* (Gardner 1963) and the book *Gardens of War* (Gardner and Heider 1969), who explained it to me this way, several years before he died in 1993. Pua said that there are no male and female stones as far as he knows. But, yes, the decorations put on the stones are symbolic, each and every one of them. They are put on the stones for different reasons, none of which are to identify a stone as being male or female. According to Pua:

> for example, the stones are often used as 'bridal gifts.' In such a case a thoughtful donor might decorate the stone with a *jogal* to indicate the transition of the bride from an unmarried virgin to a married adult woman. *A sali* (alt. *dadli*) skirt might or might not be added to represent memories of the new bride from times before she was married. At a funeral the female symbolic skirts might be added to *je* stones to visually show the ghosts and spirits that the women are also paying respect to those beings of the unseen world—not just the men. This message reportedly furnishes some degree of protection against malevolent ghosts and spirits
for those women closely related to the giver of the stone. Fur and feathers are symbolic of the men involved. These are favorite items of adornment used by men. When a man adds feathers, especially parrot feathers, to the stone and bits of fur, he is really symbolizing mementoes of himself on the stone (or loved ones who are close to him), rather than dressing the stone as a man. Boar tusks and pig tails are considered male items and are sometimes used as mementoes of ceremonial occasions or to alert the ghosts that the pigs are being duly considered and cared for. The cocoons stand for the ghosts and spirits. For me, I use some things which are just reminders or mementoes of people I care for or of ceremonial occasions. I like to dress a stone for all of these reasons but I guess I think of the items mostly as mementoes.

Other informants scattered throughout the study area have confirmed essentially the same story: although there are those few who say that an undored display-exchange stone is a male, and that a decorated stone is female, regardless of the kinds of decorations or sizes of the stones. A Kimyal man from near Sela in the Yali and East region told me in 1991 that the female attire is symbolic of women, the feathers and fur of men, but that none indicates nor designates the sex of an individual stone: "They are just decorations on the stone." Unedited excerpts from my field notes taken through the years from indigenous informants while I was observing display-exchange stones in traditional uses and questioning the meaning of decorative objects follows:

fur (this one from a ground rat) is for health of man... sāli -- a girl’s skirt is symbolic for young girls, may they be healthy and strong... feathers for young boys to be healthy and become adults... wrapped jë with orchid fiber cording to represent woman and because jë is given as a bridal gift... sāli, little girls’ skirts before they marry when they are virgins and for their health... cus cus fur bits--as a man decorates himself so he decorates a jë... parrot feathers are for adornment--same as fur; these are for men’s adornment--so also adorn jë.

Winoco, one of the indigenous translators and helpers on my annual excursions to the Highlands has heard me ask the same questions over and over again about the sex of the stones and the meaning of the decorative objects. He always shakes his head and says that his parents never told him anything about a female and male jë stone. He says that he assumed that they were just stones.

Value

Within the Grand Valley, the geographic center and most densely populated area within the confines of the research area, I found correlative with the high population, the greatest numbers of symbolic stones. I found general agreement that: 1) the longest display-exchange stone is the most valuable, 2) width is less important, 3) there are definite color and rock type preferences, 4) adornment does not enhance the value of individual stones for trading purposes, and 5) sometimes the most value can be derived by trading more than one display-exchange stone at a time or by combining an display-exchange stone with some other wealth item. The people of the Grand Valley use and like light green (pibit pibit), green-dark green, blue, and black stones. Most of the people who were interviewed in the Grand Valley preferred the Yeineri sourced stones over the Tagime. Some informants could enumerate from seven to 19 different
kinds of stones, taking into account length, shape, color, and lithologic aesthetics. Few could agree with others on many of their own named types of stones, with the exception that they all knew a *pibit pibit* (light green, slate-like rock from Yeineri), those that they classified as short stones (less than about 40 cm in length), and the distinctly shaped *puluen*, with its characteristic dark green-blue color and rock type. Wali and many in the mid Grand Valley favor the green *pibit pibit*. Wali pointed out that before trading for a stone he always checked its midpoint area carefully for hairline cracks which might be points of weakness.

Although the profane display-exchange stones (*je* and *jao* in the Grand Valley and West and *sie* and *siengga* in the Yali and East regions) are traded for quite a variety of items throughout the entire network of different language speaking groups within the research area (to be discussed in Chapter VII), the common denominator for their value and all other material goods throughout the entire Irian Jaya Highlands is pigs. In the Grand Valley and West area, a very large display-exchange stone, more than about 70 cm in length, might be worth a large pig. One medium size stone is equivalent in value to a medium size pig. Five assorted stones of varying individual quality might be worth five pigs of assorted sizes or three big pigs. These values are, of course, general and subjective, with significant variables of each stone and each pig (age; sex; size; health; and when female, pregnant or not) that can effect any one exchange, but it does give an idea of the general value of a *je* in the Grand Valley and West region. The approximate same values seem to prevail throughout the Yali and East region. The last time I saw Wali in 1992, he was carrying a beautiful three meter long *jerak* (woven band decorated with cowrie shells) in a net bag and the helper accompanying him, a display-exchange stone, travelling on their way to Pugima where Wali said he had negotiated a trade of his two wealth items for a pig and some Indonesian rupiah, which he badly wanted.

**Uses**

The profane display-exchange stone (*je* or *jao*, Grand Valley and West; *sie* or *siengga*, Yali and East) is the most visible symbolic stone with many uses:

1. Funeral display and payments
2. War indemnity payments
3. Marriage wealth transfer
4. Stone of value for trading purposes
5. Profane source from which to select sacred symbolic stones.

Since the profane display-exchange stones lack the secret nature of the sacred stones (*ganekte*, Grand Valley and West; *owili*, Yali and East) they are stored in easy view, leaning up against the interior circular wall of the men’s house. Except when being ritually displayed, exchanged, or personally examined, the
display-exchange stones are almost always neatly wrapped in *gisakpel*, the dried outer bark of the banana tree (Figure 275). When going to ceremonials where the display-exchange stones will be used or just somewhere for trading purposes, women sometimes carry the stones, just another indication that they are handled like other profane objects. Some men maintain that the display-exchange stones cannot be traded outside of affinal groups and that they are reserved only for ritual use.

**Funeral Display and Payments.** In the Grand Valley and West, a series of four funeral rituals that extend over a period of three to five years is initiated by the death of a person. The first stage of the funeral is held one to two days after death. The body is cremated at a ceremony where pigs are ritually killed and eaten and grief is dramatically expressed by loud wailing and other ritual acts, to both purge personal sorrow and to placate ghosts and spirits. In the Grand Valley and certain bordering areas, joints of fingers are amputated and small pieces of ears sliced off to purge grief and express sorrow, as well as to placate ghosts and spirits by showing this degree of sacrifice on their behalf. Finger amputation is not practiced within the Yali and East area. Although all funerals within the Highlands area are similar, there is considerable variation in the ordering of events. Everywhere, however, ritual display and exchange of wealth items take place and the use of the display-exchange stones is manifest.

As Heider says, "The funerals of very important people differ from those of unimportant people chiefly in size, as measured by numbers of mourners at the cremation, number of pigs slaughtered, and number of valuable exchange goods brought into circulation" (1970:147). The second stage of the funeral process is, like the first, held for individual deaths and takes place within a month or so after death. The *je wakanin*, or third stage, is held every year or two, involving one or more confederations, and is for all of the deaths occurring within the larger area. The *ebe akho* pig feast, as previously mentioned, takes place every three to five years and, in addition to being the time for marriages and the boys *watija* initiation ceremonies, is the final funeral rite within the alliance for all deaths since the last *ebe akho*.

At the first stage of a funeral, the display and passing out of the display-exchange stones, ceremonial nets, and cowrie shell bands may be delayed a day or two to allow donors time to accumulate necessary items. A death often prompts a flurry of rapid borrowing and trading of items of wealth such as the display-exchange stones, so that a donor will have what is needed. At the appropriate time in the funeral ritual, the big man in charge prompts the laying out of the funeral bundles with their display-exchange stones. There is a sudden rush of activity of men laying out their items in just the right way. Individual funeral bundles called *jatele* in mid Grand Valley Dani dialect consist of strapless ceremonial nets (*tegetagi su*), funeral display-exchange stones (*je*), and cowrie shell bands (*jerak*). First, fresh banana leaves and/or grass are laid out at the designated spot within the compound, then, on top of these are laid the *tegetagi su*, neatly folded, followed by the display-exchange stones (*je*), and then on top of them the long *jerak* (woven string bands decorated with cowrie shells) (Figure 262). Later during the funeral ritual,
Figure 275. Five exchange stones (je) awarded to Siba at Pua’s funeral.
these wealth items will be distributed to deserving people. It is customary for some of the display-exchange stones to be assigned to men who donated pigs for use at the funeral.

At a small funeral, where a child of a common man or an unimportant adult has died, the funeral bundle may be small, with practically no objects, and perhaps, no display-exchange stone at all. Conversely, for a very influential big man or admired warrior killed in battle, a compound may be nearly filled with funeral bundles, all laid out in long rows.

Individual display-exchange stones are identified as to their importance by their length and position on the funeral bundle (Figure 276). In the Grand Valley and West, the longest, and therefore the most important, is/are laid out in the center. If there is one that is distinctly longer than the others it is called (mid Grand Valley Dani dialect) je oak (je bone). If there are more than one je distinctly longer than the others, and about the same length, they are all called je oak. Those slightly shorter and laid out to the sides of the je oak are called je aie (je leg). The small ones are laid out at the ends of the net piles and are called ogosi.

Informants in both the Angguruk-Pasikni and Pass Valley locales within the Yali and East region state that the Yali prefer a different configuration of their funeral display-exchange stones than that elucidated above for the Grand Valley and West. The northern Yali dialect speakers call the je display-exchange stones, sie; the jerak cowrie shell bands, sulanggen; and the tegetagl su ceremonial nets, sum. On each pile of ceremonial nets, the Yali feel that it is desirable to lay out seven display-exchange stones (sie) in a configuration that to them is symbolic of an entire human figure (Figure 276). On the center of the bundle and perpendicular to the long dimension of the underlying folded nets, a “second longest” stone called an ilinggo (for the heart) is positioned. The ilinggo is flanked on both sides by the “third longest” stones called inggik (for the shoulder and arms). To the outside of the inggik are placed the “longest” sie of each bundle, called iok (for the legs, including the feet), and finally on the outer edges of the display the shortest sie, called the aho (for the leg between the knee and the thigh). Next, numerous small display-exchange stones, about 22 cm in length are set at each end of the bundle, next to the aho, before the sulanggen cowrie shell bands are laid across the top. It is argued by some Yali informants in the Pass Valley area that the ilinggo is the longest sie stone in a presentation bundle, rather than the iok (Figure 276). I could get agreement among most Yali informants (using forearm, hand, and fingers as measuring devices) that the long ilinggo and iok stones vary from about 45 to 65 cm in length, with rarely one being longer than about 65 cm. A minority of Yali informants state that all of the sie in a presentation bundle except the aho, are painted with red stripes and polished with special leaves before a presentation is made. I never had the opportunity to observe a Yali presentation.

To put the numbers and sizes of display-exchange stones presented at Grand Valley funerals into ethnoarchaeological perspective I will cite four examples; first a general statement about the funeral of
Grand Valley Dani je presentation configuration

Ogosi   Aie   Oak   Aie   Ogosi

Two Yali sie presentation configurations

a. Aho   Iok   Inggik   Ilinggo   Inggik   Iok   Aho

b. Longest

Figure 276. Funeral exchange stone display configurations.
Gutelu (alts. Kutelu, Kurulu), one of the most influential big men (leaders) who is historically known in the Irian Jaya Highlands: second, the funeral for Obaharak (alt. Obagatok), a big man of lesser influence but still one of the more influential leaders in the Grand Valley in recent times (Heider 1970:119; Sargent 1974); the funeral of Jagik, a lesser known leader, who died some time ago and was cited by Heider (1970:151); and, finally, the funeral of Pua, which is of interest and importance because of the longitudinal information on Pua of anthropological fame as the young boy swineherd in Gardner's film *Dead Birds* (1963) and the book *Gardens of War* (Gardner and Heider 1969).

When the powerful alliance big man Gutelu died in 1990, his family knew him as Iluagimo P. Gutelu Mabel. Gutelu had "converted to Christianity (Catholicism)." The "P" in his name stands for his Christian name of Petros, after the disciple Peter. Daoke Mabel, Gutelu’s oldest son, showed me photographs taken at the funeral in Gutelu’s home compound in Jiwikia. The main courtyard was filled with three rows of funeral bundles with five display-exchange stones (je) per bundle. Daoke said that there were a total of 400 display-exchange stones displayed. Since, even in historic times, there were other big men in and around the Grand Valley, with as much and possibly even more influence than Gutelu. I would presume that at some big men’s funerals more than 400 display-exchange stones may have been involved. Daoke Mabel says that in the mid Grand Valley area around Jiwikia, for marriage displays and payments only three display-exchange stones per bundle are required, rather than the five that I have normally seen and which were used, as described above, at Gutelu’s funeral.

At the time of Obaharak’s death, he and Wali were each other’s father-in-law and each other’s son-in-law. Some years ago, they had previously each married a daughter of the other one in a move to formally cease hostilities between their two warring factions and to cement mutual support for social activities and political maneuvering. Obaharak died on December 2, 1992. Obaharak’s funeral was held at his residence compound of Pabuma on December third, the day after his death. The following information was derived from my interview with Obaharak’s oldest son, Akabuga; Obaharak’s youngest brother, Huliak; and Akabuga’s uncle, Ananias (Akabuga’s mother’s brother) on March 28, 30, 31, 1993. At Obaharak’s funeral there were ten funeral bundles (jetalek) presented. Nine of the jetalek were comprised of ten ceremonial nets (tegetagi su), five display-exchange stones (je), and one cowrie shell decorated band (jerak). One jetalek consisted of 20 tegetagi su, five je, and one jerak. Upon Obaharak’s death, Akabuga immediately became the big man, replacing his father as the man of influence, but by his own admission a man of lesser influence than Wali. Akabuga received one of the jetalek bundles at the funeral and distributed the rest of the wealth items from the other bundles. Reportedly, the longest stone of the jetalek bundle which went to Akabuga was laid out at the funeral as a je aie as shown in Table 8 (not as the je oak, longest je in the bundle by common usage, and as shown in the configuration of the same stones in the photograph in Figure 277).
Figure 277. The five je awarded to Akabuga at Obaharok’s funeral.
The reason for this was unexplained to me but well understood by Akabuga and his family. The laying out of a proper funeral bundle (jetelek) is complicated and takes the skill and experience of the indigenous inhabitants in each sub-cultural area within the study area to be able to effect an acceptable presentation. For each funeral bundle, which consists of tegetagi su, je, and jerak, there is a fundamental formula that is somewhat subjective but which still must be properly invoked in building the bundle before even contemplating the difficult-to-understand aesthetics of the stones, which also has some influence on the ways they are laid out. The formula defines the number of tegetagi su, je, and jerak that are used in any specific presentation. For example, the jetelek shown in Figure 277 and the stones defined with measurements in Table 8, consisted of ten tegetagi su on the bottom, then five je, and on top one jerak. But if the longest je is "very, very" long (longer than the one shown here), then there must be 20 tegetagi su underneath, and two tegetagi su on top of the bundle. The length that a display-exchange stone (je) must be to mandate this requirement is only defined subjectively in terms understood by the "people." If the two end je are too short (again length not defined objectively), then, by social custom, they are not to

Table 8. Flat Style Display-Exchange Stones (je) That Went to Obaharak’s Oldest Son.

<table>
<thead>
<tr>
<th>Functional Name</th>
<th>Length</th>
<th>Width</th>
<th>Color</th>
<th>As would be named at Yeineri Quarry</th>
</tr>
</thead>
<tbody>
<tr>
<td>je ogosi</td>
<td>73.5</td>
<td>14.0</td>
<td>light green</td>
<td>pibit pibit</td>
</tr>
<tr>
<td>je aie</td>
<td>74.0</td>
<td>8.0</td>
<td>very light</td>
<td>pibit pibit</td>
</tr>
<tr>
<td>je oak</td>
<td>79.0</td>
<td>8.0</td>
<td>green</td>
<td>pibit pibit</td>
</tr>
<tr>
<td>je aie</td>
<td>80.0</td>
<td>13.0</td>
<td>green</td>
<td>pibit pibit</td>
</tr>
<tr>
<td>je ogosi</td>
<td>60.0</td>
<td>10.0</td>
<td>dark green</td>
<td>?</td>
</tr>
<tr>
<td>Mean</td>
<td>73.2</td>
<td>10.6</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: Measurements in cm.

be adorned. The symbolic value of such a jetelek, both to please the people in attendance and the ghosts and spirits that are hovering about would be less than when all the stones are adorned. Akabuga and his uncle stated that all of these display-exchange stones were passed down from their ancestors, and that they are maintained the way received—dressed if dressed and naked if naked.
Akabuga and his family, in trying to answer my questions, pointed out that they call the narrow end of each stone *ekat*, the longitudinal sides *adel*, and the wide end *ukat*, but that this nomenclature (in the central-eastern part of the Grand Valley) is not used to describe the stone as a person but just to define various parts of the display-exchange stone as an object for communication purposes. This family reiterated what I had been told by others that there are no male or female stones; that size, shape, and "dressed" or "not dressed" makes no difference.

In this example of a top quality funeral bundle (*jetalek*), four of the five *je* stones are of one kind known to the Yeineri quarrymen as *pibit pibit* and quarried as an item that they feel are favored by the users in the Grand Valley over stones of other colors. Additional information about the *pibit pibit* will be brought out in Chapter VIII under the discussion of rock quarries. The fifth display-exchange stone on this particular *jetalek* is also from the Yeineri quarries, but of a different type.

Heider (1970:151) points out that at the funeral of old Jagik, a former big man, old enmities were removed when several display-exchange stones, carrying nets, strapless ceremonial nets, and shell bands were brought to Jagik’s funeral by people who had done him injury in the past. Those wealth items were presented in the courtyard, along with other funeral bundles, and, as is the custom with all funeral bundles and display-exchange stones, the name of the donor was clearly and loudly shouted over the items for all people, ghosts and spirits present to hear.

Pua, of anthropological fame as previously pointed out, died on February 5, 1993, reportedly of natural causes. Pua’s funeral was held in Suroba with his older brother Siba officiating on February 7, 1993. Of the traditional wealth items, 25 pigs (which were for the ceremony), 90 *tegetagi su* nets, 12 *je* flat style display-exchange stones, one *je puluen* display-exchange stone, four *jerak*, one cymbium shell *mikak*, one nassa shell *walimo* bib, and one cuscus headband were presented and distributed. Siba, Pua’s older brother, received four flat style display-exchange stones (*je*) and one *puluen je* style display-exchange stone from the distribution. I was able to see and photograph all five display-exchange stones in their dried banana bark wrappers, then measure and examine four that Siba removed from their wrappers for this purpose. Siba explained that the fifth stone was received from one of Pua’s uncles, Hubit Marian, with the restriction that neither Siba nor anyone else would touch the stone without permission from the uncle. I suspect that there are traditional *wasu* obligations involved. See Figure 274 for a composite of photographs of all five of the exchange stones in their dried banana bark wrappers: Siba holding the *pibit pibit je oak* (Table 9) (not true green color in the photograph due to many pig fat rubbings and dirt); Siba holding the *puluen*; and the ghost house directly behind Siba’s house and in front of a small thatch roofed house that contains the ashes and bone remnants from Pua’s cremation.

Siba showed me how the five stones were laid out for display on the funeral bundle (Table 9). In the context of funeral display nomenclature, the two longer stones were centered and classified as *je oak*,
the two stones on either side of the centered je oak as je aie. The shortest stone, set to one side of a je aie, was considered an ogosi in the context of the funeral bundle presentation but a je puluen in the area-wide symbolic stone classification based on stone structure. Siba was delighted that the ogosi was a je puluen. He told me that as soon as he saw it he started planning to empower it through ritual as a special stone to replace a sacred puluen which had disappeared from his ganekhe.

Heider (1970:158) relates that on the day before a funeral resumes (in the Dugum Dani neighborhood) with the second stage (four to six weeks after the first stage), the funeral leader paints a stripe on the sill of the men’s house with red clay and then holding an display-exchange stone on which he has also painted a red stripe, stands in the courtyard and shouts "Waloto weto" (come bring pigs). The word is spread by courier and word of mouth. The second stage is a one-three day ritual in which pigs are killed and eaten. Ritual acts are performed, and the grief over the loss of a loved one or friend is continued to be expressed and purged. Heider feels that this second stage, like the first, has the explicit function of placating the ghost of the deceased (1970:158). Although he points out (1970:158) that this is also the time that mourning clay is removed. I observed instances where this was not true and those in mourning would tell

<table>
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<tr>
<th>Functional Name</th>
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<tr>
<td>je aie</td>
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<td>je oak</td>
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<td>je ate</td>
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<td>je ogosi</td>
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<td>Yeineri puluen</td>
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<td>Mean</td>
<td>72.5</td>
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*Note: Measurements in cm.*

me that they would continue to stay in mourning and wear clay until they personally felt that the ghosts had been properly placated and that they also were feeling prepared for personal renewal. Only in rare instances could I find that display-exchange stones were displayed at this stage of the funeral, other than the use of a single stone to announce the "call" for commencement of the ceremony.
The third stage of a funeral takes on a different complexion. The purposes of the first two stages are to purge the grief of those “close” to a single deceased and to placate the ghost of the dead person and ghosts in general. The third stage recognizes all of the deceased within one or more confederations since the last large alliance-wide funeral ceremony was held. The third stage is held about once every year or two. Its cyclic period commences with the alliance-wide funeral ritual which is held as one of the numerous ceremonies that are a part of the alliance-wide ebe akho, held every three to five years. This third stage is the je wakanin—the carrying of the je display-exchange stones.

Preceding commencement of the je wakanin announcements are sent far and wide, even to people outside the alliance who had responsibility for local funerals during the period of time involved. Then for several days there is much coming and going between compounds as display-exchange stones, ceremonial nets, and cowrie shell bands are carried from compound to compound and collected into funeral bundles, one for each funeral, by the men who were responsible for those funerals. The exchange of goods is extensive. Heider (1970:160) feels that the exchange may be even more extensive than at the funerals themselves and that the goods distributed at the earlier stages of the funeral ceremonies were to assure that goods be brought to this stage.

Although the ceremony starts in individual, scattered compounds with the gathering of the wealth items, the people ultimately converge in groups on a designated compound of an influential ceremonial leader within the confederation in which the ceremony is being held. Men, women, and children carry the ceremonial nets, the cowrie shell bands, and the je display-exchange stones to the designated compound. This is the je wakanin—the carrying of the je display-exchange stones.

As the groups move into the compound of the ceremonial leader, the women’s nets containing wealth items are placed in the area that will later be used for display. The women leave the courtyard and gather in the women’s houses and communal cook houses to watch the proceedings.

In one such ceremony that Heider observed (1970:161), each bundle of ceremonial nets was neatly folded and then each laid out in a line along the long axis of the courtyard. The display-exchange stones, three to seven to a bundle were then properly formatted on each pile of nets. In one line there were about 25 piles of nets, with about 108 display-exchange stones. In the shorter line about 12 piles of nets with 59 display-exchange stones. Then, one by one, cowrie shell bands were carried carefully from the men’s house to the lower compound, and laid on the long lines of nets and stones. Heider reports a few moments of hushed silence while the ceremonial leader walked the lines and inspected the stones. Then he returned down the line, touching each bundle with foot or hand, while loudly shouting out the name of the dead person it represented. He returned to an upper courtyard and shouted various kin terms, following each with an approving loud “thank you” (wa). (This author’s comments. It was by shouting of the names of the deceased and various kin terms that the ceremonial leader was both assigning the exchange goods to
relatives of the deceased and alerting the ghosts and spirits as to what had transpired.) The atmosphere changed. Men and women swooped down on bundles, packed them up, and returned home. The next day in their own courtyards they again laid out the bundles, with display-exchange stones well exposed, and went through the approximate same ritual of display and exchange before enjoying a meal of steamed vegetables.

For another perspective and example of a je wakanin ceremony in the Grand Valley, the reader is referred to Peters (1975:109-111).

The fourth stage, and ending ritual of the three-five year funeral cycle, is but one ceremony of several that are held in the alliance wide ebe akho in the Grand Valley. Elsewhere in the Irian Jaya Highlands the funeral ritual cycle also covers a time span of about three-five years, but nowhere does the cycle end in a climax of ceremonies that is so important as it is to the Dani in the Grand Valley. As a part of the ebe akho, mass marriages are performed; the important waija moiety boys initiation ceremonies are held; enmities between enemies are sometimes settled (or at least tension relieved); the "ritual killing of many pigs" is enjoyed with food for the attendees; pork is sent to relatives and friends who are outside of the areas of participation; the castration of pigs is highlighted; mock battles are fought for different purposes; new bark string and bark strip necklaces are empowered to protect the wearers from the untimely entrance of ghosts; and to end the funeral cycle, the je display-exchange stones are carried to a compound of importance within the alliance to display both to the people and to the ghosts and spirits of everyone who had died within the alliance since the last ebe akho. There is feasting in memory of people who were killed by the enemy, for people who had died of natural causes, and an "arch ceremony" for the ghosts of all people who had died; truly an important manifestation of ancestral worship as an integral part of the complex Dani belief system.

War Indemnity Payments. After every war in which revenge killings have occurred, indemnification ceremonies are obligatory. In ritual wars, the "owners of the wars" and/or confederacy big men leaders are responsible to make indemnification. I found that generally throughout both the Grand Valley and West region and the Yali and East region that profane display-exchange stones are an important part of these payments to relatives of the dead and even to men who had been wounded but who had recovered. In the primary war indemnification ceremonies, certain rituals are sacred and wusa--these will be addressed in the next section in context with all of the various uses of sacred stones.

Larson, in his work in the Ilaga area, reported in The Structure and Demography of the Cycle of Warfare Among the Ilaga Dani of Irian Jaya that resolution of conflict, after a death balance had been achieved, was accomplished by a series of highly ritualized payments between allies in each alliance (1987:167-169).
The first was called 'distribution of dead birds,' made less than a month after the truce in memory of those killed in battle. War leaders in each alliance simultaneously sponsored a separate feast for their respective allies at which they distributed both the feathered head-pieces and live pigs owned by warriors killed in battle on their side. Those who received were close kinsmen of the "owners" of the war or close allies who also called for battles during which victims fell. They did so with the understanding that they would make an 'axe-pig' (yewam) indemnity payment to the agnates of the victim as soon as they could raise enough pigs to sponsor the payment. The second was made by the same war leaders in each alliance 8 or 9 months after the truce. It was a massive payment called 'paying for the cost of the war' (wim anep yakwi). War leaders slaughtered and distributed more than 70 large, full-grown pigs to individual allied leaders as compensation for wounds their men had suffered during battle. The last and largest were the yewam indemnity payments, made during a 6-18 month period which began about 2 years after the dead birds distribution, at a time when gardens planted since the war had time to mature so pigs could be fattened for payment. . . . The ceremonial yewam payments were intercommunity festive events attended by hundreds, sometimes thousands, of persons decorated with bird plumage and painted with red ochre or blackened pig grease. While many danced or performed mock-battle maneuvers, scores of pigs and much other exchange wealth were presented to the agnates of the deceased who, in turn redistributed the payment to kinsmen to whom they were related as agnates, affines, or cognates [1987:168-169].

At these final payments, pigs, display-exchange stones, and other wealth items were distributed. I quoted Larson at some length to describe in detail the framework for indemnification ceremonials so that the reader can visualize just what is being replicated by numerous esoteric groups scattered throughout the entire research area, during which thousands of pigs, display-exchange stones, and other wealth items must have been kept in circulation just by war indemnity payments alone. Within different Una, Kimyal, and Yali groups I was told that wealth item payments at similar war indemnification ceremonials consisted primarily of pigs, utility nets, display-exchange stones (sie or siengga), cowrie shell bands, and sometimes cakes of salt.

Transfers of Wealth Items at Time of Marriage. Bridewealth transfers (previously called "marriage payments" in dated material) are customary in almost all parts of the Irian Jaya Highlands, although the details of transfer ritual and the kinds and number of items are variable. Pigs, display-exchange stones (je to the Grand Valley Dani and part of the Western Dani, jao to other Western Dani, sie or siengga to the northern Yali, and sie or siengga to the Kimyal and Una), ceremonial nets, bands of cowrie shells, and loose cowrie shells are the wealth items most consistently used for bridewealth transfer throughout the Irian Jaya Highlands. Other items that are customary parts of the transfers in many areas. sometimes used in others, and little or never used in a few areas, include loose cowrie shells (jeraken), utility carrying nets, stone axes and/or large axe blades, adzes and/or adze blades, stone knives, nassa shell bibs, baiier shell necklaces, braided orchid fiber cording, bows and arrows, salt, vegetables, and sometimes services (labor).
In intra-group transfers made both at marriage and at death, display-exchange stones have both symbolic and economic utility. Like pigs, nets, and cowrie shell bands (jerak), they are one of the most universally used wealth items as a part of bridewealth (and headprice) throughout the entire study area. O’Brien (1969:530), working with the Konda Valley Dani near Bokondini (Figure 3), says that from a life cycle perspective "marriage payments are the largest in a series of payments between affines." In a total of 17 marriages taking place in the Konda Valley area between 1960-1962 in which O’Brien felt she could document the total components of "payments," she found that out of a grand total of 318 items used, there were 61 pigs and 64 display-exchange stones (jao) for a mean of 3.6 pigs and 3.8 display-exchange stones that changed hands per marriage.

Farther to the west, working with the Dani, Western Dani, and Damal in the Mulia Area (Figure 3), Hayward (1992:237) found that the groom "drawing upon his own resources and along with the help of his kinsmen" makes the betrothal payment (kwe awu) which consists of four to five pigs, three to four display-exchange stones (je), and 10-11 shell bands. These "payments" are made to the parents of the bride. At the next wam lengganak wakwi ceremony the bride can be skirted (Figures 91 and 92). While the girl is being skirted inside, the girl's father is making the "father's payment" (kwe owak) outside in the courtyard. This "payment" made by a girl's father to all those individuals who had earlier sponsored her mother's own skirting ceremony typically consists of gifts of seven to eight pigs, two to three display-exchange stones (je), and approximately 18-20 shell bands. According to Hayward (1992:239), "the primary purpose of this payment is to express appreciation to the members of the wife's family, via reciprocal gift giving, for their support and investment on behalf of both mother and daughter." A groom's "payment" (kwe onggo) made a few years after a girl's skirting ceremony, to her father and his kinsmen is to reciprocate specifically for the "payment" they made earlier at the girl's skirting ceremony. Such a transfer of goods may or may not include the presentation of display-exchange stones.

Larson (1987) found that similar marriage customs and "payments" prevailed in the Ilaga area, as did I throughout the Grand Valley to the east and the entire Grand Valley and West region during the course of my research.

Throughout the Yali and East, marriages are generally formalized with similar rituals as in the Grand Valley and West. Bridewealth bundles are laid out. Display-exchange stones (sia, alt. siengga) are displayed and presented. Differences include the absence of the "dress-the-bride" ceremony which is held only in those areas in the west where married women wear the orchid fiber corded skirts. Also, in the East, marriages are not put off until the periodic alliance-wide ebe akho ceremony, which is not conducted as such in the east, although their important pig ceremonies do adhere to a ritual cycle. In the central Yali Angguruk area, Koch (1967:61) reports that, "A man will often augment the value of the initial ongkama
(pig) transaction (part of marriage formalization) by adding valuable display-exchange stones (sie), cymbium shell segments, and new nets" (Figure 2).

Big man Morahidek Kombo and several advising Yali elders said that at a wedding, the parents of the bride never ask for a "price." the wealth transfer is decided by the groom’s side. For a wedding the ritual which binds the marriage is called a he ongoo. In a wedding, where the groom is marrying a daughter of an influential big man, the wealth transfer might be approximately 10 ceremonial nets (sum): seven normal size (about 47-64 cm) display-exchange stones (sie), plus numerous small sie (about 22 cm); approximately four cowrie shell bands (sulanggen); and about three nassa shell necklace "bibs" (walimunggen). At the Yali marriage ceremony, the groom's family displays the wealth bundle as described above outside the men's house of the groom's father. The bride-to-be and her family are invited to come view the display. The bride's parents bring he yihiruk, which is one live pig and a pig that has already been killed. The live pig is given to the groom’s parents, who care for it and then later return it to the bride and groom as a symbol to give them a "good start in life." The dead pig is cooked and eaten. Only the bride-to-be and the groom’s family eat the pig. While eating, the family of the bride-to-be examines the wealth bundle. After the meal the bride-to-be’s family picks up the display items and goes home. This wealth bundle transfer is called he ongoo. After the he ongoo, the bride and groom are considered married, and then the bride moves to the husband’s ward (house cluster) and lives in the same hut with the groom’s mother. Prior to the he ongoo it may have taken the groom and his family as long as a year to collect the sie display-exchange stones and other items of wealth for the he ongoo.

Near the eastern part of the Yali and East area, the Una inhabitants also use display-exchange stones as important items of marriage wealth transfers, but among the Una, the Langda-Sela Style adze tool has also become important as a marriage wealth transfer item. I am told by Una informants that at least as many as 30 adzes must be presented to the bride and her family.

**Profane Display-Exchange Stones as Sources from Which to Select Stones for Sacred Uses.** At the quarry sites, the quarrymen only know that they are quarrying the flat display-exchange stone (je) and the elongate ellipsoidal shaped je puluen to be traded as profane stones to user populations. They profess to know little about the ultimate uses of the stones. Perhaps this practice stems from an earlier time when only rock for profane stone tools was quarried, not rock for symbolic stones at all. Today, once in use as a profane display-exchange stone, it is up to the user’s prerogatives to select, from time to time, particularly desirable stones to be converted through ritual to the supernaturally powerful sacred stones. Some Dani and Yali informants say that for use as sacred stones, the profane flat style display-exchange stones must not be too long. The informants agree that this practice was inherited from their ancestors. Strictly from a viewpoint of practicality it would seem rather difficult to store many of the long style display-exchange stones within the confines of the relatively small space of a normal sacred stone storage
cabinet. It is difficult to discern how a profane display-exchange stone is selected at any one time to be converted through ritual into a sacred stone with supernatural power. Some informants say in very hushed voices (so the ghosts will not hear) that the subject is too wusa—too sacred—to be discussed. Others in serious but offhand ways say that they really do not know about selection because their own personal Dani sacred stones (ganekhe) and Yali sacred stones (owili) were handed down from ancestors. Yet others say that their own sacred stones were chosen through experiences of divination. Wali sites one example of how this might be accomplished. First, a male desiring to replace a ganekhe stone, for whatever reason, accumulates all of the je stones that he owns (or has control over) into one place (presumably in the men’s house where his ganekhe is maintained). Then, he just keeps them together until by a divination he is directed to select a particular stone from the collection for transformation into a ganekhe through an empowerment ritual.

Conclusions

After pigs, the profane display-exchange stones (je and jao in the Grand Valley and West region, sie and siengga in the Yali and East region) are the most valuable wealth item in the research area. They are binders of the cultural systems, without which the systems would cease to exist in their present form. The Highlanders’ sociopolitical organization (alliance, confederation, hamlet, and compound in the Grand Valley and West and the district, village [hamlet], and house cluster in the Yali and East) provides the hierarchy and framework within which the stones move. Within most, if not all, of the different language speaking groups within the study area, the display-exchange stones are necessities for marriage and funeral presentations and important as usual parts of war indemnity payments. In the Grand Valley, indigenous informants say that a war cannot be stopped without the payment of large numbers of the stones. The exchange of ownership by public display and presentation of the display-exchange stones not only fuels the economy by the repayment of debts and the establishment of new obligations, but it appeases the ghosts and ancestral and other spirits of the unseen world that are observing and listening to the proceedings. The many formal displays of these stone items of wealth before distribution also establish social prestige—when both humans and ghosts/spirits are alerted to the donor’s identification by loud pronouncements by ceremonial leaders. It is the presentation of sacrificial pigs (Chapter VII) and the exchange of display-exchange stones at marriage and funeral rites and for indemnity payments that fashions the continual circulation of wealth items.

The display-exchange stones are symbols of wealth that are evolved mixed-media expressions of plastic (three-dimensional) art (Graphic and Plastic Art, Chapter IV). These sculptured art pieces consist of both the flat and the tubular types of display-exchange stones. Initially the stones are selected by
quarrymen and shaped and usually ground at quarries, before being traded into the use areas where some are further ground and most decorated with small, natural materials. The fundamental aesthetic qualities of the display-exchange stones derive from their simple form and natural colors—stones of certain structures and colors being more desirable to individuals in one area and stones of slightly different structures and colors being sought by individuals in other areas.

Once acquired, the using owners of display exchange stones usually decorate the mid-parts with bits of fur, one or a few feathers (even dried whole skins and heads of small birds), one or several kinds of miniature symbolic female skirts, and other small objects. All of the objects used to decorate the stones are individually symbolic in themselves and, taken in entirety as a decoration bundle, the items are representative of many facets of the Highlanders' way of life. According to indigenous informants, however, the items of decoration, taken individually, or in their normal decorative group associations, do not identify the stones as being male or female, as suggested by Heider (1970:289).

These works of art, that serve as symbols of wealth and which are meticulously laid out in conformance with rigorous culturally-approved patterns on display "bundles" for viewing before presentation, make powerful social statements to the indigenous users and furnish outside researchers with insights to the peoples' motivation and response to aesthetics.

In addition to their important function as artistically created profane symbols of wealth, some of the display-exchange stones are removed from the secular and instilled with spirit power to become powerful sacred stones—just one of many examples of different types of objects that are hierophanies within the Highlands cultural system (refer to the forthcoming Chapter VII).
CHAPTER VII
SACRED SYMBOLIC STONES AND EMPOWERED STONE TOOLS

The broad range of types of sacred stones in all of their functional simplicity and complexities are in their entirety the most powerful tools that the Highlanders use to deal with the myriad of ghosts and spirits which are omnipresent. It is important to understand all that we can about the detail of function of the sacred stones and other kinds of accompanying material objects within the cultural system in which they exist and the cultural behavior which is prompted by their presence. A reasonable amount of scholarly information is available regarding both the identification and behavior associated with icons (sacred images) and other sacred objects (including idols) that are present worldwide in historical religions but there is a serious gap of information regarding the identification and uses of artifacts made of stone, bone, ivory, clay and wood which are present in the prehistoric record, and which we often perceive to be religious in nature.

As was pointed out in the preceding section, some sacred stones are selected from the broad choice of available flat style je (sie and siengga in the Yali and East) (Figures 278a and 278b) and the elongate, ellipsoidal je puluen profane display-exchange stones, but many are selected from a plethora of other kinds of rocks, produced both by natural processes and by the hand of man. Some supernaturally powerful stones are river tumbled pebbles or small cobbles that may have impressed their original owners by their smoothness, degree of rounding, other unusual shapes, colors, or any combination of the foregoing. Some are ammonite fossils (cephalopod mollusks), molds and casts of their interestingly coiled shells, with lobes and saddles, that would appear as objects of interest and mystery to almost anyone (Figure 279). Natural quartz crystals: some transparent, others translucent are objects that glisten and sparkle—surely entities already with mystic power that must have come from the "other world" and which are to be treated as wusa, with care and caution (Figure 280).

It was and is the unusual, or just a natural stone, that by its aesthetic appeal causes someone to feel that it already might be wusa, or with proper treatment can easily be imbued with supernatural powers, that was/is selected to be a "sacred stone." Perhaps a felt divination prompts a stone owner to make a stone of this type sacred. Certain stone axe, adze, knife, and chisel blades that are unusual to the beholder, in addition to the natural stones, are sometimes made sacred; some because they are archaeological artifacts from a bygone people and had been only rarely or never seen before, others because they had worked their way over long distances from a culture of origin, to a people who rarely or never before had seen that particular type of tool blade or kind of rock.

In addition to all of the above described choices of stone objects, shaped both by geological process and/or by the hand of humankind, certain commonly used stone tools and tool blades, just like some of the
278a. A short flat je-type, typically decorated sacred ancestral stone.
Figure 278b. Stone in Figure 278a and an unusually long sacred power stone.
Figure 279. Sacred ammonite fossils.
Figure 280. Naturally-occurring quartz crystals used as sacred objects.
profane display-exchange stones (*je*, *puluen*, *sie*, or *siengga*) are selected to be transformed into sacred objects. Axe and adze blades, knives, and chisels of common current usage are sometimes selected because it is thought by the owner that the object so selected had performed some task in such a way that it had already expressed an inherent supernatural power. Others make sacred a special memento from a favorite relative, or because there is just something about the aesthetics of the stone that impresses the owner. Sometimes, an event or act involving the stone tool causes the owner to feel that there had been a divination directing the owner to create a sacred object out of that tool. In addition, many, perhaps most, of the sacred stone tools and blades in the *ganekhe* cabinets are inherited objects, already within a collection of sacred *ganekhe* stones, about which the living recipient knows only that the special *wusa* object had come from an ancestor. Within the Una tradition (Figure 2), stone adze blades (Figure 281) and knife heirlooms that are of slightly different lithologies than those used today were converted to sacred stones and maintained in that context, rather than used as profane tools like their ancestors before them had done. It can be seen that there was, and is, always an attractive choice of stones to be converted into sacred objects for use as ancestral spirit stones or as other tools with supernatural powers.

Once stones are selected for sacred use, they are transformed from the profane to the sacred. With proper ritual, spirits (with supernatural power) are put into the stones and then through manipulation of the spirits with their power within the stones, most facets of life are kept in order. After the metamorphosis by ritual from the profane to the sacred, the stones are not identified, talked about, nor used in their original profane context. Only when *spirit* (supernatural power) abandons an object, usually through neglect of its owner, can the object again become profane and so treated.

Within the multitude of functionally different kinds of spirit stones used in the Highlands, one type is used to domicile venerated ancestor spirits. Ancestor worship, at the core of the complex Dani belief system, is manifest by the way the ancestor stones are empowered, maintained, and utilized. These are the most sacred of stones kept within the *ganekhe* cabinets (with the exception of the sun spirit stones, which are discussed later in the chapter) and are treated ritually with the highest regard. It is the ancestor stones that are propitiated and manipulated along with all other spirit stones to maintain daily life and keep the people healthy, happy, and successful. Wars are fought and won and warriors kept safe with the assistance of spirit power directed through ritual with empowered stones. Wounds and illnesses are healed with the assistance of healing powers from the *power* stones. Successful births and the encouragement of healthy large litters of the all-important pigs are encouraged with specially designated sacred stones. Too much rain is discouraged and the disappearance of flooding rains are mandated through ritual with stones. Sweet potato and other crops are fertilized and growth encouraged with stones and their supernatural power. The recognition and routine uses of sacred stones with supernatural power are just as fundamental to ways of life among the Irian Jaya Highlanders as the use of profane stone tools and the raising of sweet potatoes.
Figure 281. Una adze blade heirlooms are used as sacred objects.
In the following sections, I will first review "Ownership of the Stones" and then, to establish a baseline from which general principles can evolve that are pertinent to making interpretations of behavior and belief systems of extinct cultural systems from material goods, considerable detail will first be presented from an archaeological perspective, regarding the architecture of the place of the stones, spatial relationships of these places to community, the stones themselves, and then their spatial relationships to both sacred and profane objects within place. Finally, the cultural behavior which directly involves interaction of the owners of the stones with the stones, both in those places where the stones are maintained and elsewhere, will be reviewed.

Ownership of the Stones

Sacred objects, including most of the sacred stones, are owned individually by adult men, but maintained, manipulated, and worshiped within small socio-religious groups which number from an unusual minimum of 3 to as many as 22. Normal membership in these groups varies from 6-11. These are the ganekhe (mid Grand Valley Dani dialect) groups previously mentioned in Chapter IV and also by Heider (1970:85). Every adult man belongs to one of these groups. The ganekhe themselves are the individual, sacred and secret (outside of each ganekhe group) objects and packets of objects that are maintained in the special ganekhe cabinets within certain men's houses. [Author's note: Ganekhe literally translates to "sacred stones" but within a broader context the indigenous users of the term expand its meaning to include all of those sacred objects kept within the ganekhe cabinet.] Henceforth, I will use the mid Grand Valley term ganekhe to refer to such objects, packets, cabinets, and groups throughout the entire Grand Valley and West region. A man's ganekhe is his entire ganekhe packet with one or several ganekhe objects inside.

Each adult man has within his ganekhe at least one stone--sacred (wusa) and supernaturally powerful. I have even observed that the "worthless ones" (gebu) and the physically deformed possess ganekhe and belong to a ganekhe group. Thus, the cultural system has provided a social mechanism for every initiated male to belong to a religious group, in spite of possible mental or physical frailties, and through the ownership of a ganekhe stone to participate in a very personal way in the worship of ancestor spirits, the Highlanders' "God-power." However, all females, and young boys until initiated, are precluded by taboos imposed locally by the different cultural groups, across the entire research area, from being involved with these sacred objects or with ritual within the confines of sacred space. It is at the time of initiation that this taboo is formally removed from young boys. Within the religious variance of Highlands' cultures, there are circumstances, however, when a ganekhe object is owned and manipulated on behalf of a female (to be later discussed).
Each *ganekhe* group is composed principally of members from a segment of a given patrilineage. Within the Grand Valley and West (Figure 2), I suspect that membership of each group is composed solely of members of a single patrilineage, but in the pragmatic ways of the Highlanders there are exceptions to this generally enforced rule. In the Yali and East region (Figure 2), the issue of membership in the religious groups that control the stones becomes a bit clouded because some of my own observations throughout a broad area are contrary to Koch's statement that "men's house" membership is from multiple lineages and his inference that this membership also composes the stone-controlling religious groups (1967:117). Regarding the importance of lineage, ownership of the stones, and ritual, O'Brien (1969:90-91), working a considerable distance west of the Grand Valley with the Western Dani states that, "The ceremonial function of lineage derives from its corporate ownership of sacred objects, most commonly various small kinds of stones, or 'spirit bones,' used in ceremonies associated with war, death, sickness, and fertility." My observation is, as previously stated, different than O'Brien's in that even within O'Brien's area of research, I conclude that the *ganekhe* packets and objects are individually owned, even though they are communally stored and then treated as corporate entities when manipulated in group ritual. Each man, if he moves to another location, has the right to remove his *ganekhe* from a sacred cabinet and install it at another location. Also, for personal devotionals and to assist in carrying out group honored social and political functions, individuals do possess some control over the temporary removal of their own *ganekhe* objects from a *ganekhe* cabinet. This issue of individual versus corporate ownership of supernaturally powerful spirit stones is important to our comprehension of the religious concepts that are at play within the Highlanders' belief system. An understanding of the complex role of *stones* in this construct is a prerequisite to establishing boundaries (perhaps even a model) from which we can mentally manipulate calculated guesses about belief systems and cultural behavior within the archaeological record and also, to use the data for comparative analyses between the Highlanders' belief system and the religions of others.

Perhaps Heider's statement from the perspective of his research area northwest of Wamena is a pertinent transition from a discussion of the ownership of the stones to that of the sacred places in which the stones are maintained and ritually used: "... much of Dani ceremonial activity centers around the *ganekhe* which are certain sacred objects that are stored in the cabinets of certain men's houses. These objects include *sugan*, very sacred stones that lie wrapped on the floor of the cabinet" (1970:85).
Houses for the Stones: Both Profane and Sacred Space

We take the built environment for granted; yet we create worlds of meaning through the buildings we construct. Architecture is a powerful medium for representing, ordering and classifying the world. For over a decade archaeologists have been using concepts of the symbolic use of space, but until now there has been no single field of study of this field, or its interaction with architecture and anthropology.

(Pearson and Richards 1994: inside cover leaf)

An average men's house, whether in a Dani compound or a Yali or Una house cluster, is at once, from a modern Western theological perspective, a seeming paradox. It is the primary living quarters for men and older male children, with all of their normal household activities, and, as such, the storage area for all manner of profane items of dress, adornment, tools, and valuables. At the same time, it is the sacred house of worship for male religious groups where their most sacred stone objects are maintained. Yet to live in a house with its every day routine, where the most sacred objects are stored and the most sacred rituals celebrated, is completely compatible to its inhabitants who are accustomed to living in a world where they are constantly interacting—having transactions—with ghosts and spirits of deceased human beings, who are as much present to them as are living humans. The religious scholar Mircea Eliade is also quite comfortable with this context of the homogeneity of the profane and the reality of the sacred within the same household. In his book The Sacred and The Profane (1987:12-13), Eliade states that:

The man of the archaic societies tends to live as much as possible in the sacred or in close proximity to consecrated objects. The tendency is perfectly understandable, because, for primitives as for man of all pre-modern societies, the sacred is equivalent to a power, and in the last analysis, to reality. The sacred is saturated with being. Sacred power means reality and at the same time enduringness and efficacy. The polarity sacred-profane is often expressed as an opposition between real and unreal pseudoreal. (Naturally, we must not expect to find the archaic languages in possession of this philosophical terminology, real-unreal, etc.; but we find the thing.) It is easy to understand that religious man deeply desires to be, to participate in reality, to be saturated with power.

--which the male Irian Jaya Highlander is ("saturated with power") within the very functional profane-sacred architectural confines of his own men's house.

To follow Eliade's (1987:22) observations a bit farther:

If the world is to be lived in, it must be founded--and no world can come to birth in the chaos of the homogeneity and relativity of profane space . . . the hierophany reveals an absolute fixed point, a center.

Picking up on Eliade's possibly arguable line of reasoning (and that of other authors as well), Pearson and Richards state that the "centre of the world, or axis mundi might be replicated in tempies or even in domestic dwellings" (1994:12). For the Irian Jaya Highlanders, the men's houses with their sacred
space and objects, are their axes mundi, the centers of the world where Highlands men put their world in perspective and develop definitions and understanding of the cosmos. The men’s house with all of its sacred paraphernalia is the place where the Highland males retreat to obtain holistic measures of comfort and to experience sacred sharing within their religious groups. Within this same cultural system, the women are completely left out of this experience.

Whether a normal men’s house, with its dual profane and sacred roles, or in certain cases, a sacred house built specifically to house sacred paraphernalia and to be the focal point of religious ritual, the architectural style and construction of the men’s house in the Highlands is almost always the same within the bounds of each language group. The architectural styles, with their similarities and differences, and the spatial relationships of the buildings to community, scattered across the landscape, as well as the descriptions and spatial relationships of their contents, are of fundamental importance as we develop thought models to be considered when we are contemplating cultural interpretations from only material goods of the archaeological record. To turn this proposition around and pose it from the archaeological perspective from which specific cultural questions would be asked of material goods, let us condition our own thought patterns before reading on by reciting just a few pertinent questions. If these houses and their contents, both profane and sacred, or any part thereof were preserved in the archaeological record, what might we be able to correctly interpret about the cultural systems of the inhabitants of the structures—the size, number, and sex of the people who occupied the structures; dress and adornment; subsistence methods; state of technology; and belief systems? These, and many more are all powerful questions which we would like to be able to answer.

The big man (leader) of each socio-religious group who is responsible for the care and uses of the sacred objects for the group, determines the locale which is the repository for the sacred objects—the ganekhe—that belong to the members of the group. Usually the men’s house in which he resides is this repository, as well as the place where the men residing in that particular men’s house also maintain their profane je display-exchange stones (sie or siengga in the Yali and East region). On some occasions the big man of a ganekhe group may not be the big man of the men’s house in which he resides. When this is the case, the ganekhe objects for which he is responsible may be kept in another man’s house, more propitious as a ceremonial center for the group. Such a house may be within a normal residence compound or in a special, secreted men’s house away from all “habitation” compounds and which is used only for sacred purposes.

A big man of particular influence beyond the confines of the compound (or Yali house cluster) in which he lives may even control more than one ganekhe repository and place of worship. This is especially true for those big men who are of sufficient “big man” stature at the Confederation and Alliance levels that war trophies consisting of bows, arrows, occasionally spears, sometimes items of a dead
warrior’s adornment regalia, even small clumps of hair, and, on rarer occasions yet, other body parts accrue to that leader’s control. Under these circumstances, a men’s house (with a ganekhe cabinet in the rear) also becomes a storage vault for war trophies. War trophies are treated as sacred (wusa) but are only rarely commingled with ganekhe in the sacred cabinets, which contain only objects with active spirit power.

When men of influence construct special, well-hidden sacred houses or even an entire sacred compound for the sole function of a sacred ceremonial retreat, the geographic boundaries of land-holding segments of patrilineage (or at least areas of common political control) become important not just for political and economic reasons but for religious reasons as well. Land ownership is marked by geographically named natural features from which it is easy to identify boundaries. Hilltops, crests, ends and slopes of ridges, heads of gullies and the gullies themselves, springs, groves of trees and even single trees, all have names which might define boundaries and identify not only land-controlled areas for gardens and forest manipulated food plants, but also those areas in which sacred houses, caves, and rock shelters could be used to house sacred objects, including the stones.

A restriction or taboo prevails across the entire research area to prevent any uninitiated from walking on sacred ground or viewing sacred things. The consequences for knowingly or unknowingly breaking this taboo is treated locally with various consequences. Once when I was visiting the personal sacred cave of one of the influential big men in the Grand Valley, we both got into trouble. The general restriction was broken because the big man had guided me very near to a sacred house that belonged to a religious group that is of a patrilineage different than his own. Even the big man whom I was with did not know of the presence of the sacred house. My guide (the big man) was willing to risk the wrath of the ghosts and spirits of his belief system (and also of his neighbors) for taking me to one of his personal private sacred spots, but he had not reckoned with the situation where we would cross boundaries near another group’s sacred house. I did not actually see the sacred house myself. In what I believe to be done in overly dramatic fashion, missionary-writer Don Richardson reports the incident (possibly true) of a young Yali girl being hurled into the Heluk River to her death because she had unwittingly played on the sacred ground of a "Kembu temple" (conventional men’s sacred house) (1977:22, 35-42). It was in 1989 that my facilitator in the Grand Valley (not in my presence) was fined a pig for breaking a wusa taboo by picking up a small stone in a wusa area along the banks of the Aikhe River. That particular restriction is motivated yet today in many areas across the landscape by the thinking that a specific area is a segment of landscape inhabited by sacred spirits. The picking up of the stone may have been disturbing to the spirits who dwelled at that locale or there might even have been a spirit residing within the stone itself. Such thinking is one of the reasons why a rock with attractive dimensions from an indigenous finder’s viewpoint and which is carried away from a wusa area is henceforth treated with proper religious respect, or even coveted,
and through ritual converted into a sacred implement to be used to the owner’s benefit when dealing with ghosts and spirits—the stone already has the natural inclination toward the possession of supernatural power.

**Architecture, Contents, and Spatial Relationships**

The men’s habitation and sacred houses—the places in which *the stones* are empowered and maintained—are relatively small structures that contain human beings, collective spirits (ghosts, ancestor spirits, and other spirits), and numerous material objects, both profane and sacred. Interactions of the humans with the unseen ghosts, spirits, and material contents of the house translate to contemporary behavior within the cultural system. It is interpretations of the material residue from such interactions that form the bases for some of our constructions of cultural systems that have been lost in the archaeological record. To gain the greatest advantage from a construct in the ethnographic present, one must keep in mind that to the human beings living within these small quarters, the spirit and ghost entities are in many ways like another human species, competing for space and attention with *Homo sapiens sapiens*. To the Highlanders, the collective spirits have many of the same capabilities and behavioral patterns as the people, but, in addition, special abilities that allow them, among other things, to be invisible to the normal human eye and to travel through barriers that would deter humans. The ancestral spirits can also perpetuate themselves with the help of their human lineage descendants in a symbiotic relationship through time without temporal boundaries. Many of the implications of the existence of the collective spirits on human behavior are manifest; while at the same time, the psychological effect on human beings of such unseen entities is little understood from a modern Western perspective. We do know, however, that fear of reprisal from the spirit world by breaking an absolute taboo or being attacked by spirits manipulated through sorcery against a victim can bring about the death of humans (McElroy and Townsend 1989:252-254). This fear of the ultimate consequence for action taken against them by ghosts and spirits for breaking an absolute taboo is one of the strong motivating factors for adherence by the Highlanders to their strict regimen of proper ritualistic manipulation of the stones—certainly a factor to be understood when contemplating behavior within the Highlander’s men’s houses.

Although it is only male spirits that are recognized as personified ancestral spirits within the *ganekhe* stones and other objects, female ghosts and spirits are also known to be present in the world of the unseen, some of which are discussed in Chapter III. The personified male ancestor spirits that are domiciled within the *ganekhe* stones retain their specific identity and known place (in the stones) within the world of the seen only as long as descendent members of their *seen* patrilineages continue to revitalize the spirits’ superhuman energy (life) through a continuum of renewal rituals. Whenever this "life-giving" continuum of rituals ceases, the personified ancestor spirits in the stones do not "die", they just "move out"—abandon the *stones* of domicile to join the large number of other ghosts and spirits that roam in perpetuity within
the milieu of the Highlands' landscape. To an individual in the *seen* world, the vacated stone has lost its special power (its spirit), and no longer has the supernatural ability to deal with circumstances or other entities in the world of the *unseen* on behalf of the owner of the stones. The stone is then, once again, a stone of only profane reality and can so be treated.

The multitude of unidentified ghosts and male and female spirits that seem to abound everywhere throughout the landscape, and to come and go from houses in the seen world, are thought to be individually and collectively capable of both malevolent and benevolent deeds within the world of the seen. Consequently, a great deal of time and energy is expended to both contradict potentially malevolent acts on the parts of ghosts and spirits, as well as to foster beneficent help from the ghosts and spirits in endeavors promoted by individuals in the seen world. To an outsider, what is first observed is the tremendous amount of cultural energy that is constantly being utilized to: a) keep malevolent ghosts and spirits out of houses, entire living compounds, potato fields, water supply points, stands of manipulated plants, and away from numerous cultural activities with the uses of seen ghost and spirit barriers; and b) to placate the ghosts and spirits by both thoughtful deeds and a never ending continuum of sacrificial rituals --cultural acts that are motivated within the world of the seen because of the constant fear of some reprisal or deed of mischief about to be enacted to their disadvantage by a malevolent ghost or spirit.

From the viewpoint of a human member of a Highlands' male household, the presence of ancestral spirits and the possibility of visits by unwanted ghosts certainly adds to both physical and mental crowdedness in conditions that are already filled by humans and an array of both profane and sacred material objects. Cultural interpretations from only the material residue of interactions of household contents (humans, spirits, and material goods) are at best difficult; but to archaeologists, that is a difficulty which we must continue to surmount if we are to improve our qualitative interpretations of prehistoric cultural systems. As archaeologists, our increasing understanding of these things and also of the identifications and *interrelated roles* of profane and sacred stone tools and symbolic stones within both profane and sacred space will not only favorably impact our interpretations and thinking regarding the origins and evolution of architecture and religion, but more broadly, systemic interpretations of prehistoric cultural systems. With the objective of adding "missing links" of understanding between scholarly knowledge of historically known places of worship (with their icons and other sacred objects, including idols) and suspected prehistoric places of worship and sacred objects, a considerable amount of detail regarding the architecture, contents, and use of sacred space follows.

All of the different language-speaking groups within the research area build men's houses of architecturally planned and volumetrically compact space that within the boundaries of each language group are of about the same dimensions and design, some of which are used only as sacred space, while others are used as *both* profane living and sacred space. Raglan (1964) states that houses were originally built
as temples, not shelters or dwellings, and as recently as 1990. Highlands substantially agrees with this view (1990:55). Rapoport's own views concerning the theory for religious origin modifies Raglan's and Highland's position: "It is one thing to say that the dwelling has symbolic and cosmological aspects... and another to say that it has been erected for ritual purposes and is neither shelter nor dwelling, but a temple" (1969:40). Pearson and Richards state that, "Part of the problem is undoubtedly the modern perception of clear distinctions between symbol and function, and religious and secular aspects of life" (1994:55). Certainly in the highly sacralized lives of the Highlanders, with the omnipresence of collective spirits, the religious and secular merge, until to even an understanding outsider, the distinction becomes clouded and to the indigenous dweller himself, sameness.

In the Grand Valley and West, the men's house, as the focal center of male activity, is located across the central courtyard from the single entrance into each compound. From inside a men's house, any activity within the compound can be observed as well as people coming and going through the compound entrance. Architecturally, the men's houses are similar. They are round hemispheres with plank board walls about one to one and half m high, grass thatched conical roofs, and a single entrance. Some have two openings through a small antechamber, while others have only a single entrance and no antechamber (Figure 282). These houses are the largest of the round structures in a compound or house cluster, being bigger than the women's (or family's) sleeping houses and different in shape from the rectangular women's communal cook houses and the pig sties. Inside diameters of Dani and Western Dani men's houses fall within an absolute range of two and one-half to five m, with most between four-five m (13-16.5 ft). Peters (1975:24-25), working near Wamena, found that men's house diameters "may vary from about three to five meters." In these same geographic areas, the inside diameters of the women's sleeping houses range from about two and one-half to three m (8-9.8 ft). Normal Dani men's house occupancy varies from 5-10 males, with an absolute range of 1-17. The entrance openings through the antechamber into the men's houses are about 50 cm (1.64 ft) wide by about 80 cm (2.62 ft) high (Figure 282). Both openings are usually slightly raised from the ground and can be closed with one to three wooden slats. Even though the small house entrances make an archaeological statement about the size of the users, the adult Dani males, given their mean heights (Chapter IV), still must squat low and proceed slowly to negotiate their two-opening entrance through the antechamber.

The antechamber serves several functions. First, it slows a visitor down as he maneuvers the small door openings to enter the main house room. Those inside have time to carefully look at a visitor, who, himself, is at a disadvantage as he enters into a dimly lighted interior to which his eyes have not yet adjusted. For the house residents, in addition to slowing down an entrance of a visitor, the antechamber offers a convenient place to temporarily set tools during the day. It also serves as the first line of defense to keep unwanted ghosts from entering, especially during occasions of ritual. Hopefully, visiting ghosts
Figure 282. Grand Valley and West men's house with antechamber.
will tarry in the antechamber rather than enter the house proper. This small room also provides human visitors a place to pause or to have protection from the rain or direct sun. Sometimes, it is used by people who have a message or some food to pass to someone in the house, but who do not have authority to enter. At times of courtyard pig sacrifices, this area may become especially crowded during typical sudden downpours.

Throughout the Yali and East region, there are no antechambers at the entrances of the men’s houses. From measurements of five men’s houses chosen as representative, at three widely scattered areas, two in the Yali and one in the Una, the average dimensions of the entrance openings are 37 cm (.94 ft) wide by 80 cm (2.62 ft) high. Yali ground floors are raised off the ground by as much as about 60 cm. Yali men’s houses with the sacred stones (jouei and in secluded areas söumō) vary in inside diameters from about four to five m. the same sizes as the big men’s houses in the Grand Valley and West.

The floors of the men’s houses in the Grand Valley are usually at ground level, which is different than the slightly elevated floors of the women’s houses and the greatly elevated floors of the men’s houses among the Wano to the west. Planks stuck into the ground form the outer perimeters of all Highlands’ houses. In the Grand Valley and West region, these plank walls stand about 1.5 m above ground level, higher in the Wano area. Horizontally laid wooden rafter poles lashed to the tops of the wall planks form the support for reed flooring that is both the ceiling for the ground level room and the floor for a sleeping loft above. Ceiling height in the lower area varies from one to just slightly more than one m above floor level. One might observe that relative to male adult heights varying from 1.5-1.8 m, vertical accommodation of a standing male is restrictive.

Four center poles form the central support for the conical roof. Their bases are sunk into the ground to form a square no bigger than 1.2 m in both Dani and Yali men’s houses, which outlines the space for a circular, earthen hearth. In Dani houses, a shallow hole is scooped out of the ground and lined with a layer of clay which becomes fire-hardened with use of the fireplace. In houses with raised floors, an earthen fireplace mound is built up to floor level from the ground. Above the hearth, the four center poles slant inward up through the sleeping loft to the apex to support the semispherical roof. A distinguishing feature between houses in the Grand Valley and West region and those within the bounds of the Yali and East is an adze-sharpened wooden spike that rises above the roof at the apex of each Yali and East region house. The spike is securely fastened under the thatch to supporting poles of the roof. This short "lightning rod" serves an important functional purpose, which will be discussed under a later heading with sacred symbolic stones. Such a wooden spike is not present on the roofs of Grand Valley and West houses. Inside each house, less than two-thirds of the distance up from the fireplace to the lower ceiling, a square plank board rack is lashed between the four center support poles as a convenient place on which to dry firewood or to dry and/or store various other objects. Bamboo knives, marsupial mandibles, tusks, a few
arrows and other odds and ends are often found here. Rattan, bamboo, and vine lines are often stretched at various places between ceiling rafters to furnish support from which to hang or creatively "stick" personal dress items, accumulated wealth items from funeral and wedding exchanges, and, in certain specially designated men’s houses, war trophies. Wooden hooks are sometimes suspended from the ceiling and center poles from which to hang various and sundry objects. Articles placed on the rack over the fireplace or suspended near the ceiling soon become soot-blackened. They, like the ceiling itself, take on a black tarry appearance. The same black carbon residue that coats the ceiling and artifacts stored up away from the floor of a man’s house also coats and contaminates the lungs of house inhabitants. Health complications caused by the ingestion of smoke is the number one cause of natural death among Highland dwellers (personal communications with medical staff at the Wamena Hospital, Irian Jaya, Indonesia, 1989, 1991, 1992, and 1993).

Within the Grand Valley and among the Western Dani, it is the practice to keep both the ground level and sleeping loft floors covered with a comfortable mat of clean grass. In the Wano area farther west and to the east, within the Yali and Una areas, the more conventional practice is to have either reed or wooden plank floors on the lower level on which individuals can place their Pandanus leaf mats. Reed floors in the sleeping loft on which mats are also placed.

Access to the loft sleeping quarters is through a small opening in the ground-level ceiling, set to either side of the house entrance (from my experience, more often to the right as one enters a house). The sleeping loft is maintained relatively free of objects, although a minimum of items may be hung from the center poles. The loft is warmed by the fire from below in the Grand Valley and West region, and kept relatively free of night-marauding rodents by the dense smoke which accumulates beneath the unventilated tight thatch roof. Sometimes in the sleeping loft, a false (not used by living people) hearth with ashes is located under the grasses on the floor to accommodate ghosts who might pay a visit. In the Yali and East region, this is often an active fireplace for use by humans, located in the center of the room above the ground level hearth.

On the back wall of the lower floor, opposite the entrances into those men’s houses where ganekhe are maintained, is a raised narrow wooden box, attached to and constructed as a part of the wall itself (Figure 282). A section of the circular wall of the house is the back side of the box. The front plank wall is festooned with a curtain of ferns that have been steamed along with pig meat from pigs ritually killed at sacred ceremonial feasts, and in some houses also with the long, narrow leaves of the jiwi plant. In most houses a bundle or at least a number of plant stems ("sticks") are located at the edges of or across the single wooden door of the cabinet. This solid curtain of special materials that have been ritually treated at pig sacrifices not only shields the ganekhe that are stored within the cabinet from view but acts as a barrier to the penetration by malevolent ghosts or spirits. Access to the ganekhe cabinet is through a
centrally located door that usually consists of one or two removable soot-blackened planks. Inside, the people's most sacred objects are maintained in great secrecy. Hanging below the elevated box are two, or in the cases of the most influential big men, three rows of age-browned pig mandibles suspended from rattan or bamboo thongs that are stretched wall to wall, horizontally between the front support legs of the cabinet. Leaning upward from the floor against the central front part of the box are often one to four display-exchange stones (je), usually but not always, individually wrapped in the conventional gisakpel banana trunk coverings. An unadorned je puluen stone rests upright against one of the front central support legs of the box or is sometimes tied to the leg at floor level. This is just below the left side (as viewed from the front) of the box opening which is located above. Sometimes one or two rattan thong-stick fire-starting tools are laid casually on the floor under the box, along with other objects, such as digging sticks, bows, arrows, and smaller items. Bows and arrows, standing vertically, are often leaned up against the outer edges of the box and against the adjoining circular house wall. Throughout the rest of the room are all manner of profane objects and a variable number of well wrapped sacred objects; some stuck between ceiling rafters and the loft reed floor, some hung from the ceiling, and some attached to the circular wall of the house.

A minimum number of profane objects are usually communally maintained in each men's house for the personal uses of its members. These may be considered house furnishings. When one goes into a men's house, he will know that these items will be there. Along the outer perimeter of the room and standing upright from the floor against the wall are one to as many as three or four, usually aged, light brown gourd water containers and sometimes a gourd which contains pig fat for greasing the body. Directly in front of the fireplace (toward the entrance), a rectangular shaped, shallow wooden bowl or open-ended bark trough receptacle is conveniently placed in which to collect sweet potato and yam skins before feeding them to the pigs. The Dani are meticulous about not eating tuber skins. On occasion, the functional wooden waste container is turned over and its surface used as a mini-altar on which small sacred paraphernalia can be laid out for healing procedures and other sacred rituals. In the Yali and East region, it is the common practice to use bark from the casuarina tree to fashion this waste receptacle, rather than to use a wooden bowl. Another object often present alongside the fireplace is one or two pieces of hollowed bamboo tubing, less than one m in length, through which a person blows to fan still-glowing embers into a flame or to encourage a new fire just-started. Sometimes one to several stems of long narrow hollowed reed tubing lay by the fireplace to be used as cigarette holders. On the back side of and adjacent to the fireplace, often partially hidden from view by the loose grass floor coverings is a single smooth, river rounded, usually linear shaped hammerstone and an accompanying single river rounded, circular but somewhat flattened anvil stone. This tool pair, located in each men's house, appears to have been carefully selected for the symmetry of each stone and for their high degree of smoothness.
Sometimes one or two similar hammerstone-anvil pairs are maintained along the side edges of the fireplace. The routine use of the stones is to crack roasted Pandanus nuts, the consumption of which has possibly been perpetuated from times preceding the advent of horticulture. Another use of the hammerstone-anvil tool pair is to crack pig bones for their marrow. Daoke Mabel and two of his brothers told me (May 11, 1992) that the river-rounded, oblong anvil stone (12.7 cm thick x 15.2 cm wide x 20.32 cm) on the floor in front of Gutelu’s ganekhe cabinet was used for just that purpose. Pandanus nuts are usually cracked close to the hearth because the Dani are careful about keeping their house floors clean, and they throw nut hulls into the fireplace. Just as the wooden waste receptacles are at times used to create mini-altars for use with small sacred paraphernalia, the stone anvils are sometimes used in rituals as bases on which to burn sacred tree resin (hotali). When observing such, I doubted that there is symbolism in this use of stone anvils. More likely, they are just stones of convenience on which to burn the hotali, of which there is great symbolism.

The array of personally owned material goods that comprise the contents of a sacred-profane men’s house would make quite a statement about their owners if found in preserved archaeological context. What might come across in an archaeological find of such a house and its contents is that the occupants were of the Stone Age—possibly Neolithic because of the presence of only ground stone tools, no copper, bronze, nor iron—also that the inhabitants had yet to discover pottery or the use of baskets; that they collected bird plumage, fur, pig mandibles and an assortment of different shaped linear gourds (the penis sheaths), the function of which, without prior knowledge would be impossible to interpret. It might be thought that the inhabitants worshiped stones because there would be many in the house. Whatever name one might assign to this culture, at least one would feel confident that the occupants were of the Stone Age, using ground stone versus flaked tools.

Although there are no physical partitions or visible markings to define an individual’s space, each occupant of a men’s house does have his own "understood" space on the wall, at the juncture of floor and wall, and sometimes on part of the ceiling, where he consolidates his belongings. Some few flat and thin objects, like packets of feathers, may be slipped under the grass floor covering, especially around the outer perimeter of a room. Axes, adzes, and display-exchange stones (in Yali and East, adzes and display-exchange stones) are usually leaned against the wall, but sometimes stuck between the curved horizontal re-enforcing pole members and the vertical wall planks. Individual feathers and packets of feathers, feather and fur headdresses (sometimes protected in circular bark containers), packets of penis gourds as well as singles, tied strips of orchid fibers (for cording), nassa shell bibs (walimo) and bailer shell neck pieces (mikak), white egret and black cassowary feather wands, envelopes of cigarette leaves, small gourds or leaf packets containing fat for greasing the body, small tool kits—all of these and other artifacts of culture are
stuck into wall plank lashings, wedged between horizontal re-enforcing poles and the upright wall planks, or tied to the lashings of the wall.

The ceiling is another matter. All kinds of packages of different sizes are tied to or hung on both wooden hooks suspended from the ceiling and on rattan, bamboo, and vine lines tautly tied between ceiling rafters. Some of the packages (both gisakpel and leaf wrapped or unwrapped bamboo tubes) contain items for profane personal use, such as feathers, penis gourds, boar tusks, both pulverized red hematite and ochre cakes for coloring purposes, and packets of flint chips. Men’s net carrying bags are also often hung from ceiling hooks. These unwrapped items become soot-blackened over time. Other packages and bundles contain string nets, both those received at ceremonies of exchange and stored as items of wealth, and those newly made to be used at a future time. In those houses where the leadership is of such stature that war trophies are collected, some of these items are secreted from view as sacred (wusa) objects or just protected from the accumulation of smoke soot by being packaged and hung from the ceiling. Some few other packages might even contain items that are considered ganekhe, but this method (outside of the cabinet) of maintaining ganekhe objects is rare. The larger packages and bundles are usually hung at the sides or toward the back of a house. The area toward the back of the ceiling is reserved for packaged war trophies and/or other well hidden (by wrappings) sacred relics. The area on the ceiling from the fireplace toward the door is kept free of large hanging bundles, both as a matter of practicality to keep the entrance into the house unobstructed and to provide ceiling space which can be both used to set up a line of defense against marauding ghosts and spirits and as an avenue for the departure of friendly spirits on missions of attacking the spirits of the seen enemy (human beings). Foremost in this line of defense-offense are one to several soot-blackened arrows that are maintained in the ceiling over the fireplace or between the fireplace and the entrance, with arrow-tip ends pointing toward the door. These are arrows which have been removed from wounded residents of the house. Empowered with the flow of energy from the ganekhe cabinet, these arrows are capable of powerful counter-magic. Also, usually stuck in the rafter lashing above the fireplace is a blackened arrow that is used at times of ritual gatherings as a wand, waved in the air to cleanse both humans entering the room and the room itself, of malevolent ghosts. One or a few jiwi leaves on a short branch are tied midway on the arrow point and held over a fire in the hearth to activate the spirit power before the smoking arrow tip with leaves is used.

High up on the front two center poles (toward the entranceway from the fireplace) other objects with ascribed supernatural power are often hung facing the entranceway as another line of defense between the house opening and the sacred ganekhe cabinet. In addition to various amulets, these are often the same soot-blackened neck gear (bark, spider web strips, and one or several pig tails fastened to a string) that are worn by the men to keep malevolent ghosts from entering their own throats, thought to be one of the two most vulnerable passageways for ghost entrance into the body (previously discussed Chapter IV). Whether
or not this placement of amulets and neck gear within the houses on the front sides of the fireplace is indicative of a degree of anthropomorphism of the house I do not know. It is possible that the opening between the center posts and above the hearth is considered a vulnerable, throat-like passageway to the ganekhe cabinet with its edai egen (singing seeds of life) of the house. What is known is that it is desirable to keep unfriendly ghosts away from the ganekhe cabinet, and that available precautions have been taken.

Architectural style of house construction in the Yali and East and the Grand Valley and West is quite similar, yet with differences that should be noted. In both areas, men's and women's houses are round and the men's houses are of larger diameter than those of the women. Yet even with this same round architectural style, houses in the two areas are visibly quite distinctive, one from the other. Throughout the Grand Valley and West, roofs are thatched with grass; whereas east of the Grand Valley, the roofs are covered with either Pandanas leaves and their stems or bark strips from the casuariri tree. A wooden spike, as previously mentioned, sticks skyward from the roof apex of the Yali and East houses but is absent from houses in the Dani and West region. House diameters are nearly the same across the entire research area. The diameters reported by Koch (1967:118) at Angguruk-Pasikni in the geographical center of the research area for the Yali "big jōuéi ranging between 13 and 16 feet" (3.96 and 4.87 m) is representative of men's houses for the entire research area. In the Yali and East, it is common practice for the floor of the men's houses to be elevated about one-half m above ground level. Earthen, fire-hardened, clay-lined fireplaces are built up to floor level in these houses. Always in the Yali women's (or family) houses one or two enclosures, separated from human use areas, function as pig pens; rarely but sometimes even in a men's house. Whereas in Yali and East house clusters, the women's houses often stand relatively close to one another (as close as two m on occasion), the sacred men's houses are usually set apart by at least approximately seven and one-half m. Thus, sacred space can be identified both by the relative size of dwellings and by spatial relationships within any house clusters. The smallest continuously human occupied dwelling that I ever encountered anywhere in the Highlands is 2.5 m (8.2 ft) inside diameter at ground floor level and 1.1 m (3.3 ft), from ground floor level to the room's ceiling, with an even more restricted sleeping loft (Figure 283). It is occupied by Uwehe Sama, an aged Yali woman [134 cm tall (4.4 feet)], and her two piglets, high on a hillslope above Pasikni.

Wali's Sacred Compound and Sacred House

Secrecy on a flat area above a gentle rise toward the mountains, not far from the mountain-side end of Dutoba Ridge is Wali's sacred compound, known among the people as Yalogn (ait. Yalohn). It is sacred and wasa and, therefore, little talked about. Yalogn translates to "you stay here," referring to the ancestor spirits who dwell in the ancestral stones (ganekhe) but have the inherent right and ability to come
Figure 283. The smallest continuously occupied house in the Highlands.
and go. Yalugon is only about a 45 minute walk from Hupainma, the compound where Wali lives. In Hupainma, the men’s house is known as pilamo (alts. pilai, bilai) Wali mege (literally “house where Wali lives” or “house of Wali”). In Yalugon, the men’s house is known as pilamo (or bilai) Wali wusa, “the sacred house of Wali.” This is the place where Wali maintains the ganekhe for the men who comprise the religious group of which he is the leader. Adjoining Yalugon compound (sharing a common fence) is another sacred compound which is shared by three other big men, where they maintain ganekhe, and use the compound as their own ceremonial center for sacred affairs.

Wali once said that every big man—at least those with significant influence on the Confederacy level—has his own secret compound apart from the men’s house where he normally lives. Due to the sacred (wusa) nature of the subject, I was never able to properly corroborate this with informants in other areas, but I suspect that there are numerous hidden sacred houses and even entire compounds scattered about the Highlands landscape. In addition to Yalugon, I have, however, visited (with permission of appropriate big men and their ganekhe group members) four other isolated secret compounds that are maintained for only sacred purposes. In each case, as at Yalugon, when either the sacred men’s house or the entire compound is not being used for ceremonial purposes, the compounds are only occupied by a single adult male guardian with his nuclear family (or parts thereof), none of whom dwell in the sacred house, but in another house within the compound. The job of caretaker of a sacred compound and sacred house (pilamo wusa) with its sacred stones (ganekhe) is handed down from father to son. Considerable responsibility inures to the job: the sacred house and its contents must not be profaned and the house must be protected from all but authorized visits. I have never entered a sacred men’s house without the accompaniment of at least its big man leader, nor elsewhere within the confines of a sacred compound without at least the presence of its designated guard. Most of the time these sacred places are quite literally “ghost towns”, inhabited only by ghosts and unseen spirits of the unseen world, and a single guard and his family. In two different sacred compounds, while taking photographs and making notes, once at Yalugon and once at a sacred sun house compound (to be discussed later under Sun Houses and Their Sacred Symbolic Stone), with only the unobtrusive presence of the in-residence guard, I was impressed by the aloneness of the compounds. The sites were without life. At times of inactivity, these places become the cultural artifacts, the stuff of which the archaeological record is composed. No life, only the opportunity to interpret life. While at those places I was within the confines of sacred space. What could be learned from the architectural style, spatial relationships, and the kinds of material goods present that would be helpful in developing a model for cultural interpretations, to be made from only the archaeological preserved residues of material objects of such places? With the exception of the house where the guard lived and the sacred men’s house, the other buildings of both compounds were void of material goods that are normally related to inhabited “living” sites. The designs of the compounds themselves and their various
structures are all within normal size, shape, and material variance of compounds being lived in with the exception that at the sun house compound, one house is rectangular in shape with a board slat roof and it is built up on stilts. Spatial relationships of buildings are the same. The view at Yalogan compound is across the length of the open courtyard to the front of the sacred men’s house at the far end of the compound (Figure 284). The sides of the courtyard are lined with the same kinds of buildings that are present in a traditional “living” compound. Three piles of heating rocks are visible in the central part of the courtyard along with some wooden rock tongs and the nearby accumulated charcoal debris worked into the surface soil from numerous fires which have been burned to heat those rocks (and possibly for other purposes). Fanning out from the concentrated, centrally located pile of small pieces of charcoal, the ground can be seen to be darkened by surface scatter of tiny bits of charcoal and charcoal dust. Vegetation has not taken the compound over as it would if the compound were functionally abandoned. The grass near the compound entrance looks as if it had been cut or worn down by recent use. From casual observation of the courtyard and the outside of the buildings, it would appear as if the compound were in use, but just not occupied at the present time—perhaps even only vacated for part of the day while its occupants were off in the fields or tending to other routine matters (a normal situation). It is only by examination of the interior of the buildings that one would realize that this compound is only being lived in by someone in one house. There are no pigs here, and the men’s house, although containing many objects, does not appear to be lived in (absence of a normal quantity of items of dress and adornment, tools, and weapons).

Wali sometimes goes alone to Yalogan to meditate, experience vision quests, or to open the ganekhe cabinet and deal personally with its contents. He may remain for several days, exposing himself to divination, worshiping ancestor spirits in privacy, seeking communion with the supernatural, and/or manipulating the supernatural for his own or, more commonly, group social ends, through the power in the stones. At other times, there are rituals involving the entire ganekhe group of which Wali is the leader. All members who maintain their own personal ganekhe in the cabinet are expected to be in attendance. They trek in from different directions, prepared to stay the duration of the ritual, be it part of a day or in continuum for several days. Women and children are sometimes enlisted to carry food, firewood, water, and grasses (for the steam pits) into the compound, but then they usually leave. For some ceremonies that take more than one day but at which nighttime attendance is not required, some of the participating men may leave to overnight in their own nearby compounds of domicile and return the next day. On other occasions, when larger numbers of people are involved in ceremonies where the activities for most of those in attendance are out in the courtyard, but in conjunction with which, the head shaman and his group must manipulate supernatural power in the sacred ganekhe, people may come from a broader geographic area and even overnight in the houses around the perimeter of the courtyard. A common cookhouse is available as part of the courtyard accommodations for occasions like this. As in other compounds, a ghost or spirit
Figure 284. *Yalgon*, a Dani sacred compound.
enclosure (waro leget) is present between the courtyard fence and the outer fence, set to one side of the back of the sacred men's house. In this part of the compound, not far from the waro leget, a large pile of cooking rocks are maintained, in addition to the cooking rocks that are piled within the compound's central courtyard.

From the exterior, big man Wali's pilamo wusa at the Yalogon compound looks just like any other Dani men's house that might be located in either an occupied habitation compound or secreted away at a wusa location, to be used only for sacred purposes (Figure 284, May 30, 1991). In the lower photograph of Figure 284, Wali is standing in front of his pilamo wusa. He is adorned with a delicate white egret feather headdress, and a broad white nassa shell chest bib of unusually good quality (by virtue of its large size) hangs from his neck to almost the base of his penis gourd. On each wrist, Wali wears a tightly plaited fiber band, which Waili himself has weaved onto his wrists. Soot-blackened, sacralized pig grease has been carefully rubbed onto Wali's face, shoulders, and chest as atonement to ancestor spirits for breaking faith with them--a private matter not to be discussed. For three months Wali appeared daily with freshly applied sooty ointment which he said was applied nightly by a guardian spirit. (I suspect Alula, a personal healer of Wali's with wusahun power, of being that "spirit.") To the reader's left in the photograph is an upright meat rack on which special pieces of butchered pig meat and pig entrails are hung during sacred pig feast ceremonials. The courtyard in front of the pilamo wusa and with the meat rack to one side is an outdoor altar where pigs are ritually killed as sacrifices at the time of sacred ceremonies. It is also the place where sweet potatoes and other edibles are accumulated during ceremonies. The red appearing stripe on the roof of the house is a growing vine and not a painted symbol.

The interior architecture and the sum total of objects within the sacred house (pilamo wusa) identify it as a sacred men's house. It can only be distinguished from any men's house (also with a ganekhe wall cabinet) that is located in an occupied "living" compound by the paucity of the presence of profane items of dress and adornment, tools, and weapons.

A series of photographs taken over a three year period of the undisturbed (by me) interior of Wali's pilamo wusa, adds visual detail to the previous summary of the architecture, contents, and spatial relationships within a typical men's sacred house. This pictorial review, in addition to providing visual insights, sets the archaeological stage before the "dead" material objects are brought to life with cultural behavior that is observed in the following sections entitled The Ganekhe Hakasin Ceremony and Typical Use of A Religio-Medical Kit: Wali Treats Alula.

Figure 285 (1989) is a view from inside the entrance looking across the centrally located fireplace to the back wall. Nearest the entranceway, one sees the usual barkwood receptacle for potato skins in front of a partially visible bamboo "bellows" fire-tube, a piece of firewood, the fireplace outlined by the four center poles, another piece of firewood and then the back wall. Hanging down from the front side of the
Figure 285. View from doorway into Wali’s sacred house (*pilamo wusa*).
wood storage rack over the hearth is a barely discernable small packet of sacred objects—unidentified talismen—meant to block the paths of potentially malevolent ghosts that may have penetrated the house entrance. At the top of the picture, the lower part of the wooden slat door to the ganekhe cabinet is visible. Hanging below the cabinet door on a rattan thong stretched between the cabinet's two front wooden legs is a row of pig mandibles. Of importance to note but impossible to see is an upright, dark green puluen stone leaning against the left edge of the front of the right center leg (to the reader's left) of the ganekhe cabinet. The sharpened distal end of the stone rests on the house floor; its pointed end upward, toward the sacred stones (ganekhe) in the cabinet above. Almost wherever there is a ganekhe cabinet within Dani culture, a puluen is traditionally set against or tied to this same positioned cabinet leg, always in the same spatial relationship to the ganekhe objects in the cabinet above. The orientation and placement of this functionally important type of stone is more visible in later figures. Maintained on the floor just behind the fireplace but masked from view by a piece of firewood and grass floor covering is a single river rounded, oblong hammerstone and a very smooth disk-shaped stone anvil.

The significant objects and their spatial relationships in the back two-thirds of the sacred house are depicted in the next six figures, commencing from central-left along the left wall and ceiling to the ganekhe cabinet itself, then across the ganekhe cabinet to the reader's right and back along the right wall toward the entrance. Figure 286 (May 30, 1991) shows spatial relationships of those objects present on the left side of the room. Hanging from the ceiling on the left is a newly wrapped bundle of ceremonial nets, received at a recent funeral exchange ceremony by one of the members of the socio-religious ganekhe group that uses this particular sacred house and who says that these nets can be recirculated at future exchanges and need not be permanently maintained. Just to the right of the net bundle, a Yeineri Flat Style adze is stored against the center of the wall. The proximal end of the haft is stuck between a wall plank and its horizontal bracing beam. The Yeineri Flat Style adze blade has been bound to the socket of the adze by a wrapping combination of both rattan strips and braided fiber string cording (not a normal way of binding an adze blade to a haft, see Chapter V). This single adze is kept in the sacred house for easy access when butchering pigs at sacred rituals and for chopping firewood. Wali says there is no sacred connotation to the adze. Always one, sometimes two, are kept for the same purpose at all sacred houses.

Next, seen in Figure 286 and hanging from the ceiling, are two narrow, partially soot-blackened bundles of bamboo knives that are opened and used only at sacred ceremonies. These knives are sacred implements, differentiated from profane bamboo knives by a wrapping around a section of each knife to form a handle, which on occasion may include one or more attached feathers or pieces of other organic materials. At certain ceremonies one of these knives is used to make the initial incision when skinning a sacred pig after it has been singed and is ready for butchering. The knife is used to cut through the skin and fat layer on the under side of the pig from snout to anus as the first step in the butchering process.
Figure 286. Left, backside of sacred house (*pilamo wusa*) and *ganekhe* cabinet.
Then, any number of profane knives may be used while butchering the pig for steaming. In other men's houses, I have observed that one or more sacred bamboo knives are often stored nearer the ganekhe cabinet than the packet of sacred knives shown here. Next, from the ceiling, hangs a squash gourd of holy water, used only for the steam bundle at sacred (wusa) ceremonies. Stuck in the soot-blackened rafters above the water gourd are two hard-to-see gisakpel wrapped packets which contain bamboo knives, profane and conveniently handy for any suitable cutting chores in or near the sacred house. The long narrow package hanging from the ceiling between the water gourd and the large round net (very near the reader's left side of the ganekhe cabinet) is a packet of penis gourds, which one of Wali's brothers hung there. These penis gourds are for personal profane use. The nearby round bundle presents a different situation. It is a very large carrying net (nogen) which contains an assortment of exchange bands (jerak) that were distributed to Wali at funeral exchanges. The longest jerak (perhaps eight m, not measured) of the collection has taken on sacred connotation and will stay in the pilamo wusa as a relic and not be exchanged again. The other, less important jerak, may, however, be removed from the sacred house and reused at the owner's discretion; although at this time they, too, are considered to be relics. Behind the round bundle of jerak are several smaller packets of unknown (to me) content. A profane straight penis gourd can be seen laying on the grass-covered floor in the same area. One small, out-of-sight gourd container, next to the end of the ganekhe cabinet contains sanctified pig fat that is reserved for ritual function to anoint sacred objects. I am told that the very long, slender gisakpel wrapped bundle hanging from the ceiling near the left side of the ganekhe cabinet contains several long ceremonial nets of the kind that are laid out as the base for ceremonial display bundles (Figure 263). Between this rather elongated package and the round net of jerak to its left can be seen several objects standing against the end of the ganekhe cabinet, including a bundle of exposed reed arrows. The upper ends of the arrows are soot-blackened (on close inspection they even appear charred) and the bases are tightly wrapped with a protective covering of gisakpel. The blackened portion of the arrows indicates that they were once stored in the ceiling, or possibly laid on the center rack over the fireplace. The black soot residue on arrows can at times be used to distinguish functional profane arrows from those that are war trophies and which have been relegated to the rafters of a men’s house, their presence there for the comfort of ghosts, spirits, and human beings as artifacts of war. In Figure 287 (May 30, 1991), the left side of the fern-curtained ganekhe cabinet can be seen, with its closed, centrally located door, to the reader's right. In Figures 286 and 287, a long packaged je stone can be seen leaning against the left center leg of the ganekhe cabinet, below the ganekhe cabinet door. A puluen stone, first photographed tied to the cabinet leg in 1989 is observed in Figures 286 and 287, in photographs taken in 1991, tied to the same cabinet leg, but partially shielded from view by the long packaged je. The puluen is reportedly tied to the leg of the ganekhe cabinet so that the spirit in the stone will not cause the stone
Figure 287. The left side of the *ganekhe* cabinet with boar tusk mandibles.
to depart. [Author’s note: The people feel that the spirit within such a stone can leave its stone body from time to time, but also that the spirit stone as an entity has the ability to also depart and move about.]

The two photographs shown in Figure 288 (May 30, 1991), with Wali in both, are to be viewed as a composite pair that together show the entire front side of the sacred ganekhe cabinet. The same oblong hammerstone can be seen casually laying on the grass in front of Wali’s left knee in Figure 288 (May 30, 1991) that was first photographed in 1989. The front wall of the cabinet (facing the sacred space within the sacred house) is curtained with an abundance of hanging ferns that have been steamed and sacrilized with ritually killed pigs at sacred ceremonies. A scattering of long, slender jiwi leaves, also so-steamed, are sparsely intermingled with the ferns. In the center of the cabinet is the door, which in this case consists of a single adze-smoothed, fire-smoked, blackened wooden plank. In some cabinets, the door is a single board, as it is here; in others it consists of two boards. On both sides of the door is a curtain of bunched reed sticks, present on many ganekhe cabinets, but not used on all. In a similar fashion, the long jiwi leaves present as part of the curtain on Wali’s cabinet are not always present along with the hanging ferns (always present) on ganekhe cabinets. The front cabinet legs which support the cabinet well up off the floor are also the vertical supports for horizontally tied wooden poles, rattan, or bamboo thongs from which pig mandibles are hung beneath the cabinet. In this case, the smoke-aged, pig-grease rubbed, sometimes soot-blackened mandibles fill two complete rows below most of the cabinet, but only a single row of five below the cabinet door. In all men’s houses and sacred houses (pilamo wusa), these mandibles are mementos, sacred relics, kept in perpetuity out of respect for the spirits of the pigs that have been ritually sacrificed on the outdoor ground altar in front of the pilamo wusa, and as tallies to show both humans and ancestral ghosts and spirits that sacred sacrificial ritual is, as it should be, performed with regularity. Those mandibles hung below the left side of the cabinet door are from pigs that were sacrificed at ceremonies which focused on: 1) driving malevolent ghosts and spirits from habitation compounds, gardens, or other specific locales; 2) promoting health and fertility among women and the birth of healthy offspring; 3) insuring the good health and bountiful reproduction of pigs; and 4) creating fertile gardens and abundant and healthy crops. The pig mandibles to the right of the cabinet door and below the cabinet, were collected from rituals that were held for war purposes (success in battle, "good" warriors, and the safety of each warrior in the group while he is fighting). Any overflow of mandibles from below the ganekhe cabinet are hung in spatial and subjective continuity on the house wall to the right and left sides of the cabinet. Wali maintains that mandibles from all pigs killed at sacred ceremonies in front of those men’s houses with ganekhe are preserved. If they fill one structure, then another men’s house or sacred house must be constructed by the headman responsible for the rituals which produced the mandibles. The number and sizes of pig mandibles present around the margins of a ganekhe cabinet are an indication of the number
Figure 288. The left and right sides of the *ganekhe* cabinet.
of rituals performed by any given ganekhe group and an attestation to the influence of their leader to attract the donation of numerous large pigs for sacrifice.

Of functional significance in Wali’s sacred house are two small objects out of view behind Wali, and stuck in a vertical position in the ganekhe cabinet curtain. One object is a small feather which functionally is a wusa wand, used to cleanse (deactivate) the hands and bodies of contaminating spirits at those times when a person is involved with certain sacred objects or procedures (to be discussed more fully in the next section on “function”). Slanting downward to the right and behind the feather is a sacred bamboo knife which has a single red feather (called nararin) and a white feather (called taktak) bound to that portion of the knife that is used as a handle. The red feather on the handle of the knife has symbolic meaning. It transmits to viewers that when the knife is used to make the first long cut of the skin and underlying fat layer on the underside of a pig (from snout to anus) that the meat from the pig is for all to eat who are participating in the ceremony.

To the left of Wali (reader’s right), hanging from the wall, are some drying cigarette wrapper leaves for the use of whoever put them there (Figure 288). Above the leaves, the jawbone end of a small pig mandible, stuck into the construction materials of the house wall, is visible. Below is a leaf-wrapped roll of thong fire-starting cord (or rattan loop headband?). Above, to the reader’s right, are two recently gisakpel-covered bundles of funeral display nets, and above them a small packet which contains something that is sacred and which would not be discussed by its owner (Figure 289).

The many flat objects that are lashed tightly against the ceiling, only slightly more than one m above the floor, are coated with a black tarry residue from fireplace smoke. Wali says that the soot-browned bundle contains ceremonial exchange nets from a funeral distribution (Figure 290, 1987). This bundle is located alongside a blackened package which is said to contain war trophy arrows. Both bundles are located on the left side of the house, near the ganekhe cabinet. The package of war trophy arrows are being maintained as a sacred war trophy relic. Both bundles were present at this same position at the time of the 1991 photography (Figure 286) and were also observed again in 1993.

Figure 291 (May 30, 1989) documents a moment of great anticipation on my part: the opening of the ganekhe cabinet and a look at the contents in an undisturbed context. One sees Silometek, the guard of the ganekhe cabinet, removing its door. Silometek has both the delegated authority from the ganekhe group leader and the ritually transmitted wasahun power to be able to maintain the ganekhe cabinet and to handle the stones. Note the puluen stone tied to the front-center leg of the cabinet near Silometek’s left knee. Once the door had been removed, I was allowed to hold my camera inside of the cabinet and take three photographs of its contents. There were 10 conventionally wrapped ganekhe bundles on the grass covered floor of the cabinet, three standing unidentified objects, and two carelessly wrapped packages. Both before and after I held the camera inside the cabinet and released the shutter (three times), my hands
Figure 289. The details at the right end of the *ganekhe* cabinet.
Figure 290. Ceiling, only slightly more than one m above the floor.
Figure 291. Opening the cabinet door reveals its contents.
and body were cleansed with a feather wusa wand (removed from its position on the front of the cabinet) which was waved over them, while at the same time both Wali and Silometek whispered esoteric formulae. The moment to me was tense. The contents of the box is most sacred. In Figure 291, three of the 10 ganekhe packets that were within the cabinet look simple enough, but their unseen power is of mythical proportions and they are not to be tampered with outside of wusa connotations. What, specifically, are the contents of the packets and what would be our interpretations if they were found in the archaeological record? I could not, and did not want to touch these packets of supernatural power at the time these pictures were taken, but in a forthcoming section, I will discuss the packets and their contents not only from an archaeological perspective, but from the cultural perspective of behavior.

**Gutelu’s Compound of Residence and Men’s House at Jiwika**

I have made naked the power of The Stone by removing it from the ganekhe cabinet and shedding it of its gisakpeil wrappings. It now stands upright against the center of the ganekhe cabinet, facing the people of the Valley [Author’s note: Grand Valley] so that its power may go forth unobstructed to make fertile all of the fields of the Valley that they may produce abundant crops of sweet potatoes, even those of my enemies, that all of the people will be of good health and without sickness, that the pigs will multiply and become abundant, with many healthy piglets, that there will no longer be wars and that the people will be safe. This I have done for the people. Maintain The Stone in its upright position against the ganekhe cabinet where I have used my authority to place it—so that The Stone can continue to exude its power to the benefit of all of the people. Defile not the salt pool [Author’s note: lleukaima], but maintain it in its natural condition. Neither modernize it, nor let anyone construct buildings near it. I have set the boundary . . .

[Gutelu Mabel’s instructions to Daoke Mabel and his other sons, shortly before he died in February 1990. Gutelu (pro. Kurulu) was one of the most powerful historically known big men living in the Grand Valley at the time modern outsiders began to move in and interrupted the Stone Age lives of the Grand Valley Dani]

A paper print copy was given to me by Daoke Mabel of a photograph of his father, Gutelu Mabel. A photograph of that print is seen in Figure 292. I presume that the original photograph was taken by one of the members of the Harvard Peabody Museum Expedition of the early 1960s and presented to Gutelu. Gutelu’s compound at Jiwika (Figure 293) is architecturally similar to many Dani compounds, with the exception that the central courtyard is bigger than most, as is Gutelu’s men’s house at the far end of the courtyard. The presence and spatial relationship of six piles of burned rock are pointed out. In an archaeological construct in which only stones were preserved, these might be the only remnant clues of the compound and cultural system within which these items were used. All of the individual cooking rocks are gray colored limestone that were quarried and then carried by about a 30 minute walk from the base of the Cretaceous New Guinea Limestone formation, which crops out at the valley floor juncture with the rising mountain wall, just west of Gutelu’s compound. One pile of rocks (which could be interpreted as
Figure 292. Gutelu Mabel (photograph 1960s?).
Figure 293. Gutelu’s primary residence compound, located at Jiwika.
a small midden if found buried in the archaeological record) behind the tree in the left foreground is somewhat light colored relative to the grey of the other piles of rocks, indicating newly sourced materials that have only been heated once or a few times. Two of the rock piles on the right are actually located against the courtyard-bound wooden fence and two house walls. The surface of the front two-thirds of the courtyard is "greyled" with the dissemination of charcoal particles from the numerous fires that have been built through time to heat these rocks that are then moved from the fire to the steam bundles that are used for cooking. Today, as the Dani in the central portions of the Grand Valley where there are no rock walls or other structures, move about from compound to compound and in the process abandon compounds, they move their tools and symbolic stones with them, leaving behind only piles and a scatter of burned rocks (which are even themselves sometimes moved) as the only rock remnants of habitation.

Gutelu's compound at Jiwika is located at valley floor level, on the east-central edge of the Grand Valley near the Mountain Wall to the east (Figure 6). The important Ileukaima (ileu, salt; ai, water; ma, place) brine pool, under Gutelu's control, is about a 45 minute walk/climb almost due east of Gutelu's compound up into the higher edge of the mountains. The route from Gutelu's compound is eastward across a short area of flat ground and then up the steep valley through the trees. Access to the salt pool was historically through the courtesy of Gutelu. Back a short distance into the mountains, still farther east away from the Grand Valley near the river toward Pass Valley, is the location of Wadangku, a sacred "sun house" compound controlled by Gutelu for religious purposes (to be discussed in the forthcoming section on Sun Houses and Their Sacred Symbolic Stone). Gutelu's compound is located at the junction or funneling point of three access routes to the Ileukaima salt pool from the Grand Valley floor and near to two mountain routes from Yali territory. One of these is a main trade route between the Yali at Pass Valley and the Dani in the Grand Valley. By virtue of Gutelu's political power as the big man (gain) of a major Grand Valley alliance, his control and leadership of a sacred sun propitiation ceremonial center (to be discussed under Sun Houses and Their Sacred Symbolic Stone), and his control of the important Ileukaima salt pool, as well as regional trade routes between the Grand Valley and West and the Yali and East regions, it is logical that Gutelu had significant knowledge of goods that traded between the Yali and the Dani of the Grand Valley. Gutelu was the direct Dani recipient of artifacts traded from the Yali and then either retained for his own use, the use of some member of his patrilineage, or traded onward to other Dani. Did Gutelu, as a mighty gain of the Grand Valley Dani, use stone tools and other objects that could have been traded directly from the Yali and, if so, for what purposes? Let us look at the inside of Gutelu's men's house at Jiwika and at many of his belongings. Commencing in early June of 1991, one of Daoke Mabel's brothers acting in Daoke's absence, accepted the idea that it would be advisable to inventory his father's belongings. Work was commenced in June of 1991 and carried out intermittently over a three year period from 1991 through May of 1993. In one sense, as work progressed, I felt that we were conducting
an archaeological excavation of an assemblage of artifacts that had been owned by a known high level leader of the cultural system within which he lived.

The architectural design of Gutelu’s men’s house is the same as that of big man Wali’s sacred house at Yalogon (just reviewed) and of other men’s houses scattered throughout the Highlands of the Grand Valley and West, only bigger. The ceiling is 124 cm (4 ft) high, about 15 cm higher than the average Dani men’s house. Numerous banana (gisakpel) bark and other wrapped packages hang from the ceiling, the four center posts around the fireplace, and from the firewood rack above the earthen fireplace. Objects stored in Gutelu’s men’s house are similar to those in Wali’s sacred house, only there are more of them and some of the packages are larger. The ganekhe cabinet across the back wall of the building looks the same as in Wali’s and other men’s houses, but with a thicker curtain of ferns and a few leaves (jiwit) and reed sticks that shield the contents of the cabinet from the view of people who are inside the room.

From wall-to-wall, below the sacrilized fern curtain of the ganekhe cabinet in Gutelu’s men’s house, with the exception of an open space in the center, there are three horizontal rows of crowded mandibles, usually from large-size pigs: whereas, at Wali’s sacred house there are two rows of mandibles, several of smaller size than the smallest ones hung in Gutelu’s house (Figure 294). In Gutelu’s men’s house, like in Wali’s sacred house, the rows of pig mandibles to the left of the cabinet door are maintained as sacred relics from ceremonials where help from the spirits was enlisted on behalf of social health and fertility (of women, female pigs, and "mother earth"); those on the right for the safety and success of warriors in battle.

To the right of Gutelu’s ganekhe cabinet, the back half of the right house wall is filled with crowded rows of pig mandibles (Figures 295 and 296); at Wali’s sacred house there are only two mandibles displayed on the wall to the right of the ganekhe cabinet and none on the left. (The holes seen in some of the pig mandibles in Figures 294, 295, and 296 were human made, through which to push out the tusks). In the men’s houses in compounds with big men of less social and political stature than either Wali or Gutelu. I have observed that there are always fewer mandibles, and often of a smaller size than those present in either Wali’s sacred house at Yalogon or in Gutelu’s men’s house at Jiwika. Thus, a simple "archaeological" statement is made about the status of leadership, relative to at least one kind of sacred artifact of culture.

The first time that I was in Gutelu’s men’s house in Jiwika (after his death in February of 1990), was in May of 1991. I was astounded at the length of the unwrapped je stone leaning against the right side of the ganekhe cabinet opening. I was allowed to look at it, but at the time, not to photograph or touch it. [This is The Stone referred to in Gutelu’s instructions to his sons before his death in 1990.] I could see underneath the many rubbings of pig grease that The Stone is dark green (maybe pibit pibit), Yeineri-sourced type and about 121 cm long. The Mabel sons told me that it was the longest such stone in the Grand Valley. Later, in June of 1991, I learned the story of this particular stone from Gutelu Mabel’s sons,
Figure 294. Gutelu's *ganekhe* cabinet at Jiwika.
Figure 295. Crowded rows of pig mandibles.
Figure 296. Mandible religious mementos from sacrificed pigs.
and on June 12, 1991, I was told that I was the first outsider who was allowed to measure and photograph it. It is an elongate, rectangular, typical Yeineri dark green slate-like stone, 13.5 cm wide and about 121 cm long. A bit above mid-point, The Stone is wrapped with about 20 turns of typical Dani yellow orchid fiber cording. Other than that, it is obviously soot-blackened and has had many pig fat rubbings, but I could not discern (with the aid of my flashlight) any other markings or decorations. I was not allowed to touch The Stone, so I could not measure its thickness or view its back side. Both before and after I photographed it, my hands, camera, and body were cleansed with a tolok (alt. toluk) feather wusa ritual. I have seen this extraordinary stone in its mandated position just to the right of the ganekhe cabinet door in May and June of 1991; April, May, and June of 1992; and May of 1993. Apparently, it has never been moved although objects around it have been. It was placed just to the right side of the ganekhe cabinet door opening, so that the ganekhe cabinet could be used without disturbing it, which was Gutelu's strong wish, made known to his family shortly before he died.

To the left of this unusual stone in Figure 294, standing on the floor and leaning against the left side of the ganekhe cabinet opening, is a beautiful, highly polished, large puluen stone; symmetrical, pointed on the proximal up-end, rounded and semi-sharpened on the distal end; variable dark green in color, with linear, eroded grooves. What might be remnants of a stripe of sacred red hematite paint (red bimut, alt. pimut) can be seen in one of these grooves in the upper central part of the stone. This very sacred stone, because of its functional role as a communication link between the world of the "seen" and the world of the "unseen," is maintained in this select position in front of the cabinet as a special ganekhe stone, between the ganekhe stones in the cabinet above and the sacred and profane space of the men's house without.

In Figure 294, a segment of a permanently tied board plank can be seen in place along the floor at the base of the ganekhe cabinet. This board, along the house floor, seems to extend the height of the ganekhe cabinet from the ceiling to the floor, rather than just from the ceiling to a shelf midway between the ceiling and the floor, as is the case in all other ganekhe cabinets which I have observed. It was through this opening that one of the Mabel ganekhe group members reached in to retrieve ganekhe packets and other objects of Gutelu's for me to inventory and photograph. Whether or not there is yet a second raised cabinet shelf or floor above the lower level and shielded from view by the fern and stick curtain, I do not know. The ganekhe group members, including the Mabel brothers, did not want to discuss this wusa subject. Perhaps there are more sacred objects than were inventoried, secreted away behind the ferns and above the floor level. The objects on the house floor in front of the ganekhe cabinet (with the exception of the vertically-standing, tubular shaped bundle on the extreme left of the cabinet and the clean reed arrows also on the left side in Figure 294) were carefully removed one at a time from within the cabinet, through the central opening above the floor. The items recovered from within the cabinet through this
open access include several typical ganekhe bundles, and various and sundry objects, most of which I was
told are wusa and belonged to Gutelu. Of interest, among other items, are the three soot-darkened, pig-
grease rubbed, shiny staffs visible on the left edges of Figure 294. I was told that these staffs belonged
to Gutelu, had been enriched with supernatural power through ritual, and were Gutelu's "staffs of
authority." The musty gourd, seen in the central area of Figure 294 reportedly once contained holy water
used in dowsing steam bundles of pig meat and greens being cooked at sacred rituals. In Figure 294, a
reader can see in the foreground the edge of a blackened loop of sacred cording, purportedly used as a
headband; an unused piece of cocoon wrapping material, a long narrow wrapped packet of bamboo knives,
and to its right the edge of a ganekhe inner wrapping of deteriorating bark cloth. The clean, recently
bound adze blade is profane (Figures 294 and 297).

The large, classical axe seen in Figures 294 and 297, I was told was a favorite of Gutelu's and which
he stored on the floor of his house, within the bounds of the ganekhe cabinet. It was removed with the
other items for me to photograph as a part of our inventoring project. The aged, brown bulbous axe
handle with its large green and blue-black variegated colored Yeineri Style amphibolite axe blade, I feel
with time, may become a modern symbol for the "Dani of the Stone Age." It is a type of rare tool of
grand proportions which is rapidly disappearing from the Grand Valley. Daoke Mabel says that this one
is now sacred. In the immediate Jiwika area, Daoke Mabel knows of only one other of similar size and
beauty, and that one is owned and maintained by an elderly man, living in a nearby compound. As
previously discussed in Chapter V, the only use of this kind of axe was/is to longitudinally split tree trunks
and large limbs; not to cut down trees or to chop wood.

In Figure 298 (May 11, 1992), The Stone was present in its same position as on the earlier date one
year before (June 12, 1991) and also a year later on May 10, 1993. In the photographs of June 12, 1991,
the puluen of May 10, 1993 (Figure 294) was not present, but instead the je stones were, one wrapped and
two unwrapped. I might point out that the wrapped je was present the first time I saw The Stone in May
of 1991 and then when I first photographed it on June 12, 1991. At that time, the wrapped je was touching
The Stone and no other stones were present on the front side of the ganekhe cabinet, not even a puluen.

During the early years of my research (1982-1987), I often photographed between one and four je
stones, almost always wrapped with traditional gisakpel wrapping, and often an unwrapped puluen stone
leaning against the front, central part of ganekhe cabinets. In 1982, I was told that the je were profane
funeral display-exchange stones, but that the ganekhe cabinet was wusa, not to be looked at, questioned,
or discussed. The term wusa in mid Grand Valley Dani dialect was carefully explained to me. If I
questioned an object, place, or idea and was told that it was wusa, I was being given the "code" word that
for whatever reason, the subject was to be abandoned, with no further conversation. When I would see
wrapped or unwrapped je stones leaned up against ganekhe cabinets, the Dani would just casually say, "je",
Figure 297. Gutelu's bulbous-type Dani axe.
Figure 298. *The Stone*, Gutelu's most powerful spiritual object.
knowing that I knew a bit about those kinds of stones and would ask no further questions. As my inventory of 35 mm slides taken inside different men’s houses began to increase with the work of each field season, I would routinely lay them out on a light table back at home between periods in the field, to scrutinize the similarities and differences between a diverse group of men’s houses and to begin to get longitudinal temporal appreciation of changes within a given man’s house. One year, early in my research, it became apparent during a light table review session, that nearly always one or more je were propped against the central part of the front of the ganekhe cabinets and that usually a single shorter stone, of the same dark green color (from stone to stone) and with a diagnostic symmetrical structure, was leaning against a front center leg of the ganekhe cabinets. The next field season I went directly to a man’s house of one of my most helpful informants. I was advised that I could not pick up the relatively short, dark green, symmetrically ground stone which leaned against the left central front leg of the ganekhe cabinet. This particular stone is called a puluen by the mid Grand Valley Dani. No discussion was forthcoming. The object which was before simply referred to as “je” with a shrug of the shoulders, was now known by me to be sacred (wusa). Interestingly, that same year (1985), in two different men’s houses in which I did not know the inhabitants or anything about the ganekhe groups of those houses, I was told the stones leaning against the central front of the ganekhe cabinet were “je”. but that they could not be touched to measure them. I then concluded that although these stones were “je”, that in their context of placement against the men’s ganekhe cabinet they were also, at least temporarily, wusa, not just simply profane like je that might be present elsewhere within the houses. With time, as one local inhabitant, whom I visited year after year, got to know me and my team of indigenous assistants, information about the exposed je stones that are maintained against the front-center area of ganekhe cabinets was forthcoming. Of these, the puluen is indeed an important, functional sacred stone when used in this context, leaned up against or tied to a leg of a ganekhe cabinet. It is considered a wusa ganekhe stone. Through ritual empowerments, it has attained supernatural spirit power; whereas in the je display-exchange stone context it is only a profane display-exchange stone. In a functional sense, the puluen, when in its position in front of the ganekhe cabinet, might be called a "priest stone." It is the communication intermediary between human worshipers in the seen world and those ancestor spirits of the unseen world that are domiciled within the ganekhe stones in the ganekhe cabinet. For example, when a ganekhe group leader, who is both in one sense a priest for the group whose function it is to "make sacrificial offerings and perform other religious rites as an intermediary between deity and worshipers" (Neufeldt and Guralnik 1988:1068) and a shaman, whose role is to influence both good and evil spirits (wherever they might be) on behalf of the group, prays before the ganekhe cabinet to the ancestor spirits who are deified within the stones, his supplications are to the puluen, who transmits these prayers to the spirits within the ganekhe cabinet. Thus, there is a two-fold communications link between the common man of the seen world and deified ancestral spirits of the
unseen world: 1) from the people to the shaman-priest and 2) from the shaman-priest to the puluen stone and on to the spirit stones in the ganekhe cabinet. This role of a stone-spirit intermediary between the seen and unseen world is even more complex than it might seem from only this superficial understanding of that fact. The puluen is believed by the people to be, in a very responsible sense, the "eyes and ears" of the ganekhe-housed ancestor spirits. It is the puluen spirit who reports to the ancestor spirits in the stones, the conduct of the profane aspects of "house" life. When ritual is being performed within the house and it is being used as sacred space, the puluen also observes and reports. At certain spiritual "renewal" ceremonies, the ganekhe packets are carefully removed from the ganekhe cabinet and the stones manipulated in ritual in front of the cabinet. At those times, the spirits in the stones themselves, sense what is going on within the sacred space of the house, but they do not know whether or not proper ritual protocol is being adhered to within the courtyard outside of the house. At these times, as well as at other times when the ganekhe packets are left inside the ganekhe cabinet, but ritual pig sacrifice and feasting is going on outside of the house, the puluen might be carried outside where it can observe the happenings and report back to the spirit stones within the cabinet.

Gutelu’s Stone, the longest symbolic stone which has been observed by me (and which Daoke Mabel says is the longest present in the Grand Valley), is seen in its place of exposed prominence against the front-center of the ganekhe cabinet in Figure 298 (May 11, 1992). To its right is an unwrapped green-blue Yeineri Style je stone (7.6 cm x 74 cm). To its left is a green pibit pibit je stone (9 cm x 71 cm), and to the left of that, nearest the center-left leg of the ganekhe cabinet, a packaged stone that is 10 cm wide by 66 cm long. I did not touch any of these stones, only photographed them and held the measuring tape slightly away from them when making measurements. I was told that the two "je" adjacent to Gutelu’s Stone had been sacralized and in the context in which they were being used, were guardians of the ganekhe and also of Gutelu’s Stone. They could, however, be removed from this wusa context as ganekhe guardians and changed back into profane context and used as profane stones. If and when this is done, "remanent spiritual power would make them especially good funeral display-exchange stones." The gisakpel wrapped stone, leaning against the leg of the ganekhe is wusa. "Gutelu’s spirit is in this stone, and the stone is placed so that Gutelu will always be with us in the ganekhe house" (Daoke Mabel, May 11, 1992). The stone between the wrapped stone and the Gutelu Stone is pibit pibit, itself powerful and at this time wusa, acting with spiritual duties on behalf of the puluen stone that is not present. Note that against the left front leg of Wali’s ganekhe cabinet in his pilamo wusa at Yalagon (Figures 286, 287, and 288), there is a single, long, wrapped je-ganekhe stone, about which Wali would only say it is a wusa guardian of the cabinet. I point out that a puluen was also present behind the gisakpel wrapped stone and tied to the leg of the cabinet.
On the floor in the foreground of Figure 298, a segment of one of Gutelu's walking sticks (segeluk) can be seen. This staff is 133 cm long and made of yewogat wood. The Mabel brothers say that this particular segeluk is more than just a walking stick; it is a staff of authority, signifying Gutelu's position of leadership.

As in Wali's sacred house, many bundles and wrapped objects hang from the ceiling of Gutelu's house, with the most sacred being those at the back of the house and hanging nearest to the ganekhe cabinet. A part of the ceiling, before the central cabinet door, is free of hanging objects, the intent being to keep that space open for the movement of people and the manipulation of objects in and out of the ganekhe cabinet during sacred rites. Around the wall perimeters of the ceiling toward the back of the house, the situation is different. This space is crowded with many stored ceremonial relics. A torn net bag contains two power bundles (wamabat) (Figure 299). The one on the right looks very much like any other ganekhe packet from within the ganekhe cabinet. These two items are sacred, their contents spiritually powerful. (Similar packets will be opened and discussed later in the chapter.) Leaning against the wall, just to the left of the entranceway (as one enters the house), are four profane gourds that are traditionally used to hold drinking water (Figure 300). Similar gourds used to hold holy water are hung from the wall or the ceiling, as shown in Wali's sacred house (Figure 286).

Gutelu had many personal belongings, both profane and sacred. Only a few examples of each will be discussed and/or shown with photographs in the following text, although a more complete itemized list is included in Appendix II.

Two of Gutelu's all-purpose, durable and lightweight bamboo containers are shown in the upper photograph in Figure 301. Items ranging from feathers (profane and sacred), pulverized mineral coloring materials, chert flake tools (moli), shaman healers' medicines and paraphernalia, and sacramental pig fat are examples of items that might have been stored within. Gutelu's bamboo containers look just like the ones used by the Wano and Duve (to the west) as parts of their bamboo fire-starting kits (Chapters IV and V) and by the Yali (to the east) as ear lobe adornment plugs (Chapter IV). The lower container has been incised with either a mandible tooth graver or a chert flake tool (moli). The engraving is of a waija moiety symbol, although Gutelu was wida (alt. wiita). Perhaps the container held material for use in the waija boys initiation ceremony.

The lower photograph in Figure 301 shows the size range of traditional fire-starting implements. The forked stick is called a sekantok and is made from the wiki tree. The split in the lower stick is held open by a small rock, although pieces of stick or even bone are sometimes used for this same purpose. One roll of fire-starting thong, called sekandade, is seen laying over the shorter sekantok. These particular fire-starting tools belonging to Gutelu are not considered to be sacred by his family. Daoke
Figure 299. Torn net bag with two power packets.

Figure 300. Four typical water gourds.
Figure 301. Two bamboo containers and two stick-thong fire starters.
Mabel told me that he knew nothing about the "Wano bamboo matchbox" fire-starting tool that is described in Chapters IV and V.

Photographs of the contents of three ganekhe packets (from the ganekhe cabinet) are shown as examples of Gutelu’s ganekhe. The contents of other ganekhe packets from Wali’s ganekhe cabinet are shown in a forthcoming section entitled The Ganekhe Hakasin Ceremony. Figure 302 shows, according to oral history as related by Daoke Mabel (1992), the adze blades which are the original jaga (original adze blades) of the Grand Valley that were handed down through the ancestral chain to Gutelu. All other adze blades, according to Daoke, followed. The upper photograph in Figure 302 shows blade G-1 [Author’s code], carefully nested on a few special leaves inside a reddish-brown cocoon cloth wrapper. The cocoon cloth packet was folded tightly and lay on a doubled-over piece of bark cloth inside a small man’s carrying net. This packet, tied with string, constitutes a single "ganekhe". It is pointed out, however, that most ganekhe packets consist of an inner object or objects wrapped with or without a cocoon cloth, then two or more wrapping cloths of tree bark, all enclosed in a banana trunk (gisakpel) or Pandanus leaf outer wrapper and tightly tied with narrow bands of gisakpel, rattan, or string cording. The adze blade (G-1), wrapped with one single grass strand and piece of bark fiber string, lays within the cocoon cloth on several slender brownish colored leaves (jiwi and wolo by mid Grand Valley terminology). I have not, as yet, been able to scientifically identify the jiwi and wolo leaves. The adze blade is a typical dark green Yeineri Style. Included in the bundle is one black pig’s tail. The ganekhe packet in the lower photograph of Figure 302 contains two small adze blades, one a dark green-black Yeineri Style (G-2) and the other a green-black Yeineri Flat Style (G-3). The Yeineri Style blade (ventral side up) is both wrapped with a knotted grass stem and also tied-around with a thin strip of bark fiber, onto which has been slipped a nassa shell. Two wolo (Grand Valley terminology) leaves are tied with about eight loops of a grass stem to the dorsal side of the Yeineri Flat Style blade (dorsal side up). Both blades rest on several wolo and jiwi leaves, inside their multiple wrappings of two kinds of bark cloth, a layer of modern cloth (unique in my experience), and an outer cocoon cloth that was folded tightly within a banana trunk (gisakpel) outer wrapping.

I was not allowed to touch any of the three stones in these two ganekhe bundles, nor any other sacred stones in the course of my research regarding these most sacred of objects. After these two bundles were closed and re-wrapped, the hands and bodies of those involved were cleansed spiritually with a traditional feather wusa wand totok procedure. Although I had not touched the objects, my camera and hands were also cleansed in a similar fashion, with a shaman waving the feather wand over my hands and camera as incantations were recited.

Ganekhe Packet No. 28 [Author’s identification code] is perhaps one of the informationally more significant (Figure 303). Underneath the traditional gisakpel wrapping is an outer dark brown colored bark
Figure 302. Two Gutelu *ganekhe* packets which contain Yeineri Style adze blades wrapped with strands of grass and fiber string.
Figure 303. A Gutelu-owned *ganekhe* packet contains three tool stones, each wrapped with numerous loops of grass.
cloth, then a lighter colored, stone beaten, buff colored, bark cloth, on top of which are three *ganekhe* stones. As in the previous two packets, the three stones lie on several leaves of the same kind of plant (*wolo*) as is tied to stone G-3. In addition to the stones and leaves, there are two buff colored pig tails within the packets. Daoke Mabel informed me that the white moldy-looking coating on the stones is not "mold" as I thought when the packet was opened, but is white clay, rubbed onto the stones for ritual purposes. From top to bottom, I coded the stones Nos. G-4, G-5, and G-6. I did not touch the stones as I crouched over them for measurements (tape held away from the stones), visible analysis, and two quick photographs. Stones G-4 and G-6 are Langda-Sela Style stone knives, similar to those that I have seen in pervasive use as profane cutting tools throughout the entire Yali and East region. Knife blade G-4, at the top of the photograph, is about 4 cm wide (widest point) and 18.5 cm long. It is gray(?) in color. Knife G-6, at the bottom of the photograph, is about 4.2 cm wide by 9.7 cm long and gray in color. The *ganekhe* stone between the two Langda-Sela Style knives is a green-black Yeineri Flat Style adze/axe blade about 32.5 cm long by about 7 cm wide. Knife G-4 is wrapped with about 13 loops of a special grass; axe/adze blade G-5 with about 18 loops of grass, and knife G-6 with about 19 loops of grass, and underneath the grass, several loops of a bark fiber string. The stone objects with their grass blade ties, two pig tails, and leaves are wrapped in three inner layers of a heavy bark cloth, one a dark brown, and the other layers a buff color. When secured as a *ganekhe* packet, the bark cloths are folded over the contents of the packet and then secured in an outer layer of tightly folded dry outer covering of a banana trunk (*gisakpel*). This entire packet is tightly bound with narrow strips of *gisakpel* when stored. Some similar looking *ganekhe* bundles are secured with a strong bark fiber braided cording (*kopi* in the mid Grand Valley dialect) of the same kind that is used to tether pigs.

In Figure 304, a relatively large bundle is seen suspended against the right wall of the men's house, just to the right of the right end of the *ganekhe* cabinet. Whereas all other large bundles are hanging from the wall or the ceiling with their long dimensions vertically, this bundle hangs with its long dimension horizontally. Above the bundle, one can observe some soot-browned and blackened pig mandibles hung against the wall with a small scattering of fern leaves. It would appear that the motif of the closed *ganekhe* cabinet to the left of this bundle has been extended along the wall beyond the closure of the *ganekhe* box to include this large bundle. Actually, *it is being* treated as a *ganekhe* packet—the largest that I have had the opportunity to observe, although it is maintained outside of the *ganekhe* cabinet. Do the contents include one or more long stones, a number of individual *ganekhe* packets or what? On June 12, 1991, I was told what was in the bundle, but because of religious taboos it could not be opened. In 1992, I again photographed the bundle in its same hanging position but was not allowed to see its contents. On May 10, 1993, a brief cleansing ritual was performed and the bundle opened. First, it was laid on the grassy floor of the house. Only several of the Mabel brothers were present with me and my Melanesian assistant.
Figure 304. A large sacred bundle hangs outside of the ganekhe cabinet.
After the tie strips of *gisakpel* bark were unwound and the outer covering removed, one could see a very large, conventional *ganekhe* bundle inside of a beautifully crafted carrying net (Figure 305). It was immediately apparent by the tight, evenly spaced loops that the net was crafted by the Yali, not the Dani. Western Dani, Damal, or Wano (Chapter IV). An unusually large *ganekhe* packet was removed from the nicely crafted carrying net. It was neatly tied with dark brown braided fiber cording (*kopi*). As the packet was laid open, its torn outer covering of dark brown bark cloth lay on the grass covered house floor (Figure 306). Next was a large newer-looking buff colored piece of bark cloth, followed by the typical reddish-brown bark cloth that I was becoming accustomed to seeing used as an inner wrapping of *ganekhe* objects. The inner three layers of bark cloth wrappings form a cushioned "blanket" on which leaves (*jiwi* and *wolo*) and grass furnish the nesting material on which lay seven pig-fat anointed, soot-browned and blackened human jawbones and three clavicle, two of which can be seen in the lower photograph of the figure. The front of each jawbone is wrapped with many individual loops of grass that may have been put on the jawbones at different times, as distinguished by color variances of the grass loops (Figures 306 and 307). White teeth can be seen emerging through the grass stem wrappings on at least two of the jawbones. The long, slender leaves that can be seen lying in the packet on the outer sides of the jawbones, are from the *jiwi* plant. Leaves from this plant are often maintained with sacred *ganekhe* objects as well as used for other sacred purposes. As can be seen in Figures 306 and 307, the human jawbones lay nested inside of each other. In whispered voices (so hopefully the ghosts and spirits would not hear) the story of the jawbones was told. Since the same story was related to me during the two preceding years (before I was allowed to see the jawbones) and again in the year of 1993 when I was first allowed to see and photograph them, it would seem that this is at least what the Gutelu Mabel descendent sons wanted me to know and believe. These seven jawbones, according to the story, are from seven male ancestors, each one from "the" big man of seven contiguous generations, genealogically flowing and contemporaneously touching in the *ganekhe* packet from the viewers left (oldest) to right (most recent). The jawbones reportedly from the seven big men, each the son of a previous big man, are relics of an unbroken chain of patrilineage descent. The jawbone on the reader's left comes from the first *human* from which "all" succeeding humans descended [Author's note: not the first life form but the first *human* life form.] According to several but similar origin myths told within the Grand Valley and West region, the first human was preceded by a mythical "god-power" (Chapter IV). The first human spirit power, located within the first jawbone to the reader's left, is so sacred, so spiritually powerful, that it is taboo to speak its name. (I do not know the name of this "first human spirit power.") That first jawbone on the left represents (domiciled within) the people's *most powerful* ancestor god-spirit, whom I will henceforth call Unspoken-Name. Second from the left is the jawbone of one of the sons of Unspoken-Name who is known as *Aula* (alt. *Aulusa*). I do not believe that the practice of teknonymy is involved. The third jawbone is from the son named *Walimo*
Figure 305. Inside the bundle, a Yali-made net contains a large ganekhe packet.
Figure 306. The inner wrappings of two kinds of bark cloth contain seven human jawbones and three clavicles.
Figure 307. A composite pair of photographs show details of the mandible chain.
(alt. Bukale), the fourth jawbone from the son known today as Umo (alt. Wumo), the fifth jawbone from son Akalunonggo, and the sixth from a son who is known as Filiak. From oral history, it is said that Filiak did not want to be cremated, but requested that upon his death the people mummify his body and henceforth keep it forever. The people did not do this; instead, they preserved a jawbone and cremated the remainder of his body. The seventh or end jawbone on the right is said to be from the son Yagathbuk (alt. haliheli). According to this origin genealogy, Yagathbuk was the father of Wamena, from whom the Highlands’ town of Wamena (first a traditional compound, then a hamlet, and now a modern town) derived its name. By this genealogy and origin myth, Wamena was Gutelu Mabel’s father and representative of the eighth generation in line of descent. Consequently, by the Mabel patrilineage origin myth, Gutelu is in the ninth generation from the first human in the Grand Valley, and Gutelu’s son. Daoke Mabel, within the tenth generation since the creation of the first human. Three of the Mabel informants say that the three short bones in the ganekhe bundle, alongside the jawbones (two seen in Figures 306 and 307), are human collar bones (clavicles) that were from people eaten by the ancestors. These bones are called agosiot. Under questioning about the bundle of human jawbones my informants replied that No-Name consumed all of himself by cremation except his jaw, so the people decided to make it sacred and saved it. This is the origin, as related by the Mabels, of the custom of cremation in the Highlands. The custom of saving human jawbones by the Gutelu Mabel patrilineage was apparently abandoned at the death of Wamena. But the practice of ancestral worship strongly endures as one aspect of the Highlanders’ complex belief system (Chapter III).

Within the Mabel brother story of their genealogy and the revelation of ancestor worship by the preservation and sacramentization of ancestor jawbones, the Mabels briefly mention cannibalism but do not elaborate on the subject. From my own research during the period 1982-1984 in areas away from Jiwika, I suspected that cannibalism was an integral part of ancestor worship (at least in scattered areas throughout the Grand Valley and its environs). Indigenous informants of different Grand Valley and West language groups made innumerable relating cannibalism to ancestral religious ritual and two different informants stated that "select parts" of deceased ancestors were "sometimes" consumed to perpetuate "life power" (Chapter IV). From a theoretical viewpoint, it would seem that such an act of consecration---holy communion---at the time of death of an ancestor would perhaps establish an early rapport between the living and the ghost/spirit of the recently deceased. If such were the case, even in only isolated incidents, a seeming paradox exists regarding the practice of cannibalism in the Highlands because of other incidents where enemies’ bodies are known to have been cannibalized as parts of victory celebrations or to disgrace the dead enemy’s living cohorts (Chapter IV).
Before I summarize the use of sacred space, it is pointed out that in the Yali and East region, pig mandible mementos are often hung outside underneath the roof overhang, rather than on the inside of the men's houses, as they always are in the Grand Valley and West (Figure 308).

A House Plan for Its Material Contents and Places of Worship

The spatial arrangement of artifacts of culture within both Highlander men's houses that are located in normal habitation sites, as well as those special sacred houses that are secreted away in isolated locales, adhere to a common house plan. To an uninitiated modern outsider visiting Highlands' men's houses, "the plan" might not at first glance be recognized, but it is there.

House content can be grouped into five categories for functional and spatial analyses: personal belongings, house furnishings, counter ghost/spirit objects, relics, and ganekhe cabinet and ganekhe objects. Personal profane belongings are maintained around the perimeter of the house floor, on the house wall, and attached to or hanging from the ceiling. The reader is referred to Figure 309 to see the spatial relationships of the other four of these five categories of cultural artifacts, which are the categories that define the use of sacred space. On Figure 309, the numbered artifact items indicate representative kinds of objects in each of the four categories and their location in space:

House furnishings on floor level
1) barkwood potato skin trash receptacle
2) gourds for drinking water
3) bamboo fire "bellows" tube
4) reed cigarette holders
5/6) hammerstones and anvils, and in addition to the numbered items, one or more thong and stick fire-starting tools

Counter ghost/spirit objects from ceiling or fireplace supports
7) packaged sacred objects with supernatural power
8) supernaturally powerful spider web necklace
9) stone amulets with supernatural qualities
10) empowered string necklace (dibat) to protect the house
11) sali stick to cleanse the area of malevolent ghost spirits
12) power packet
13) soot-blackened arrow

Relics hanging from ceiling or wall and on floor (some wusa)
14) bundle of ceremonial nets from a funeral exchange
15) bundle of war trophies
Figure 308. Pig mandibles hang as mementos on the outside of a Yali house.
1. House furnishings on floor level
2. Counter ghost/spirit objects from ceiling or fireplace supports
3. Relics hanging from ceiling or wall (some wusa)
   Relics standing on floor (some wusa)
4. Ganekhe cabinet and ganekhe objects outside of cabinet

Figure 309. Placement of objects defines use of sacred space.
16) wealth items from exchange rituals
17) sacred bamboo knives (to be saved) and sometimes relic sanctified pig fat
18) objects "from the ancestors"
19) bundle of sacred relics (which in this special case contain Gutelu and Daleke Mabel's bundle of human ancestor jawbones and clavicles which are ganekhe
20) jerak from funeral distribution
21) sacred ancestor relics and/or trophies
22) bundle of war trophies
23) bundle of nets with ritual attached pig tail mementos (su walon)
24) bundle of arrows collected as trophies of war

Ganekhe cabinet and ganekhe objects outside of cabinet
25) puluen stone (guardian and "go-between"—see text)
26) sacred je stone (guardian of the ganekhe)
27) sacred je (in this case Gutelu's Stone)
28) sacred je (guardian of the ganekhe, and/or ancestral spirit je)
29) ganekhe cabinet, the box container for the sacred stones

What we see by the plan at the back of the house is the ganekhe cabinet and its adjacent sacred objects (Figure 310). The ganekhe cabinet is the box for the supernaturally most powerful and revered items. Below and to each side of the cabinet is the space for religious relics. Between and to the front of this space for relics are those items of supernatural power that are advantageously located to protect the sacred space and its contents at the back of the house from potentially malicious intruders from the spirit world. In the following sections by examining function within sacred space, it will become clear that parts of the floors of the men's houses, usually used as routine profane space, are readily converted to altars during times of sacred ritual.

At the Highlands' people's places of worship [men's houses and sacred houses (pilamo wusa) with their adjoining courtyards] there are places for the most sacred and supernaturally powerful of objects (the ganekhe cabinets), places for religious relics, indoor and outdoor ground altars, places for the ganekhe religious groups with their shaman leaders, and places for the general people (both initiated and uninitiated (Figures 310 and 311). During religious ceremonies, the uninitiated (all females, very young boys before initiation, and outsiders) are restricted to the compound courtyard, with its outdoor altar and nearby cooking pits. The shaman ceremonial leaders and members of the ganekhe group on whose grounds a particular ceremony is being held are authorized to freely come and go between the men's house and the courtyard, depending on their personal desires and ritual duties. Attendance at meditational rites may be restricted to only the leader of the ganekhe group of that particular sacred place and the resident guardian of the
Figure 310. Plan view of use of sacred space.
Figure 311. Sacred compound at Yalogon.
ganekhe. Most rituals are, however, conducted for all members of the *ganekhe* group; others for the *ganekhe* members and their guests. Some ceremonials are open to not only invited guests of a particular *ganekhe* group who live nearby but also to both the initiated and uninitiated who might come from afar.

**Spirit Power, the Power Circle, and Ancestral Spirits**

From the viewpoint of a cultural systems analysis, the cumulative spirit power in the unseen world of the Irian Jaya Highlanders is formidable: hundreds or maybe even thousands of other-than-human-originated individual spirit types abound which all seem to be evil (Chapter III), the supernatural power of the sun is awesome, and the ancestral spirits never die but just increase in number. Both the positive and negative aspects of this power must be considered when people in the seen world are establishing, building, and maintaining social relations with the ghosts and spirits in the unseen world. Successful contradiction of malicious acts from the ghosts and spirits and some measure of control of the potentially positive power of ancestral spirits, as well as the perpetuation of the beneficial power of the sun can be understood as tantamount to success for those living in the world of the seen. How, to the esoteric groups dealing with this unseen supernatural power, is something so powerful, so potentially precious, beneficially perpetuated and controlled? It must have taken a great deal of mental agonizing, group learning, and planning to first evolve a strategy for dealing with the world of the unseen and to then develop a tactical plan to activate the strategy. The strategy was to venerate, propitiate, and manipulate ancestral spirits, to propitiate the sun power, and to both placate and take contradictory measures against all malevolent ghosts and spirits. In tactically pursuing such a plan, do the people in general, or at least their shaman leaders, enter the world of the unseen to directly interface with ghosts and spirits to plead their cases? Are sacrifices and offerings made to placate the spirits and to attempt to gain favors from them through propitiation? Is it possible to identify general principles that are at play and which have cross-cultural and temporal commonality, the hope being that by identifying such principles we can gain confidence in the uses of the material goods involved (and of similar ones preserved in the archaeological record) from which to interpret behavior?

Within the hierophany of the sacred space of the men’s house, its contents, and adjoining outdoor sacrificial ground altar (Figures 310 and 311), the presence of supernatural ancestral spirit power manifests itself during ritual in grand proportions in a never-ending continuum or circle of power. Henceforth, I will refer to this phenomenon as the *power circle*. From time to time, additional power is added to the circle by the installation of another ancestral spirit into another *ganekhe* sacred stone or sometimes other kind of object. The individual and cumulative power that is already within the *power circle* is nurtured and rejuvenated by periodic ritual. At the same time that the power is being moved about in a seemingly
complex symbiotic relationship between objects, pigs, and humans, it is being propitiated to commit heroic beneficial deeds on behalf of the religious ganekhe groups which attempt to control the power.

Individual ghosts (new power) are born into the world of the unseen at the time of death of each human. The soul matter (or edai egen, "singing seeds of life") departs the deceased to become a ghost. With maturity (subjectively understood only within the esoteric group), the ghost passes through a metamorphosis to become an ancestral spirit (Chapter III). At different times religious ganekhe group meetings are called by group leaders for the purpose of conducting one of several different sacrificial rituals. All members of the religious ganekhe group are expected to be present. During the rituals, supernatural power which seemingly effervesces constantly from the individual ancestral stones (the ganekhe) and which also combines to form an aura of immense unified power within the ganekhe cabinet is transferred from object-to-object, object-to-person, person-to-object, person-to-person, and object-to-object-to-sacred pig. The people in this power circle are the shamans (wusahun). To the people involved, the power is awesome. For an outside researcher it is difficult to know where to enter this never-ending flow of power to analyze and describe it from a non-participating secular viewpoint. It seems that this supernatural power, of and from the unseen world, just is. It does not seem to have a beginning or an end, but just is.

Supernatural power is added to the power source in the world of the unseen with the addition of each new ghost that has been created by the death of a human individual. The ghost is first thought to enter the ghost bundle (wagun ai) during a cremation Chapter III. Some informants say, no, that they feel each ghost first goes to the compound bone enclosure after each cremation to tarry a bit with its bone remnants before moving on to the sacred, secluded ancestral ghost house. Regardless, at whatever time that it is decided by a human individual to venerate a specific ghost-spirit and to formally recognize it as a personified ancestral spirit, that particular spirit entity is lured from wherever it might be living, into a select stone, which at the time of installation becomes a personified ancestral spirit stone, a ganekhe. Ganekhe are passed down from generation to generation and it is not often that a spirit stone is replaced or a new ancestral spirit otherwise installed into a stone and added to a ganekhe collection. When this is done, it is during a ritual called a ganekhe hakasin (mid Grand Valley Dani dialect), which is a periodically performed power renewal and ancestor worship ceremony.

A ganekhe is thought of and treated not just as a "house" where the spirit, as a complete living entity ("mind, body, and spirit"), takes up residence (much like a human being in a traditional house), but as the body for the yet-living spirit power of a deceased human being. This is why ganekhe objects are sometimes thought and talked about as "spirit bones" within the indigenous population. Wali, Hanomoak, and Aluk say that when a new ganekhe is to be created, the sponsor lays out all of the stones from which he might choose: funeral exchange je, profane tool stones, geologically shaped stones and oddities that he
may have collected, and other candidates that might be acquired from within his family. The man then visually studies this collection and meditates (maybe for days) until a choice is made for him through a divination.

The Highlanders selectively choose ancestor spirits from deceased leaders for veneration within their patrilineages of ancestor beings (the ganekhe of each ganekhe group), omitting the spirits from men who were of small social or political consequence. They feel that if a man were a powerful gain (war leader and/or big man of other influence within an alliance) that his departed spirit, if propitiated to advantage, would be a much stronger ally than, for example, the spirit from a man who was of less influence and power in his community.

As previously stated, the perpetuation of the life of an ancestral being (empowered single ganekhe stone) can be achieved by the inheritance and continued maintenance of stones already vitalized with spirit. The creation of a new spiritual being is by the selection of a body ("spirit bones" which is a profane stone, or rarely, another kind of material object) and the installation of a personified ancestral spirit into the body through an appropriate sacred ritual, usually the ganekhe hakasim. The body, then, is the rock, which once installed with an ancestral spirit is the complete spiritual entity: the ganekhe. The room (or living space) for the spiritual entity is the ganekhe packet. The stone is nested and maintained in its packet with symbolic materials that its owner or caretaker (both the individual owner and the ganekhe group shaman leader) feel will assure a measure of physical comfort and mental well-being to the spirit that dwells within.

The Highlanders state that although there are female ghosts and spirits, it is only the male spirits that are installed into the stones to create ancestor beings. One would suppose then, that all of the ancestor stones, duly installed with "spirit life," would be anthropomorphically male, but my informants are steadfast in their stated views: "No. we do not think of the stones in themselves as being male or female; although we do very much think of the spirit power within a stone as being male."

Once a formerly "dead" profane stone has been given life by the introduction of a personified male spirit, the top, bottom, front, sides, and back of the stone (which were previously discussed by the users only from a structural perspective, without identifying the stone anthropomorphically) are discussed and treated as an anthropomorph, but not treated specifically as a male versus female regardless of the kinds of material goods which might be maintained on, and with a stone.

It is felt by the ganekhe groups that the ancestor individuals (ganekhe stones) like to either stand or lie on their backs. Only during periods of temporary discomfort might an ancestor stone in a prone position roll over and turn or toss about (and thereby cause earthquakes, a belief of the local inhabitants). Thus, the ganekhe groups either stand the stones vertically or lay them on their backs. It is further felt that when the internal spirit power of any ancestor stone departs its body, to travel about and later return, it
does so through the head. To be able to please and to not cause discomfort to the ancestors, the owners of the stones go to great lengths to properly orientate the stones. If there is a slight curvature in a stone, it is felt among the esoteric group that the concave side is the front of the individual, and should thus face upward when the individual is placed in a prone position. Sometimes, it is difficult even for the owner of a stone to remember which side he has identified as the front. In such a case he might lay a single feather on the front side of the ganekhe stone within the ganekhe packet. Occasionally, to assist those manually manipulating a ganekhe packet, a single feather or stem of a plant might be wrapped to the outside of the packet to indicate the orientation of the stone within. Once in the middle of the night, I asked Wali why there was an earthquake. He sleepy informed me that one of the ganekhe had probably rolled over. In the morning when we could discuss the matter, Wali said that the after-shocks were caused because the ganekhe tossed and turned until it was again comfortable on its back.

The symbolic ancestral beings of the Highlanders are adored, feared, and treated in many ways as venerated human beings, but also as spirit beings which possess supernatural powers. Through periodic ritual the ancestral spirit beings (personified spirits within sacred symbolic stone bodies) are fed, beautified, prayed to, and their spirit power revitalized. Such repeated acts have been called "ancestor worship".

Spirits within Sacred Space

Four classes of guardian spirits live within each ganekhe cabinet and its adjoining space: 1) Pasoware, 2) Abut (alt. hale), 3) Asugum, and 4) Unspoken-Name (too powerful for his name to be mentioned). Pasoware is the universal guardian spirit which domiciles in each dibat, wherever that dibat might be located, around the necks of human individuals (Chapter IV), or tied around sacred objects. Abut (alt. hale), considered to be the son of Pasoware, is, like Pasoware, thought of as a single spirit but with the capability of being present simultaneously everywhere at once. Abut's sole function is to protect Unspoken-Name, the most powerful guardian spirit of all. Asugum is thought of as the general clan power, whose job is to protect the many clans and individuals of the clans. Asugum might be thought of in a slightly different way as the ancestral spirit power which manifests itself as any of the numerous personified ancestral spirits, which are installed as individual entities into individual ganekhe stones. The fourth kind of guardian spirit is Unspoken-Name, which is so powerful that the people do not say its name. Unspoken-Name's function is to be the guardian of the human leader of the clan. Unspoken-Name, like Asugum, is an ancestral spirit that dwells within a ganekhe inside the cabinet. Three different informants, including Wali and Hanomuak, attested to the fact that they themselves (as individual leaders of three different ganekhe groups) do not even know which stones of their own ganekhe are Unspoken-
Name. This is an understood and respected ploy by these men so that none of them would be encouraged to identify the personification of Unspoken-Name within their own ganekhe cabinets.

The spirit within the puluen stone, which leans against the left central outer front leg of the ganekhe cabinet, is called Waganilan Wagnailan (alt. kinoke). This spirit entity is in all puluen stones and may be the second most powerful spirit (after Unspoken-Name) that is among the array of ancestral spirits of that are centralized within the ganekhe cabinets. Waganilan Wagnailan is installed within each puluen in a sacrificial ritual, during the ganekhe hakasin when the stone is anointed with sacred pig grease and the shaman leader directs the spirit into the stone. Waganilan (used hereafter as an abbreviation for Waganilan Wagnailan) within puluen is rejuvenated from time-to-time with sacred pig fat rubbings.

Although all four groups (or types) of spirits that domicile in and around all ganekhe cabinets are ancestral in nature, it is clarified that each ganekhe group worships and installs individual ancestor spirits from their own patrilineage, including the most powerful of them all, their own Unspoken-Name. Within a single patrilineage, separate ganekhe groups may be venerating and worshiping different specific ancestors, but all from the same patrilineage.

The Ganekhe Hakasin Ceremony

The ganekhe hakasin ceremony (ganekhe, sacred stones; hakasin, to make) is the most sacred and powerful ritual practiced by the Highlanders to deal with their fundamental life issues: health, food, procreation, and enemies. When called by a ganekhe group leader to deal primarily with war concerns, the ceremony is formatted slightly differently and in mid Grand Valley Dani dialect is called a wim ganekhe hakasin (wim, war). During either ritual, supernatural power in the form of ancestral spiritual entities is there. It is being feared, simultaneously worshiped, propitiated, perpetuated, and moved about. Meticulous attention to ritual doctrine is enforced by the ganekhe group leader, or else it is believed (by he and others of his ganekhe group) that the endeavor might not only fail, but the ancestral spirits become upset and take malicious action against them.

Each ganekhe group conducts its own ganekhe hakasin at least once a year; although usually it is more often because the ganekhe group leader feels the need. This is a time of the most holy communion for the members of the ganekhe group with their venerated ancestral spirits. Pig sacrifices and food offerings are made to the ancestor stones as they are venerated and propitiated in a most holy atmosphere in a sacred place, while the men enter into direct communion with the spirits in both the world of the seen, and by extensionalism into the world of the unseen. It is at the ganekhe hakasin ceremony when the power in the stones is rejuvenated and when supernatural power, both emanating from the stones and the shaman leader, is manipulated within the power circle. It is during some of these ceremonies that newly selected
ancestor spirits are installed into their "spirit bones." During the ganekhe hakasin ceremony, very audible and visual emotional peaks are reached by both the pigs being sacrificed and the human participants, as the humans strive to make contact with and beneficially influence the ancestral spirits. For years, I have searched for the use of hallucinogens in the Highlands that the human participants might use as assistance in these endeavors. To date, I have identified no chemical substance as a candidate for such function, other than tobacco, which is pervasively smoked but which I feel does not play an hallucinogenic role in the ganekhe hakasin. I recognize that at other times it is used to enhance a relaxed, dreamy state. I have observed people go into trance states with exercise induced exhaustion (sometimes assisted by rhythmic chanting or the clapping of hands, Chapter IV) but never hallucinogenic experience promoted by the ingestion of natural (or other) chemicals. Wali and two others have alluded to the idea (but not directly stated) that he and certain others with wusahun can see spirits in the unseen world. How, I have always wondered.

One day, while in conversation with Wali and Hanomuak, Wali in a whispered voice informed me that he had issued the call for a ganekhe hakasin. Unknown to me, he had already sought out each of his ganekhe group members and obtained their individual approval for me to attend the ganekhe hakasin if I so desired and to even take photographs. There are about 20 members in Wali's ganekhe group at Yalogon of which 17 are listed below. They are all members of the Wilil patrilineage: 1), Wali Wilil, 2) Silometek Wilil, 3) Asudek Wilil, 4) Elapinmo Wilil, 5) Kolo Wilil, 6) Sokalik Wilil, 7) Ilae Wilil, 8) Kuluka Wilil, 9) Alela Wilil, 10) Sikabelek Wilil, 11) Tomali Wilil, 12) Holitnabolo Wilil, 13) Ababin Wilil, 14) Tuanoba Wilil, 15) Abitmo Wilil, 16) Segiarek Wilil, and 17) Wimoba Wilil. In addition, Wali considers those men such as Hamomoak Wilil, a first cousin, who is a leader of his own ganekhe group and a few others who are close advisors, as having special rights to be involved in wusa consultation on matters of utmost importance. Regarding my attendance at the ganekhe hakasin, I was not asked to contribute a pig or any other kind of wealth item or Indonesian rupiah for the occasion.

When I arrived, as instructed, at Yalogon at about 8:00 a.m. on the first day of the ceremony, with only one indigenous inhabitant as an assistant, few people were in sight—only four men, whom I did not know. They obviously knew who I was as they were members of Wali's ganekhe group. Two of them showed me to an abandoned pig sty in the compound garden, between the interior courtyard and the outer compound fence, indicating that this was my private space for the duration of the ceremony. Wali had not arrived as yet at Yalogon. I set my gear down, walked around the compound, and then entered the sacred men's house, (pilamo wusa, Figure 311) carrying my camera, notebook, tape recorder, and a water bottle. Several old men, already in the house and seated to the right of the entrance welcomed me with the conventional greeting (narok). I seated myself by the left side of the door where I could observe what was happening outside as well as in. There was a smoldering fire in the fireplace. The inside of the house
looked as it always had at other times I had been there. Significantly, the same puluen was leaning against a center leg below the lower left side of the ganekhe cabinet door.

The four men inside the house carried on small talk. Aluka, a close friend of Wali's, picked up the bamboo tube "bellows" and gently blew through the tube against the barely glowing embers (Figure 312). The men in the sacred house (pilamo wusa) agreed that I could take a photograph. I especially wanted to document the presence of a packet of sacred sticks that was tied to the right front leg of the four roof support poles.

Outside, men began to gather, one or two at a time. A few women came, carrying nets of very large sweet potatoes, some greens and ferns. These they would deposit in a front corner of the interior courtyard near the sacred house. Other women carried bundles of grass, some of which they deposited in the interior courtyard near the sacred house and some loads they carried through a courtyard gate to deposit nearby in the compound garden. After depositing their loads, most of the women left the compound, but a few entered the communal cookhouse (Figure 311).

I wanted to walk around outside to see what was going on throughout the compound, but I did not leave my spot inside the sacred house. If anything were to be done relative to the ganekhe cabinet and objects therein I wanted to be there to observe. At one point I heard new male arrivals, herding two pigs. It seemed that they may have taken the pigs back to the pig sty where I had stacked my belongings. Some pig grunts and a squeal alerted my attention to another man carrying a live pig toward the pig sty where I assumed the other pigs had been taken. These pigs were to be the sacrifices for the ceremony which was to ensue.

At about 9:00 a.m., Wali, walking alone, entered his sacred compound of Yalogon. He called out to members of his ganekhe group who were already either in the sacred house or seated in the courtyard nearby. His enthusiastic greeting of "wa, wa, wa" was answered with a chorus of "wa, wa, wa, wa" from the members of the ganekhe group. There were handshakes and hugs as Wali quickly moved about the courtyard greeting each man there in this traditional style, before entering the sacred house and going through the same procedure. Wali was obviously pleased. There was a smile on his face during the greetings, and the individuals of the ganekhe group responded with the same enthusiasm. They had gathered to celebrate the ganekhe hakasin (ganekhe, sacred stones; hakasin, to make, to do), the time of intimate communion with their much worshiped ancestor spirits. Wali, at this moment in time, was acting in the capacities of a high priest and the shaman leader: he was the priest who would be the sacrificer and who would direct the sacrificial ritual; he was also the shaman who would enter the world of the unseen and plead the cases for his ganekhe group and others in the community.
Figure 312. Aluka fans fire by blowing through a hollow bamboo tube.
When Wali entered the sacred house, there were perhaps eight others of Wali’s ganekhe group present, in addition to me who was seated up against the wall of the house by the left side of the door. Wali acknowledged my presence with a smile and a modestly spoken narok.

While exchanging information with his staff of ganekhe advisors and giving instructions, Wali sat on the floor and began to retie a very small gisakpel wrapped packet (Figure 313). This packet is called an ilelegeke (alt. jerabo). Inside were bits of sweet potato peelings, the ends of smoked-down cigarettes, and bits of unsmoked tobacco. These are items that I was told Wali’s ancestor spirits had collected from enemy compounds, and then secretly placed in Wali’s habitation men’s house, and which Wali found and carefully wrapped into the small ilelegeke packet. Before the commencement of the ganeke hakasin, Wali unwrapped the packet, showed the contents to his ganekhe group, and then carefully rewrapped the items. Esoterically understood formulae, directed to the ancestor spirits, were briefly recited by Wali and the men present in the pilamo wusa, then all leaned forward toward the ilelegeke and pointed their fingers toward it before Wali hung the ilelegeke from the ceiling in front of the fireplace (Figure 313). It was placed alongside a soot-blackened ilelegeke which I had first photographed hanging at this same spot on May 30, 1991, but at the time did not know either its contents or significance. The newly hung ilelegeke was being put in place at the time of this ceremony to help direct the propitiated ancestral spirits to take action against enemies of the group. The materials reportedly collected from the enemies, act. as it were, in the same fashion as giving the scent to a hunting dog of the animal or person to be hunted. The hanging of an ilelegeke seems to be a part of the initiation of magical procedures that can be on-going for a period of years—maybe even as long as an ilelegeke is left hanging in the line of flight of out-of-body spirits leaving their ganekhe to attack an enemy.

Other items at ceiling positions seen in Figure 313, which were also previously recorded include: from left to right, a soot-darkened bundle of fems from a 1991 sacrificial ritual hung in front of the front left center post; a vertically hanging narrow packet of sali sticks; from the wood rack by the right-front leg of the fireplace, a bundle of seven spiked cocoons (pumpalep); and in front of the previously mentioned blackened ilelegeke, a packet of wooden sticks that are sometimes used to toss to young people in the courtyard at the close of certain ceremonies. Two relatively newly hung cowrie shells (jeraken) are seen to the left, and a piece of medicinally-used gami wood bark to the right.

Wali relaxed into a sitting position on the grassy floor while he adorned himself with a construction of brightly colored parrot tail feathers, that would become the upright focal point from a headband, and two yellow-white feathers that he carefully stuck into his red and white net cap. Very large sweet potatoes had already been laid on Altar 2, between the entrance and the fireplace, both as offerings to show the ancestral spirits what was to be cooked for them and to absorb supernatural power from those spirit stones within the cabinet before the sweet potatoes would be removed and cooked (Figure 314). Later on, after
Figure 313. Wali's sacred house at Yalogon.
Figure 314. Large uncooked sweet potatoes are laid out on a ground altar.
the ancestor spirits had enjoyed the essence from the cooked potatoes returned to the altar and the sweet potatoes had commensurately absorbed supernatural power from the spirit stones, the sanctified potatoes would be fed to *wusa* pigs that were being raised for yet another sacrificial ceremony. Wali was apparently pleased with the size and quantity of the potatoes. He continued conversation with those in the house and now and then would look through the entrance and shout instructions to members of the *ganekhe* group who were building a pile of sweet potatoes on Altar 3 outside of the entrance to the *pilamo wusa*. These were also considered an offering to the spirits, but perhaps more importantly at this point in time in the early stages of the ritual, it was to show the spirits the effort that was being made on their behalf.

Wali suddenly turned quite serious. He was seated on the edge of a banana leaf near the fireplace while he contemplated a packet laid next to him, the contents of which I was ignorant. A man crouched over and entered the house, shaking hands all around and quietly acknowledging, "Wali" as he disappeared into the darkness of the back of the house. Wali replied "wa. wa." Others crowded in and seated themselves. I estimated that there were about 20 men crowded into the *pilamo wusa*—perhaps the entire *ganekhe* group. Wali talked rapidly—changing language, slipping easily back and forth into the *wusa* *ane* religious language which had been handed down from the ancestors and which had been perpetuated among the shamans. There was silence in the room. With head partially bowed, Wali simultaneously uttered a drawn out cry, then short term, high-pitched crying yips as he pressed both eyeballs into their sockets with his thumbs. His hands were on each side of his head. He kept pressing his eyes with his thumbs. The look on his face was one of pain, mixed with ecstasy. I could not believe the degree with which Wali put pressure on his eyes. Tears began to run down his face. Wali, the shaman, the *wusahun*, had entered the "other world," the world of the unseen and without the visible use of chemical hallucinogens but by the phosphene experience. He was making this contact to act as intermediary for his entire group with spirits in the world of the unseen. As he maintained the pressure on his eyes, he remained with head bowed in an apparent state of deep concentration. Tears continued to run down his checks as he commenced the very sacred proceedings by expounding audible formulae. Others of the *ganekhe* group joined in and followed Wali's wailing. After a short time, Wali released the pressure on his eyes. The wailing continued and soon all were audibly expressing themselves in a chorus-like dirge, intermittently following Wali's sobbing incantations directed to the spirits—the cumulative god-power of the world of the unseen. Wali and his *ganekhe* group were now pleading before the ancestral spirits. They were saying that they were ashamed at the small size of the potatoes that were being offered, that they knew their sacrificial pigs were too little and too few, but in spite of all these inadequacies, would the spirits please forgive them and act positively on their behalf.

Abruptly, the wailing and incantations ceased. Wali raised his head and looking at the people in the house told them how glad he was that they had come for this occasion. He addressed the group with
enthusiastic repetitions of "wa-wa-wa-wa-wa." Some of the men then moved outside the house to spread more grass in front of the sacred house, to ready the rocks for heating, the steam pit for cooking, and the outdoor altar for the pig sacrifices.

Inside the sacred house, Silometek, keeper of the stones, was directed to open the *ganekhe* cabinet and lay the *ganekhe* packets onto the banana leaves that had been set down in front of the cabinet on the area designated as Altar 1 (Figure 310). The stones, in their 10 sacred packets, were removed from the cabinet and laid out in the same relative position in which they were routinely maintained inside the cabinet. After Silometek had correctly positioned the stones, he requested that Asudak, another member of the *ganekhe* group, bring him three of the biggest potatoes. Silometek set them on the altar next to the *ganekhe* packets (Figure 315). These potatoes would absorb supernatural power from the *ganekhe* objects before being cooked, cut, and the pieces then passed to certain *ganekhe* group members, who would later feed the pieces of sacralized potatoes to *wusa* pigs which were being raised under their supervision. Other large sweet potatoes were brought into the *pilamo wusa* and laid out on Altar 2, to likewise absorb supernatural power from the *ganekhe* before being cooked with sacred pig meat in the outdoor steam bundle.

Activities associated with the *ganekhe hakasin* outside of the sacred house took place within the interior courtyard in front of the entrance to the sacred house and nearby within the compound garden that is located between the courtyard fence and the outer compound fence (Figure 311). While Wali was still inside the sacred house, several members of the *ganekhe* group, following normal procedure, cleaned up the area around the permanently located ghost enclosure (*waro leger*) (Figures 311 and 316) while others cleaned out the previously used earthen fireplace and reconstructed an outdoor furnace to heat the cooking rocks. Note that the *waro leger* shown in Figure 316 has the fairly common two compartments for such a structure.

In Figure 317, a man in a yellow colored net string cap can be seen cleaning the old heating rocks and dried grass debris from the continuously used cooking pit. The largest rocks are those that had been previously used, after they had been heated in a nearby fire, to line the base of the 38 cm deep, conically shaped pit. Once the pit had been cleaned of the previously used rocks and grass debris, the base for a new steam bundle was fashioned with a lining of three different kinds of grasses that had been carried and stocked at *Yalogon* earlier in the morning for just this purpose. Bundles of the fresh grass, that were used to line the cooking pit and to scatter as a ground cover for the outdoor altar, can be seen piled with freshly cut ferns and other greens in one corner of the compound near the cooking pit (Figure 318). Three different kinds of grasses were splayed out in a fan shape from the center of the pit as the new cooking pit was prepared (Figure 318). On the bottom was a kind of grass called *jalenka*; next, *silak*; and on top, *oojekka/kukaba*. 
Figure 315. Three of the largest sweet potatoes lay next to the sacred packets.
Figure 316. The freshly cleaned ghost enclosure.
Figure 317. The cooking pit is cleaned of rocks and debris.
Figure 318. Fresh grass is splayed out from the center of the clean cooking pit.
Nearby (three on Figure 311), a square-shaped open fire box was built in which to heat the rocks for cooking. First, a square of the desired dimensions was outlined on the ground with unsplit logs called _helege_ (Figure 319). Second, quite a number of cooking rocks (_hekiti_) were spread within the square and covered with a ceiling of closely spaced split logs (_elem_) that rested on the unsplit log perimeter of the fireplace. Next a second row of split logs (_ebe_) was laid parallel, one-to-the-other, and closely spaced in a transverse direction to the first layer of logs. These two layers of split logs furnish both a good supply of fuel for the fire that would heat the rocks and a sturdy floor on which to pile a second layer of heating rocks. This is the conventional outdoor open furnace in which rocks are heated for steam bundle cooking throughout the Highlands, in similarly built open furnaces. The open furnace can be built higher with additional intermittent layers of split logs and rock or made of smaller outside dimensions, to fit the need. For funeral pyres, a special kind of wood, high in resin content is used in similarly built open furnaces so that the fire will continue to burn, regardless of sudden downpours.

While part of the _ganekhe_ group was completing preparation of the cooking pit and piling logs in the outdoor open furnace for heating the cooking rocks, others of the _ganekhe_ group greeted the few invited guests, who usually seated themselves on the ground in a relaxed fashion in the central courtyard, leaning against the fence at the edges of ground Altar No. 3 (Figure 311). Most, perhaps all, were relatives of Wali’s. For example, one was Siba Himan (Pua’s brother), who is a nephew of Wali’s by virtue of his mother being Wali’s sister. Another big man, Hubi Walalua, a brother-in-law of Wali’s, was in attendance, coming from a compound on Sekan Ridge. These men had come out of respect for their deceased friends and to show the ghosts and spirits of their continued reverence.

Final dirges were wailed and incantations recited before Wali emerged from the sacred house. The _ganekhe_ group, through this action and their own individual meditation, had prepared both themselves and the spirits for the live sacrifices that were about to take place. To the Highlanders, the moment of sacrifice is both an essential and fearful time. It is known that the ancestral ghosts and spirits must be placated by such acts, but the pigs are themselves mostly _wusa_, having been thoughtfully raised and given special care and attention. Many have become a part of the human family of any given compound. They have been nurtured, held, and cared for almost as pets. The pigs possess their own soul matter (_edae egen_, singing seeds of life). These souls, which are about to become pig ghosts by the sacrificial arrow, must be properly addressed in the sacrificial rites, so that the wrath of the ancestral spirits, and those of the pigs will not become agitated or enraged.

At this particular _ganekhe hakasin_ five pigs were sacrificed. Although the number of sacrificial pig offerings vary from _ganekhe hakasin_ to _ganekhe hakasin_, at least one of the pigs must be a large sacred pig that has been raised specifically for this purpose and fed, from time to time, sweet potatoes that have been sacralized at yet other ceremonies. Usually _all_ of the pigs for the _ganekhe hakasin_ are sacred and
Figure 319. The open furnace is built with logs and heating rocks.
raised according to proper protocol. At this particular ceremony, the pig donors were Wali himself, giver of the largest pig and one smaller pig; Wene Wilil, giver of a medium size pig; Abibmo Wilil, giver of a small pig; and, from outside the ganekhe group, Ulap Walilo gave a small pig. The small pig donated by Ulap was called the ilelegeke pig and was sacrificed specifically to insure action by the ancestral spirits against the owner of the sorcery items (ilelegeke). The cooked meat from this sacred pig would only be eaten by a trio of members called the aikmali, consisting of Wali, Hanomoak, and Ulap.

During the early afternoon, while the steam bundle was being built, ganekhe group members were gathering numerous long, freshly cut blades of a special grass that were brought into the pilamo wusa, to be sacralized for use later that night and on into the early morning hours of the next day. Each grass stem was rubbed with sacred pig fat by Silometek and another of the authorized shamans, who at the same time chanted religious formulae. Supernatural power was being transferred into each stem of grass as it was anointed with the fat and chanted over. Seven to 12 stems were then stretched at one time above the banana leaf covering of Altar 2, in front of the fireplace, before each bundle was knotted and laid on the altar (Figure 320). Throughout the remainder of the day, these functionally important bundles would continue to absorb spirit power from the ganekhe packets that had already been laid out on Altar 1, below the ganekhe cabinet (alt. opalek), as would the three large sweet potatoes that had been set next to the ganekhe packets (Figure 315). That night and into the next day these grass stems would be used as the grass stem dibat that would be wrapped individually onto each of the sacred ganekhe objects.

In this ganekhe hakarioki version of the ganekhe hakasim ceremony, it is considered quite important that an ilelegeke (or aikmali) pig be killed to please the spirits of the ancestors so that they will bless the people for what the people have done. If an ilelegeke bundle is presented, and an ilelegeke pig is not sacrificed, the ancestor spirits, according to Wali and Hanomoak might go on a rampage and wreak havoc against the people—even against entire compounds of people. The aikmali staff is the group who is responsible for proper protocol of the ceremony. The meat of the ilelegeke pig is routinely dedicated to this group.

Earlier in the day before the pig sacrifices, the area of sacrifice, identified as Altar 3 on Figure 311, was covered with freshly cut grass. Sweet potatoes had been set on this grass in front of the entrance into the pilamo wusa to both absorb power from the ganekhe within and to show the spirits and human attendees what was being done on behalf of the spirits. Beyond the grass covered area of Altar No. 3, toward the central part of the courtyard, a fire would be lighted at the proper time on which to singe the sacrificed pigs before butchering them.

At sacrificial ceremonies, each pig, unless unusually large, is lifted above the ground of the altar and held feet down by the sacrificer’s assistants. One or two men hold the rump of the pig, while the head is held by one or two others. The sacrificer, who is the leader of the ganekhe group conducting the rites
Figure 320. The important grass stem *dibat* are anointed and stretched.
(or the big man leader in charge of cross ganekhe group ceremonials), kills each pig in the same fashion. He leans forward toward the pig, or crouches lower in a similar position, braces himself, and shoots the pig in the heart just behind a foreleg with a very sharp bamboo-tipped arrow (Figure 321). (A bow with sacrificial, bamboo-tipped arrows is shown leaning against Wali's pilamo wusa in Figure 313.) As the sacrificer draws the bowstring, he almost touches the side of the pig with the arrow tip. Onlookers take on a serious countenance, not particularly sad but very solemn. This is serious business. A life is being sacrificed. The ghosts and spirits are being placated. The procedure must be properly conducted. At the moment of impact of the arrow, the pig howls and cries loudly. It is set down on the ground where it runs or wanders around, mortally wounded, then falls over and dies. If the arrow misses the heart, the procedure is repeated. For me, the sacrifice is extremely unpleasant to watch, document, and listen to. At such sacrifices, I usually could sense varying degrees of this same emotion being felt by the ritual participants. I once asked Wali about the killing procedure which does not seem to necessarily bring death quickly. He replied that the killing method is the custom that was passed down from the ancestors: this is the way they want it.

When Wali shot the biggest pig, one of the two which he donated for the occasion, the pig did not die immediately. After it was dead, Wali recited religious chants and audibly cried. The pig, although owned by Wali, was cared for by his daughter Aku, who was one of Obaharak's wives. The prolonged death of the pig was taken as a strong indication that both the soul/ghost of the pig and the spirit of Obaharak were objecting to Wali killing the pig. This was a very bad sign. Wali had to make supplications. He had to make amends for killing the pig. He earnestly promised Obaharak's spirit that at the next stage of Obaharak's funeral during the coming year, he would kill a pig for Obaharak's spirit that would be at least as big as the pig just sacrificed at this ritual.

The last pig killed was the small one brought by Ulap and designated as the ilelegeke pig. After it was killed, Wali again cried and esoteric incantations were recited, interspersed with Wali's sobbing. I have never heard Wali cry so loudly or so vociferously. This is the way it is at a ganekhe hakasin in the Highlands. When dealing with the ghosts and spirits, feelings are not muted or concealed. The ghosts and spirits are either rudely shouted at to get their attention or loudly wailed to in persuasive dirges.

After the pigs had been sacrificed, a woman's nogen, an essential item of female attire and also used as a utilitarian carrying net, was laid on the back of each pig (Figure 322). Symbolically, the dead pigs, each wearing a nogen, were on display to assure humans in the audience, ghosts of the pigs, and ghosts and spirits of departed humans that the pigs were being respectfully treated—just as members of a living human family. After the pigs were so adorned, then, as is the custom at all sacrificial ceremonies, the pigs' tails and ears were cut off with bamboo knives (Figure 323). These sacred mementos of the occasion were
Figure 321. Wali, the sacrificer, kills a pig.
Figure 322. A woman's head-back net is laid over the back of a dead pig.
Figure 323. The ears and tail are cut off with a bamboo knife.
laid onto a fresh banana leaf and removed to the sacred house, where they were displayed on Altar No. 2, in front of the fireplace.

Symbolically, the nogen placed on the back of a pig after sacrificial death is thought to protect the pig's soul-spirit from embarrassment before the soul departs the pig to become a ghost, just like a woman's carrying net, hanging down her back and over her buttocks protects her from mortification by humans. It is also thought that a net, pulled down over the gaping wound caused by removal of a part of the rump with the tail (on the larger pigs), will restrict bleeding. Blood spilled on the barren ground is a dangerous omen for onlookers. The moment the net is lifted off of the pig, its soul-spirit departs the body to become a pig ghost. Butchering can then proceed without offending the pig.

At about this time in the ceremony, the wood-rock furnace was lighted with burning tinder that had been ignited by a traditional thong-split-stick fire-starting tool (three on Figure 311). As the wood burned down, the rocks were heated until they were finally hot enough to be moved with large wooden tongs from the fire pit to the steam bundle (two on Figure 311 and Figure 324). Inside the pilamo wusa, the ears and pig tails were on display in front of the fireplace (Figure 325).

Before the first pig was carried to an open fire which was burning near the center of the courtyard, to singe off its hair, available members of the ganekhe group bent over the pig and pressed their hands on the pig in a group effort to beneficially influence human ghosts to act on their behalf because of the sacrifice (Figure 326).

A circular area, within the confines of the larger grass-covered outdoor altar, had been designated as the butchering site for the ritually killed pigs. This area can always be identified by a mantle of freshly cut ferns (sometimes, also with banana leaves) which have been transported from nearby for the occasion. The butchering site is identified by numbers six and seven on Figure 311. On Figure 327, one can see the pile of sweet potatoes (with a few yams and taro roots) on the grass matting of the altar, before the door of the sacred house and adjacent to the butchering area, which is distinguished by a matting of fresh ferns overlaying fresh grass. The ferns themselves, may have been growing in a wusa area that is preserved to furnish ferns for just such sacred rituals. These ferns play an integral role within the power circle because they catch the blood from the recently sacrificed pigs, often at a time before the soul-spirit has departed from the pigs, and it is these ritually used ferns which compose the organic curtain for the important ganekhe cabinet. None of the blood during butchering is allowed to be spilled onto barren ground—only on the fern or on banana leaves that are carefully placed to catch the blood. During the butchering process, the ferns are used to mop up blood from within the carcasses—this blood is supernaturally powerful. These are the sacrificial bodies of wusa pigs, which were raised and then sacrificed for the explicit purpose of placating the ancestral spirits. The bloodied ferns are then cooked in the steam bundle with the meat. Upon removal of the ferns from the steam bundle, some are spread onto the same circular part of the
Figure 324. Rocks are heated in an open furnace.
Figure 325. Ears and pig tails are displayed on the indoor altar.
Figure 326. Men press their hands on a sacrificed pig as a part of the ritual.
Figure 327. A pile of tubers is accumulated on the sacrificial and butchering site.
outdoor altar where the cooked pig meat will be laid for further distribution. Some are placed indoors over the grass of Altar No. 2, on which both pig meat and cooked sweet potatoes are set as offerings to the ancestral spirits of the *ganekhe*, before the tangible food is eaten by the *ganekhe* group staff. Some of these ferns may be eaten by participants later on when they are partaking of the sacred pig meat. Others of the sanctified ferns may be added to the curtain of ferns that cover the front side of the *ganekhe* cabinet. Power has been introduced into these ferns through ritual so that they, in turn, become a shielding curtain for the *ganekhe*. While hanging in place as the curtain on the *ganekhe* cabinet, the ferns continue to receive power from within the cabinet.

After burning the hair off the pigs, they are accumulated at the butchering site, and oriented so that their heads face toward the compound entrance and their tail-ends face the doorway of the sacred house. The largest pig is centered. Its hide and attached fat layer will be kept whole, after removing the meat, the mandible, and intestines. Informants at this *ganekhe* hakasin said that this common orientation of the pigs during butchering is so that the power of the pigs themselves is directed toward the entrance of the compound and acts as a contradiction to sorcery that might be practiced against someone at the ceremony. Also, the men themselves, while they are butchering, are in a good position to see anyone who might enter the compound. If an enemy would enter or someone whom they might suspect of coming to use sorcery against them, they can take appropriate counter measures.

The men worked rapidly and efficiently with bamboo knives while butchering (Figures 328 and 329). While the pigs were being butchered, they were, as always, laying on the fern ground cover and not on just the underlying mat of fresh grasses. Here, as is the methodological custom, first a pig was laid on its back and then one or two long cuts were made with a bamboo knife from snout to anus (Figure 328). The lower jaw (mandible), which ultimately became a sacred memento of the sacrifice to be hung below or to the sides of the *ganekhe* cabinet, was carefully severed from the upper jaw. I have never seen an adze used for this purpose. An entire pig can be dismembered at its joints with only bamboo knives, although a stone adze is also usually used. It is only when a pig is halved along the backbone or broken apart transversely to the backbone that a stone adze is *always* used, along with a bamboo knife. For convenience, the tail of a small pig is severed from the body with a stone adze. For cutting up meat, ligaments, and tendons, the Highlanders consider the bamboo knife superior to the stone knife (and even in most cases, where I have been an observer, to the recently introduced steel knife). Even when butchering larger pigs, a bamboo knife is the tool of choice (Figure 329).

The intestines and other innards were separated from the rest of the meat, placed on bamboo leaves and carried to a water source and meticulously cleaned and voided of internal food and fecal material. Then, these choice pieces were carried back to the compound, some hung on the meat rack outdoors to dry overnight for use the next day (five on Figure 311 and Figure 330), and some hung inside of the sacred
Figure 328. Men work rapidly with bamboo knives to butcher small pigs.
Figure 329. Bamboo knives are the tools of choice.
Figure 330. Intestines and special pieces are hung on the outdoor meat rack.
house for the same purpose. Choice pieces of meat were also hung from the outdoor meat rack as well as from the ceiling inside of the sacred house. The intestines and meat hung inside the sacred house were saved primarily from the largest pig (Figure 331), to be used as a food offering after being cooked the next day. the spirits to partake of the essence of the meat, and the ganekhe staff of the meat itself.

At this point in the procedure, spatial relationships of material goods within the sacred space of the worship area are reviewed. Outside of the sacred house, the pig meat was being readied for cooking on a circular mat of sacralized fern leaves (seven on Figure 311). The pile of large sweet potatoes were still located at position nine on the outdoor altar where, I was told, they continued to absorb power from the ganekhe spirit stones from within the sacred house. Inside the doorway of the pilamo wusa, the very large sweet potatoes were still displayed before the ganekhe, from which they absorbed sacred power. Wali appeared pleased, presumably by both the state of the proceedings and the quality of the offerings. If one did not know Wali as a big man, he is identified in Figure 325 as a person with supernatural power (wusahun) by the single cowrie shell worn on his dibat. In the foreground of the photograph of Figure 325, a newly wrapped small power packet is commingled with the select, very large sweet potatoes to also ingest power from the ganekhe. The ears and five pig tails from the sacrificial pigs were also present on Altar 2, laid out on a large banana leaf that was located between the potatoes and the fireplace. The tails from the smaller pigs would be wrapped in leaves to protect them from being burned, then dried by the fire and tied to a sacred net (su walon), which is maintained in the pilamo wusa as a sacred relic. Sometimes a single tail or two are introduced to the ganekhe packets themselves or utilized in other ways as power objects. The tail from the larger pig, with the attached disk of pig fat, would be wrapped in a leaf bundle and steamed outdoors with the pig meat, the fat later cut away and preserved, to be used as a sacred ointment—the tail itself to be preserved as a sacred object like the other tails. On Altar 1, below the ganekhe cabinet, the ganekhe packets were laid out informally, in an arrangement that was similar spatially to the way that these same ancestor stones were maintained inside the ganekhe cabinet. Alongside the ganekhe packets were the three largest sweet potatoes that had been set there earlier in the proceedings (Figure 315). Leaned up against the front left leg of the ganekhe cabinet was the unadorned pulwen stone.

At this time in the ceremony, I noted that there were ten men in the sacred house. Of the ten, I noted that two, in addition to Wali, were shamans (wusahun), as indicated by the single cowrie shell that was strung on their dibat. All ten men were wearing dibat. Nine were dressed traditionally and one man in a T-shirt and shorts. Note in Figure 325, that one of the men also wore a piece of gami bark as an amulet around his neck. Most of the ten were smoking traditional tobacco in their carefully rolled leaf wrappers (wisaken). All of these men ingested the smoke as they inhaled with an audible sucking sound. I could not detect that the men were using tobacco to prepare themselves for an hallucinogenic experience or that anything unusual was about to happen. Wali himself, as usual, was visiting enthusiastically with
Figure 331. Intestines and meat are hung inside the sacred men's house.
abrupt changes of tone of voice while the others of the group seemed to be listening to him and indicating, with brief utterances, concurrence with what their religious group leader was saying.

Then the mood changed abruptly. Inside the sacred house it became silent. Wali bowed his head, pressed his eyeballs with his index fingers, and in a pleading voice began to make supplications to the ancestral spirits in the world of the unseen. He shed some tears. The group of worshippers, both sitting and squatting about the sacred space of the sacred house, lowered their heads. Most pressed their own eyeballs with their index fingers and began to audibly respond to Wali's brief incantations. Wali and the men were jointly experiencing the dimensions of the unknown world, the world of the unseen by each of the group concurrently controlling his own phosphene experience (manuscript in progress). With emotionally-toned supplications, amid flowing tears from Wali and brief, tearfully recanted dirges from the group, the ancestral spirits moving about in the individually produced unseen world of phosphenes and those spirits felt by the group to be before them in the ganekhe, were addressed. Then, suddenly, the pressure was removed from the eyes. Wali stopped crying. The solemn mood of the group changed just as rapidly as it had begun. Wali looked up and called out with a different tone of voice, "Wa, wa, wa, ne wa, ne wa, ne wa, wa, wa, wa, wa, wa, wa, wa, wa, wa." [In the context of this use, the author feels that "wa" literally means "come" (Bromley 1981:176) and that "ne" means either "you" or "place".] After offering emotionally presented apologetic supplications of inadequacies to the spirits, the shaman leader of the ritual group had changed his tone of voice and invited (almost demanded) that the great spirit "come to this place" to "see what we do for you" and to accept the sacrifice and offerings. Wali then gave verbal instructions to those of the ganekhe group within the sacred house before leaning toward the entranceway and shouting instructions to the men who were dealing with pig meat and the cooking pit outside.

Soon there was a flurry of activity around the cooking area (two and three on Figure 311) as a circular rim of fern leaves (and a few other special kinds of leaves) were spread within the cooking pit and around its margins, covering the long grasses that had been splayed out from the center in the shape of a circle on the ground. Next, a layer of fresh grass was laid over the leaves into the pit and around its edges. From the adjacent supply of hot rocks, the largest were first selected to be set into the bottom of the pit (Figure 332). Note in Figure 332 that the first, and possibly the largest rock to be transported from the heating furnace to the cooking pit, was carried with a spontaneously made handle of grass stems, rather than the more conventionally used large split wooden tongs. The large rocks that were observed being tightly packed into the bottom of the shallow pit are insulated underneath and around their perimeter by the packed soil in which the pit was dug. In this position the large rocks furnished a massive heat source at the base of the oven from which the heat flowed upward through the steaming mass of repeated layers of sweet potatoes, grasses, pig meat, ferns, and smaller heating rocks. The grass and leaf interlayers that were added between food and hot rocks as the steam bundle grew vertically were sourced from nearby
Figure 332. The largest heating rocks are moved with a grass handle and wooden tongs.
bundles, which had been soaked in water to keep the grass and leaves from burning and to add a source of moisture from which steam would be created. As the cooking unit grew, loops of rattan "rope" were tightly secured around the cooking bundle to preserve its integrity. Each time that a new loop of rattan was added and pulled tightly around the bundle, the splayed grass that formed the base was concurrently pulled up between the rattan and the bundle and laid over each loop and out away from the bundle, so that this outer side-covering of grass was slowly worked upward as the bundle grew.

People moved rapidly as a well-formed work party, building the bundle. No one person stood out as the leader in charge, but all felt free to give advice to each other. The process was a buzz of verbosity, but tempers rarely flared. Care was taken not to get burned with the hot rocks and not to burn one another.

On this particular occasion of building a steam bundle, the participants were all male, but at many pig sacrifice celebrations, the wusa activity is confined only to the men's house, and women participate in the courtyard. In those circumstances, the men and women can join together as a common work party to build the cooking bundle, but always it is the men who are solely responsible to kill and butcher the pigs. Either men or women can clean out the cook pit. When a new pit is to be dug, it is a man's job. The men build the outdoor open furnace and load it with fuel logs and the rocks which are to be heated. Men and women together carry heated stones with wooden tongs and add them to the cooking bundle, as sweet potatoes and other tubers, often greens, and chunks of pig meat are added—also by men and women alike. These are times of mutual cooperation by members of both sexes in a joint endeavor. Individuals of either sex may, from time to time, douse the contents with water from a gourd. The men are responsible to wrap and bind the growing steam bundle as it is being built. But in the special case of a ganekhe hakasin, all of the activities are considered to be wusa and there are no female participants.

At this particular ganekhe hakasin, as the steam bundle was nearing completion, the hide and fat layer of the entire carcass of the largest pig, called the wam oot, was flattened on the top of the cooking bundle. Next, grasses were added over the flattened pig carcass and overlain by heated rocks, then more grass was added. The contents were doused again with water. Then a layer of fresh banana leaves was laid across the top for insulation, after which still more grasses were added. The grasses that had been initially laid out in a circular fashion on the ground from the center of the then-empty cooking pit were lifted above the last loop of rattan and folded over the top. Some more grass was scattered on top of the steam bundle and the final loops of rattan tightened around the outer circumference of the cooking "vessel" to secure it while its contents steamed. A couple of sections of the trunks of banaa trees, a large wooden limb, and some dried gisakpel that was handy, were hapazardly thrown onto the top of the bundle, as a final lid to secure it (Figure 333). One participant looked on thoughtfully as he rested against his rock tongs (Figure 334).
Figure 333. The steam bundle is doused with water as it is built.
Figure 334. A man rests, leaning on his wooden rock tongs.
While the meat and sweet potatoes (*hiperi*) cooked (for about one and a half hours), Agalela Wilil came over to show me how he had cut off the tips of four of his fingers at a sacrificial funeral ritual in honor of his uncle Yagar Waliaken. Waliaken was killed by enemies in a battle at Minugibaka hill near Pugima. Agalela hobbled about with a club foot, with only a trace of toe nail sticking up from the front of the club. It was not a propitious time for me to photograph this unusual (in the Highlands) deformity. Agalela said that his fingers were amputated out of a motivation of grief and to placate not only the ghost of his uncle but also the unified "big power". (Author is unsure of this quoted translation relative to the "big power.")

When the bundle was opened, amid loudly shouted instructions by Wali, the steamed ferns were placed on the front side of the outdoor altar, to provide a circular ground cover on which to lay out the sacred food (seven and nine on Figure 311). Some fresh banana leaves, with a few edible greens and ferns were laid on Altar 2 inside the adjoining sacred house. Cooked food, consisting of pig meat and fat from the five pigs, sweet potatoes, and the few yams and taro tubers, were then set out in a conventional arrangement on the cooked ferns in front of the sacred house. Around the outer circumference of this ground altar-table, small accumulations of sweet potatoes were set out at spaced intervals. The largest sweet potatoes, which had earlier been blessed and sanctified, were held back at the cooking bundle. The intact pig skin with its attached layer of fat, the *wam oat*, was placed on the fern ground cover with its head-end facing the compound entrance. Its tail-end faced the entrance of the sacred house, just as it did during the butchering process. The rest of the cooked pig meat from the other four pigs was set out in piles in and among the accumulations of sweet potatoes and also in the center of the fern covered "table" area. The pig tails were placed directly in front of the entrance to the sacred house: the four from the smaller pigs were wrapped in a banana leaf and the single largest tail, with its still-attached chunk of fat, was set to one side, all with their tail tips toward the entrance of the sacred house. A single very large sweet potato was set next to the largest tail. This single "largest" potato would later be set inside the sacred house on the banana leaf and fern leaf covering of Altar 2 (Figure 311). At that time it would be blessed as an offering to the powerful Unspoken-Name ancestral spirit, who domiciles within one of the *ganekhe* stones. At a later time in the ritual, the potato would be divided by Wali into several pieces and sent back to more than one compound where the precious potato meat would be fed to living *wusa* pigs that are themselves destined to one day be sacrificed to the ancestors.

In just one day, this single large potato, while manipulated within the "power circle," had been displayed in an uncooked condition on both Altars 1 and 2 inside the sacred house where it had reportedly been appraised and supposedly accepted for a food offering to the ancestral spirits by *Waganilan*, the powerful spirit within the *puluen* stone. At the same time the potato was also absorbing spirit power from the ancestral spirits within the nearby *ganekhe* stones on Altar 1 (Figure 311). It was further sanctified
by then being cooked with the ceremonial ferns and sacred pig meat before it was replaced on the indoor altar and its essence offered as food for the most powerful ancestor spirit of all who domiciled within one of the *ganekhe* stones. Again, simultaneously with this religious act, the tangible potato absorbed additional spirit power from the sacred stones before it was to be fed to sacred pigs that would one day be sacrificed for these same spirit ancestors, who were, on this very day, passing along some of their supernatural power to the pigs via this sweet potato.

But for now, the table had been set. Earth was its base. The freshly cut grasses on the ground in the area of the outdoor altar furnished a clean pad for the overlying "tablecloth" of fern stems and leaves. The table was arranged to include the sacred foodstuffs, the sanctified pig fat, and the pig tails which would be preserved in the sacred space of the sacred house as religious relics from this particular occasion.

The adult male members of the *ganekhe* group and their few guests assembled around the outer circumference of the fern covered ritual ground altar. A few men stood, but most were seated on the ground with folded legs or legs outstretched. Some even leaned against the adjoining courtyard fence as they waited for the special meal to begin. A few young male children played in the area of the cooking pit and open furnace outside of the courtyard (two and three on Figure 311). No females were to be seen; although some were quietly present within the communal cookhouse (Figure 311). This was to be a special meal as part of a very special ceremony. The ceremony was, overall a communion between a segment of the Willi patrilineage with the clan ancestral spirits who were present inside of *ganekhe* stones within the adjacent sacred house. Wali was the shaman for the group. He was also the high priest, who, with the help of his staff—the inner circle—of the *ganekhe* group, had meticulously planned and orchestrated the ceremony. It was this group and their few special guests who participated in the outdoor meal.

It was now about 3:45 p.m., and it had started to rain. Wali stepped out from the sacred house and walked directly to the *wam oat* where it lay on the fern covered altar. As he started to cut the slab into strips of skin and fat with his bamboo knife, he shouted loudly at the rain spirits to stop the rain! It continued to drizzle but not to rain hard. The strips of cooked pig skin and attached fat are considered to be ritual delicacies. Momentarily they would be eaten with both relish and reverence as Wali passed them out to the attendees. (Such strips of skin-and-fat are also used as symbols for communication, such as at those times when designated couriers carry like-strips of skin-fat to big men throughout clan groups, and sometimes even to designated big men throughout a political confederacy to announce a call to forthcoming ritual events.) As Wali, the central figure on the altar, worked fast with his bamboo knife, the men in attendance began to partake of sweet potatoes that were before them, and to sample small bits of pig meat. Now and again small boys would dash in from the adjoining area to be given a sweet potato or a bit of meat, and then dash back to "their" area to eat with their comrades.
Wali walked about, thoughtfully handing out strips of pig skin and fat to each attendee. He happily but with solemnity distributed the strips to all of the men who were in the area of the outdoor altar. He continued to watch and assure himself that everyone was getting sweet potatoes, pig meat, and fat to eat. The light drizzle did not seem to dampen the enthusiasm of the occasion, but it did hinder my photography.

After everyone had been supplied with fat, some very large pieces of pig meat (estimated by the author to weigh about seven kilos) were carried by one of the staff of the ganekhe group into the sacred house. The remainder of the pig fat was then picked up by Wimoba, Wali's second oldest son. (Wimoba may follow in his father's footsteps as a big man.) Wimoba disappeared into the sacred house and deposited the pig skin and fat just inside the entranceway, onto the floor covering of banana leaves and greens that had been spread over the floor of Altar 2 (Figure 311). At this time, Wali was still circling about outdoors among the ganekhe group and guests. A dwarf, who lived with Wali, was present, getting his fill of sweet potatoes and meat. The dwarf was healthy, happy appearing, quite muscular, and was deaf and dumb. He liked to arm wrestle with the bigger men who played roughly with him in a loving way. The dwarf and those about him communicated by "signing."

As eating and visiting continued outdoors around the area of Altar 3, a staff member of the ganekhe group carried a small whole-cooked pig from the fern-covered area into the sacred house to set it on the banana leaves of Altar 2. Silometek Wilil, the "keeper of the stones" for Wali and the group, spoke to all from the center of the fern-covered outdoor altar. He uttered a few sentences in an esoteric religious dialect and then assured those present that the ritual protocol of the ancestors was being followed. Everyone was assured that the sacrifices had been properly made and that, "Your blood will not be spilled" by the act. Wali watched as a small bundle, consisting of the cooked shoulder of a pig, some fat and greens, were wrapped and tied into a banana leaf and left in the center of the eating area. This bundled food would be eaten later in the night during a continuation of the ritual proceedings, after all guests had departed Yalogen. From in front of the entranceway of the sacred house, Silometek solemnly advised that later on during the night the "holy communion" with the stones would be celebrated inside the sacred house. Four of the largest sweet potatoes were carried from the dismantled steam bundle and set in the center of the outdoor circle of fern leaves between the banana leaf bundle of meat, fat, and greens, and the door of the sacred house. Soon a fifth large potato was placed in line with the other four potatoes.

Two of the very large cooked sweet potatoes (that had been carried earlier into the sacred house and blessed by a shaman in front of the ganekhe stones) were brought out of the sacred house and added to the five very large potatoes that had just been accumulated into one pile. While this was going on the men continued eating. One man carefully cut his apportioned pig fat into very small pieces with a bamboo knife as he continued to eat with a loud sucking-chewing noise. The men were eating both yellow meated
and white meated sweet potatoes. I do not know what happened to the few yams and taro tubers which had been cooked.

At this time, from the uneaten sweet potatoes (but not from the seven largest that had been recently accumulated in a single group), Wali distributed what were obviously choice potatoes to select guests and members of his ganekhe group. He loudly called out the names of certain individuals (thereby alerting both those human beings in attendance and the ghosts and spirits), identifying the especially devoted, "giving" members of the ganekhe group, before placing an especially large potato in the hand of each acknowledged recipient. This procedure is reminiscent of the way that jerak and je stones are distributed from display bundles at funerals (Chapters IV and V).

At 4:00 p.m. the men were still eating, cleaning every morsel of meat and fat off the bones and pig skin. Wali called to Yamake, one of his wives, who was in the cookhouse, where she had been out of sight in seclusion all day with other women of the nuclear family. Yamake brought her carrying net and Wali lined the bottom of the net with cooked fern greens from the outdoor altar before he carefully loaded the seven largest sweet potatoes that had been accumulated at the front of the altar into the net. During the day those potatoes had been first blessed by Wali, presented as offerings to the ancestor spirits (ganekhe), and enriched with supernatural power which emanated from the stones—an interesting symbiotic relationship between potatoes in the world of the seen and the ancestor spirits in the world of the unseen. Now the potatoes would be carried to Wali's habitation compound and fed by Yamake to specific wusa pigs, which were being raised to be used as future sacrifices. Other men in the ganekhe group, who were going to return home for the night, loaded a few of the sanctified large sweet potatoes into their carrying nets as they said their good-byes and commenced to leave Yalogn, hoping to arrive home before darkness set in.

The inner corps, or "staff" of the ganekhe group stayed on at Yalogn to continue with the on-going ritual and especially to be available later during the night for the intimate holy communion with the ancestor spirits domiciled in the stones and the rejuvenation of their power.
VOLUME III
Ancestor Stone Packets (*Ganekhe*) and Their Empowerment

At dusk, as the last of the ritual participants who were going home left *Yalogon*, the members of the *ganekhe* group who were staying for the nighttime activities split up, some to take care of corporate ritual matters and others to seek out privacy after a day of continuous activity. I suspected that two or three of the men returned to an adjoining sacred compound with its leader Hanomoak, who, although not a member of Wali’s *ganekhe* group, was one of his most trusted advisors. Wali and three others of the *ganekhe* staff (plus me) retired to the sacred house where the others would quietly discuss matters of group concern and relax. The fire was stoked. After a short time, Silemotek Wilil, the *Yalogon* resident guard, took leave to go to his own house which is one of those that opens out onto the *Yalogon* courtyard (*pilamo*, Figure 311). Wali and the others remaining in the sacred house whispered to each other and napped from time to time. I, likewise, napped with them. We were spread out around the margins of the room. Cooked sweet potatoes, greens, and pig meat occupied the space on Altar 2. The 10 *ganekhe* packets lay on banana leaves on Altar 1, just as they had been placed earlier in the day.

One or two men at a time would come and go in the outdoor darkness of nighttime and the almost completely dark room of the sacred house. The only light was from a flickering fire which outlined bodies as occasionally a man would enter, whisper for a few moments, and then depart. The brief conversations were always hushed, as the men wanted to avoid disturbing ancestor spirits that were also within the sacred space, and might also be resting or sleeping.

At about 10:00 p.m. the *ganekhe* staff gathered once again. Eight men, including Wali and Silometek, were there. Wali began to lead a subdued, intermittent dirge that was accompanied by utterances from the group. After a time, the men ate the sweet potatoes, greens, pig meat, and some pig fat in hushed, near silence.

At this point in time, the contents and spatial relationships within the sacred house were in order for the all night proceedings, during which the ancestral spirits in the stones (and a few other objects) would be empowered, rejuvenated, propitiated and at times pleaded with for assistance in human endeavors. *All* of the collective supernatural energy from within the *ganekhe* cabinet, the power box, had been removed and its individual entities in the form of the ancestral power packets laid out on Altar 1, in front of the *ganekhe* cabinet, in the same spatial relationship in which they were maintained inside of the box. The collective supernatural energy of *Asugum*, the great clan guardian spirit, which is composed of the individual particulates of energy of all of its parts (the individual personified spirits that give spirit life to each of the *ganekhe* objects) was out of the box, and was present as a unifying aura over and around the *ganekhe* packets. (Wali later whispered to me that *Asugum* was there, outside of the *ganekhe* cabinet, and that although he was a part of each of the individual spirit stones he was also, always, everywhere.) *Pasoware*, the single guardian spirit that is in everlasting abundance and available everywhere, to be
installed with ritual by wusahun into dibat throughout the Highlands, was there. He might be moving about in the air or occupying, at any given moment, any of the objects within the room or structural parts of the sacred house. But Pasoware was present and would come when properly summoned by Wali. the wusahun, or his authorized designee to be put into those dibat which would be individually wrapped around each of the ancestor stones. Abut (alt. Hale), the son of Pasoware, was there. This ancestral guardian spirit of Unspoken-Name (Wali’s most powerful ancestor spirit), like Pasoware, had left the ganekhe cabinet and was out where he could function unencumbered by the box within the sacred space of the room, to protect Wali’s primary guardian spirit from possible malevolent spiritual intruders. Wali, more than once, and along with Hanomoak his most dependable advisor in such priestly matters, had said that they did not know which stone was Unspoken-Name’s body. But he was most certainly there and now exposed, like all of the other ancestor spirits, to both benevolent manipulation by humans and to the potential dangers of malicious spirit intruders.

Overseeing all of this, as the powerful watchdog and communicator for the ancestral spirits in the world of the unseen, was the always-present Waganilan, which domiciles in all puluen (that have been empowered with Waganilan) and are maintained in an upright position against a front-center leg of ganekhe cabinets. In addition to his function as a watchdog for the ancestral spirit stones and a few other spirit objects that are sometimes maintained in the the power box (ganekhe cabinet), when Waganilan is in his puluen, he is a spirit that each of the ganekhe group leaders makes supplications to on behalf of himself and others in the community. Waganilan not only communicates matters appropriately to the proper ancestral spirits, but also has the power to act on his own to mete out both assistance and punishment to human members of the community. Wali says that other than the most powerful ancestral spirit (which is personified as a different specific spirit within each ganekhe group). Waganilan is the most powerful and accessible spirit to each ganekhe group leader. The puluen is always available, in its upright communicative position at the base of the ganekhe cabinet. It can look, listen, and communicate to the individual ancestral spirits within the ganekhe cabinet and make retributions on its own behalf against humans if things are not conducted in the way that was prescribed by the ancestors.

In front of the puluen on Altar 1, the 10 ganekhe packets were neatly laid out, in the same spatial relationships, one to the other, as the way that they are maintained when inside of the ganekhe cabinet. Inside of eight of the ten packets, a personified ancestral spirit stone is maintained and worshiped as an ancestral entity. In the other two packets, other kinds of primary objects are so maintained and worshiped. The same kinds of other sacred materials that are present in Gutelu Mabel’s ganekhe packets are included with the carefully wrapped spirit stones of Wali’s ganekhe group, just as they are in other ganekhe packets throughout the research area. These are the kinds of things that the ancestors prescribed, to both comfort the spirit entities of the stones and to augment the spiritual power which emanates from the stones. Wali
and his *ganekhe* staff said that all of these particular spirit stones were passed down from the ancestors so that neither Wali nor his staff knew why particular stones were selected to be the bodies for certain ancestor spirits or why specific ancestors were selected for embodiment. In the Highlands' tradition, however, each *ganekhe* group leader and his staff must know the names of each of the ancestors that are embodied within each of the stones of the *ganekhe* for which they are responsible and be able to recognize each personified ancestral spirit stone.

Off to one side of Altar 1, lay a fresh supply of short strips of the white, cellular looking material from the inner part of a banana trunk. According to informants, the juices from these inner pieces of banana trunk are the favored cleansing agent to be used to wipe each spirit stone before it is anointed with sacred pig grease. The white organic cleaning "cloths" and their included juices are called *wakiapolo*. These strips had been already spiritually cleansed of the presence of possibly malevolent ghosts by a brief procedure administered by a *wusahun*.

By now a few packets that looked similar to the *ganekhe* ancestor power packets had appeared adjacent to Altar 1 under the *ganekhe* cabinet. These other kinds of power packets had been placed to be charged with supernatural power that was emanating from the *ganekhe*. These packets were not going to be opened during this ritual, but so placed just to absorb spirit power, so that they could be used for their own social purposes (to be discussed in following sections).

Wali maintains that the empowering spirit for this sort of power transfer to other kinds of power packets is only the Unspoken-Name ancestral spirit, which Wali himself controls. Other informants have denied Wali's position, saying that beneficial power emanates from all of the ancestral spirit stones and that both nearby objects and people absorb some degree of supernatural power from all of them, especially at those times when the power in the stones is being moved about—such as at the *ganekhe hakasin*. These informants further point out that the shamans of the *ganekhe* group are always present during empowering ceremonies, not only to assure that proper ritual practices are followed and to help perform the ceremony, but to absorb from the stones a measure of spirit power to help them perform their social obligations.

Sanctified pig grease, both in the form of hardened cakes that are maintained in the sacred house and fresh fat from the largest pig that had just been sacrificed, were available for the stone anointing procedure. In some cases, individual pigs are identified while still being raised to be the sacrificial animals that will be killed in honor of specific ancestor spirits. The sacred pig grease from the fat of such animals is thus predestined to be used to beautify and anoint specific spirit stones at the time of sacrifice. Some of the fat is also saved to be used at a later time if another such designated pig for that particular ancestor spirit is not large enough for sacrifice during an ensuing *ganekhe hakasin*. At the time of this *ganekhe hakasin*, the grease from the fat of the largest pig donated by Wali was used to anoint certain of the stones. The
fat from one of the other live sacrifices was also used. Grease from preserved, hardened pieces of fat were used for yet others of the ganekhe spirit stones.

A small pile of ferns (piteka) that were sanctified as previously explained through the earlier phases of this ganekhe hakasin was available to be used for the greasing of the stones, once the stones had been cleaned by rubbing them with white inner pieces from a banana trunk (wakiapolo). The stone greasing ferns were first rubbed with the fat from the correct pig, concurrently with the anointing procedure.

During the night, Silometek Wili would carefully open each packet, remove the ancestor spirit stone (two other kinds of objects in the cases of two of the ten packets), cleanse the stone and its previously tied-on bundle of dibat wrappings with wakiapolo, and then anoint the stone with grease from fat of the designated pig. To grease the stone, Silometek used a small clump of the ferns that one of his assistants, usually Asudek Wili, had already daubed with the right pig fat. In a couple of rare instances, I observed some pig fat touched directly to the stone and the grease rubbed about with the ferns (piteka). Objects, other than wolo or other kinds of leaves that accompanied the spirit stones in their individual packets, were also sometimes rubbed with the fern-saturated pig fat.

The anointing procedure was said to beautify the spirit stones, and thereby let the spirits within know that they were properly being cared for and were maintained in a handsome condition. In addition, the anointing process is felt to pass some spirit power back into the stones from the pigs and to rejuvenate the power of the ancestral spirits within. After the anointing process had been completed to the satisfaction of Silometek and staff and before laying each stone back into place in its packet, the symbolically most important function took place. One of the grass dibat stems was handed to Silometek by a nearby assistant. Along with his own accompanying verbal recitations (inapefu) and a rapid blowing in short breaths on the stone (which were audibly enunciated with a sharply worded, "whoo, whoo, whoo, whoo"), Silometek looped a single strand of sacred dibat around each spirit stone and tied it off with a single knot over the front up-side (elokoma) of the stone. With this seemingly simple act of tying the knot, Silometek, with the assistance of Wali, the head wusahun, and others of the ganekhe staff had once again secured the spirit power in the stone. At the same time, they had tied on a dibat which exercises with its own on-going power, protection for the spirit dwelling within. At a first-time installation of an ancestral spirit into a stone or other object, it is the tying of the knot of the dibat that is the symbolic moment when the previously inanimate object is joined with the life of an ancestor spirit. This is when the object becomes a tangible "living" entity with supernatural power, instead of an artifact that is profane and dead, or, at best an object that inherently contains some sort of unidentified supernatural power that cannot be beneficially controlled. Just as the presence of a dibat on a human being signifies that there is life (edai egen) within the body, a dibat on a non-human material object signifies that there is a spirit life within the object. Without the dibat, the ganekhe has either not yet been empowered with an ancestral spirit or for whatever
reason has been desacralized and can again be treated as a profane object—dead, without spirit and not to be worshiped or feared. By the repeated rejuvenation of personalized ancestral spiritual power within a ganekhe through numerous dibat isin procedures, a bundle of knotted grass stems (omatok) builds up on the spirit-stone entity. The knotted side of the grass bundle identifies the front side (elokoma) of any spirit stone or other object.

Throughout the night of the ganekhe hakasin, once the dibat isin procedure was completed on each stone, the stone was laid back down into its ganekhe packet, but the packet left open, not to be closed, bound, and returned to the ganekhe cabinet until completion of the all-night ritual. An object in each of the 10 packets from the ganekhe cabinet contains an identified spiritual entity, the particulars of which are set forth in Table 10. Eight of the 10 packets contain personified ancestral spirit stones, of which three

Table 10. The Primary Contents of the Ten Ganekhe Packets from within Wali’s Ganekhe Cabinet.

<table>
<thead>
<tr>
<th>Domiciled Ancestor Spirit</th>
<th>Width x Length cm</th>
<th>Color Beneath Pig Grease</th>
<th>Former Function</th>
<th>Quarry Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pusawarek</td>
<td>8 x 37</td>
<td>green</td>
<td>je</td>
<td>Yeineri</td>
</tr>
<tr>
<td>Awadek</td>
<td>7 x 32</td>
<td>green</td>
<td>je</td>
<td>Yeineri</td>
</tr>
<tr>
<td>Kolo</td>
<td>6.5 x 44</td>
<td>green</td>
<td>je</td>
<td>Yeineri</td>
</tr>
<tr>
<td>Agit</td>
<td>5.3 x 9</td>
<td>green</td>
<td>adze</td>
<td>Yeineri</td>
</tr>
<tr>
<td>Nawit</td>
<td>4.9 x 10</td>
<td>green</td>
<td>adze</td>
<td>Yeineri</td>
</tr>
<tr>
<td>Wimarek</td>
<td>4.7 x 10</td>
<td>lt. green</td>
<td>adze</td>
<td>Langda-Sela</td>
</tr>
<tr>
<td>Unnamed</td>
<td>4.5 x 12</td>
<td>black</td>
<td>rd. stone</td>
<td>river</td>
</tr>
<tr>
<td>Awinilik</td>
<td>4.7 x 6</td>
<td>green</td>
<td>adze</td>
<td>Yeineri</td>
</tr>
<tr>
<td>Takali</td>
<td>6.2 x 47</td>
<td>dk. green</td>
<td>puluen je</td>
<td>Yeineri</td>
</tr>
<tr>
<td>Unnamed</td>
<td>2 x 117</td>
<td>woven nassa</td>
<td>shell band</td>
<td>Culture</td>
</tr>
<tr>
<td>Unnamed</td>
<td>2 x 21</td>
<td>piece jerak</td>
<td>shell band</td>
<td>Culture</td>
</tr>
</tbody>
</table>

were interpreted by the author as having formerly been Yeineri-sourced flat je style profane symbolic display-exchange stones. One is a Yeineri-sourced puluen je style je before installation; three, Yeineri Style profane adze blades before installation, and one a Langda-Sela Style adze blade. Along with the Langda-Sela Style dibat-tied adze blade in the ganekhe packet is a sacred rounded black stone without a dibat. Of the other two, of the total of ten ganekhe packets, one contains a short piece of a dibat-wrapped jerak
cowrie shell band and a similar, but longer dibat-wrapped nassa shell string band. Eight named ancestor spirits were identified with their stone bodies ("spirit bones"). It is correct to think of the spirit-stone entity in two different ways: for example, at the top of the list in Table 10, the spirit of an ancestor named Pusawarek lives in the green stone and "green stone" is thought of as being Pusawarek.

During the all-night rites when the attention moved from one stone ancestor to another, there was a near constant buzz of efficacious esoteric formulae, punctuated by the blowing sounds when a new dibat was being knotted onto a particular stone. Sometimes there were "uhhs" and "ahs," accompanied by muttering as Wali and the others, at times individually and sometimes jointly, addressed Waganilan in the puluen and the ancestor spirits, either individually or as a group. Wali and the men asked for direct assistance on a number of subjects, which ranged from raising many healthy pigs, to requesting that the spirits stay close-at-hand to drive off malevolent spirits that may have been sent from an enemy, to protect the people from sickness or mishap, and to foster good crops. Sometime throughout the night Wali requested assistance on most of the major issues with which the Dani, as a group, must deal. While the stones were being manually manipulated certain staff assistants would lean over Silometek or others working with the stones to cleanse hands (including mine) with the totok feather wand. This was an important part of ritual as these people, especially Silometek, moved from one sacred task to the next and I photographed and made measurements, but without touching the stones. The background sound consisted of near-constant subdued talk and utterances of sacred formulae, as those people of the group who have wusahun powers communicated in this very intimate session with their spirit-powers.

Two days later in a much appreciated de-briefing session with Wali and several of his staff advisors on religious protocol, I was told in more detail of the meaning of some of the near-constant verbalizations during the empowerment of the stones. One important new aspect that came out in this conversation was that Wali, the wusahun, was not only making supplications, or requests to the spirits in the stones, but that with some of his wusa ane (little understood sacred language) he was passing a degree of his own supernatural power to the stones.

A brief review of some of the photographs that were taken during the night of the empowerment rites of the ganekhe hakasin ceremony can broaden our visual perspective of the material goods, the same kinds of artifacts that are found in the archaeological record. In Figure 335, four of the total of 10 ganekhe packets are seen lying on banana leaves at the front of the ganekhe cabinet. On top of two of the packets are the soot-blackened rattan headband hoops called wasinade, that were reportedly worn by Wali's grandfather. On the left side of the photograph, the right ends of two hareken power packets are seen, advantageously placed to receive supernatural power from the ganekhe ancestral spirit stones (to be discussed in a future section). Note the black-looking puluen guardian stone leaning against the front central leg of the cabinet. At the top of the photograph one can see the lower ends of the bottom row of
Figure 335. The sacred stone packets lay before the *ganekhe* cabinet.
pig mandibles that are hung across the front of the cabinet. In the lower photograph of the figure, Silometek starts to unwrap the first ganekhe packet. Figure 336 reveals the contents of a typical ganekhe packet. Beneath the outer covering of Pandanus bark, the layers of reddish brown and buff colored bark cloth (called heisan and reportedly traded from the Yali) are similar to the bark cloth layers revealed in the ganekhe that belonged to Gutelu Mabel. Inside the packet, the sacred stone is identified as the ancestor spirit stone called Pusawarek (Table 10). It is a green colored, eight cm wide by 37 cm long, Yeineri sourced je type stone that is wrapped with an abundant clump of grass stem dibat. Accompanying the stone in the packet are one pair of boar tusks, about 14 black and blonde colored pig tails, several loose wolo leaves, and a single cowrie shell (jeraken). As esoteric formulae were recited by other nearby ganekhe group staff members, Silometek tidied up the dibat bundle (omatok) around the stone. He pulled back loose dibat grass strands toward the center, cleaned the stone by rubbing it with banana trunk juices (wakiapololo) and then anointed it with the appropriate sanctified pig grease. He rubbed this on with a small bundle of fern leaves (piteta). After Silometek completed the cleansing, anointment, and the tying of a grass stem dibat onto Pusawarek, Silometek’s hands were ritually cleansed with the use of the feather (totok, alt. kut) that is maintained on the house wall, to be used for just such purposes (Figure 337). As can be seen in Figure 337, Silometek is wearing a yellow and green tricot shirt. He was the only man of the ganekhe group who was not attired in traditional Dani dress while in the sacred house. Throughout the entire night, the same feather wand was used over and over, in what is called a totok procedure, to cleanse Silometek’s hands (and also mine and my camera) as Silometek moved from packet to packet to conduct his empowerment chores and to photograph the contents of the packets. As the wand was waved over our hands, formulae were sometimes recited. The waving of the wand would remove supernatural power that had been absorbed from one spirit packet so that it would not be unwittingly passed on to cause a problem with a spirit in another stone.

The spirit stone in Figure 338 is known as Awadek. As can be seen in Table 10, Awadek is a green. Yeineri-sourced 7 x 32 cm je type stone that is wrapped with a bundle of grass dibat. Underneath the grass bundle (omatok) that was formed by the accumulation of numerous dibat, a stick called a jagat is tied tightly to the stone with loops of what are either strips of bamboo or rattan. The jagat stick had previously been empowered and is used in this case to furnish Awadek with a measure of comfort and to demonstrate visually that Awadek is being properly cared for. Commonly, sticks such as this empowered jagat are used as devices to protect human individuals and others from illness and harm. In Figure 338, after the stone was cleaned and then anointed with the sacred pig grease, the hands of Silometek can be seen knotting the important dibat in place. In Figure 339, a grass stem dibat is being tied onto a green, just-greased 6.5 x 44 cm sacred stone whose personified ancestor spirit is known as Kolo. In the upper right corner of the center of the three photographs, a white piece of the banana trunk cleaning material (wakiapololo), as well
Figure 336. The contents of the first sacred spirit packet to be opened are revealed.
Figure 337. An empowered spirit cleansing feather is maintained along the house wall.
Figure 338. A grass stem *dibat* is tied onto an ancestor stone.
Figure 339. A grass stem *dibat* is tied around the sacred ancestral stone known as Kolo.
as the just-used anointing ferns (píteka) can be observed, as well as a single wolo leaf that has been removed from the packet as the stone was being manipulated. The wolo leaf will be laid on top of Kolo before the packet is closed. Figure 340 reveals a dark green 6.2 x 47 cm Yeineri sourced puluen type je. wrapped with reddish brown cocoon cloth. In the lower of the two photographs, two white pieces of the cleansing wakiapolo and a few anointing ferns can be seen as Silometek ties on the dibat. In the upper photograph a single fiber string dibat can be observed on the outer edge of the bundle of grass dibat. The ancestral spirit within this stone is known as Takali.

In Figure 341, a 117 cm long nassa shell decorated string band is seen being secured with a grass stem dibat. Wali nodded his assent that this decorated string band contains a personified ancestral spirit, but he would not reveal the name of the spirit that dwells within. This so-called ganekhe entity, although certainly not a stone, and another "ganekhe" cowrie shell decorated band are similar to shell bands maintained by Gutelu in his ganekhe cabinet. The looping on of the dibat seemed to confirm Wali’s affirmation that his shell-decorated string bands are personified ancestral entities, although he would not reveal their ancestral names. Figure 342 shows the anointing with pig grease of Wali’s grandfather’s black headband hoops that are called wasinade. In the center photograph of Figure 342, a dibat loop is knotted onto a pair of sacred pig tails that were removed from a ganekhe packet for the purpose. This act indicates that a spirit dwelling within the bundle must be given attention and protected with a dibat. The two boar tusks seen in the lower photograph are a pair from one pig. They are about to first be cleansed with the white piece of banana trunk cleaning material before being rubbed with the hardened, old piece of sanctified pig fat seen in the lower right corner of the photograph. On top of the hardened piece of pig fat is the same wolo leaf seen in another photograph. The pig tusks were cleansed, anointed, and then put back in the packet with the ancestor spirit stone that they accompanied, but were not tied with a dibat.

After the 10 ganekhe packets had been opened and the ancestor spirit-stones and a few other items of their contents cleaned, anointed with sacred pig fat oil, the grass dibat carefully tied around each ancestor stone (and a few other objects), each ancestor was appropriately addressed in the sacred language (wusa ake) and other (translatable) Dani formulae of "straight-talk." For the time being the packets were left open on Altar 1. Waganilan in the puluen stone watched over them. The ganekhe human staff moved away from around the front fringes of Altar 1, with all of its exposed supernatural power, to rest sitting on the floor and leaning against the wall of the sacred house or sitting around the outer edges of Altar 2, while they finished eating the last morsels of pig meat and fat. The only utensil with the food on the ground altar-table was a single bamboo knife. I asked Wali why no one ate the two large cooked potatoes that were located on the back edge of Altar 2, toward the fireplace. Wali did not want to talk. He did, however, whisper, "for the wusa." Later in the day, after sunrise and away from the sacred house, I was told that those potatoes were left there for a specific ancestor spirit (or spirits) to eat, while they in turn
Figure 340. A grass stem *dibat* is tied around the sacred ancestral stone known as Takali.
Figure 341. A nassa shell string band is looped with a grass *dibat*.
Figure 342. Various items from within the *ganekhe* cabinet are rejuvenated with power.
exuded their spirit energy into the meat of the potatoes. Wali would later take the potatoes and personally feed them to one or two sacred pigs that were being raised as future sacrifices to that or those specific ancestor spirits—just an example of the on-going movement of supernatural power within the power circle.

Later in the night, before sunrise, the stones were once again bound tightly, along with their accompanying leaves, sticks, boar tusks, and pig tails into their individual ganekhe packets and following a prescribed methodology passed down orally from the ancestors, returned and secured into the ganekhe cabinet. Each ganekhe packet was returned to its correct spatial location in the cabinet, and its included ancestral stone oriented properly. The ancestral entities must always be lying on their back, front side up when laid down horizontally, or front side facing the front of the cabinet if stood vertically. In some cabinets, spirit stones representative of ancestors killed in war are maintained on one side of a cabinet, while those spirit-stones representing ancestors who died of other causes are maintained on the other side of the cabinet. In certain other sacred houses entire ganekhe cabinets are devoted only to ancestor stones that contain the spirits of ancestors killed in war. In these cases, only ganekhe hakasin wim (wim, war) empowerment ceremonies are held in conjunction with such accumulations of ancestral power. Both the accumulated power within the ganekhe cabinet and the individual ancestor power stones are propitiated and manipulated to assist in dealing with war matters. Some of the ancestor war spirit stones may be laid in a cabinet with their head ends facing the entrance of the house. Reportedly this is to facilitate the propitiated ancestor spirits leaving through the heads of their bodies to kill enemy spirits. Once the invisible spirit of an enemy has been driven out of its living human body by another spirit, that human is vulnerable to being killed on the battlefield or in ambush. In addition to all of these things that were considered when orienting the stones within the cabinets and the spatial relationships of the stones, one to the other, the hierarchy of power of spirits within the individual stones was carefully remembered. Some spirit stones are thought by the esoteric members of each ganekhe group to be more powerful than the others. Such a presumption must be considered both in the placement of the stones within the cabinet and the manner in which they are manipulated in empowerment and rejuvenation rites.

The Ancestor Guardian Stone (Puluen)

During times of the movement of the ganekhe packets, Waganilan, the puluen sentinel, remained in its usual upright position to protect the spirit stones at this time of vulnerability when they were outside of the ganekhe cabinet and to continue to report to them that proper protocol was being followed. If dissatisfied, this puluen sentinel might himself wreak havoc within the community.

In addition to its importance as a sentinel and guardian for the ganekhe within the cabinet, the puluen also functions as a communication link between each ganekhe group leader and the ancestor spirit stones within the ganekhe cabinet. For example, when Wali wants to communicate with a spirit or spirits within
the closed ganekhe power cabinet, he addresses his formulae or incantations to Waganilan within the puluen. Whether or not Waganilan can be addressed by other designated members of the ganekhe staff or possibly even all members of the staff I do not know. Wali says that Waganilan is "his" spirit. Others may not agree. Wali says and others agree, however, that Waganilan does not transmit his power to individual humans or objects, but instead it is the ancestor spirits that transmit power to human beings and objects.

Waganilan is initially inducted into a puluen stone through a typical installation ceremony at which the properly raised sacred pig is sacrificed and a big man conducts the installation, following ancestor-formulated protocol and the significant blowing and utterances of formulae (inapefu). In effect, it is the wusahun who transfers the waganilan spirit from the unseen world into a selected puluen stone. It is also the wusahun who later maintains, feeds, beautifies and propitiates the spirit that has been installed into the stone. Waganilan (alt. kinoke) is installed into all puluen stones, not different individual ancestral spirits who function for each individual ganekhe group.

Wali says that the puluen is maintained outside of the ganekhe cabinet, not only to act as the guardian of the ganekhe within the cabinet and to be the communication link with humans in the world of the seen, but it is also so positioned to maintain good luck for the entire community in which its ganekhe group members live. Although the puluen is maintained in a position outside of the ganekhe power cabinet, it is considered a "ganekhe" stone and not a sacred stone of another category. Wali maintains a special relationship with his puluen. Siba, the big man and ganekhe group leader within his own compound, told me that he, too, has this relationship with the puluen that leans against the center-left leg of his ganekhe cabinet. Wali stated that in his big man capacity with supernatural power (wusahun), he often goes alone to Yalagon to communicate with the puluen and ask for spiritual help for his people in matters dealing with health, both human and animal, and such social problems as fertility, food crops, and wealth. For example, before Wali might go to another compound to ask the big man leader of that compound to present a large pig at a planned forthcoming sacrificial ceremony, Wali might go alone to his sacred compound (Yalagon) to ask for assistance from the spirits through communication with the puluen. In such a case, Wali might remove the puluen from its guardian position in front of the ganekhe cabinet and carry it out into the area of the outdoor altar in front of the sacred house, anoint the stone with sacred pig grease and commune with the spirit in the stone. Wali said that sometimes instead of just anointing the puluen with sacralized pig fat he might first rub the stone with sacred pulverized red hematite that is used as red paint (pimot, alt. bimot or bimut). [Author's note: This is one of the few comments that I have had from a Dani, saying that red paint is rubbed onto either a je or a ganekhe.] Wali said that he might continue to anoint, manipulate, and talk with the stone for quite a long period of time. On one serious occasion, Wali said he went into communion with the puluen for a period of five days. Only
Silometek, his authorized resident and guardian for Yalogen and the sacred house and its contents, knows of these actions by Wali. Wali has transmitted supernatural power (wusahun) to Silometek's use so he can carry out his responsibilities as official guard of the sacred place and of the sacred objects contained therein. Silometek can use this power to hold communion with the puluen and act on Wali's behalf when necessary.

The Power of the Ancestor Stones

The individual sacred stones (ganekhe) are the embodiments of personified ancestral spirits. Individually, these spirit stones exude noteworthy spiritual power. Accumulated together inside of the ganekhe cabinet, the emanations of their combined supernatural power is awesome to the minds of individuals in the male religious groups that are responsible for the care and uses of these ancestor entities. The ganekhe cabinet, by virtue of the presence of the spirit stones, become the power source, the power box, within which supernatural energy is transferred into other material objects, which in turn are used by various individuals and groups to assist them in keeping life in order within the cultural system. Sometimes these other kinds of sacred symbolic stones (and other objects) are exposed to the beneficial power within a ganekhe cabinet at the time of a sacred rite; other times they might be exposed to power absorption by being hung, laid, or stood within a cabinet for variable periods of time.

Supernaturally Powered Objects for Social Uses

The sheer number of stone and other kinds of supernaturally powered objects in circulation within the Highlander cultural systems at any one time is indeed profuse. In addition to the ganekhe packets, with their personified ancestral spirit stones and accompanying objects, that are worshiped and utilized within the sanctity of the men's house, there is a vast array of other kinds of power packets and power objects which are used out in the "field," as it were—away from sacred space—to help solve all kinds of social problems. These packets contain all of the power objects other than the ancestor stones that are used by the wusahun, other leaders, and even the common people in dealing with all manner of social and personal ills. Some packets contain only a single stone with a leaf; others might contain as many as 6-10 different kinds of objects, but almost always with at least one stone, the power stone. These power packets and objects might be thought of as sacred tool kits, with their sacred tools; to be used to handle the kinds of personal, social, political, and natural problems that any cultural system must contend with but for which there are no profane tools in the technological tool kits that can be helpful. With the vast array of tangible objects in the sacred tool kits and with their acquired supernatural powers, all manner of social problems are addressed.
The supernatural spirit power within this broad array of power packets and their individual items is sometimes initially installed by wusahun directed rituals, and sometimes by absorption of the supernatural power that emanates from the ganekhe, by placing a designated packet inside of the ganekhe cabinet. Whatever the method of initial installation of supernatural power into these power packets, it is known that storing them near the ganekhe cabinet or exposing them to ganekhe packets during spirit stone rejuvenation rites is essential to the maintenance of vital spiritual energy within the packets.

The broad array of these kinds of power packets, with their variety of included objects, are similar to other artifacts of culture that are used on a worldwide basis in other cultural systems. Many similar individual objects are also known in the archaeological record. Often their uses are revealed from written records or from reliable oral histories. Objects with similar symbolic meanings and associated with similar behavior are also known within historical religions. Based on the assumption that the manifestation of all of these kinds of objects in both the prehistoric and historic world and their related kinds of uses are driven by common human needs and reactions to solving those problems, it would seem plausible that we might be able to identify common principles that motivated behavior in the past and which continue to motivate today the creation of the material objects, their ownership, and associated behavior.

Within the Irian Jaya Highlands, most of the power packets and the individual items within are maintained by men who have wusahun, although a multitude of individual power objects, such as amulets, are owned and used by the multitude of people who do not possess (or, are not) wusahun. Wusahun literally translates as "the sacred or supernatural power." Those men who rise to the level of "big man" learn about sacred (wusa, alt. wesa) objects, places, and activities from the time of childhood initiation and throughout their lives in the men's houses. Those who ascend to leadership are instilled with wusahun along their journeys to achieve big man status. They then have the wusahun and are called wusahun. Some big men, by the continued ascendancy in the hierarchy of political power, achieve or derive increasing levels of wusahun, and some of these big men become especially known for their wusahun (shaman) abilities. Some seem to perpetuate their political leadership while delegating and installing varying degrees of wusahun in many of those around them. Some men (and also a lesser number of women) who are adept at healing and have desires to become healers can be trained and installed with appropriate wusahun by so-trained big men.

Within this system of achieved and developed specialities there are different kinds of healers with different degrees of wusahun. Some have the wusahun to be able to deal only with those kinds of illnesses which are relatively simple in nature. Others rise to a level with a recognized ability of more knowledge and they possess a greater degree of wusahun. Some of these healers are known to control supernatural powers of such quality and strength that they can overcome the negative effects of even powerful malevolent magic. An individual with a serious illness that he/she suspects has been caused by malevolent
magic of another, or when one suspects that his/her soul matter ("the singing seeds of life") has been stolen by malevolent magic, seeks out an appropriate person with sufficient *wusahun* to successfully restore the normal living spirit before a serious illness or death occurs.

In times of war, war leaders are assigned to act with authority and a precise set of duties. *Wusahun* is delegated from the big man who is in charge and has the responsibility for the war. In fact, *wusahun*, in varying degrees and operable over varying periods of time, is routinely instilled in different big man staff members who are always available for consultation while they carry out their assigned responsibilities. At any one time and within almost any group of compounds or house clusters, a big man would be able to name several men who are known to be *wusahun*.

In addition to those in authority of leadership and the various kinds of healers, there is the vast array of common folk who must contend with their own personal problems on a daily basis: the women who carry their babies to and from the fields in carrying nets and are concerned about the children’s health and safety, the horticulturists who want abundant crops, and the women who care for the pigs and want to promote the births of many healthy piglets. These kinds of concerns and other more routine daily situations are the actualities of life that the common folk must deal with and for which they, too, must have supernaturally charged tools to assist in their endeavors. The various power objects, amulets, and talismen that these kinds of people use are thought to often possess inherently generated supernatural power by virtue of the nature of the objects themselves. In other instances, power must be transferred into the artifacts by *wusahun* who possess the power to do those kinds of things. Any of these objects, whether inherently empowered or empowered through ritualistic installation by a *wusahun* are felt to be beneficially treated by exposure to the *ganekhe*. Those objects kept by women can be rejuvenated by blessings from a *wusahun* and at times carried by a male relative to store near to or, better yet, inside of a *ganekhe* cabinet. The contained accumulated ancestor spirit power within the *ganekhe* cabinet seems to be the rejuvenating power for most of the power packets used in the Highlands.

Power packets range in size from as small as about seven cm in length to as long as about 40 cm. Their outer covering is usually banana trunk bark (*gisakpel*), *Pandanus* bark, *keisan* bark, cocoon "cloth," a tightly folded small carrying net (*nogen*), or, in still rarer instances, a relatively small, purse-like, woven fiber string bag.

The power packets, and their removable power objects, can be found at any given instant in time scattered throughout the cultural system. Some are at points of temporary storage, some are at places of permanent installation, such as the *ganekhe* packets inside of the *ganekhe* cabinets, and others are found being used by their owners at various activities to help keep life in order and to promote community success. A war chief might be using his power packet with its power stone out near the field of battle to prepare his warriors for success, a big man of a surgical team at a pig castration might have a power packet.
(or individual stone) lying nearby to protect the area from marauding ghosts, the grounds' keeper for a ghost bundle memorial site (wagun ai) might carry a power packet to the site from a nearby compound while he is preparing it for a memorial service, a group of farmers with a wusahun in charge might carry one or several supernaturally charged adze blades to plant with potatoes in a new field to act as a "fertilizer" and insure good potato growth, and a woman might be putting an empowered ball-stone in the corner of a pig sty to insure the health of a pregnant pig.

Religio-Medical Kits (Hareken) and Their Power Stones (Wamaket)

The religio-medical kit (hareken), always with one or more included power stones (wamaket) and other objects, is of utmost importance to those Highlands’ healers who use supernatural powers (wusahun) in their healing procedures. The paraphernalia within a single religio-medical kit is quite variable. Healings, with the use of such a kit and its contents, are almost always conducted indoors in a healer’s house, be it a men’s house or a female healer’s family compound house. In either case, a spirit enclosure (waro leget) is either attached to the back side of the healer’s house or is set alongside, very near to the back of the house, both as a convenience to the spirits who assist in a healing procedure and also to assure reliable communication between the wusahun healer and the healer spirits who dwell in the waro leget.

Wusahun healers hang their religio-medical kits (hareken) within a ganekhe cabinet from time to time, to empower their contents. Certain ganekhe group leaders are reported to even store their personal religio-medical kits in a ganekhe cabinet on an almost permanent basis. The primary object inside of a religio-medical kit (hareken) is a power stone (wamaket) of either natural or human shaped origin. The primary function of the power stone is to absorb and store supernatural power from the ganekhe at those times when the kit is hung (stood or lain) inside of a ganekhe cabinet and then be the power source for the other religio-medical implements within the kit, as well as a source to beneficially direct power through the healer to a patient. In addition to using the religio-medical implements during healing procedures from within the kit (hareken), both healer and patient are reassured by just the presence of the included power stone (wamaket).

The following classification lists the general kinds of materials and items which are included within Highlands’ religio-medical kits (hareken):

1) Rocks
   a) shaped by geological processes
   b) shaped by human hands
2) Parts of trees and plants
   a) pieces of wood
   b) bark
c) leaves and stems

d) roots

e) seeds

f) resin

g) trees and plant fiber human-made string

3) Mammal and reptile parts

a) rodent skulls

b) rodent mandibles

c) rodent teeth

d) small bones and pieces of bone

e) pig feet

f) bat skulls and bones

g) pieces of fur

4) Bird parts

a) feathers

b) body parts with feathers attached

c) skulls

d) feet

5) Invertebrates

a) small snail shells

b) pieces of shell

6) Natural paints (applied to objects). Example: from pulverized hematite

It is anticipated that similar religio-medical kits (or "medicine bags") that are constituted by other people across both spatial and temporal boundaries probably contain different contents that are at least a function of environmental change.

The Highlands wasahun healers attempt cures by utilizing and demonstrating to others control of healing spirits along with the supernatural power from their power stones and the other objects from within their medical kits. The people of the Highlands, especially the healers themselves, feel that the broad classification of diseases being treated is caused by supernatural powers and, therefore, must be treated by the manipulation and application, if you will, of supernatural powers. To effectively identify religio-medical implements and comprehend related behavior within both contemporary nonliterate cultural systems and those that are prehistoric, it is necessary to understand cause (illness) and effect (treatment) through the eyes, ears, and minds of nonliterate medical practitioners.
For analyses of "primitive medical practices." W.H. R. Rivers was one of the first to study systems of medicine cross-culturally (Moore et al. 1980:194). Rivers concluded that "... the medical system of a preliterate people was based on a definite, patterned underlying belief system" (Moore et al. 1980:194 from Rivers 1924). Forrest Clements (1932), another early contributor to the field of medical anthropology "focused on tracing similar traits—beliefs, practices, rituals, and artifacts—cross-culturally both spatially and temporally" (Moore et al. 1980:194). From his world-wide work, he divided disease causation concepts among nonliterate groups into five categories: sorcery, breach of taboo, intrusion of a disease object, intrusion by a spirit, and soul loss (Moore et al. 1980:194 after Clements 1932). From information obtained from my informants and from my own observations in the Irian Jaya Highlands. I point out that the wusahun healers think, talk about, and act upon disease cause in the same way that Clements, as an outsider, defined it in 1932. I doubt that Dani wusahun healers would delete or add to Clement's classification—only argue about those gray zones that exist between boundary line definition of the explicit categories. If disease causation concepts within nonliterate medical systems are themselves patterned, then there is a greater likelihood that the paraphernalia (artifacts) and behavior used to treat illnesses by nonliterate is patterned, and therefore may have predictable similarities from one cultural system to the next, even within extinct cultural systems that are lost within the archaeological record.

**Nilik's Religio-Medical Kit (Hareken)**

During the late 1950s and early 1960s, Nilik (pronounced Nee-leek and meaning "present at pig eating") Walilo was considered the most influential big man of the Walilo clan. He was considered one of the great modern gains (big men) of the Grand Valley, who at one time in the 1960s even attempted to usurp some of Gutelu's power. Nilik belonged to the waija moiety and lived two generations preceding the initiation of his grandchildren during the last valley-wide ebe akho in 1993. Nilik, like most Grand Valley big men, had inherited the basics in his primary medical kit (hareken) from his father. Before Nilik died, he passed this wusahun healer's power kit on to a son. It was this son and an older male relative of Nilik's generation who showed and explained the power kit to me.

Like most ganekhe packets and many religio-medical kits (healer's power kits), this packet is neatly wrapped with an outer layer of banana bark (gisakpel) and tied with a strong piece of braided cording. When the outer covering is laid back a single wusa wand feather and a hard narrow stem are seen stuck into the outside of a bundle of items neatly included within a wrapping of tree bark "cloth." I was told that the wusa feather and the hard narrow stem are placed there to both identify the top of the packet but more importantly for the wusahun healer to use to cleanse the air, people, and objects of any potentially contaminating spirits. The stick would be used to first cleanse the healing room, the persons within, and later anyone who enters. To function, one end of the special cleansing stem-stick is held in the fire and
when it is smoking it is waved around various parts of the room and over and around the people within, as well as over any person entering the house at a later time. The feather (totok) is for use at propitious times throughout the healing to cleanse the healer's hands and those of assistants as they move from one supernaturally charged healing task to the next (previously described, the Ganekhe Hakasin Ceremony).

The package was opened to reveal and discuss its contents (Figure 343). The two layers of outer brown bark cloth are known as tage; the innermost white bark cloth as hisang (alt. heisan). Both kinds of bark cloth are reportedly traded from the Yali. Centered in the packet, and resting on eight light brown wolo leaves (slightly aromatic and possibly medicinal) is a pair of power stones (wamaket). Figure 343 provides the overall view of the packet and its contents and Figure 344 the individual items that are present in the packet. The front, up-side of the power stone is shown in Figure 343 and the back, down-side of the stone in Figure 344. The elongate power stone is a typical dark green, Yeineri-sourced puluen type je, 30 cm long by 5.1 cm at point of maximum width by 1.4 cm at point of maximum thickness. One end of the stone structurally looks like the cutting edge of an adze/axe blade in plan view but it has not been sharpened to the degree of an adze or axe. The other end of the stone, which is considered its head-end, has been ground to a point. The pointed end rests on an H-shaped black argillite stone that has been well polished and configured by geologic processes. The front, up-side, of the puluen-type stone is decorated with a bark strand miniature skirt, a boar tusk pair, and several loops of grass that are bound in the fashion of a grass stem dibat. Six large pig tails are fastened onto the under (back) side of the stone. Ten loops of grass are wound around the H-shaped river-tumbled stone. The long dimension of the H-shaped stone is 9.5 cm. A sacred bamboo knife, 15.6 cm long, with a fiber wrapped handle is included in the packet. A trace of feathers protrude from under the handle wrapping on the cutting end of the knife. In addition to the boar tusk pair that is fastened to the puluen power stone, four individual boar tusks are included in the kit. None of these has an inner sharpened edge, indicating that they were never used as profane scraper tools. Seven assorted pig tails, all smaller than those bound to the puluen power stone, are attached to a narrow strand stringer. Two black ammonite fossils make up the rest of the contents of the packet. Both fossils are river tumbled and smoothed pebbles that have been broken open by the geologic tumbling process to expose the fossils. The stone with the exposed fossil toward the viewer is 1.9 cm wide, while the other pebble fossil is 2.3 cm in its longest dimension.

The objects that are discussed in the following text are illustrated in Figure 344. Both of the larger stones are considered to be power stones (wamaket). They are known to contain spirit power, which must be nourished and renewed, and which transmit supernatural power to both inanimate objects and people about them. Although they do not contain one or more personified ancestral spirits, they do contain "spirit power," which must be protected. Hence, the grass blade and fiber string dibat are put about them just like fiber string dibat around the necks of human beings and ganekhe stones, to protect the "life force" of the
Figure 343. A religio-medical kit (bareken).
Figure 344. The contents of the kit shown in Figure 343.
person, or, in the case of the ganekhe, the ancestral spirit within. In the case of this pair of stones, previously reliable informants pointed out that they did not know why the originating ancestor had selected them. They further stated that they had never thought of the power stones as an anthropomorphic spirit stone resting its head on a "pillow" (as a Western observer might surmise), or in any other way as even a possible conjugal pair of stones. They supposed the ancestor selecting the stones had good reason for his choices but that information was not known to them. These power stones and the other healing paraphernalia along with them would be used, just like other packets by other wusahuns, at the discretion of the owners. One routine use of the power stones is, however, to just be placed near the healer, usually in the packet, to exude beneficial supernatural power throughout a healing procedure. In some cases, during a healing, the wusahun might also set a power stone (within or outside of its packet) next to the patient or even give it to the patient to hold and thereby help with the healing process. Often special minipackets with a single power stone are made up by the healer for a particular healing procedure, at which the stone (in or outside of its packet) is presented to the patient as a "prescription" to help effect a cure.

The pig tails on the back side of the puluen-type power stone and those seen strung separately are the accumulation from separate healing procedures. It is customary for a pig to be sacrificed at a healing. The meat is ritually prepared and cooked for only the patient and the healer (wusahun) to eat. Often the attending wusahun will add the pig tail from the rite to his power packet, as had been done in this case. The larger pig tails on the puluen-type power stone were added from healing procedures at which the gain Nilik officiated and the small tails are from smaller pigs sacrificed at healings officiated by Nilik's less influential son who inherited the packet.

The boar tusk pair, seen on the front side of the power stone in Figure 343, was thought by the informants to have been added to the power stone as wusa mementos of a healing ritual which had been officiated by the owner of the packet. The fiber strand symbolic miniature skirt they thought was added to the stone only as a discretionary added decoration.

The eight leaves (wolo) on which the power stones and other objects within the power packet lay are a bit of an enigma to the living population. The leaves smell slightly aromatic, and are thought of as being in some way medicinal and spiritually powerful. These kinds of leaves as well as jiwi leaves are included with the sacred stones in all kinds of power packets as well as with ancestral spirit stones in the ganekhe packets. According to informants, the leaves have been so-used since the times of "the ancestors." I have noticed that wherever spirit stones are packaged, across the broad research area, they are associated with these kinds of leaves. Some informants say that just as babies are laid on soft leaves in carrying nets, so are spirit stones cushioned with wusa leaves in their storage and carrying packets. The leaves, however, have meaning beyond this, for they are generally used along with stones and other power objects as part of altar paraphernalia during sacred rites. All adult males know that this practice was inherited from the
ancestors. Some informants only say that, "we do it, because that is the way it has always been done."
I have not yet confirmed scientific identification of the two leaf types and refer to them only by their
Grand Valley Dani names, jiwi and wolo.

The sacred bamboo knife seen in the center of Figure 344 can be identified as being wusa by its
wrapped handle with included feathers. Its use is to make the initial cut on the pig (or in unusual cases,
pigs) sacrificed at a healing.

It is difficult to distinguish ancestor packets (ganekhe) from healer power packets. I asked the
informants who reviewed this packet with me, as well as other informants, including both Wali and Daoke
Mabel, how they are distinguished. I felt their answers vague and unsure, not because these informants
avoided the question or chose not to answer it because of religious taboos, but because it is a difficult
question to answer and there is honest disagreement among the group of informants. The descendants of
Nilik, the big man owner of the packet who handed it down to this generation of adults, said only that the
packet came to them as a healer's power packet, not as a ganekhe ancestor spirit packet. They were sure
about this. Because one of the power stones is a puluen type je morphologically and by rock composition,
they all also agreed that the stone could just as well have been identified and transformed into a puluen
ganekhe. With the dibat around the stone, perhaps differentiation becomes even more difficult. Wali, on
the other hand, says there is no problem at all as to differentiation. The packet is obviously a wusahun's
power healing packet for two reasons: 1) The puluen style je, although the stone has dibat around it,
showing that the stone is wusa, not profane, could not be used as a ganekhe because a ganekhe cannot be
decorated with a symbolic female skirt, only functionally je profane and other than ganekhe kinds of
sacred spirit stones can be so decorated. This line of reasoning, however, is refuted both by the inclusion
of a ganekhe stone with a hidden symbolic female skirt (sali) under a dibat bundle in Wali's ganekhe
cabinet and by the verbal refutation by other reliable indigenous informants within the Grand Valley and
West region. Regarding Nilik's healing power packet just reviewed, I feel that it would not be possible
for an outsider to correctly classify it as to which kind of spirit stone packet it is based only on its contents.

Religio-Medical Kit (Hareken) from Head of Baliem Gorge

In a small compound located on the east side of the Baliem River, southeast of Kurima, at about the
point where the river spills out of the Grand Valley to start its rush through the Baliem Gorge, an elderly
wusahun healer showed me his religio-medical kit (Figures 6 and 345). It, like the religio-medical kit just
reviewed from the mid Grand Valley area (Figures 343 and 344), contained two power stones (wamaket),
but these were of a radically different nature than the two stones present in the mid Grand Valley kit.
These were ritually converted, Yeineri-sourced rock chisels (Tools, Chapter V). These kinds of chisels
(pulu) are used both hafted and unhafted and in various ways as spiritually powerful medical implements.
Figure 345. The contents of a religio-medical kit from the head of the Balkan Gorge.
I have observed more Yeineri-sourced chisels than from Tagime-sourced chisels that are used as supernaturally empowered objects throughout the Grand Valley and West. Denise O'Brien (1969), in her doctoral work with the Western Dani in the Konda Valley, a considerable distance northwest of the Grand Valley (Karubaga on Figure 24), adds her own grounded truth. O'Brien was surprised by the numerous stone chisels present at a time when she saw practically no use of the chisels as profane tools: "I remained puzzled by their function, however, until my last few months in the field. [Author's note: O'Brien reports her period of field work, 1961-1963.] The relative abundance of chisels became clear only when their ceremonial importance was divulged" (1969:90). O'Brien goes on to add that she found that the small unhafted stone chisels were used to represent slain men in war ceremonies.

The old *wusahun* of the Upper Baliem Gorge had other uses for the sacred chisel power stones, as did others whom I interviewed throughout my research. For the pair of chisels in the Baliem Gorge *wusahun* healer’s kit there was a single important function in addition to empowering and protecting the other implements of the kit from outside ghostly interference. For the treatment of serious illnesses a sacred pig is always ritually killed to furnish meat for both the patient and the *wusahun* healer. While the pig meat and often sweet potatoes and greens are steaming, the *wusahun* is usually inside his own house (or the house of the patient if he has gone on a house call) talking with the patient, diagnosing the cause of ailment, cleansing the area of possible ghostly or spirit contaminations, and otherwise preparing for a treatment. The old, retired *wusahun* stated that when doing a healing he liked to first outline a circle with a narrow rattan strip (about 85-110 cm in diameter) beside the fireplace and next to the patient. Along the circumference of the circle he would put one of the empowered chisels (*pulu*), at a point nearest the doorway, with the cutting edge facing the house entrance. Then, opposite this chisel, along the circumference of the circle he would place a second chisel, with the sharpened cutting edge facing outward from the circle. The purpose of the first power stone was to repel ghosts, unfriendly spirits, and other possible malevolent intrusives at the entranceway. The power from the second was to protect the important pig meat that was prepared for the patient (which would be placed in the center of the circle) from ghostly contaminations and "disease." The *wusahun* then would spread banana leaves on the ground in the center of the circle on which he would lay uncooked parsley (*musan*) and wurika leaves, which the patient and the *wusahun* would eat raw. Next, the cooked pork was added to the top of the greens. This *wusahun* liked to salt the pork to give his patient a culinary treat and added strength to expel the cause of the illness. Some pieces of the cooked and salted meat would be set aside in one or two small banana leaf bundles for the patient to eat at a later time. Before eating, the headbone of a water snake (*heane*), which is seen in the upper left corner of Figure 345, would be laid beside the *wusahun* on the outer perimeter of the circle. The *wusahun*, squatting along the perimeter of the circle then would extend his arms as far as they would reach, symbolically embracing the circle on the ground and the food within. At this time, the *wusahun*
said that he would audibly repeat formulae and blow short breaths directed at the food inside the circle to call upon healing spirits and the power within the stones to help him spiritually cleanse the food of "disease" and instill it with supernatural curing power. If conditions were "right," a meal would be eaten before the wusahun picked up the heane and rubbed it over the wound or "sick place", while at the same time blowing and uttering esoteric formulae. If a patient was suffering from a malaise or illness that could not be localized to a simple body part, the wusahun would start at the patient's head and work the heane down and out over the entire body, while at the same time blowing in short breaths onto the patient.

Another curing procedure that features the use of a single chisel power stone is for the wusahun to tie the power stone (chisel) onto a patient's lower arm with a string dibar, all-the-while blowing the traditional short, sharp breaths against the stone and the patient's wrist. The sharpened end of the stone is tied facing the patient's hand and is believed to be effective in preventing the introduction of more illness while the patient is so vulnerable. At the same time the power in the stone reportedly reacts against the causal malevolent factors that are within the person to eject them and thereby get rid of the cause and cure the illness. For such a procedure a pig must be sacrificed and the chisel be an expendable prescription from the wusahun.

Below the heane, in the upper left corner of Figure 345, is a short pendant with five cowrie shells sewn in a single narrow band. The healer sometimes uses this during a curing procedure to drive illness causing elements from a patient's body. The healer says that the implement is supernaturally powerful and in favor with the spirits because each cowrie shell on the band represents a man killed by an ancestor. When the current owner's older brother owned the necklace, he would reportedly wear it from a string around his neck when he wanted to signal to his staff and allies that he was preparing for war or an ambush against enemies. [Author's note: I have heard these same anecdotal stories about the symbolic uses of cowrie shells on narrow bands throughout most of the Highlands area.]

In the loop of the handle of the man's net string purse in Figure 345 is a single piece of amber colored tree resin. Tree resin (hotali) in mid Grand Valley dialect is an item of fundamental importance in a medical kit. Different kinds of resin are used for different purposes. Most tree resin is clear or near-white when first collected but it turns first yellow and then a dark but translucent brown as it ages. Pieces of resin (hotali) are thought to have a natural affinity as a power object for illness diagnoses, various uses in healing treatments, for burning on the altar to clear the air of malevolence, and for uses as objects of power in talismen and amulets. Every wusahun healer has a supply of the appropriate kinds of tree resin for a variety of eventualities. Only among the Wano people in and around the Yeineri quarry area did I find resin used on a routine basis as a light source, like a candle.

Below the brown cocoon wrapper is a fire-burned, soot-blackened marsupial skull, and to its lower right two single mandibles. All such skulls and mandibles must be preserved. This seems to be because
of a general taboo, present throughout the research area. In the Kurima-Upper Baliem Gorge area (Figure 6), the people feel that non-compliance will result in the death of some human within the community. The sharp front protruding tooth of the mandible is well known as a profane tool carver (or "tooth graver") and is present in almost every man's profane tool kit. The mandibles that are used as sacred power objects are also pervasively present within the culture. Note that the burned mandible on the left is looped with a bark string, dibat, which will be better illustrated later in the paper by an enlarged photograph. All three of these medical implements are available for discretionary use by the wusahun healer in any of his treatments, as is the small pig hoof object with the reed insert. A fiber band dibat is also present on the reed stem insert to protect the spirit power within. A discerning wusahun can show his concern for a patient by hanging a pig hoof power object above the entrance of a house in which a healing is being performed.

In the lower right hand corner of Figure 345, four silvery-white pelecypod shells are seen tied together on a tree bark fiber string. At the wusahun's discretion he can quickly fasten these objects onto a string around his neck or just hold them in his hand to use as a rattle to attract the attention of helper healing spirits. Sometimes when the wusahun wants to converse with these spirits and cannot get their attention (or wants to show a patient that he is conversing with the healing spirits on the patient's behalf), he rattles the shells. Since the healing spirits reportedly do not want these conversations with the wusahun overheard, the wusahun communicates with his mouth closed. Successful consultation with the spirits is manifest when a wusahun returns to a patient, purses his lips tightly and blows short breaths in rapid succession onto the patient. It is then expected that the patient may recover as soon as the next day.

The religio-medical implements, shown in Figure 345 as well as others added and subtracted from time to time, are tightly wrapped in the brown cocoon "cloth" wrapper (wulagap) and then carried by the wusahun in his net string purse. Such string purses are often used by older men but rarely by the younger men.

Typical Use of a Religio-Medical Kit (Hareken): Wali Treats Alula

Alula Wilil is a female healer (asiok) who can deal with only certain types of illnesses; supposedly not those requiring advanced skills of the more experienced healers. She lives in Abukulmo compound, not far from Hupainma, Wali's habitation compound. Some years ago, while Wali was treating Alula for an illness he received a divination that Alula should become a healer (as Wali tells the story). Alula happily concurred. She derived her wusahun from her older brother and her healing skills from Wali. On emergency calls to help a sick Wali, Alula need only walk by trail down a short hillside slope to Hupainma, a comforting feeling for Wali, knowing that an asiok is available close by.
One year, when I returned to field work and wanted to visit Alula, I sent a message up to Abukulmo from Hupainma. A message came back that Alula was sick, resting in her house (*homea*), not working in the fields as was her daily routine, and she could not receive me. Three days later, I received word that Wali was going to "do" a healing procedure on Alula at Abukulmo and that I could be present and photograph if I so desired—which I did. The healing treatment lasted most of one day and was typical. It started at 8:50 a.m. The indoor part of the ritualistic treatment took place in Alula's brother's house, which contains the powerful *ganekhe* cabinet and its contents on the back wall. Alula sat to the left of the fireplace, where various acts of treatment were performed on her during the day. The area in front of the fireplace was converted to an altar, or preparation space, on which the implements from the medical kit were laid out and spiritually cleansed and their beneficial powers rejuvenated before they were used in the healing. A typical set of objects from a religio-medical kit (*hareken*) were used, including just one version of the very important *wamaket*, which is the essential power stone.

The medical team that performed the treatment consisted of Wali, as the *wusahun* healer, and six assistants, the primary one of whom was Dogobma Wilil, an adult son of Alula's. As is the procedure at all healings of this type, a pig was ritually killed and steamed with sweet potatoes (*hiperi*) and greens in the courtyard adjoining the healing house. The sanctified meat was primarily for the patient but was also eaten by the *wusahun* healer and his assistants. Just before the healing, Wali slipped out of his *holim* and into a pair of running shorts and a blue sweatshirt and carefully donned a white net cap. (At this time during my relationship with Wali he would intermittently dress in his traditional attire but at other times in the simple modern dress that had been introduced by modern Western outsiders—just a visible part of the acculturation that is occurring.)

Before actual treatment was commenced, the altar space was prepared and cleansing and empowerment of the implements initiated. A net carrying bag holding the healing kit (*hareken*) was conveniently set near the fireplace. Most of the objects from the kit were removed and laid out on a short board between the net bag and the conventional fireside wooden trash container (Figure 346). From right to left, a packet of narrow *jiwi* leaves, a piece of *gami* bark, some freshly cut *wolo* leaves, a strip of *gami* wood overlying a piece of *wolo* leaf, and on the left edge of the board, a piece of *hotali* can be seen. Just off the board toward the fireplace is a nut (*nalelen*) set into a woven handle. A stone, disk-shaped anvil called a *helikit*, had been brought around from the backside of the fireplace and was the base on which a piece of tree resin (*hotali*) was lighted with a wooden stem (*hite*) that was itself lighted in the fireplace. During this part of the procedure, Wali uttered incantations to drive off malevolent ghosts and spirits. The stated reason for burning the *hotali* was so that, "evil ghosts and spirits would leave the area where the healing was to be conducted." Dogobma laid down two large sweet potatoes on the space that was now starting to function as an altar. Wali, seated to the right, leaned over the sweet potatoes and with a laying-
on-of-the-hands quietly recited religious formulae which blessed the sweet potatoes (Figure 346). The sweet potatoes, while on the altar, would continue to benefit from the power being transmitted from the ganekhe cabinet as well as by their proximity to ceremonial power transfers that were to take place on the altar. The sweet potatoes would be steamed with the sacrificed pig to later be fed to a wusa pig that Alula was raising. [This wusa pig is the largest (1.8 m long) which I have seen in the Highlands. It is being raised to be killed at a future unspecified but admittedly important healing ritual, where the cure of a patient will be considered of utmost importance.]

Soon Dogobma removed the power stone packet from the carrying net and unwrapped it (Figure 347). In this case, the power stone (wamakhet) was tightly wrapped with light colored isan bark in a packet which also included both old and freshly cut wolo leaves. This particular power stone (wamakhet) is called, in its present context as a sacred stone, a uken. Before transformation from the profane to the sacred it was known to the users as an adze blade (habo). In either function, modern Western outsiders would recognize it as a small, green, Yeineri Style adze blade. In a similar fashion, the Dani users call the profane stone chisel (pulu) as described in the previous section, also a uken. They do not seem to differentiate a uken stone by its lithology, structure, or by its former profane use. In the photograph one can see that this uken was maintained with wolo leaves. The fresh wolo on the small board altar with the bundle of jiwi leaves, the gami bark, and the piece of hotali were not only functional within this healing ritual but they were simultaneously being spiritually cleansed and empowered for future use.

It was only moments later that one of Wali’s assistants made a piece of fiber string from yakik bark. Using this, he carefully made three loops with the string around the uken and tied it off as a dibat (Figure 348). Both the uken and its newly applied dibat were then generously anointed with sacralized pig fat. While this was happening, the assistant was blowing, in short quick breaths onto the stone and intermittently muttering uninterpretable words. The freshly anointed stone was next handed to Wali, who profusely recited religious formulae and also blew on the stone before it was set back down onto the wolo leaves in its open isan wrapper.

Next, a narrow woven neck band that had been decorated with a cowrie shell and a single row of nassa shells (walimok) was picked up from its place on the altar and rubbed lightly with sacred pig fat (Figure 349). Again, Wali blew and uttered religious formulae. Then, while holding the neck band, Wali audibly recited the names of all of the people in Alula’s family who had died. The assistants joined in from time to time with agreeable noises. Wali and the group were advising the spirits that already too many relatives had died in the hope that the spirits would abandon any evil project against Alula, and remove the cause of her illness. Wali set the neck band (walimok) down beside the uken (Figure 349) and then burned a piece of hotali that had come from the medical kit. He next summoned the assistants closer as he urged them to put their hands on (or point toward) a piece of hotali that he held in his hands.
Figure 346. The contents of one of Wali’s religio-medical kits.
Figure 347. Dogobma, one of Wali’s assistants, unwraps the adze blade power stone.
Figure 348. A fiber string *dibat* is tied around the power stone.
Figure 349. A nassa shell neck band is empowered to be used as a healing necklace.
Incantations and formulae were again verbalized by Wali as he attempted to exorcise himself and his assistants of any malevolent spirits (negative power) that might be within them and to properly empower their hands for what they would do next. After Wali uttered a final loud, "out, out" as he clapped his hands, he, Dogobma, and Ikibadek rubbed sacralized grease on their hands before transferring it onto Alula’s head, face, and body. The two power objects (the power stone [wamaket uken] and the necklace [walimok]) were still lying exposed on the altar during this procedure. This was the end of only one facet of the ritualistic healing treatment. Before going on to the next task, Wali cleansed his hands as well as those of the two who had assisted him in this part of the ritual by waving the feather wand (totok) and reciting more formulae.

Then Wali and the men departed the house to make ready the rock heating fire, the cooking pit, and to kill a pig. After the two hind legs of the pig were briefly looped with twine and tied, symbolically with a dibat isin, the pig was killed and its tail cut off with a bamboo knife. Alula emerged from the house and sat on the banana leaves, where the pig would be butchered. Ikibadek, another of Wali’s assistants, carried the dead pig. Wali carried the sweet potatoes as they circled around Alula to demonstrate for all the spirits to see what they were doing for Alula and to hopefully lure the good spirit back into Alula’s body so she could enjoy the wusa food she was about to get. [Author’s note: Apparently it had been diagnosed that the cause of illness was the departure of Alula’s spirit from her body.] Alula sat for a few minutes and then went back into the house. Ikibadek carried the dead pig over to the door and laid it down for a few seconds as a gesture to invite both Alula’s spirit and that of the pig to enter the house where Alula was waiting.

Wali and two of his helpers entered the house to continue the healing inside, while the others attended to chores in the courtyard. Wali settled down on the floor, setting the tone by uttering incantations. Next he picked up the cowrie shell necklace (walimok) from its place on the altar and proceeded over to Alula where he placed it about her neck. Then, he picked up the adze blade (uken), rewrapped it with wolo leaves into its isan covering, and by placing it inside of a net bag that Alula had removed from her head and back, presented the adze blade (uken) to Alula. As Alula bowed her head while holding the net bag, with the included power stone against one shoulder, Wali did a blessing and laying-on-of-the-hands as he encouraged any bad spirits to depart and Alula’s good spirit to re-enter (Figure 350). This was the end of the eyageukalek. The feather wand (totok) was waved again before Wali moved on to the next task.

While the eyageukalek was in-progress inside, Dogobma and Sularek Wilil were laboring across the courtyard (sili) behind Alula’s family house (honea). The two of them were fastidiously weeding the low ghost/spirit enclosure (waro leget) that was built against the backside of Alula’s house (honea). Old crumbling slats that formed the walls of this low enclosure were replaced with new. The small doorway
Figure 350. Wali, the shaman, does a laying-on-of-the-hands on Alula, the patient.
of the waro leget was cleaned of moldy leaf debris. Dogobma stuck two sticks from a he tree that are called asusu in the ground in the center of the waro leget. After the steam bundle was opened, a bunch of freshly cooked ferns was added to the top of the asusu, looking symbolically like a flag at the top of a flag pole. Friendly spirits were thusly alerted that they had not been forgotten and that their spirit house had been cleaned. Other humans would also be alerted by this visible signpost to stay away from the waro leget. This is the enclosure from which Alula would call friendly spirits to enter her house at propitious moments to assist her with healing procedures which she as a healer (asiok) would be conducting. It was hoped by this act of renovation and cleaning of the waro leget that friendly spirits would return and assist in helping Alula to a speedy recovery. As the two men left the now new-looking waro leget and returned to the central area of the courtyard, it was with a feeling of satisfaction that they had played a role in helping to remove the cause of Alula’s illness (Figure 351).

As the men finished with their task of refurbishing the waro leget, Elegius Faluk was working at his chore of setting a long, slender limbless tree trunk, that had just been cut, into a freshly dug hole in the courtyard, to one side of Alula’s house (hornea). Before tamping dirt back into the hole to support the pole in an upright position, Elegius added a piece of newly blessed tree resin (hotali) to the hole. This was a gesture to ask the ancestor spirits to hold the pole upright and to move through it into Alula who was about to climb onto it. This would be a way to help Alula in her fight to ward off evil spirits.

Inside of the house, Wali concurrently presented Alula with a bow and set of arrows for her use in a symbolic fight against the malevolent spirits that were causing her illness. It is thought that the bow and arrows might frighten away bad spirits and discourage them from attacking Alula in the future. Alula was led outside of the house to the tree-pole which she climbed onto, while clutching her newly acquired bow and arrows (Figure 352). [Note the black streak of paint (charcoal bits mixed with pig grease) across Alula’s face which she wears with the authority of a healer (asiok) to attract beneficial healing spirits for desired communication]. As Alula stood for a few minutes, holding onto the tree trunk. Wali and his six assistants danced in a moving circle around Alula, sing-chanting, much as is done at some war victory dances (edai), but in this case the circular dance, with the patient in the middle, is called an akot wakanin or a "bringing back of the spirit." Malevolent spirits were by this act hopefully scared off, to encourage Alula’s life-spirit to re-enter her body.

Cooked pig meat and sweet potatoes had already been laid out on banana leaves and greens on the floor altar before the fireplace by the time that Wali, with Alula and the entourage, had re-entered the house. Wali moved the ceremony along as he blessed a single white cockatoo feather, called a yakik. As Wali carefully inserted the feather into Alula’s hair, just above her forehead, he muttered in the religious language (wsu ake) and by this act and verbalizing urged Alula’s good spirit to return to its place of normal residence in her forehead. Wali next carefully selected a fiber dibot that had been previously
Figure 351. The ghost/spirit enclosure behind Alula’s house.
Figure 352. As a part of the healing ritual, Alula stands on a tree-pole.
prepared and blessed. While blowing on the *dibat* and Alula, he affixed it about her neck in a *dibat iriyogi* procedure (Figure 353). Next, Wali selected a choice piece of sanctified pig meat and a large sweet potato from the combined food offering and held them before Alula while she took her first bites. An assisting *wasahun* pointed his hands toward Alula as she began to eat and recited formulae that urged the missing soul spirit to return with the food into Alula’s body. Alula, humbly postured, with the newly acquired power stone (*unken*) tucked within her headnet and resting on her back, the recently acquired power nassa shell necklace, two old *dibat*, and the ritually powered new *dibat iriyogi* around her neck; the white cockatoo *yakik* feather stuck above her forehead, and a hand with the stubs of four amputated finger tips guiding the sacralized potato to her mouth, appeared as receptive as I suppose one could, within her cultural system, to receive back the soul-spirit whose disappearance it was thought had caused her illness (Figure 354). No foods with chemical medicinal properties were used during the procedure.

As Alula began to eat, Wali and the other medical team also began to eat of the sweet potatoes (*hiperi*), greens, and pig meat that were on the altar. This ritual feast is called a *wamataik ntuwok*. That night the healers and others in Alula’s compound, came together to traditionally sing and dance as a continuing thrust to cure Alula, their healer (*asiok*). In three days, Alula appeared to have regained her strength and she said that her *edai egen* was normal.

In the healing ritual to cure Alula, the rich interplay of the kinds of material goods that were used so often as symbolic tools in humankind’s endeavors to deal with problems caused by unknown factors are apparent. We were able to observe material objects in the archaeological context of an assemblage, if you will, and then in some detail the behavior that was prompted by function. To gain a broader understanding now of the range of stone objects with their interrelated other material goods as related to known function. I will visually show and describe a representative set of the more simply constituted healing kits (*hareken*) and power stones (*wamaker*) that are pervasively used throughout the Highlands; any of which are representative of similar objects that we often uncover in the archaeological record.

**Variances of Religio-Medical Kits (*Hareken*) and Power Stones**

In Figure 355, in the packet on the upper left, the outer covering consists of a single piece of cocoon cloth tied with a fiber string. The power stone (*wamaker*) is a gray-weathered, black naturally shaped stone that is rectangular in plan view and quite arcuate in cross section. It is 11.8 cm long by 5.2 cm wide, and 1.3 cm thick. On its visible, concave side a wide red stripe has been painted longitudinally after a double looped fiber string *dibat* and a band of braided yellow orchid cording were tied around the upper middle section of the stone. On the reverse convex side of the stone, 11 nassa shells are tied along the lower side of the orchid fiber cording. The nassa shell decorated side of the stone rests in the cocoon cloth wrapping on a stick (piece of *jiwi* root that is 9 cm long), a piece of *gami* wood that is 4.8 cm long, a *nalelen* nut.
Figure 353. Wali fixes a *dibat*. 
Figure 354. Wali feeds Alula.
Figure 355. Two religio-medical healing kits.
assorted linear sali leaves (or possible jiwi), and about eight wolo leaves. The wolo leaf is called woloka in some areas. It is slightly aromatic. This is the only painted healer's power stone which I have observed in the Highlands. The outer covering of the packet on the right is bark cloth. This packet, when tightly secured with its fiber string, is 6 x 22 cm in size. Two power stones with two dried wolo leaves are included. The power stone on the left is an important device used for magical purposes. It is an imak, used for witchcraft. This particular imak is a black mudstone ammonite fossil which protrudes slightly from a woven handle. The fossil protrudes 1.5 cm from a 18.5 cm long fiber string woven handle. The power is a special kind of spirit that resides inside of the fossil and which can be directed out of the object only by the specialist wasahun who is a sorcerer. Alula, as just previously described, for example, is not a specialist sorcerer who handles these kinds of powers and would not have a use for this particular symbolic object. Alula reportedly has, however, the ability to counteract sorcery (imak) induced illness. The power stone to the right of the imak is, in its present symbolic power stone context, a uken that was transformed by the introduction of supernatural power into a former Yeineri Flat Style adze blade. 10.5 cm long, by 3.3 cm wide by 1.9 cm thick.

In Figure 356, the covering consists of a four-layered series of brown, light brown, and red-brown bark cloths. The contents of the packet include a much-decorated power stone laying on three boar tusks, one pair of which have an inserted reed connecting element. The power stone is a black, tubular shaped, smoothed mudstone or meta-argillite that is 21.4 cm long by 4.2 cm wide. The stone was basically shaped and smoothed by geologic processes, but has been somewhat modified by human grinding. Four loops of twisted grass constitute a dibat near one end of the stone. The trailing decorations below the dibat consist of nine pig tails, four stick-studded cocoons (pumipalep), and six red and yellow colored feather bundles.

In Figure 357, in the upper photograph, the outer covering of the religio-medical kit is a beautifully hand-woven, yellow and brown colored, orchid fiber cord purse with a long trailing loop of a tightly woven string band that is looped several times around the packet to secure it. Within the outer covering of the yellow purse is a multi-folded piece of dark red-brown bark cloth into which the contents of the healing kit are wrapped. The power stone is a uken, which in this instance was, in its former profane tool context, a small green colored Yeineri Style adze blade. Four boar tusks accompany the power stone as the remainder contents of the healing kit that are wrapped inside the bark cloth after each use. A string of pig-grease-rubbed, aged, brown colored marsupial mandibles is tied to one corner of the yellow purse and its mandible contents are slipped inside of the purse when not in use. All mandibles from animals which were killed for any of a multiple of uses must be preserved or "the ghosts will wreak havoc." By exposing the mandibles outside of the healing kit during times of use of the power stone, a healer is putting the ghosts and spirits on visual notice that the healer is following their edict. The mandate (or custom) of preserving the mandibles was passed along to the present generation in the peoples' oral history. The emptied outer
Figure 356. Religio-medical kit, with a black, decorated power stone.
Figure 357. Two kits: adze blade and rock sphere power stones.
banana bark covering of another healing kit is shown at the top of the lower photograph in Figure 357. The inner contents include a red-brown color cocoon cloth wrapped power stone with several accompanying small pig tails. *wolo* and *jiwi* leaves, and a stick of *gami* wood. The power stone (*wamaket*) is a river tumbled, round, black mudstone or meta-argillite sphere which is wrapped with two turns of yellow orchid fiber braided cording and four fiber string *dibat*. This black stone ball is typical of stone balls that are used pervasively throughout the Highlands. Women often carry one such ball, usually smaller, in the bottom of a carrying net, to protect a human baby or pig that is within the same net, but separated from the power stone by a soft layer of leaves. A more common use of these kinds of stone balls is to set them inside a corner of a pig sty of a female pig to encourage the birth of many healthy piglets. Sometimes such small power stones are even fed to female pigs inside of a potato to hopefully ingest the pig with fertility promoting spirit power. A pig will usually spit the stone out, but it is hoped that the fertility spirit power has already been transmitted. The *gami* stick, such as the one within the packet, are even more pervasively used throughout the Highlands. Almost everyone owns one or more. They are aromatic bark from the *gami* (alt. *kami*) tree, which I suspect might be a cinnamon. People eat bits of the wood to cure minor ailments, by nibbling off bits from the end of a stick and spitting it in a rapid succession. Sometimes this efficacious practice of biting off small pieces and then spitting them out is a procedure of a healer, directed at the sick or hurt part of a patient to drive out the illness or pain causing spirit(s). Pieces of *gami* are also worn as amulets from strings around the neck and hung from the walls or ceilings inside huts. Pieces of *gami* sticks are placed beside sick people in their houses. Pieces of the *gami* bark or short sticks, broken from small limbs of the *gami* tree are thought to possess inherent supernatural qualities and with further empowerment through ritual are thought to become even more powerful. To the right of the cocoon cloth wrapped power stone is a stick (piece of an aerial root or liana) which is included with the power stone in the outer banana trunk wrapping to make up the entire contents of this religio-medical kit. These special sticks are called vines, sometimes roots, by the indigenous people. They too, are slightly, but only slightly aromatic. The inner wood of the aerial root (or liana) is subtly yellow in color. It may have been this aspect of the wood that led the people to believe that it possessed inherent power or at least was favorably inclined to accept power and be a transmitter.

The outer wrappings and contents of five simple religio-medical kits (*hareken*) are shown in two photographs in Figure 358. The upper left packet is composed of an outer covering of wood bark cloth which encloses a black, river rounded rock as its power stone, along with a single *wolo* leaf. The wrapping of the centrally located healer's kit in the upper photograph is a white colored piece of bark cloth. Its power stone is a *uken*, which before conversion to a sacred power object was a small light green, Yeineri Flat Style adze blade. The *uken* is accompanied by *wolo* leaves in this packet. To the right of this healer's kit is another outermost wrapping of banana bark. The inner wrapping consists of a piece of cocoon cloth.
Figure 358. Five simple religio-medical kits.
Its included power stones are a black river-rounded stone ball and a gray-black, unusually shaped small stone. Included with the items is a single wolo leaf. Below, in the lower photograph, in the healer's religio-medical kit on the left, a single power stone is seen laying on its cocoon cloth wrapper. The power stone is a uken, which in this instance is a Yeineri Style chisel before conversion. To its right, the contents of another kit is seen to include a power stone, which was formerly a Tagime Flat Style black meta-argillite adze blade; accompanied by long, slender jiwi leaves, two wolo leaves, a stick of gami wood with a hole drilled in one end, and an amber colored piece of tree resin (hotali).

In Figure 359, the upper kit contains, on the left, a piece of aerial root (or liana) (sometimes called jiwi and sometimes called sali) and to its right an opened bark cloth wrapping which includes as its power stone a piece of a black, river rounded, pebble that includes an ammonite fossil. With the power stone in the packet are two long, slender jiwi leaves; three wolo leaves; a stick studded cocoon (pumpalep); a piece of gami bark on a fiber string loop; and a semi-rotted sali stick that is wrapped with a strip of bark fiber (like a dibat). The relatively large piece of liana on the left is 12.1 cm long and with a diameter of 4.2 cm. The power stone is 4.2 cm in longest dimension. In the lower photograph, the healer's kit contains, as its power stone, a uken which before conversion was a black Tagime Flat Style adze blade. The uken is 5 cm wide by 7 cm long. It rests on a bed of wolo and jiwi leaves with a small piece of sali root. When tightly tied with a fiber string (seen in the figure), the healer's kit is 10.2 cm long.

The healer's kit in the upper photograph of Figure 360 contains a power stone, which is a river-tumbled, black, spherically shaped stone. Two cowrie shells are tied onto the power stone with a fiber string, one loop of which may have been put on in the context of a dibat. This slightly oblong, rounded power stone is 7.2 cm long by 4.3 cm wide. Included in the packet with the power stone are both wolo and jiwi leaves, plus one traditionally made cigarette. The outer covering of bark cloth for the healer's kit seen in the lower photograph in Figure 360 can be visually contrasted with the outer covering of banana trunk bark seen above. In the lower photograph, the three power stones are broken pieces of river-tumbled black ammonite fossil pebbles.

As depicted in Figure 361, two unopened small religio-medical power kits are displayed on the outer edges of the upper photograph. Between them is a small net purse, which with its contents is considered to be a healer's kit. The purse is decorated with bits of soft marsupial fur and the claws from the feet of a marsupial. The power stone in this religio-medical kit is a black, river-tumbled stone sphere, of the kind used to protect babies in carrying nets and to encourage the fertility of pigs and the safe birth of healthy piglets. An included piece of tree resin (hotali) has multiple uses as previously discussed. Two bone awls, tightly wrapped with string to the inner curve of a piece of gami bark are included as a neatly composed packet. One of the major hazards in Highlander lives are thorns and splinters that become deeply imbedded into bare feet. The wusahun healers like to maintain a selection of bone awls in a cleansed, powerful
Figure 359. Two kits: fossil and adze blade power stones.
Figure 360. A spherical rock and ammonite fossils are the power stones.
Figure 361. Four religio-medical kits.
condition to probe out not only the imbedded splinters and thorns, but also to "symbolically" encourage other sick-causing elements to leave a body. The healer's kit displayed in the lower photograph is an unusual one, both by virtue of its simplicity and also its contents. The outer covering of the kit is a rather aged piece of a carrying net—not so unusual in itself—but the inner covering is a relatively large piece of marsupial skin with soft whitish fur attached. Inside the fur wrapping is a small banana-trunk-bark (gisakpel) wrapped power stone which is a small triangular rock that has been shaped by geological processes. This stone is black on the lower half and light brown colored on the upper half. It is 3.4 cm long, 2.6 cm wide at its base, and 1.1 cm wide near its narrower end. The small packet with the little power stone is set on the inside curve of a section of white bailer shell. Formerly a piece of a commonly worn bailer shell necklace (mikak). I suspect that in this case both the small stone and the section of shell were considered by the wusahun to be the power objects. This is one of the few medical kits which I observed in which the power stone was not included with one or two leaves and/or pieces of sticks or roots.

In the upper photograph of Figure 362, the outer covering is a white bark cloth and the inner covering a piece of reddish brown cocoon cloth. The power stone is a uken, a Yeineri Style stone chisel before conversion. The chisel is 7.3 cm long, 1.7 cm wide, and 1.0 cm thick. Other contents include a piece of beeswax (3.2 x 3.9 cm); a piece of yellow colored treee resin (hotali) (3.9 x 3.7 cm); two pieces of gami wood, each with a drilled hole tied onto a piece of string (the larger piece of gami is 1.6 x 4.0 cm); two wolo and two jiwi leaves; and two brown colored, pig fat rubbed sticks, the longest being 1.4 x 16.2 cm. The religio-medical implements in the healer's kit that are displayed in the lower photograph are wrapped in an outer covering of cocoon cloth. The power stone is a dark green uken that before conversion was a Yeineri Style stone chisel. It has its own gisakpel wrapper. To the left of this power stone in the photograph are eight small sacred cleansing feathers (totok) that have been woven or wrapped with fiber string onto small wooden handles. Each wand has a distinctive name, indicating function. Three are small feathers that have been wrapped with fiber string onto sticks.

In Figure 363, separate enlarged photographs of two small marsupial mandibles show the details of fiber string wrapping on each of the two objects. These are religio-medical implements that were removed for photography from two unrelated religio-medical kits (hareken). The mandible at the top of the figure has been tied to a piece of gami bark, which itself has been wrapped with fiber material and string. The fire-charred mandible in the lower of the two photographs (also seen in its original kit context in Figure 345) is wrapped with a few loops of twisted fiber string, which was probably tied around the mandible as a string dibat.
Figure 362. Religio-medical kits with chisel (pulu) power stones.
Figure 363. Fiber string wrappings on two small mandibles.
Power Stones and Packets for Other Than Medical Uses

In addition to the solution of health problems with the assistance of supernaturally empowered religio-medical implements, there are a multitude of other kinds of specific problems and broader societal issues that must be faced with the assistance of power stones and empowered packets which contain an assortment of material objects.

Throughout the entire research area, men and women alike may individually or as groups maintain a single or several different kinds of empowered but undecorated stones to promote individual or group well being (including pigs). These kinds of power objects include river-rounded and polished pebbles, ammonite fossils, to a much lesser extent belemnite fossils, small pieces of white quartz, quartz crystals, other naturally shaped rock oddities and small ground stone tool blades (both adze and knife). Sometimes pig tails received at a dress-the-bride ceremony or a shaman directed healing procedure are maintained in a similar fashion. Of all of these kinds of rocks used in this context, the most common is the river-rounded pebble, examples of which are shown in the upper photograph of Figure 364. These round stones are maintained mostly by women. They are held in such high regard by the women for promoting pig health and fertility and family well-being, that I doubt there are many adult married women throughout the research area who do not own one or more of them. Because these stones are sacred, a special effort is made to keep them hidden from children who consider them attractive toys.

Among the Kimyal (Figure 2), all of the various kinds of these unadorned power stones are individually called bumado, as well as entire assortments of such stones that are maintained in small net bags (Figure 364). The stones are usually nested with vegetal fibers in the containing nets. The men hang bumado (entire bag of stones) near ancestor power stones to continually empower the bumado. The group (of old men) who maintained the bumado shown in the lower photograph of Figure 364, stated that whenever they would open a new potato field, a man would climb a tree that was located in the center of the garden and cut a lower limb letting the white quartz rocks (bumado) fall with the limb to the ground. Then work could be commenced in the new field. Two or three of the old men, at least one with shaman power, would hide the white stones at the base of the tree, unbeknown to others who would work in the garden. The tree would be left standing, with its power objects at its base, until the garden was allowed to go fallow. Then the power of the stones would be rejuvenated and the procedure repeated at the opening of another new garden. The three old men thought that the white quartz stones were pieces of very old sacred pig fat that had turned to rock.

Among the Kimyal, all of these kinds of power stones (bumado) were empowered through sacred ritual by an appropriate Kimyal shaman (sunrubu). Knowing that a sunrubu had put spirit power in the stones, the people would use them with confidence. From time to time before most sacred rituals, but
Figure 364. River rounded power stones and a Kimyal bag of *bumado*.
especially at times like a major harvest or the opening of a new garden, a big man (with supernatural power, sunrubas) would direct that all people anoint their bumado with sacred pig fat.

The Kimyal, as well as other language speaking groups in the Yali and East region, sometimes include small Langda-Sela-produced adze blades as bumado. When this is done, all flake scars must be ground down until the entire surface of the blade is smooth and polished. Such an acze blade used as a sacred power stone (bumado) by the Kimyal is called a yogaba. In addition to the completely polished Langda-Sela Style adze blades so-used, the Kimyal also use small Yeineri and Tagime Style adze blades as bumado. Sometimes stone knives are used. Empowered adze blades (bumado to the Kimyal, wamakets to the Dani) are commonly used, not only by the Kimyal but throughout the entire Grand Valley and West and the Yali and East regions, as favored objects to plant with both taro and potato cuttings to encourage their growth.

Power Stones with Woven String Handles

When empowered stones (and less often objects of other materials) are fastened with a meticulously woven jacket of string onto wooden or reed handles, the resulting sacred implement is called a liru (alt. iluk). Before being empowered through ritual and/or exposure to the ganekhe, most of the liru power stones are either profane adze blades or chisels. Once transformed from tools with a profane function to tools with a sacred function, the stones are no longer identified by their former profane names (adze blade or chisel).

The liru shown in the following sequence of photographs are representative of this kind of power implement, which is not normally used as religio-medical tools, as are the healer’s kits (hareken) and power stones (wamakets) previously discussed. Instead, they are more often used by wusahun, as well as the common people to deal with the myriad of problems of life with which people routinely contend. Wusahun often carry power packets with a liru included, as they go about any of a variety of special duties. A war chief in time of war might use a selection of several liru out on a battlefield site to drive off attacking enemy spirits and to keep his warriors safe. When a warrior is wounded in battle, the war chief wusahun may accompany the surgeon specialist who removes arrows, or he might be that very man himself. The fact that the wusahun carries an empowered liru or other power objects to assist at occasions like this is comforting to other involved individuals, even though the liru may not be visually apparent. When returning from battle, a wusahun often proceeds to hang one or more liru (or other power stones) that he has been carrying, inside a ganekhe cabinet to rejuvenate them; although the normal place for storage of these implements is in the ceiling of the men’s house. In one respect, liru might be said to be of prestigious power because of their influence on social etiquette, even though these power tools may not necessarily be seen by those whom they are controlling. An example follows. Often when hosting a pig
feast, the big man in charge may be concerned that some people might attempt to eat more than their share of pig meat. Having this fear, the host—a big man responsible for the feast—may invite a particular wusahun who is known for his skills with handling protocol and social behavior to be a guest. A wusahun, so invited, usually does attend the function, and, as a part of his wusahun duties, he secretly brings with him a liru, which he either hangs inside of the men’s house or carries with him as he circulates among the guests. One wusahun told me that on some occasions he would even hide a liru under the leaves of the ground altar where a pig is to be sacrificed. Seeing the presence of this particular wusahun, the people know that a power object is nearby, and that they must therefore be careful to exhibit proper manners and not eat more than their share of meat. To otherwise indulge would assuredly enrage the spirit within the liru who would cause the offender to become ill, or in cases of flagrant violations, to die.

In Figure 365, nine liru are presented. For reference purposes they are numbered sequentially from left to right. Each liru has a string or string loop on one end with which the liru can be tied or hung from another object, such as a structural member within a house or as an amulet from a person’s clothing. The woven parts of the implements are thought of as handles by most modern Western outsiders but not by the users of these power objects. To facilitate description of the liru, I will, however, refer to the woven parts as handles. The nine objects come from nine different male owners and were collected in the period of time from 1982 through 1991. The decoration present on each liru reflects a normal variation of the personal preferences that are expressed by each owner. Similarly, different personalized weaving styles are obvious by the variation in loop patterns that are seen on the individual objects. Most of these liru and others like them are normally maintained in combination with other objects, such as sticks, pieces of wood or leaves, and carried about in neatly wrapped packets or small net purses, like the healing kits previously described in the last section. Recognizing that the liru are sacred tools and that their included power stones are no longer identified by the traditional population in the context of the former profane function of each stone, I will however, for the purposes of this analysis, identify the power stones of each liru according to the classification previously used for profane stone tools (Chapter V). In this set of nine liru, five of the power stones are small adze blades; three are Yeineri Style and two Tagime Style. Three of the stones are chisels; two are Yeineri Style and one a Tagime Style. One of the power stones is a black pebble, shaped only by natural process. It is probably either a mudstone or meta-argillite. A summary of certain aspects of the nine liru shown in Figure 365 follows:

1) Power stone: Yeineri Style chisel. Simple yellow orchid fiber strand woven into handle may represent a cross, a shape so often visualized by individuals of the indigenous population in all sorts of the natural objects that abound about them. The two cowrie shells have been ground on a rock in order to cut off the apex of each shell in preparation to sewing it onto a funeral exchange band or fiber band neck piece.
Figure 365. Nine woven-handled amulets (*liru*), each with its power stone.
2) Power stone: Yeineri Style adze blade, barely exposed. The interface of the stone with the woven handle is decorated with small delicately red and gray feathers. An unusually tight weave is seen on the handle.

3) Power stone: Yeineri Style chisel. 2.0 cm wide. The entire implement is 10.5 cm long. The decoration consists of delicate red feathers around the interface of the power stone and the woven handle, with a single small nassa shell.

4) Power stone: mottled green Yeineri Style adze blade. Decoration is seven stick-studded cocoons (pumpalep).

5) Power stone: Yeineri Style adze blade which is 5.5 cm wide, 1.6 cm thick, and with 4.6 cm exposed. The entire implement is 17.5 cm long. Delicate gray and iridescent green feathers are glued with beeswax or tree resin along the stone-handle interface.

6) Power stone: naturally round black round pebble about 1.8 cm in diameter, with 0.4 cm protruding. The entire implement is 17.9 cm long.

7) Power stone: black Tagime Style chisel which is decorated with loops of braided yellow orchid fiber cording which are symbolic of a woman’s Dani and Western Dani wedding skirt, a miniature fiber string female’s skirt, and a few delicate red feathers. Without the woven "handle," this object is only arguably (among the indigenous inhabitants) considered a liru. It has a string loop for attaching it onto another object.

8) Power stone: black Tagime Style adze blade which is 3.4 cm wide at its cutting edge and with 3.9 cm exposed. The blade is 1.4 cm thick. At the stone-handle interface it is decorated with delicate red feathers. Four small pig tails and one very small stick studded cocoon (pumpalep) adorn the other end of the implement. The elderly wusahun owner of this liru, said that he added the pig tails, one at a time, from pigs that were sacrificed at stone empowering ceremonies to furnish added power to the implement. Likewise the small cocoon was attached as an item of additional power.

9) Power stone: black Tagime Style adze blade which is 2.9 cm wide. The entire implement is 10.1 cm long. An entire flattened red feathered bird’s head with its red beak still attached adorns the implement at its stone blade-handle interface. At the other end of the implement, a reed moutharp (bigon) and a stick-studded cocoon (pumpalep) are attached as other items of adornment. See Figures 366 and 367 for the details of this liru. When contemplating the vibrancy of the beak and feathers and the details of the stick-studded cocoon (pumpalep) in the photograph of Figure 366, and the details shown in the ink drawing of Figure 367, it is not difficult to understand that the indigenous inhabitants would view these items as objects with inherent supernatural power.
Figure 366. The power stone in amulet number nine is a Tagime Style adze blade.
Figure 367. The details of amulet number nine.
Attention to detail in the woven jackets and decoration of power stones numbers two, five, seven, and eight can be seen in the drawings in Figures 368 and 369.

A more formal style of woven-handled power stones is seen in Figure 370, where "handle" lengths vary from 15-21 cm, with overall lengths that vary from 19-25 cm. All of the nine power stones in these particular sacred objects are Yeineri Style adze blades. The largest blade so-used is 4.2 cm wide at the chord of the cutting edge, 2.0 cm thick at its thickest point, and 7.1 cm long. The smallest blade is 2.9 cm wide, 0.8 cm thick, and 4.0 cm long. Handle circumference varies from 8-15 cm. All of the objects have a braided string cord (about 14 cm long) or a woven looped end (that varies from about 2.0-8 cm long), with which these empowered objects can be hung from articles of clothing, but more often within houses. In addition to adze blades, empowered chiseis are also favored items to be used as empowered objects, not only without decoration or embellishment (Figure 371) but, like the adze blades shown in Figures 365 and 370, in tubular-shaped woven "handles" (Figure 372).

The most unusual "handle" that I observed on an empowered object while doing research in the Highlands was a dried section of leg skin from a cassowary bird (Figure 373). The length of the sacred object is 24.7 cm. The Tagime Style adze blade power stone that is tied into the piece of leg skin is 5.1 cm wide, with 3.9 cm protruding from the "handle."

Very small natural stones and other small attractive natural objects also often have woven "handles" of bark string, made with a loop or strand to facilitate their handling as amulets, not only to be hung on articles of clothing and as adornment but also placed over entranceways or other places within the house. These sacred objects are used pervasively throughout the entire adult population without regard to the political or religious status of a using individual. The kinds of objects and materials so-used are thought of as being natural spirit containers, although their power is usually also enhanced by ritual and/or exposure to the ganekhe. The specific objects most-used within both the Grand Valley and West and the Yali and East are quartz crystals; ammonite fossils exposed in broken, river tumbled pebbles; spherically shaped river stones; pieces of amber colored, solidified tree resin (hotali); and small pieces of gami, sali, and jiwi wood. In Figure 374, two of these commonly used amulets are shown along with the exposed, unwrapped types of materials from which they were made. On the left are quartz crystals, often called star stones, and on the right a piece of amber-colored, solidified, tree resin, which is highly regarded for use as a power material. At times, the tree resin (hotali) is spoken about as a rock, a very special kind of rock which will burn.

In Figure 375, Kocia Posia, at the head of the Baliem Gorge, is shown wearing one of these kinds of amulets attached to her carrying net. The power material in the amulet is a small stick of sali wood. This amulet is being worn by Kocia to protect the baby in her carrying net from harm. Another small amulet of jiwi root, carried in the bottom of the net, below the baby, is to protect the child from ants.
Figure 368. Amulets (a) number five and (b) number two.
Figure 369. Amulets (a) number seven and (b) number eight.
Figure 370. Nine woven-handled amulets with adze blade power stones.
Figure 371. Empowered chisels are often used as sacred objects.
Figure 372. A woven-handled chisel amulet and three empowered plain chisels.
Figure 373. An adze blade power stone with cassowary leg skin handle.
Figure 374. Two commonly used types of amulets.
Figure 375. Kocia Pocia wears an amulet tied to her head net.
especially attracted by urine. Kocia said that for the general health and care of her children she also likes to use sali wood powered amulets, routinely tied in other places:

1) over the tie string of another young daughter’s skirt and

2) inside her house, above the entrance.

Sun Houses and Their Sacred Symbolic Stone

Within the Dani and Western Dani language speaking groups (Figure 2), the culturally most powerful individual sacred symbolic stones are the least known. Peters, working in the early 1960s in the Grand Valley learned that the Dani understand a beneficial relationship between sunlight and good potato crops and that the Dani held the sun in great respect. Carefully pointing a finger at the sun, the Dani said, "Mo ninajuk-en", which means "We shudder with awe for the sun" (Peters 1975:59 from a German publication 1965). The Dani would tell Peters no more. Heider, working northeast of Wamena in the Grand Valley at about the same time, recognized that the big men Maikmo and Gutelu both had close relationships with the sun and that Maikmo even "has a special relationship with the sun and the moon" (1970:90-91). But Heider, like Peters, was never able to penetrate this taboo subject and put the people’s relationship with the sun into a cultural systemic perspective—let alone find out about the very wusa symbolic objects that are manipulated as a part of Dani sun ritual.

In Heider’s review of the subject he points out the following (1970:210):

The sun is called mo and is a woman of terrible aspect: she has long hair, which is uncommon for Dani women; wears a married woman’s skirt; she carries a spear, and wears men’s decorations. . . . During the day the sun moves across the underneath of the sky. At sunset she sits down on a dabul (the dried grass on the floor of a house) and retraces her steps above the sky to her home. In the winter months, when the sun is in the south, her home is in the Jalemo; during the summer months at Wadlagu, in the Pass Valley . . . Most questions about the sun were met with professions of ignorance . . . The Wadlagu compounds lie at the far eastern end of the Pass Valley, and it is here that the sun is said to spend the night . . . Although I visited Wadlagu with Gutelu, I was not allowed to examine the house carefully and I took photographs with difficulty. This attitude . . . suggests the great wusa, or power, of the house. The house is about 2.5 meters high at the roof’s ridge. It stands on stilts one meter above the ground. The wall and floor construction is of wood slabs . . . The entrance is closely boarded. The roof is of two-meter semicircular bark strips, apparently from the trunk of pandanus trees. . . . The entrance faces west.

Gutelu explained that inside the house were nets, skirts, and other such feminine paraphernalia of the sun. . . . F. Verheijen, who visited the house after I did, reported (in a personal communication) that when he saw it, it was empty. It was not possible to learn more of the ritual or symbolism surrounding the sun.

The simple architecture of the house that Heider describes at Wadlagu (alt. Wadangku, as used by Gutelu Mabel patrilineage today), as well as the aura of almost absolute secrecy about the function and
contents of the house, belies its true significance as a religious center where some groups of Dani and Western Dani come to conduct rituals to propitiate the sun. In a very real sense, these people belong to a regional "sun cult," who, in addition to the practice of ancestor worship, make periodic pilgrimages to the sun center to conduct rituals with pig sacrifices and vegetable offerings before a sun symbol. Hereafter, I refer to this regional group as members of the "sun cult." In 1989 and again in 1991, I photographed the rebuilt version of the "Heider sun house", which was burned to the ground in the war of 1977. The rebuilt house is a remarkable replication of its predecessor (Figures 376 and 377).

To many people in the Grand Valley and West, the sun is a woman called mo. Some people refer to the sun as "our mother" (Ninakoja, alt. Naguja); while others call the sun Muliki. Throughout the area of the Grand Valley, the moon is called sut. The stars are called husagal. The people believe that all of these are important to the well-being of all forms of life within their cosmos, but it is the sun that reigns supreme as the most powerful life-giving entity of the three; the stars in this perspective being of little importance. Some people contend that although the sun is the single life sustaining spirit-power entity it is not female, but male. One thing that is agreed on by everyone is that the sun is very powerful and is held in awe.

The people believe that the sun, like all life forms, including humankind, originated in the center of the earth (Chapter III). The understanding of the sun’s current existence is that the sun arises each day in her sun house in the lower Pass Valley area, travels across the sky, furnishing light and heat and "making the sweet potatoes grow," and returns to her house each night (Figures 376 and 367). There is a story, most pervasively known by members of the Gutelu Mabel patrilineage, that accounts for construction of the sun house at Wadangku (alt. Wadlagu) and sun propitiation. The grandfathers passed this story down from father to son. Long ago (number of generations not speculated), the sun disappeared, left the sky. There was an eclipse. When the sun returned and showed itself again the people decided to build a house for the sun to encourage it to keep making its daily trips across the sky and thereby furnish its all important light, heat, and sun energy. [Author’s note: The sex of the sun is not revealed in the myth.]

In the Lower Pass Valley, within an hour’s walk of each other, there are three separate sacred compounds, each with its own house for the sun. These sacred compounds built just for sun worship, each with its own sun house, are Wadangku, Wagima, and Lukuluku. Wadangku has a sacred meaning which cannot be spoken. Wagima translates to "come", meaning "sun, you come." The author is not aware of the translation of Lukuluku. The sacred compound of Wadangku is often referred to as Wadangku Waga. Waga translates to mean, "the sacred sun house." At Wadangku Waga, it is said that ceremonies are held to propitiate "the sun for the sun;" at Lukuluku, "sun for the war;" and at Wagima, "sun for the waija" (people of the waija moiety).
Figure 376. A close-up view of the Wadangku Waga sacred sun house.
Figure 377. The door on the courtyard side of the wooden sun house is closed.
Control of these three individual sacred compounds, each with its separate sun house and located within the regional center for sun rituals is by an interesting arrangement of leadership. For each sun house compound there must be a pair of leaders: one big man from the waija moiety and one from the wida moiety. For the Wadangku Waga sunhouse, the leadership consists of a big man from the Mabel patrilineage and a big man from the Logo (alt. Dloko) patrilineage; for the Lukuluku, it is the same, one big man from the Mabel patrilineage and one from the Logo (Alt. Dloko); and for the Wagima sunhouse a big man from the Mabel patrilineage and one from the Dabi patrilineage. The Mabels are wida; the Loko (alt. Dloko) and Dabi are waija. During the era of the last great "big men," before the demise of the big man alliancewide leadership system due to the incursion of outsiders. Gutelu Mabel was the controlling wida represented leader of each of the individual sacred sun house compounds. Gutelu had parlayed political influence into religious leadership as well. All big men are known to have wusahun (supernatural spirit power), but Gutelu's was of the grandest proportions and most powerful.

Each of the sacred sun house compounds within the sun religious center has a resident guard, just as at Wali's sacred compound of Yalogn, which has been previously discussed. When I was doing my research at Wadangku Waga, the guard was Biolok Logo, who is the son of the man who was resident guard when Karl Heider visited Wadangku with Gutelu in the 1960s. Biolok told me that his only son would inherit the same job at the appropriate time. The other current guards (1988-1991) are Enghakhalkok Mabel at Wagima and Dabuke Logo at Lukuluku. As previously stated, the resident guards of each sacred compound are inherited positions.

Within the "sun cult" organizational system, each of the sun house compounds in the Lower Pass Valley religious center have subsidiary branches in and around Jiwika, a total of five branch sunhouses in all. The Wadangku Waga (sun worship for the sun) has one branch sun house within the current village/town of Jiwika, very near to Gutelu Mabel's habitation compound and another up the hill from Jiwika, near the compound of Obia which is not far from the Ileukaima brine pool. The Lukuluku (sun propitiation for war) has one branch at Jiwika, and Wagima (sun propitiation for the waija) has one branch sun house on the hill behind Jiwika, and another at Sunpaima, where an ancestral mummy is maintained. Outside of this close-knit organizational complex, including the ritual center for the "sun cult" in the Lower Pass Valley and its branches in and around Jiwika, there is evidence for "sun cult" presence throughout the Grand Valley, its surrounding mountainside fringe, and as far west as Mulia and Ilaga. "Sun cult" activities have been identified at Ilugum, Keliba, Bokondini, Karubaga, Mulia, Sinak, Mamit, Tagime, Tiom, Eragnyam, Winam, Obakma, Lancikma, Ilu, Wolo, Yalenga, Pyramid, Poga, Ilugwa, Kurima, Tangma, Seinma, Ituga, Pugima, Wamen, and Hetigima—none from the Yali (Figure 378). If members of the "sun cult" reside within the Yali and East region, it is not yet known by the author, but it is suspected.
Figure 378. Dani and Western Dani "sun cult" region.
The cycle of sun rituals flows with the five year *Ebe Akho*, when representative big men from confederacies within the Dloko-Mabel alliance brought a big sacrificial pig and other food offerings to Gutelu at Jiwika where the group gathered before proceeding to Wadangku Waga for sun rituals. According to Mabel informants, at least one representative from each moiety must be present at every sun ritual that is held at any of the sun houses in the Lower Pass Valley religious center. Regardless of current events, Gutelu reportedly officiated at a sun ceremony routinely once a year. Participants were obligated to bring sweet potatoes, bananas, and sugarcane to be used as offerings to the sun. Gutelu furnished a large pig for sacrifice. On a discretionary basis, other participants might also furnish one or more pigs. At any time, local groups of the "sun cult" from anywhere within the region might feel the need for a sun ceremony. On such occasions, they would send an envoy to Gutelu at Jiwika to make arrangements. Gutelu would usually allow safe passage to Wadangku Waga, even to enemies during times of active war—a payment of a pig and/or other items of food was understood. Any given big man throughout the region might feel the desire to initiate a sun ceremony at Wadangku for his group for any of the following reasons:

1) The sweet potato harvests have not been good.
2) It has been raining too much, and that is spoiling the crops or will not allow a sunny planting time.
3) Flooded areas need to be dried. Only a series of continuous sunny days will dry the fields.
4) Illness abounds and several key people are sick or are dying.
5) Children are sick or "look sickly."
6) Pigs are not plentiful or do not seem to be growing fast enough.
7) The soil in a newly opened garden does not seem "good" [Author's note: I do not know on what basis such a judgment is made.]
8) Miscellaneous, personal reasons.

War matters, in a similar fashion, are taken to Lukulu but must likewise have been taken there with Gutelu's approval and a payment of goods. When a group from out of the region would arrive at Jiwika for a sun ceremony, their offerings were divided, part to be used for a ritual to be held with Gutelu at Jiwika preparatory to the entire group (with Gutelu) proceeding from the Gutelu habitation compound to the "sun cult" center in the Lower Pass Valley. For the trip to the sun center, the participants traveled via a trail that enters the mountain wall directly behind Jiwika, rises up a steep hillside valley and winds past the Ileukaima brine pool to the Lower Pass Valley sacred sun compounds. It was felt by Gutelu and others that the answer to the riddle of the presence of the brine pool that they passed is to be found at Wadangku Waga, "where the sun has made the salt and from whence the brine comes." So Gutelu, or more probably his ancestors, have tied the presence of the brine pool, within the people's belief system,
to the "creator" sun. Just as Gutelu granted safe passage to the sun center for the devoted, so he would, for a fee, grant safe passage also to the brine pool. However, in times of war and with certain enemies it is said that Gutelu steadfastly refused access to Ileukaima.

It is customary for big men within the region to continuously be raising one large wusa pig for sacrifice to the sun. If that particular pig dies for an unknown reason before it can be sacrificed, it is said that the pig must be cremated and not eaten. On those occasions it was expected by custom and by Gutelu, for the big man concerned to pay a visit to Gutelu and explain the particulars. The two men together might decide that a sacrifice and offerings should be made to the sun at which time sweet potatoes would be sanctified and fed to another pig that would be identified and raised as a wusa replacement for the pig that had unexpectedly died.

A few of the older people attest to what some say was a benevolent act on Gutelu's part. If a big man who came to Gutelu with a great need for a sun ceremony was of poor circumstance, Gutelu himself, had been known to furnish all of the offertory items. I presume that such an act on Gutelu's part was done with the understood pre-condition of a later pay-back because that is the way these kinds of matters are handled by big men in the Irian Jaya Highlands.

One way that a big man within the region of membership of the "sun cult" notified other big men that he was planning a trip to the sun center to pay homage, in the interest of health matters, was to send by courier a single white cockatoo feather to those whom he felt might be interested in joining him in such an endeavor. A positive response for a recipient of such a feather was to send a large sacred pig back to the organizer, to be maintained by the organizer as a sacrifice to the sun, until the journey to the sun center was made.

Originally, the three sun houses at the lower Pass Valley sun center were rectangular (nearly square) closed wooden structures that were built up on stilts (like Wadangku Waga, Figures 376 and 377). However, all three sun houses were destroyed by fire during the war of 1977. The two at Lukuluku and Wadangku were replicated on the spots of the original sacred houses. The house at Wagima (sun worship for the waija) was also rebuilt but not in its original architectural style. It is circular and with a thatch roof, like any other Dani men's house (except larger). Some waija representatives of the Wagima sun house leadership discreetly told me that their sun symbol disappeared at the time that their sun house was burned in the war of 1977, but they know that the sun still exists because it continues to light the sky and heat the earth each day. When the sun symbol returns, I was advised that an architecturally correct sun house will be rebuilt. At Wagima the circular sun house is located in a separate courtyard (with its own steam pits and a small cookhouse) that joins, by a common fence, the primary courtyard of the Wagima sacred compound. The sun house courtyard is reserved for rituals related to the sun. At Lukuluku and Wadangku Waga, the sun houses are an integral part of the inner compound fence, that bound the main
compound courtyards. Architecturally, the wooden sun houses are designed with one doorway for the use of human beings, which is securely closed with wooden planks. High on another wall, a small entranceway is usually left open for the use of the sun. Conceptually it seems logical that members of the "sun cult" would want to build their sun houses up on stilts, close to and with easy access to the sky where the sun travels during daylight hours.

The mystery of evidence for a tangible symbolic presence of the sun spirit-god has been just that: a mystery. But, like the personified, worshiped ancestors with their symbolic stone bodies, the sun spirit was not to be denied its symbolic body. At Wadangku Waga it is a somewhat circular (in plan view), flat natural stone covered with a mass of sparkling quartz crystals. Similar, sacred spirit stones were the symbolic stones that were also used to represent the sun body-spirit entity at the other two Pass Valley sacred sun houses. At Wadangku Waga, the spirit stone hangs in a simple nogen from the ceiling. These special sun stones are considered as unique objects of the "sun cult" group’s ganekhe. Whether or not clumps of multiple crystals or possibly individual crystals are maintained anywhere else throughout the region of the "sun cult" as sacred sun symbols within the ganekhe, I do not know. It is professed by members of the "sun cult" that the sun spirit departs its (symbolic) stone body in the sun house each morning, to travel the skies by day as the visible ball of bright light which we know as the sun and to return to its stone "spirit bones" body each night. Some few informants even maintain that the "sun" (as the symbolic stone-spirit entity) leaves Wadangku Waga each morning to travel in the sky. Those same informants always avoid my question, however, of whether or not they had ever looked in the sun house during the daytime to see if the "spirit bones" were still there or not.

The moon is called sut within most of the Grand Valley and is also known as sut among at least the Western Dani. According to native Grand Valley informants, those ancestors who initiated moon propitiation referred to this revered spirit entity as pae. Currently there are houses especially for moon rituals secretly scattered about the cultural landscape, although I know of no "center" for a possible "moon cult." In mid Grand Valley terminology these houses are known as paëaila (or moon house). Some moon houses are structured like the rectangular sun houses and some are round, grass thatched houses, architecturally designed with interiors like the men’s houses that have ganekhe cabinets. Such houses are known to exist, among other places within the Grand Valley, near Aikima (where a mummy is maintained), at Pabuma where Obaharok lived, in the Dugum area, and at Abusa near the Bawet River. For rituals at which the moon is a featured, spirit entity and in all sacred houses (paëaila) where the moon is propitiated, a special symbolic object is reportedly maintained. It is a constructed artifact of three pieces which consists of a stick of wood that is kept in a short section of incised bamboo, which in turn is maintained within a water gourd. The gourd is hung in a net bag (nogen) from the ceiling, near the ganekhe cabinet or sometimes kept inside of the cabinet.
Painted Display-Exchange Type Stones and Sacred Boards in the Yali and East Region

East of the Grand Valley throughout the Yali and East region (Figure 188), most of the sacred flat exchange types of stones that I observed were painted with red, white, or black paint; some with combinations thereof and some fewer stones even incised. Two different Yali informants stated that during empowerment rituals when a red stripe is added to a profane stone by a Yali shaman that the stone at that moment becomes sacred. When profane, it is called sie or siengga, but once painted, owili. East of the Grand Valley, the Yali also utilize in much the same fashion as the painted flat sacred ancestral stones, incised and painted rectangular boards, which they call sabalhe.

I have reasoned (but not yet proven) that the artistic addition of incising the stones, engraving boards, and painting these items in the Yali and East may be because the eastern part of that area is on a Highlands trade linkage or migration route, upward from both the north and south coasts of New Guinea, between the more artistically inclined Sepik River inhabitants still farther to the east and the artistically inclined Asmat (north and east of Agats) to the south (Figure 1, author's work outside the scope of this treatise). The introduction of the rectangular boards (sabalhe) may have also been a solution to fill a supply deficit of the once possibly more desirable flat sacred stones, caused by distances and trade complexities with Grand Valley and West sources. Or, the presence of the artistically carved and painted boards may just be another artistic expression, whose origins were rooted with Asmat and/or Sepik River artistic traditions. As one moves eastward away from the Grand Valley Dani-Yali boundary, there is an increasing number of flat style symbolic stones that originated from sources of opportunity, rather than from either the Yeineri or Tagime Quarries.

In Figure 379, a red painted, flat style Yeineri-sourced gray schistostic slate sacred stone (owili) is shown next to three red ochre painting chips (crayons) and a paquette of red hematite painting powder. Dimensional views of the stone are shown in the ink drawing of Figure 380. The stone is 43 cm long by 12 cm wide by 1 cm thick. The left end of the stone in Figure 379 is ground to a sharpened edge, but not honed as finely as if it were ground to be used as a cutting tool. The stone and the pieces of red ochre and the packet of hematite powder came from an unnamed hamlet near Pasikni, just south of Angguruk (Figure 188). The Grand Valley Dani traded their sacred red painting ochres and hematite from the Yali.

The sacred flat type stone (owili) seen next to a chip of red painting ochre in the lower photograph of Figure 379 is from the hamlet of Pass Valley (Figure 188). Traces of red paint can be seen on this Yeineri-sourced green amphibolite owili stone. The stone is decorated with multiple loops of yellow and brown orchid fiber cording that looks Dani in origin.

The ancestral spirit boards (sabalhe) are usually engraved with various geometric and other designs before being painted with red and/or white and/or black paint (Figure 381). The red and white pigments are mineral and the black from a natural berry. Representative dimensions for a single board is about 1.5
Figure 379. Two red painted, sacred exchange-type stones.
Figure 380. Dimensional views of a painted *owili* stone (Yali and East region).
Figure 381. Two examples of the engraved and painted sacred boards (sabalhe).
x 15 x 60 cm. Some boards are larger. An example of painted boards (*sabalhe*) on the inside of a men's house that is located in central Yali territory is shown in Figure 382. Grounded truth for the presence of the *sabalhe* is throughout an area that includes the hamlets of Korupun, Kosarek, Nipsan, Welarek, Gilika, Nalca, Kasin, Angguruk, and Apalapsali (Figure 24). Their presence in prehistoric times farther east than Langda is presumed, but I have not confirmed this assumption with on-the-ground research. Whether or not there is a relationship to the symbolic *churinga* of Papua New Guinea is not known.

At the east end of the research area, the Una people call their empowered flat display-exchange style symbolic stones *biri ya*. As with the Yali, most of these kinds of symbolic stones are painted. Some of the stones are instilled through ritual with ancestral spirit power as they are farther to the west, while others are empowered and used in different contexts. For example, among the Una, in addition to "planting" adze blade style empowered stones with their sweet potatoes, the people plant empowered display-exchange stones (*biri ya*) with their crops to promote growth. Sticks are sometimes used to mark the locations of these stones so that they do not become lost. The Una *biri ya* in Figure 383 is thought to have been obtained from a volcanic sequence source of opportunity within Una territory, not sourced from a Yeineri or Tagime quarry. This 38.2 cm long sacred stone is 15.5 cm wide at its widest point. On one side, it is incised with three concentric circles and painted with a white stripe that is perpendicular to the long dimension of the stone. The black meta-argillite Tagime Style *biri ya* shown in Figure 384 is 10.3 cm wide (widest point) by 38.4 cm long. The meaning of the red and white painted design on one side of the stone is not known. The stone has been wrapped with nine loops of braided yellow oridid fiber cording, called *sika* which is distinctive of Una braiding versus the style of braided cording made in the Grand Valley and West region. Among the Una, this type of cording is worn in necklace loops as men's adornment and never as married female skirtig as is done in the Grand Valley and West. Adjacent to the band of braided yellow cording on the stone is a miniature female skirt (*gem* flattened reeds), which among the Una is called a *le*. It is interesting to note that in Figure 384, the loose ends of the miniature skirt face toward the narrower, pointed end of the stone and not toward the broader end, as is done throughout the entire Grand Valley and West region. Such reverse orientation of miniature "*gem* grass" skirtig material is characteristic of Una decoration on the stones.

**Miscellaneous Sacred Stones in the Yali and East Region**

**Adze Blades (*Biri Ya*)**

Like the Kimyal and Yali west of the Una but within the Yali and East region, the Una do not use Yeineri Style and Tagime Style adze blades as profane cutting tools, but they do use such tool blades as sacred empowered spirit stones. The Una with whom I talked did not know the source of the stones, only
Figure 382. The use of sacred boards (*sabalhe*) on the wall of a Yali men’s house.
Figure 383. An incised and painted Una flat exchange-type sacred stone.
Figure 384. A decorated and painted Una black Tagime-sourced flat stone.
that they had inherited them. Like the sacred flat style display-exchange stones, the Una call these former adze blades in the sacred stone context, biri ya. Typical of the adze blade biri ya are: 1) a green-black, Yeineri Style oblong-triangular blade that measures 6.9 cm wide by 12.7 cm long and 2) a green-blue Yeineri Style blade that measures 3.8 by 10.2 cm. A group of six head quarrymen and big men from hamlets in the Langda area (including Diman Balyo, the head quarryman at Langda) advised that two uses of the Yeineri and Tagime Style adze blade biri ya were to plant with their crops to encourage growth and to carry as amulets to help find good quarry stone. It was Weak, a Dani big man on Sekan Ridge on the edge of the Grand Valley who showed me a similar size and shaped green Yeineri Style adze blade which he said was a spirit power stone that he had inherited from his father and always carried with him in former times during warfare to keep him safe (Figure 169).

Circular Ground Stone Disks

The Una, Kimyal, and many of the Yali possess circular ground stone disks with centered perforations which the men use as sacred power stones. These disks look much like many of the shafthole stone implements that have been reported in the archaeological record worldwide. Similar artifacts have been called club-heads, battle axes, axe-hammers, mace heads, and pebble hammers. Such items have been mostly interpreted as profane stone tools or instruments of war; few as symbolic stones. The disks in the Yali and East region range from semi-square to round, about 10-16 cm in diameter and with center perforations that range from about 0.6-3 cm in diameter (Figures 385 and 386). The stones are cut and ground from pieces of gray, compacted volcanic tuff. Some are rubbed with pig fat and smoked, becoming light brown to gray-black in color; while others are left their original natural gray. Some are incised with patterned grooves which are either left the natural color of the rock or painted with red, white, or black paint, or a combination thereof. Some of these stones are tube shaped, while others are honed down to a thin circular cutting edge on their outside perimeters. Those with large enough center holes (about 0.75-3.5 cm diameter) to fit over the exterior house center crestal poles (spikes) are called bumkil (alt. tani humkil) by the Una people. These bumkil are slipped over crestal roof poles to ward off wind and rain, so that the roof will not leak, and to protect the house from being crushed in case the sky might fall. Others, especially those stones with very small center holes, are used as sacred power stones for other purposes.

Some of the disks that I have observed exhibit what appears to be both outer edge and center hole use wear, much as one would expect if these stone disks had been used as profane stone striking or cutting implements with shaftholes (c. Figure 386). I have not seen one of these types of disks used as any sort of a club-head or chopping tool in Irian Jaya; although one Yali man told me that his father had used such an implement as a special kind of club-head, and it is rumored that the Asmat used a club-head similar to
Figure 385. Four ground stone sacred power disks with centered perforations.
Figure 386. Dimensional drawings of four ground stone disks with centered perforations.
the one shown as "a" in Figure 386 and nearest to the cm scale in Figure 385 as a special tool to crush human skulls. Stone artifacts similar to number "c" in Figure 386 are called club-heads in a collection shown in the Australian Museum (White and O'Connell 1982:193) and in the Indonesian Government Museum in Jayapura, Irian Jaya.

Miscellaneous Una Power Stones

Having a nearby available source of layered volcanic tuff deposits, the Una selectively quarry small pieces of tuff that, in addition to the circular disks with center perforations, they carve and grind into simple, small oblong and rounded stones into which they ritually transfer spirit power and use as power objects. One example is a smoke blackened, rounded oblong artifact that is 7.6 cm wide by 18 cm long. A small "V" has been cut into one end, a red and white dot placed on each side of two centrally located incised concentric circles, of which the inner has been painted white and the outer red. At the other end of the object, an incised grid pattern has been painted with red and white lines. I do not know if the object is anthropomorphic. This object and other similar objects are called oboh. The Una owner stated that he plants this stone with sweet potatoes and moves it from time to time to encourage crop growth. This same man owned a river-rounded stone (5 cm diameter) which he calls amkil. He says that an empowered stone like the amkil, planted between a taro plant and a sweet potato hill, encourages both to grow better. A round, flat stone which he maintains in the house beside the fireplace he called a kwaningkil. The man said that he would pray to the spirit in that stone for good sweet potato crops.

Conclusions

Sacred symbolic stones are used to focus the Highlanders religious belief system and as special tools to deal with problems of the "unknown"—(those personal and social problems that are caused by believed-to-exist living entities of the "unseen" world). These sacred symbolic stones and tools are created by withdrawing from secular use both everyday items that are used within the cultural systems, such as profane display-exchange stones, stone tools (adze and axe blades, knives, and chisels), and also naturally shaped stones from the landscape and converting them, through ritual, from profane to sacred objects. Stones (and other objects) once empowered are treated as sacred objects and identified in a different traditional classificatory system than that used while the objects are still functioning as profane items. Once sacred, the stones are used either as ancestor-spirit symbolic objects or as sacred tools to deal with the diverse problems of culture.

Within Highlander belief systems, the people traditionally worship ancestor spirits; in at least part of the Grand Valley and West region, they conduct sacrificial rituals to propitiate the sun and moon spirits;
and throughout the entire area live in perpetual fear of ghosts and a multitude of other non-human derived spirits which inhabit the landscape. The practice of ancestor worship, from which females are precluded, is the core of this complex belief system. The theoretical issue of whether the conception of ancestors is influenced by a belief in other ghosts and spirits (or the converse) is not herein addressed. It is pointed out, however, that some theorists have claimed to find the origin of religion in ancestor worship (Hinnells 1984:39). As early as 1877, Herbert Spencer wrote in Principles of Society that "ancestor worship is the root of every religion" (Eliade 1987b:264). Spencer's theory rested on an idea in the scholarship of his day that religion as a whole had a common origin from which its many forms derived.

Pertinent to archaeological considerations, compelling analogies exist between the organization, contents, and uses of sacred space by the indigenous Highlanders to places of worship in other historical religions, regardless of the supernatural entities that are being worshiped and the ways those religions are defined. In the Highlanders architectural plan of sacred space, they define "a place for the people" (outdoor courtyard with sacrificial ground altars, Figure 311), a "place for the shamans and practising members of each ganekhe group" (the men's house or pilamo wasa, Figures 310 and 311), a place for "religious relics" (Figure 310), and a place for the "most sacred and powerful religious objects" (the ganekhe cabinet, Figures 282 and 310). I submit that the ganekhe cabinet with its contained power is the Highlander analogue of the Ark of the Covenant of the Judeo-Christian tradition.

In most Highlander constructions of sacred objects to symbolically represent personified ancestral spirits, as well as in their compositions of supernaturally powered tools, to deal with the unknown, indestructible rocks are the principle power objects but they are almost always intimately combined with a varied assortment of destructible pieces of string, grass, leaves, and wood.
CHAPTER VIII
YEINERI QUARRIES

The quarries are located in an unmapped part of the Highlands, not far from the ecological interface of the Highlands with the lowlands Dismal Swamp (Figure 387; Hampton 1992b, 1992c). Heinrich Harrar, a German explorer, is to my knowledge, the first Western outsider to have located the quarries area, which has been rarely visited by Westerners since, due to its remote location and rugged terrain. Harrar’s expedition of 1962 was successful on its second attempt, after the first almost cost Harrar his life (1965:96-97). When Harrar finally arrived at the place which his porters had described as the “source for the stone axes.” Harrar wrote in his diary (May 8, 1962). “The natives felled enormous trees and pushed them with great skill and experience over to the other side [Author’s note: of the Kiembe River], where there were rocks in all shades of blue and green” (1965:140). This was the axe blade source for which Harrar had been exploring. Harrar described the use of fire on scaffolding against a “big green rock face” to assist in the quarrying process (1965:141).

During the same year that Harrar reached what his Dani helpers called the "Ya-Li-Me" (Ya, stone axe: Li, place: Me, source), Denise O’Brien was commencing an ethnographic study of the Kondo Valley Dani near Bokondini (Figure 387). From that perspective, O’Brien (1969:43) reports:

The stones used for tools and for jao, the "exchange stones," have a single center of origin, a quarry located on the Kiembe River approximately fifty miles northwest of Karubaga. No Dani in the Kondo Valley has visited the quarry site but several men can describe it quite accurately and know the country which must be traversed to reach it, the names of the rivers and some of the settlements along the way. The quarry consists of an outcropping of huge boulders in and along the Kiembe River, at the very margin of the swampy plain (formerly called the Meervlakte) surrounding the Idenburg and Rouffear Rivers. Fires are kept burning under and on boulders to create cracks and allow fragments of rock to be fractured from the boulders.

[Author’s note: O’Brien’s "Kembe River” is Harrar’s “Kiembe River.” The Dutch-named Idenburg River in O’Brien’s work is the Indonesian-named Taritatu and the Rouffear River, the Tariku on Figure 387.]

At about the same time, Heider (1970:26-29), working still farther away from the quarries, in what he defined as the Dugum Dani Neighborhood in the Grand Valley, north of Wamena, says that:

Stone for axes and adzes is from what seems to be the only quarry in the area, lying in the Nogolo Basin [Author’s note: a large geographic feature that is located between Mulia and Dagai, Figure 387]. . . . Since the Dugum Neighborhood has only sandstones, limestones, and very rarely flints, some stones must be imported, including blades for axes, adzes, and chisels, all of which come from the Nogolo quarries; large flat slaty stones used for exchange or sacred stones which come from the Jalemo [Author’s note: Heider’s erroneous reference to the Yali and East region as the source for the profane exchange and also sacred stones, east of the Grand Valley (Heider 1970:26, 288)]; flint, from the west across the Baliem and upstream; and
Figure 387. Yeineri and Tagime quarries and trade area.
finally, river pebbles for hammer stones, which are perhaps not actually imported but were often carried three hours from the Wamena River.

From yet another geographic perspective (Ilaga southwest of Mulia, Figure 387) and while discussing "origins" within Dani cosmology, Larson (1987:42-48) has this to say about the location of the source for stone tools that were used in the Ilaga area:

When the mountains were in place the world stopped shaking and rivers began to flow toward the coast. One, on its way to the north, went through the place of the blue and green metamorphic rock from which axe and adze blades are made. . . . This is the river which flows through Yeelom "Source of Stone Axe Blades" into the Ruhl which is one of the branches of the Van Daalen which, in turn, is a tributary of the Roufflaer.

Whereas Harrar had followed a route northward from Mulia in his successful search for the "source for the stone axes." I chose to start my quest from Dagai (Duvle-speaking people) on the north, lowland edge of Wano territory, and climb back uphill to locate the quarries (Figures 387 and 188). At Dagai, where the river tumultuously spills out of the steep mountains and flows quietly out into the bordering swamplands, it dumps a large load of gravel, cobbles, and boulders. From these river-tumbled rocks, a few are selected for the proper size and hardness to be locally rough flaked by the Duvle and traded further downriver as adze and axe blade blanks. The elders (estimated ages 55-70 years) at Dagai say that their ancestors supplemented this local supply of tool stones from time to time with the more highly prized, top quality adze and axe blade blanks from quarries upriver in the mountains. It was the upriver quarry or quarries which I was seeking.

Where the river pours out of the mountains, it is called the Dagai. In the Highlands to the south, where it cuts through a broad sequence of vertically tipped, complexly banded, hard metamorphic green, blue, and black colored rock, it is called the Ye River or Yei. Some translate Yei to mean "source of the axe rock river." Some say Ye means "rock," others say it means "stone blade" or "exchange stone," or all three, and that "i" means river. There was never complete agreement. To the Wano Highlanders who control the quarry area, "neri" means literally "where the river begins," but the term Yeineri is generally understood by the Wano to refer to "the entire geographic area around the rock quarries" as well as to identify the Wano habitation site that is located within the rock quarry area from which the thriving stone goods industry was operated.

Toward the end of the second day out of Dagai, my party and I (three Irian Jaya assistants and seven porters, five of whom were Wano and two, Duvle) climbed down a steep hillside to the river. Known to the indigenous inhabitants at that location as the Ye River (Yei). Somewhere around the rock shelter of the night before, the name of the river changed from Dagai to Yei, marking the north boundary of the Wano quarry belt. As we walked over and around boulders in the stream bed, a few Wano people appeared; it was apparent they had advance notice that we were coming because they just smiled and
pointed upstream. Soon the river divided around a large pedestal-shaped promontory. An obvious trail could be seen winding its way up the steep downriver hillside, finally disappearing among trees at the top. One cluster of Wano men at the base of the hill, carrying bows and arrows, told us that they lived on the top of the hill and that we should go there.

My team and I had been following a swift-flowing, often white-water river up into Wano territory in search of a quarry or quarries, but what I was ultimately to find was far more complex than just an operationally disconnected "quarry or quarries" but an integrated, although somewhat informally operated, quarrying and trading system, that in times just recently past, had supplied a variety of stone tools to different language-speaking groups in the Highlands to the south and southwest, and also down-river to the lowlands Duvle people to the north. The Wano habitation site on the top of the hill was the center for this quarrying operation, and henceforth, I will refer to this habitation site as Yeineri.

Yeineri consists of a scattering of both round, wooden-walled, thatched roof houses and rectangular, wood-sided houses with raised floors, one doorway, and thatched roofs. The mix of house types possibly indicates a transitional adaptation of housing style to the environment, between the low, round, thatched roof houses that are used by the Dan and Western Dani at higher, colder elevations and the Duvle, open-sided, thatched roof rectangular houses that are built up on stilts in the hotter climate at lower elevations to the north. The elevation at Dagai (Duvle inhabitants) is 85 m above sea level. I estimated the elevation at Yeineri to be about 1,200 m (plus or minus 150 m). For comparison, the elevation of the Grand Valley, which is inhabited by the Grand Valley Dani, is 1,600 m above sea level.

The focal point of the hilltop hamlet is a round, wooden-walled, thatched roof men's house, which is approximately eight meters in inside diameter, much larger than the 3-5 m Dani houses. When we first entered the hamlet, Teniak Wenda, our Wano trail guide (Figure 388) disappeared into this house, which is where he resides along with 15 other Wano men. The floor of the house, built 0.9 m above ground level, is covered with cane poles where its inhabitants sleep on sewn Pandanus leaf mats. A central fireplace, used for cooking and to heat the house at night, also creates smoke to discourage mosquitoes and the nighttime presence of rats. There are two entrances to the house and no second interior level, as is prevalent in Dani and Western Dani houses at higher elevations to the south and southwest.

In addition to this prominent centrally located men's house, there are other smaller men's houses throughout the habitation area, each with a scattering of associated family houses. Yeineri informants estimated the current (1991) Yeineri population to be approximately 240 adults plus young infants. The older quarrymen (more than 50 years) stated that when quarrying operations were at what they called normal capacity, the area population was considerably larger but none could quantify those statements. Overall, hamlet architectural style is similar to Yali house clusters. Some wooden fences are present, however, to define space and control pig movement. Outlying tuber (sweet potato, taro, and yam) gardens
Figure 388. Teniak Wenda, a Wano man of the Yeineri quarry area.
are not as luxuriant and productive as in the Grand Valley. Without doing a formal study it also appears that pigs, on a per capita basis, are fewer than within the Dani cultural system.

Within the Yeineri hamlet and its environs, the population is subdivided into residential kinship segments in much the same fashion as described under the subheading "Compound and Hamlet" in Chapter VI for communities in the Yali and East region and throughout the Dani, Western Dani, and Damal language groups of the Grand Valley and West region. At Yeineri, it is within these community kinship groups and combinations of them that permanent, but flexible, work groups are formed which independently quarry the stone, own and work it to completion, and control its final distribution. Due to proximity and control of valuable resource, the focus of function and energy at Yeineri is thusly directed at quarrying rock, manufacturing stone tools and display-exchange stones, and distributing the product. Within counterpart levels of sociopolitical organization in the primary, adjacent-living user populations (Dani, Western Dani, and Damal), people, instead of quarrying groups, form groups as work crews for land clearing and fence building, the sponsorship of communal feasts, assembly of warriors for battle, the religious ganekhe groups, and among the Dani of the Grand Valley, the watchtower groups.

Although within the Yeineri quarrying system product ownership is within the kinship residential groups and their leadership, quarry ownership, overall management of the system, and responsibility for security of quarry sites accrue to the most influential leader (big man) living at the Yeineri quarry center—or, perhaps, from time to time, to a combination of two or several of the more influential men who reside there or nearby.

The Wano People

The relatively small Wano population (3,000-3,500) lives in scattered habitation sites north and northwest of Mulia in rough terrain as far north as down the flank of the central mountain core to its junction with the broad lowlands swamp (Language and Linguistic Boundaries, Chapter IV: Figures 2, 188, and 387). Large areas within the sparsely settled Wano territory are uninhabited and without horticultural gardens. While Hayward (1992:479) was gathering "origin" stories just south of Wano territory at Mulia, indigenous informants told him that their ancestors recognized the Wano "as foragers who cooked leafy plants and the fruit of trees." Today, the Wano supplement a tuber horticultural and pig husbandry subsistence with hunting and gathering. Many of the men, even when going about their business around quarry sites or gardens, routinely carry bows and arrows with which to hunt cassowary birds, marsupials, feral pigs, and tree kangaroos.

The Wano are relatively short in stature. The bare essentials of Wano traditional dress is similar to the Dani and Western Dani: gourd penis sheaths for the men (none of which are ever worn as long as the
longer of the Dani, Western Dani, and Yali assortment of penis sheaths) and primarily reed stem skirts and head-back nets for the females. Women do not exchange reed skirts for the Dani-style orchid fiber wedding skirts at marriage (Chapter IV). Women give birth from the squatting position and rear between two and five children, in comparison to Dani women who usually rear only one to three children (Chapter IV).

The number one killer of the Wano is malaria; number two, complications from hookworms; and number three, pneumonia (Lukibut Eber, an indigenous Wano who was medically trained at a Western medical station in Mulia. Personal communication, May 11, 12, 1991, Yeineri, Irian Jaya). The Wano, at least in this area, cremate their dead. Farther north, near their border with the lowland Duvle (estimated population 200, Silzer and Clouse 1991), it is my understanding that in former times some of the Wano placed their dead on stilted platforms, as did the Duvle. Wano informants have told me that when Wano people died while on stone tool trading missions or long hunting trips the bodies were abandoned in caves or rock crevices and not cremated. Perhaps this treatment at least partially accounts for the presence of human skeletons in some caves throughout the Highlands.

Geologic Setting

The primary branch of the Ye River and a subsidiary tributary nearly surround the flat-topped hill on which the Wano operational center for the Yeineri quarry complex is located. Both branches are crystal clear and full of bright colored pebbles and cobbles that exhibit combinations of the various minerals and lithologies which make up the desired array of the types of rocks that are quarried (Figure 389). It is the full force of the Ye River, both upstream and down from this location, that eroded and exposed a favorable Tertiary sequence of melange shelf strata, ophiolite slices, and metamorphic rocks, including glaucophane-epidote schists, blueschist, greenschist, phyllites, amphibolites, slates, and marble. Large boulders and bedrock outcrops along the edges of and within the river bed itself provide most of the available source places for quarrying. Due to the dense vegetative ground cover that is characteristic of the prevailing rain forest climate, few outcrops are visible on adjacent hillsides—-even for the discerning eye of a traditional rock-tool prospector. Within the entire rock sequence that is exposed over a distance of some 20 kilometers, different mineralogical mixes, degrees of metamorphism, rock textures, and degrees of stratification afford choices of different kinds of rock that were/are suitable for a variety of kinds of stone goods, and which were/are amenable to different quarrying techniques. Within the geologic sequence there are no hard sandstones or other suitable kinds of rock locally available for grinding stones. Beds of sandstone that are favorable for the grinding process crop out, however, at scattered locations or are present as exposed large boulder erratics away from the quarry belt outside of Wano territory throughout most of
Figure 389. The Rock River (Yei) runs through the quarry area.
the stone tool use area.

Kinds of Stone Goods Produced and Their Classification

Stone axe and adze blades, knives, chisels, and the profane flat-type je display-exchange stones are produced and traded outward from the integrated Yeineri quarry complex. According to active Wano quarrymen and their oral history, as related by older Wano males, sacred stones per se were never produced at any of the Yeineri quarries. Also, according to older Wano informants (35-70 years), no perforated disks or other possible shaft-hole implements, hammerstones or pounders, grinding slabs, mortars, or pestles were ever produced anywhere along the Ye River ("Source of the Axe Rock River") by the Wano or any other language-speaking group of people who might have temporarily made excursions into the area to quarry rock.

The quarrymen at Yeineri recognize and understand my classification of their axe and adze blades, which includes the Yeineri Style, Yeineri Flat Style, and Yeineri Tubular Style axe blades; and the Yeineri Style and Yeineri Flat Style adze blades (discussion in Chapter V). The quarrymen's own distinctions of blade types, however, go beyond structure and size (and even disregard structure) to include reference to specific quarry source outcrops, with implied degree of hardness, and something that I translate as color-aesthetics (caused by mineralogical content and metamorphic process). With some of the Yeineri-produced tools and je display-exchange stones, mineralogical distinctions (which relate to quarry core sources) are apparent and Wano type categories can easily be understood by outsiders but for many of the tools, mineralogical identification (indirectly by color) and/or other Wano parameters of tool classification are even argued among the Wano themselves. I suspect that this is for two reasons. At some named quarry sites, a spectrum of related rock types are available, depending on specific location within the named quarry. Also, indistinguishable lithologic types are quarried at more than one named quarry source. Because of these two variables, it is understandable that quarrymen using a quarry site name to identify a specific blade, could be in disagreement as to a "type" distinction for the blade with another quarryman. The Wano quarrymen say that they always look first for the hardest rock, because "the most valuable tools are made from the hardest," second, for source rock that is amenable to quarrying process; and third, for rock that has, what I feel in an unsure translation, aesthetic appeal to the user populations. Any personal "signatures" that might—only might—be identified in final flaked axe or adze blades are obliterated by the grinding process.

From an adze blade user's perspective among the Dugum Dani, north of Wamena in the Grand Valley, Heider (1970:276) reports:
The distinction between jaka gu [Author's note: jaka, adze blade: gu, black adze blade produced at Tagime] and ebe jaka [Author's note: Adze blade produced at Yeineri] is obvious from the color. Distinctions among the different sorts of ebe jaka are unclear. Eight different names were elicited. . . . When informants were presented with a stone, a name was immediately given with the greatest confidence. But when the same stone was checked with other informants, or rechecked later with the original informant, the names seldom agreed. This disparity was an ever-increasing puzzle. . . . Obvious cues of color and shape, which I thought would be used in the typology, were ignored by the Dani. Attempts to check this data with P. van der Stap and his informants at Wamena were fruitless, for in that region the Dani recognize only ebe jaka and no subdivision.

For a discussion of the mineralogy of the stone tools produced at Yeineri refer to Chapter V and for the je stones, refer to Sources, Color, and Lithologies in Chapter VI.

The Manufacturing Process

Seven technological steps are used in the Highlands to produce ground stone tools: 1) locate a suitable quarry rock, 2) break the rock, 3) reduce pieces to manageable sizes, 4) shape preform biface blanks at quarry sites by freehand knapping; and, away from quarry sites, in the final knapping process, intermittently 5) dull biface edges and prepare platforms on individual biface blanks as part of the 6) fine flaking procedure to produce final bifaces for 7) grinding. Within the Yeineri manufacturing process, sometimes steps two, three, four, five, and six are combined into two distinct steps and at other times into three steps.

In addition to the technical steps, Wano work groups at Yeineri reportedly conduct sacred rituals to propitiate a spirit named Elogor relative to quarrying operations. (Similar rituals conducted by the Western Dani at the Tagime quarries and by the Una at the Langda quarrying and manufacturing center are discussed in Chapter IX and X.) The Wano believe Elogor is a powerful, non-personified spirit who lives everywhere and from the world of the "unseen" owns all the land. Before departure from Yeineri for a quarry site, upon arrival at the site, and again as a "closing-down" ceremony, tobacco, fruit and tuber (sweet potato, and/or yam, and/or taro) offerings are made to Elogor to insure successful and safe continuing operations. According to informants, only the elderly Wano, ages more than approximately 60 years [Author's estimate], may successfully quarry without making offerings to Elogor. Wano informants say that if offerings are not made, the fires will not break the rock; or, at best, will take a very long time [Author's interpretation: one or two days]. Although rituals are conducted to propitiate the perceived spiritual owner of the land, including quarry sites, the quarrymen maintain that the sites themselves are not considered to be sacred places. At various times through the later stages of manufacturing, Elogor and other spirits may also be propitiated with simple acts of ritual to facilitate favorable production and maintain beneficent serenity among those spirits.
Locating favorable specific quarry rock along "The Source of the Axe Rock River" is reportedly an on-going process among the Wano. Unlike the Melanesian Ormu language group (who live north of the Wano across the lowland swamp in a relatively small area along the north coastline of Irian Jaya) where a single individual is assigned and authorized to search for new quarry rock as a full time occupational specialty (Hampton 1991), among the Wano no such prospector is identified. Instead, most Wano quarrymen are habitually on the lookout for new rock sources. Some, with a propensity for prospecting, range far and wide within the geologically favorable quarry belt of the river drainage. Journeys to quarries of up to two or three days of travel time one way from the Yeineri quarrying center are not considered too far to be within the scope of the integrated operation.

With the diverse kinds of stone goods that are produced, multiple quarry sites that together offer a broad choice of kinds of source materials are desired. Rock that is considered to be the most favorable (by hardness) for Yeineri Style adze and axe blades may be different than rock which will quarry-out advantageously along bedding or cleavage planes into thin, tabular pieces from which to shape flat je display-exchange stones, knives, and the Yeineri Flat Style adze and axe blades. The Yeineri Tubular Style axe blade is made from yet another slightly different kind of rock. Chisels are made from all of the kinds of rock from which the other stone goods are produced, even though hardness is the most sought after rock characteristic, and some chisels that are produced are not as hard as others.

What has evolved through time is a centrally operated quarrying system, within which scattered, individual quarry sites furnish rock of different lithologies, hardnesses, textures, fracture patterns, and colors. The quarrymen, working out of Yeineri, know which quarry site will produce the kind of rock that they want at a particular time, from which to make a particular kind of tool (or je display-exchange stone) for local use or need within the Wano population, or to prepare for a perceived marketing condition.

New sites are sought to replace those that have been depleted and to upgrade the efficiency and economics of the system by finding desirable core rock closer to the center of operations than that at sites that are located farther away. Having a choice of various kinds of desirable rock is always a consideration.

The best times to find new quarry sites are after torrential rains, when erosive flood waters are funneled along the course of the Ye River and expose previously hidden rock sequences. Newly exposed bedrock outcrops and river-tumbled boulders are found and examined by Wano prospectors. These core rock explorationists carefully scrutinize any new exposure which they feel might meet their hardness criteria, possess cleavage and/or bedding plane and fracture pattern characteristics which will facilitate quarrying, and where geologically-caused fractures are well-healed and will not break disadvantageously during either manufacture or tool use. Some few, newly located bedrock exposures and boulder cores get the approval of head quarrymen for further testing in which rock is quarried to decide the best quarrying technique and to determine if the quarry core can, in fact, be quarried at all. Manageable pieces are flaked
to determine how the rock reacts to normal knapping techniques. If deemed to be a commercial find by
the consensus opinion of at least a few of the quarrymen and their quarry leader, then Elogor, the spirit-
power owner of all rock, is thanked through ritual at "special places" [Author's note: which were not
revealed to the author] with vegetable offerings.

The same erosive water power of periodic flooding that exposes new quarry sites, also flushes out
and carries away debitage accumulations from operational sites, thus destroying the most important artifact
of culture that, if preserved in the archaeological record, could serve to not only identify a rock quarry but
to furnish valuable information about operations at the site.

From time to time, earthquakes cause landslides within the drainage area of the Ye River and fresh
bedrock outcrops and landslide debris are exposed. Although the Wano quarrymen examine such new rock
exposures for acceptable core rock, local informants say that seldom has new quarry stone been found in
these situations. Individual named quarry sites that are still in use along the Ye River and other abandoned
sites that are remembered in local oral history, were reportedly all found by "the ancestors." Most of the
detail of the original discoveries and early operations has since been forgotten.

Quarrying techniques include the uses of fire; large river-tumbled, rounded hammerstones; and both
rock and wooden wedges. Fires are built either on the ground or on wooden platforms against a rock
surface that is to be fractured and at other times on top of a large boulder core rock. In addition,
sometimes relatively small boulder cores are placed on a fire to be broken apart by the heat. Fire as an
engineering technique is pervasively used throughout the research area.

In addition to heating a core rock to break it, large river-rounded hammerstones are often used to
break up core rock without the assistance of fire. The hammerstones are either hurled or handheld and
pounded against a rock surface to break off manageable pieces.

In some circumstances, rock or wooden wedges are used to break core rock, especially where open
fractures or eroded thin crevices are present that allow the use of such a wedge. Tabular slate-like
sequences that are quarried in the Yeineri complex for flat type adze and axe blades, knives, and the flat
type je display-exchange stones are particularly amenable to wedging.

Quarry Ownership

The present owners of the complex of sites that are scattered along the Ye River are Wano. Quarry
ownership and control is centralized within the Wano language-speaking group at the Yeineri habitation
site, where the group of quarrymen who own and control production apparently include members outside
of a single patrilineage. It was tempting for me to identify the controlling group as the Yeineri ("Source-
of-the-Axe-Rock-River") clan, but it seems that some members who have been accepted into the group are
not only not consanguineal kinsmen but possibly are not even related as affinal relatives to the leadership. What I observed was unrelated quarrymen who joined the group by consent and who were treated as members, but who, perhaps beyond the scope of my observations, did not play a part in making group decisions relative to ownership and control of the quarries. Ultimately, at any given time within the loosely affiliated sociopolitical organization of the Wano language group, it was the most influential big man at Yeineri, in consensus with the quarrymen around him, who owned and controlled use of individual quarry sites within the entire quarry belt. This is different than two variations for quarry ownership and operation that are contemporaneously in place at Tagime and Langda, the two other major quarrying and manufacturing centers within the research area.

Other Wano, who live at scattered locations far away from Yeineri, reportedly must have permission from the Yeineri quarry owners to quarry stones as individuals or as groups, whether for their own personal uses or for trade. My informants could recall no problem with approvals for people within the Wano language group taking stone, although such individuals or groups are reportedly required to show what they have quarried to Wano quarry leadership. Likewise, I heard no anecdotal stories of intra-Wano group rivalry to control specific quarry sites, although it is difficult to believe that such did not happen. In a future section I discuss incidents of Wano intercession of quarrying operations by people of other language groups within the Wano quarry belt region. Perhaps if the quarry belt were located in a more densely populated environment, local diverse ownership of individual quarry sites by patrilineage groups or clans would prevail.

Quarry Sites within the System

The quarry complex consists of approximately nine named specific sites that are strung out along the Ye River drainage, over an estimated horizontal distance of about 15 km. Some few of the sites are located on the lower parts of steep hillsides above the very narrow incised Ye River valley floor. Most, however, are at river level. The estimated elevation range of individual sites in the quarry belt is approximately 900 m, from 645 m at Diarindo, the northernmost and lowest site, which is located about half way between Dagai and Yeineri Quarries on Figure 387, and an estimated 1,500 m at Awigowi, the highest site located south of Mulia and north of Yeineri Quarries on Figure 387. Substantial error (as much as 30%) is possible in both the distance and elevation estimates, due to the fact that most of the area was unmapped at the time fieldwork was completed. Relief is substantial (about 3,000 m), and much up-and-down climbing was repeated along often circuitous routes from my only point of positive elevation control at the MAF landing strip at Dagai to various locales within Wano territory. Distances from point to point in the Highlands are not measured in kilometers by indigenous inhabitants but by walking time.
with significant time differences between dry travel days versus rainy travel days, and for travel by only indigenous inhabitants versus by modern outsiders. The local residents normally travel much faster. A discussion of the nine named quarries that are operated out of the Yeineri quarrying center follows.

Bagaidewi

Bagaidewi (pronounced Bagereroit by some Wano) is located some 275 m down the steep hillside slope toward the Ye River from the present Yeineri hilltop habitation site. According to Wano informants, this quarry was probably the most active of the Yeineri industry group during recent pre-contact time in the Grand Valley and West region, and throughout the 1950s and early 1960s, when quarrying operations slowed in deference to the incursion of steel axes and machetes that were being brought into the Highlands by outsiders. Fire is the principle quarrying technique used at Bagaidewi to break stone from a single outcrop quarry face for adze and axe blades, a lesser number of knives and chisels, and some profane je flat display-exchange stones. The use of the fire technique and quarrying operations at Bagaidewi are discussed in detail in a following section entitled Bagaidewi Quarry.

Igwi

Igwi quarry, now abandoned, is located approximately 200 m up and across the river from Bagaidewi. It is a bedrock outcrop, about 10 m from the edge of the river and easily within reach of high water floods. The quarryman in the upper photograph of Figure 390 rests his hand on the quarry face that his father said produced the “hardest, best” adze/axe blade rock in the entire quarrying system. The rock was sampled and examined by the Colorado team (Chapter V). It was found to be an epidote amphibolite, with the major minerals being epidote, amphibole (interlocking), and minor minerals being plagioclase and chlorite. The rock texture exhibits poorly developed schistocity with a dominant texture which is matted, fine-grained fibrous amphibole with a lesser amount of equant epidote grains. By X-ray analyses, the minerals actinolite, albite, and chlorite were identified. The hardness estimate by the team from mineralogical and textural considerations in their four part scale is very hard (VH), which does not contradict technically what my informant told me, although it cannot, of course, confirm that this rock is the absolute hardest. The Colorado team made all of their analyses and hardness estimates without the privilege of knowing any of the comments about the tools made by either the quarrymen or Highlands users.

The fire process was reportedly used at Igwi, sometimes being built against the vertical core face and sometimes on top of the sloping face. It would be difficult for an archaeologist without prior knowledge of the use of this outcrop to identify it as a quarry source. To further complicate an archaeological-type of identification of the quarry site, there is no remainder debitage from either the quarrying process or
Figure 390. The site at Igui reportedly produced the hardest rock.
nearby knapping of quarry-made biface blanks. It has all been washed away by floods. The suspension bridge shown in the upper photograph in Figure 389 connects the Igwi quarry site and another nearby river bed source to a trail that leads directly into the Yeineri hamlet. While I examined the Igwi quarry rock, a Wano father at the edge of the Ye River decorated the face of his young son with white clay (lower photograph, Figure 389).

Diarindo

Diarindo (pronounced Diarendo or Dewirindo by some, means "rock shelter place") is a five to six hour walk down river from Yeineri. This is the rock shelter that I used when travelling between Duvle and Wano territory. This is the approximate boundary marker, down river from which the river is called the Dagai, and here and upriver from which the river is called the Yei. Because of the hardness of the rock at Diarindo, the Wano have considered this to be an especially good quarry source for adze and axe blades. The fire platform technique is used for quarrying.

Abuguruk

Abuguruk is approximately a three hour walk up river from Yeineri. The fire method against a river-level quarry face is used to break off manageable pieces for further reduction.

Kudaris Tengganag

Kudaris Tengganag is a short one day walk up river from Yeineri. I have little information on this site because I was never able to visit it or speak with contemporary quarrymen about the site.

Nejuwok

Nejuwok is a short one day walk up river. Fires are not needed to break manageable pieces off the mother core, which is broken by the use of hammerstones.

Wanogome

Wanogome (alt. Wanggokme) is a two day walk up river from Yeineri, one if the weather is completely dry. Flat display-exchange stones are quarried here by the fire technique. Quarrymen informants said that rarely is this stone used for percussion blades, although one quarryman showed me a ground, green colored, 27 cm long blade that I classified as a Yeineri Flat Style adze/axe blade and which he classified as a "wanogome." The owner's name is Lukibut Gire. Lukibut recalled that he had quarried this rock while with a seven or eight man quarrying group at the Wanogome site approximately one and a half years ago. They had gone to obtain core rock for flat type je exchange stones. He brought back
three \textit{je} display-exchange stone blanks to Yeineri, of which this blade is a piece of one. The \textit{je} broke during fine flaking and since this remaining piece was too short to be of value as a display-exchange stone, he shaped and ground it into a finished "axe" blade. Lukibut says he will trade it to the Dani. He would not put a value on it.

\textbf{Awigowi}

Awigowi (in Wano means "dry season") is a difficult three day trek up river from Yeineri. There are steep hillsides to be traversed and several climbs and descents to be made to cross prominent ridges. Awigowi reportedly is one of the more important quarry sites within the industrial system by virtue of market demand for the product and relative ease of quarrying core material. The rock at Awigowi is light green, thinly layered slate-like and highly desired by many Dani to be used as profane display-exchange stones (\textit{je}) and some to be withdrawn from secular use and empowered as sacred ancestor stones. The Wano call the rock from this quarry \textit{pibit} (or \textit{pibit pibit}) and many refer to the quarry site as \textit{Pibit} or \textit{Pibit Pibit} rather than the place name Awigowi. The Wano name for the rock, \textit{pibit}, has transferred with the stones outside of Wano territory and both the rock and the quarry site is known by the name \textit{pibit} (or \textit{pibit pibit}) throughout the different language groups in the Grand Valley and West region where the rock is traded. Fires are not necessary to quarry the \textit{pibit} rock as it is quarried from low-lying ledges and broken out with hammerstones and sometimes the use of wedges.

By laboratory analysis of \textit{pibit} rock samples at the University of Colorado, it was found to be a low-medium type metamorphic rock which the analysts call an epidote chlorite schist. Major mineral constituents are epidote and chlorite. Minor mineral constituents are plagioclase and calcite, with accessory minerals of pyrite and amphibolite. The texture is very fine-grained, with slaty cleavage. On the four-part relative hardness scale that was devised for this project, the hardness is rated as medium (M), which is the softest kind of rock analyzed from within the Yeineri quarry system. Even though the rock is relatively soft when compared to the best (hardest, VH) adze and axe blade material, this rock is also sometimes used to make flat style adze and axe blades, knives, and chisels.

For quarrying trips to Awigowi, Yeineri informants say a work party will vary from as few as 5 to as many as 10 men. Although the quarry is not considered to be a sacred place and women can be present, few ever go there. Women, however, often reportedly accompany the men to the second overnight bivouac spot to carry food that is stashed in caches at two or three locales to be used on the return journey. Travel in this part of Wano territory is through rugged, steep up-and-down uninhabited forest with no habitation sites having tuber gardens as local food supply-points. Hunting and gathering is unsure, and although the quarrymen say that while at the site they can supplement whatever food they are carrying with local, free-
growing, red *Pandanus* fruit and *Pandanus* nuts, they like to have dependable food caches which can be used on their return journey to Yeineri.

One Wano quarry man told me that he had been to Awigowi four times to collect stones, each quarrying trip with a work party of approximately seven men. He said that his groups would stay at the site for three days to procure the stone and that they would return with a total of 10-15 large, flat *je* display-exchange stone blanks. The informant said that the men would break and pry out flat pieces of the slate-like rock and quickly "size" the pieces with anvil-assisted or freehand percussion knapping for transportation back to Yeineri. Each large blank was suitable to become one *je* display-exchange stone, or if desired by its owner, one blank would sometimes be purposefully broken to make two flat type axe blades. If a display-exchange stone blank was broken accidentally during processing, large pieces were made into axe or adze blades and smaller pieces into either stone knives or relatively short adze blades. As percussion tools, Awigowi-sourced blades do not command as high a bartering value as the better quality (harder), dark green and blue blades made from rock that comes from other quarry sites.

**Biganme**

Biganme quarry is reportedly an approximate seven day walk from Yeineri. Biganme remains an enigma in my research. I have not yet attempted to locate Biganme on the ground, nor have I ever seen any of the stone goods that would have been produced from Biganme core rock, as it has been described to me. The Wano of Yeineri report that the rock is "crystal, similar but not the same as quartz crystals that the men possess as sacred objects." The description of the rock sounds like obsidian, which I have never seen in any form, in either the Highlands or lowlands of this part of Irian Jaya. Reportedly, Biganme is located outside of the Ye River drainage. It is possible that a local volcanic source is present with obsidian deposits. The Wano who talk about Biganme say that the core rock was used for knives and is not produced today. If there is a quarry source as described, then perhaps a plausible reason for why I have not seen its products is that the rock is of a locally rare lithology and blades are removed from secular use soon after manufacture and secreted away as sacred objects. While reviewing the manuscript, Peter Van Arsdale offered a plausible alternative explanation that the quarry might be quasi-mythical.

**Bagaidewi Quarry**

Approximately 275 m down the steep, vegetation choked hillside from the men's house at Yeineri, a 3-4 m wide horizontal ledge underlies a section of exposed cliff. This is the Bagaidewi rock quarry, pronounced Bagereroit by some Wano (Figure 391a). At Bagaidewi, pieces of rock for adze and axe blades, knives, chisels, and flat *je* type display-exchange stones were, and on a much reduced scale still
Figure 391a. Hillside profile at Bagaidewi quarry.
are, quarried by a fire technique. Approximately 45 m below the quarry ledge, the Ye River furnishes an ever-abundant supply of rounded cobbles from which workers conveniently select hammerstones with which to flake biface blanks while quarrying.

The hard, green-blue blueschist rock crops out in a curvilinear quarry face above the quarry floor. Rock from an active section of the quarry face was identified by the University of Colorado team of mineralogists (Chapter V) to be blueschist. Major minerals are glaucophane (blue) and plagioclase (clear). Minor minerals are chlorite and quartz and accessory minerals are sphenite, pyrite, and epidote. The rock texture is schistose, fine-grained. By X-ray analyses the minerals amphibole, albite, and quartz were identified. By the Colorado team subjective hardness estimates from mineralogical and textural considerations, on a four-part scale of very hard (VH), hard (H), medium (M), and soft (S), the team judged this rock to be “hard (H).” The overall shape of the quarry face is convex outward. Geological folding produced fractures with slickensided surfaces and lines of weakness in the rock that are approximately parallel to the exposed rock surface, which effect enhances spheroidal weathering and ultimately breaking off of thin layers during quarry firing. Thus, geological processes enhance the quarrymen’s engineering techniques to provide an efficient operation.

Tingen Geri, who first showed me the details of the "Wano bamboo matchbox" fire-starting tool (Fire-Starting Tools, Chapter IV; Hampton 1992a, 1992c) and three older Wano former quarrymen (estimated age range 55-70 years) who had memories of quarrying operations during periods of peak production, told me during nighttime discussions in the Yeineri men’s house, that quarrying work parties at Bagaidewi consisted of between 6 and 10 men at any one time. One old man (estimated age 65-70 years) argued in an anecdotal story that one time he was working on the crowded quarry floor when there were about 17 men, some firing the quarry face and collecting core pieces, while others were off on the ends, shaping biface blanks by freehand flaking.

While with Wano quarrymen, some told stories of injuries incurred not only at Bagaidewi, but at other sites, by flying spalled hot pieces of rock during the firing process. The fire is hot against the rock as the flames are funnelled upward at Bagaidewi from a well engineered fire platform. Mineralogic alteration by the fire is macroscopically apparent from red colored surfaces on remainder debris from previous firings.

To heat and fracture the rock, the quarrymen first build a wooden platform at heights from 1-4 m above the quarry floor and against the quarry face. Thin pieces of rock from former knapping debris and from unwanted quarry core flakes that have accumulated on the ledge below the face are selected and arranged as a protective rock hearth on the firing platform. Small sticks and short sections of larger limbs are arranged on the newly-created rock hearth and a nest of tinder is tucked into the stacked wood. The day that I was on the quarry floor, a quarryman lit tinder on the ground with the use of a thong-stick-fire-
starting kit and then lifted that lighted tinder to place it on the platform nested tinder which then caught the wood on fire.

Prior to building a new platform from which to fire the rock during my visit to the quarry floor (May 12, 13, 1991), the work party reviewed the condition of the quarry face: the location of the previously used, still-standing platform; and discussed work objectives. Subtly appearing but significant rock changes are present across the breadth of the quarry face. Whether to tear down the old platform and rebuild a new one at the same spot or to move laterally along the overhanging outcrop and fire another spot was discussed. Older, "retired" quarrymen, estimated to be 55 years of age and older, advised me that in former times and within their own memory, fire platforms had been built against this quarry face that were as high as 3.5-4.0 m off the ground. A previously used fire platform that is 1.2 m high is shown in Figure 391b. The men had already decided to tear it down and build a new platform, but they had not yet decided the exact location. Note the accumulation of previously unworked (not knapped) core debris from previous firings around the bottom of the old platform. Also, note the size, structure, and fire-induced red color of the previously used fire platform hearth material. Some of this hearth material is debitage from freehand flaking of biface blanks on the quarry floor and not just untouched spall debris. In the upper photograph of Figure 392, one can see the advantageous position of the firing platform under the quarry face overhang at the time the quarrymen were making the decision to build a new platform at the same spot. In the lower photograph of Figure 392, the older quarry-floor leader starts to knock down the previously used fire platform. Most active quarrymen range in age from approximately 18 to 45 years, although some quarry leaders are older. In Figure 393, a fire is started with a thong-stick tool on a large piece of previously spalled core rock and next to the debris of the just-demolished old fire platform. After encouraging the flame in a bundle of wood-shaving tinder in the lower photograph of Figure 393, the quarryman lifted the burning tinder onto the fire platform to ignite the tinder and wood that had been arranged there. Among the Wano, it was/is just personal choice whether to use this fire-starting method or the "Wano bamboo matchbox."

As the fire burned, three of the five-man work party sat to one side as the rock face heated (Figure 394a). The other two watched the fire and stood by to add logs from time to time to insure a maximum flow of heat from the fire to the quarry face. After a very hot fire burned for 35-40 minutes, rock pieces began to spall off from time to time, with a loud "pop" or cracking noise. After 50 minutes, a quarryman took a 3.7 m long pole and rammed the rock wall through the fire (Figure 394b). He both rammed and pried heat-loosened pieces of rock off the quarry face, causing them to pile up on the quarry floor. This process of ramming was continued for 15-20 minutes. The quarrymen advised me that this was a common technique, not only at Bagaidewi but at other quarries where platform fires were used. I named the technique the "fire-pole ram."
Figure 391b. An old fire platform at the Bagaidewi quarry.
Figure 392. The platform is knocked down before replacing it.
Figure 393. A fire is started with the thong-stick method.
Figure 394a. The quarry face is heated.
Figure 394b. Rock pieces are knocked off with a pole-ram.
A greater quantity of core pieces were accumulated in less time at Bagaidewi than at other quarry sites where I have observed the use of fire as a primary engineering element in the quarrying process. Here it seemed that both the natural fracturing of the rock and the overhang orientation of the quarry face enhanced the flow of heat against the rock and the spalling of attractively shaped core pieces. Some of the spalled rock, by its natural, almost-tabular shape, was already of an attractive structure to be used for flat type adze or axe blades, for knives, or for flat type je display-exchange stones. Many of these same naturally shaped tabular pieces were sufficiently thick that with just a little freehand flaking they could be shaped into biface preforms for grinding to finished Yeineri Style adze or Yeineri Style axe blades (described in Chapter V). I estimated that only 30-40 percent of core rock bulk that was spalled and/or broken by mechanical device from the quarry face required, because of large size, more than one to three blows from a hammerstone using the supportive anvil technique to reduce a core to manageable size for further reduction by freehand flaking.

After heat-spalled core pieces fell or were knocked to the quarry floor, it required 35-60 minutes before the individual pieces cooled enough for further handling. Water from the river could not be used to speed the cooling process because highly prized pieces would break. As soon as core spalls had cooled sufficiently to be worked, three adults selected thin tabular pieces (versus more bulky “chunks”) and started to shape biface blanks by freehand flaking. Prior to flaking, the men had each climbed down the slope to the river bank to select their own personal hammerstones and also hammerstones for their sons who had come along to the quarry to continue their education of how to quarry and knap the rock. I estimated that the ages of the five boys ranged from approximately 10-14 years. This is the time-proven system I was told, by which quarrymen teach their sons to be quarrymen and tool-makers and to follow in their footsteps. Local informants said that in every quarrying group (approximately 5-12 men), however, there were almost always one or more boys who did not develop an interest in quarrying and who did not become adult quarrymen-toolmaker specialists. As the quarry fire continued to burn and be refuelled by two attendant quarrymen, the other men and their sons shaped, at their own paces, adze/axe blade biface blanks (Figures 395 and 396). Due to the favorable natural tabular shape of the core pieces that were further shaped by knapping at the quarry site, little additional fine flaking was required back at the habitation site before these pieces were ready to be traded out as blade bifaces ready for grinding or to be ground locally by the Wano.
Figure 395. Quarrymen teach their sons to knap axe/adze blade blanks.
Figure 396. Flat style biface blanks are knapped at the quarry site.
Integrated Operation and What Prompts Production

Under the "umbrella" of overall Yeineri big man leadership, site visits to take stone are initiated from within the membership of the individual stone-working groups. Which sites to visit and when, as well as work goals, are determined by consensus of group membership, although the big man leader of each group is often in a state of negotiation with his group to get their consensus to adhere to his personal agenda. These stone manufacturing groups vary in size from as few as approximately 5 men to as many as approximately 12, with a median work group membership of approximately 7. It is these individual groups, or sometimes combinations of them in unusually numerically large quarrying expeditions, that perform the sacred rituals before taking stone and at the close of each quarry operation.

Women conventionally cook tubers and greens for the men to carry to quarry sites, or sometimes women carry the food themselves to sites and cook it there. They also assist by carrying quarry-made biface blanks and display-exchange stones back to the residences. Rarely do women overnight at the sites, even on extended quarry trips of up to as many as 8-12 days to the farthest quarries, but they are not precluded by custom or taboo from so-doing. Women never assist otherwise in quarrying operations, and when at the sites, they stay off to the side, away from the quarry floors and core rock faces.

Permanent shelters are not maintained at any of the quarry sites for overnight work groups. Instead, lean-to shelters are quickly constructed out of tree limbs and branches by each work party to accommodate their needs, although sometimes previously used shelters can be reused.

During each site visit, the initial breaking of the quarry core (Step 2 of The Manufacturing Process) and reducing pieces to manageable sizes (Step 3 of The Manufacturing Process) are usually a group cooperative effort. Each team works effectively as a unit until enough manageable pieces have been reduced to a suitable size for reduction by individuals to quarry-made biface blanks. Once the knapping process commences on an individual stone, it is owned by that stone-worker until he disposes of it in a manner at his discretion.

All quarry core blanks are carried back to places of residence for further processing and distribution. The number of biface blanks that are removed from a quarry site by a single work party visit is extremely variable, depending on size of the work party, on hardness of the core rock and the ease with which it can be quarried, the type or types of blade blanks and/or display-exchange stones that are being procured and the vagaries of the quarrying parties' own goals. Sometimes a single good quality display-exchange stone per man is considered a successful one-day quarrying operation. Other times, two display-exchange stone blanks may be taken. Likewise, a single large axe blade blank per each member of a work party might be considered a meritorious one-day accomplishment; whereas six or seven small adze blade biface blanks might not be considered a "success." At other sites and times, three to eight adze blade biface blanks are
considered a worthy daily achievement. I was not able to meaningfully quantify daily production at any hypothetically sustained rate at the Wano Yeineri quarry sites.

The stones which are brought back from the quarry sites to the specific residences of the men who quarried them are maintained by their owners during final reduction and for storage until distribution. Sometimes the stones are shifted about a bit among the work group that quarried them, during the fine flaking (Step 6 of "The Manufacturing Process") and grinding (Step 7 of "The Manufacturing Process") processes, but usually a single stone is worked to the stage of distribution by the same man who rough-flaked the biface blank at the quarry site.

There are no sandstone sequences in the geologic column within the area of the quarry belt which might furnish permanently located grinding slabs for the grinding process and only small handheld grindstones can be imported. For this reason, local informants say that during precontact production levels most of the tool goods were traded into user populations as fine flaked blanks ready for grinding, not as finished tool blades or display-exchange stones. In such cases, the stone goods would receive added value by the labor of whoever ground them enroute or at their final user destinations. Some of the grinding slab locations that are present as far away as even the eastern part of Western Dani territory and, possibly even within the geography of the Grand Valley Dani, may have played a role in Step 7 (grinding) of The Manufacturing Process, in addition to being used to resharpen and shape broken tools once they were in use. (For a discussion and photographs of grinding slabs that are scattered throughout user areas, refer to Stationary Grinding Slabs and Mobile Handstones in Chapter V).

Quarrying and knapping the core rock are the more-efficient labor aspects of the manufacturing process. Grinding is the most labor intensive and time consuming. An example of the size of the handheld grindstones that are used at Yeineri is shown in Figure 397. In the photograph, a Yeineri tool-maker is shown grinding a Yeineri Style Flat axe blade with a grindstone that he says was carried to him through kinship linkage from outside of Wano territory in the Mulia area (Figure 387). An old-timer (estimated age 65-70 years) at Yeineri who said that he had been to Awigowi quarry three times during his lifetime to procure je exchange pibit pibit core material, related that he ground on a long (60-80 cm) display-exchange stone for between 1-3 years before trading it to users outside of the Yeineri center. Other local informants stated that it takes between approximately eight months and 1.5-3.0 years to grind to completion, using Yeineri grindstones, a good quality (hard) typical Yeineri Style axe blade (25-40 cm long). Although I could not measure or make reliable estimates on how many hours are spent actually grinding these large stones, it is acceptable in general terms, that the grinding process is labor intensive.

Contrary to what I believe are reliable statements by Yeineri informants that most of their stone goods were traded out from the production center as fine flaked biface blanks that were ready for the grinding process, when I examined the "assemblage" of stone goods that were currently present at Yeineri
Figure 397. A flat style axe blade is ground at the habitation site.
during 1991, I found that most of the "stock" were either completely ground tools or display-exchange stones or were biface cores that were in the process of being ground. In Figure 398, the tape measure is in inches. In the lower photograph, seven flat, completely ground je display-exchange stones are displayed with three Yeineri Flat Style axe blades by their proud Yeineri owners. The display-exchange stone above the tape measure in the lower photograph is 63.5 cm long and 8.9 cm wide at its widest point. The unusually long display-exchange stone above it is 76.2 cm long by 11 cm wide. The display-exchange stone along the upper left margin of the photograph is 36.8 cm long by 13.2 cm wide. Next to it is a darker green Yeineri Flat Style axe blade that is 43 cm long by 8.9 cm wide at its widest point. All of the stones in the photograph are pibit pibit from the Awigowi quarry except the unusually long (43 cm) darker green flat style axe blade and the dark green display-exchange stone (63.5 cm long) along the upper edge of the tape measure. The flat style display-exchange stone displayed by its owner in Figure 399 is also a pibit pibit and is approximately 60 cm long. The owner of this stone said that he had been grinding on it over a one and a half year period of time. The stones are all being maintained at Yeineri by their makers until hopefully either Dani or Western Dani traders come to Yeineri seeking such stones. Or, more likely the Wano will transport the stones for trade to the users. Trade and the value of stone goods is discussed in Chapter XII. Teniak, the Wano who guided me to Yeineri from Dagai, displays a valuable pibit pibit in Figure 400. A display-exchange stone he states that he acquired during a quarry rock group trip to the Awigowi quarry. Teniak has smoothed the edges and other surfaces of his stone with minimal grinding, which he says took him approximately three months. His stated plans are to carry the stone himself to the Dani to barter for a large pig.

Production is prompted by (1) each quarryman's need and that of non-quarrying relatives for stone goods for their own utilitarian purposes and (2) the presumed value of "marketplace" demand. The Wano language group cultural system is pig poor and stone resource rich, compared to their Dani and Western Dani stone goods customers who are, relatively speaking, sweet potato and pig rich and stone poor. Classic marketplace factors are at play between the stone producer and the stone user groups.

Uses of Quarry Sites in Wano Territory by Others Than Wano

Information that I acquired independently from both elderly northern Wano and southern Duvle (estimated age range of informants 55-65 years) informants agree that the Duvle controlled and operated a rock quarry just a short distance inside of Wano territory, until as recently as about 40 years ago. The time of discovery of the quarry rock by the Duvle is clouded in the oral histories but may have been as recent as only two generations ago. Prior to that time, the Duvle reportedly used river tumbled stones collected in the Dagai area for trade and local use as percussion tools, supplemented with more assured
Figure 398. Exchange stones and axe blade blanks ready for transport.
Figure 399. An unusually large flat style exchange stone.
Figure 400. Teniak with a *pibit pibit* exchange stone.
good-quality (hard) blades that were traded from the Wano quarries. The lowland Duvle did/do not use je (or puluen type) display-exchange stones that are a fundamental part of Highlands cultural systems.

The abandoned Duvle quarry is known to both local Duvle and Wano as the Faira quarry. The quarry core is a low, flat outcrop of hard metamorphic rock that forms a small island mass in the middle of the Dagai-Ye River. It is located downriver from the Wano Diarindo ("Rock Shelter") quarry and just a few hours walk-climb south, up the Dagai River, from the present-day Dagai Duvle habitation site. The quarry is located in an uninhabited area where Duvle territory merges into territory that is controlled by the Wano. In the memories of the last quarry users, Faira was connected to both river banks by log pole bridges rather than by suspension bridges. The engineering quarry technique was fire, built directly on top of the quarry core surface. Quarried core pieces were carried to either river bank for further reduction to biface blanks and transportation to habitation sites for further processing or trade. Intermittent river floods flushed pieces of quarried core and flaking debitage from the area. It would be extremely difficult, probably impossible, to recognize the site today as a prehistoric quarry without the assistance of knowledgeable local informants.

Informants said that the practice was for Duvle men to go to the site to procure core rock with as few as two men and sometimes as many as eight men. The men would go on long, one-day journeys, or at times and depending on distances to their residences, stay overnight to procure tool cores. When overnighting, temporary lean-to shelters were built, never permanent shelters. No Duvle informants would discuss the subject of sacredness of the site and the use of ritual to either appease or attempt to propitiate ghosts or spirits that might be associated with the site. The lowland Duvle belief system regarding ghosts and spirits and the world of the unseen is different than that reported in this paper for the Highlanders and is considered outside the scope of this dissertation.

Duvle women were allowed at the site in the accompaniment of Duvle men. They did not participate directly in quarrying operations, but at the discretion of a work party leader, were helpful in transporting food and cooking it at the site, as well as helping to transport preform biface blanks back to habitation sites.

One Duvle informant, Buti Tiya who is the second oldest Duvle living at Dagai (age estimate 60 years), remembered that Duvle hunters searching for marsupials, wild pigs, or cassowary birds, might briefly stop by Faira to obtain just a few pieces of adze blade core rock.

The Duvle at Dagai said that in addition to trading adze/axe biface blanks downriver into the Dismal Swamp, they also traded on a rather small scale to Western Dani from the greater Kembu-Manit-Karubaga-Bokondini area (Figure 387). Sometimes Western Dani traders would come to them, but the Duvle would rarely go on trading missions into Western Dani territory.
At some point in this trading relationship, the Duvle said that they allowed Western Dani to come directly to their Faira quarry source and take stone. That practice built up until the Wano stopped it and shut the quarry down to not only the use of Western Dani outsiders but also to the Duvle. Apparently, when the Wano became targets of the Duvle baby-stealing practice, they retaliated with some baby thefts of their own and also by precluding the Duvle passage and the privilege of operating the quarry at Faira (Hampton 1992a, 1992b). At about this same time, the Wano and Duvle concur that a Wano man with a trading mission to the Western Dani Karubaga area was killed by Western Dani and in retaliation the Wano stopped Western Dani travellers from coming to Faira to take stone. Apparently, the quarry was shut down to use by all outsiders and effectively closed, not to be operated since by either outsiders or the Wano. Both Wano and Duvle informants who were not sure of the time of quarry closure felt confident in their knowledge of the circumstances and guessed that closure was about 40 ya.

Elsewhere, to the south, in the Wano quarry belt, the Wano said the Western Dani, Dani, Damal, or Moni only rarely would come to quarry sites or Wano habitation sites seeking permission to quarry stone. According to the Wano, they would allow these outsiders access for limited use, but the outsiders were required to show quarried rock and blade blanks to Wano before departing Wano territory. Within the sparsely populated quarry belt area, I believe that outside travellers were able to visit certain sites and quarry, from time to time on their own, or even to locate their own quarry spots, but I have not been able to confirm this idea with informants of the Dani, Western Dani, Nduga, Dem, or Damal language groups. All of this notwithstanding, the important link by primary users to stone goods that were sourced in Wano territory was by trade mechanisms which are discussed in Chapter XI.

Conclusions

A single, integrated quarrying and manufacturing industry is present in Wano territory. As many as at least nine named quarries within the industry are scattered over a distance of approximately 15 km. To traverse the estimated 15 km linear distance from one end of the quarry belt to the other, a traveler must walk and climb approximately twice the linear distance because of rugged terrain. The quarries are owned and operated from a single manufacturing center, which is advantageously located within the quarry belt, rather than being owned by multiple Wano residential groups who live in scattered smaller habitation sites that are, in some cases, located closer to individual quarries. A variety of axe and adze blades, knives, chisels, and profane display-exchange stones are manufactured and then marketed across language boundaries to more populace user groups who live within other language-speaking cultural systems than that of the stone goods producers. Only profane stone tools and display-exchange stones are produced and distributed. With the various cultural taboos and restrictions that define the handling and treatment of
sacred objects within product user groups, it is not feasible for quarrymen and stone goods manufacturers to produce and trade sacred items. Certain of the stone objects, once traded into user populations, are, from time to time, withdrawn from secular use and made sacred. Relatively few user groups, outside of Wano-speaking people, seek direct access to individual quarry sites to gather their own raw materials. Because of the absence in the quarry belt area of sandstone for grinding tools, a majority of the manufactured materials are traded as finished flaked biface blades, ready to be ground, rather than as finished ground stone tools.

No pit quarries or mines (either shafts or drifts), as are used to the east in the Mt. Hagen-Wahgi-Tuman areas of Papua New Guinea (Burton 1984) and at numerous other places that have been identified in the archaeological record worldwide, are used by Wano quarrymen. Instead, raw core materials are quarried from surface bedrock exposures and large boulder erratics to furnish core rock for tool and display-exchange stone production. Engineering techniques for quarrying consist of the pervasive use of fire, large hammerstones, and wood and rock wedges. Unwanted quarry core waste and flaking debitage are periodically washed away from steep hillside and river bottoms quarries by torrential rains and flash flooding. It would be difficult, if not impossible, to identify the Wano quarries in archaeological context, and it would take unusual preservation to be able to identify the Yeineri hamlet as the operational center for a regionally very important industry since large accumulations of fine flaking debitage are not concentrated.

The Wano Yeineri quarry-manufacturing industry was owned and operated at contact time within a big man egalitarian sociopolitical system rather than an authoritarian system. Although overall leadership and responsibility for the quarries was assumed by the single big man or a combination of a few such men at Yeineri, ownership of the products of production—the individual stone objects—was with the individual workers who helped in cooperative efforts to quarry the raw materials, took a share of the raw core rock, and worked it through individually to tool completion for use or trade.

Production was stimulated by the felt needs of individual quarrymen and their kinfolk for tools and display-exchange stones for personal utilitarian purposes and by the perceived demand of the marketplace.
CHAPTER IX
TAGIME QUARRIES

Whereas the Yeineri quarries and manufacturing center are located in sparsely settled Wano territory (estimated population 3,000-3,500) and are separated by one or more language boundaries from the more populace primary market areas for their stone goods, the Tagime quarries and manufacturing center are located in the heartland of the same marketing and use areas, in which they also market their goods (Figure 188). The Tagime quarries, located within Western Dani territory (estimated population 129,000) but near the language boundary with the Grand Valley Dani (estimated population 100,000), are only a two-hour walk from the relatively heavily populated Grand Valley, compared to the Yeineri quarries which are more than 150 kilometers away from the Grand Valley and separated by rugged terrain that requires arduous travel by circuitous routes.

From Heider’s perspective while doing field work with the Dugum Dani in the east-central part of the Grand Valley (Hupainma, Figure 6) during the years 1961-1963 and 1968, the stones for adze and axe tools that were used in that area were not obtainable locally but were imported (1970:272). Although Heider (1970:272-273) recognized that the local inhabitants distinguished between two fundamentally different kinds of adze and axe blade rock, one the black gu, and the other the multicolored “green, blue, mottled, streaked, and plain ebe.” Heider attributes their origin to “apparently only one source” in the Nogolo Basin [Author’s note: the Yeineri quarries]. Heider (1970:273, 276) further states that. “The gu is a dull black stone too soft to hold a good edge for long, and is described as aik dlek (aik, no tooth; dlek, none).”

During the early years of my own work, both the Dugum Dani and other Dani appraised me of the fact that although the black gu blades all look the same, some are relatively durable and considered to be valuable tools, while others are softer, will not hold a good edge, and break easily. First one informant and then another told me that there were quarries from which “good quality” black blades were sourced that were different than “the other” (Yeineri-sourced) blades. The best information that I could gather was that such quarry or quarries were located somewhere between Pyramid and Kelila, possibly not far outside the northwest end of the Grand Valley (Figures 6 and 24), and not nearly as far as the Nogolo Basin. The number of rumoured locations as sources for the black adze and axe blades increased as word spread among indigenous populations about my quest. In hindsight, after checking numerous locales to no avail, I realized that I was sometimes being led to “sources of opportunity” (discussion in Chapter X) where an individual had found a single stone or two from which he had shaped, by grinding, into an adze or axe blade. Sometimes it was auras of esoteric secrecy that made meaningful conversations about such locales difficult—the places had been designated as sacred, wusa, and not to be talked about with the uninitiated.
After all, in the minds of local inhabitants, a beneficial spirit had placed the stone where it would be found and/or had guided the finder to it. The geology at these locales was always problematic, and although disappointed that I seemed to be getting no nearer to a discovery of actual quarries, I was accumulating valuable information about sources of opportunity.

During field research in 1989, while searching for the quarries, my exploration team and I turned northward up a major tributary of the Bialem River. A short distance up the river my assistants found that local inhabitants called the river the "Gume" (gu, black or brown-black; me, river). As we went up-river in the direction of Kelila, scattered compounds and hamlets with adjoining sweet potato gardens hugged the narrow, but often flat, valley floor. When we came to a fork in the river and to a hamlet called Tagi, we established a base camp, courtesy of the local hamlet inhabitants, in the home of a Christian missionary who was temporarily out of the area. We learned that the name of the left fork of the river, flowing from the west, was known in former times as the Nendagabuk, but today it is known as the Tagime. The right fork retains the name of the river below the junction, Gume. We explored both forks, searching the rivers and their banks for rocks of just the right lithologies and hardness for tool blades. I was especially on the lookout for bedrock exposures or open pits that might either be or have been quarry sites. None were found. We were finding black river-tumbled pebbles, cobbles, and boulders, however, that appeared to be a black amorphous argillite. One day while attending a riverside cremation along the Gu River (Gume), just a short distance up from the river junction, Libarek, a key assistant and the head porter, showed me that in about 10 minutes time he could grind a black Gu River bank pebble, which were abundant, into a typically shaped Dani knife. Finally, several elders (estimated ages 55-60 years) in the Tagi area agreed that they would take us to the quarry spot and show us how the right kind of harder rock is located and tools are made. The next day, we proceeded directly to the Tagi River just above the river junction and the "experts" waded around until they had selected several river tumbled, oblong shaped, black stones, which averaged approximately 17 cm long. These were then carried uphill on the north side of the river, past riverside habitation sites and, after about a 10-15 minute walk, we arrived at the site of a large boulder that was well known to each of the men but which was buried beneath a covering of organic forest debris. When the matted leaves were cleaned off, a sandstone grinding surface was exposed which had numerous blade grinding marks, some already overgrown with algae. According to the informants, the large sandstone boulder had been, until not long ago, the primary tool grinding slab for the Tagi toolmakers. These retired toolmakers said that the blade blanks which they had just selected were so well sized and shaped by the spirits of the river that flaking was not necessary. The men also told us that black rock in the Gu River and some in the Tagime that looked similar was too soft to make the best quality hard blades. The men explained that the best tool stone source area is only along the Tagi River and for a short distance
downriver from the junction with the Gu River, but not up the Gu River from the river junction. Further, they said that the good quality source core rock can only be successfully selected by local experts.

Although my preconceived idea of one or more bedrock quarry sites appeared to be erroneous, I continued my search for open pits, shafts, or mining drifts up the Tagi River for an estimated distance of 3-4 km to the hamlet of Tagineri, at which point the river becomes quite small and enters a dense forest. This is the legendary "point of no return," beyond which local inhabitants did not care to venture. I checked topographic maps of the area and realized that anyone following the steepening drainage could soon work their way up to over 2,750 m of elevation at which heights hyperthermia might become a serious problem for near-naked indigenous travellers. Local residents confirmed what I had already been told at the down-river hamlet of Tagi, that the hamlet of Tagineri is the west end of the Tagi River quarry belt and that there are no bedrock quarries or mining operations.

Geologic Setting

The lower hillsides of the Tagi Valley between the hamlets of Tagi and Tagineri consist of vegetation covered slopes of the Kembelangan formation, which is Paleocene to Cretaceous in age (Chapter III). The Kembelangan consists of four members, with known lithologies of claystone, shales, argillites, siltstones, and some interbeds of quartzitic sandstones. Due to a combination of the erosional susceptibility of most beds within the Kembelangan and heavy vegetation, visible outcrops of beds of the Kembelangan formation are sparse within the quarrying area, although some few erratic sandstone boulders from the Kembelangan have been converted into permanent grinding slabs by ancestors of the present generation of Tagime toolmakers.

Overlying the Kembelangan and cropping out on upper hillside slopes and forming caprock are limestone beds of the Tertiary and possibly uppermost Cretaceous New Guinea Limestone Group (Chapter III). Large, exposed erratic blocks that have broken away from New Guinea Limestone cliffs have slumped as far downhill as the valley floor. Caves are present within a lower sequence of New Guinea Limestone, and along the contact with the Kembelangan. Human skeletons are present in some of the caves, which are considered sacred places by the indigenous population.

The Tagime Quarry Area and Local Informants

The Tagime quarry belt, located within Western Dani territory, is a single continuous 3-4 km stretch of the Tagi River (Tagime), formerly known as the Nendagabuk, and its river banks. The lower end of the quarrying area is bounded by the hamlet of Tagi, which sprawls across both sides of the river, near its
junction with the Gu River (Gume), which in turn is a tributary of the Baliem. The upper end of the quarrying area is bounded by the hamlet of Tagineri, with small compounds adjacent to the river, just before the river disappears into the "forest of no return," the upper reaches of its drainage system. Between the down-river hamlet of Tagi and the up-river hamlet of Tagineri, compounds of different sizes are scattered along the confined valley floor, including the named compounds of Prome, Inluga, and Melebaga. These compounds, as well as those of Tagi and Tagineri, are the scattered loci for what little knapping is done on biface blanks before the grinding process. Tagi is the name of a deceased, locally well known former leader (big man) in honor of whom his hamlet of residence, the Nendagabuk River, and the up-river hamlet of Tagineri, was named after Tagi's death. In the Western Dani and Dani languages, "gu" translates to black or brown, and in Western Dani, "me" to river. In the Western Dani of the quarrying area and its environs, "neri" (as in the Wano language to the west), translates to "where the river begins."

A favorite quarrying section of the river is shown in the upper photograph of Figure 401, which was taken from a promontory that overlooks the Tagi River within the sprawling hamlet of Tagi. The lower photograph shows the diminished size of the upper end of the Tagi River at Tagineri. Small compounds of typical Western Dani and Dani design, with nearby gardens, are located at select spots adjacent to the river to facilitate work on core rock that is gathered from the river or along its banks. The photographs in Figure 402 are of a fenced garden and its associated small compound beside the Tagi River, within the sprawling Tagi hamlet. Today, the manufacture of stone tools along the Tagime quarry belt is a fast disappearing endeavor, perhaps soon to be forgotten except by the older, retired local toolmakers (estimated ages 55-75 years).

At the lower Tagi end of the quarry belt, three local leaders (big men) with varying degrees of influence, Toat Jikwa, Pono Tabuni, and Gimanguk Jikwa, availed themselves in 1992 to numerous conversations and also accompanied me around the Tagi area. Toat is blind in one eye and depends on a walking stick, but he remains "the" quarrying expert who shared a great deal of information about the manufacturing operation in former times. Tagi, the deceased big man for whom the area was named, was the grandfather of Pono Tabuni. Reportedly, Gimanguk Jikwa is today on the same high level of influence as Tagi was in the past. Both Toat and Gimanguk are quite elderly (estimated ages 70 years) and are important repositories of oral history. At the up-river end of the quarry belt at Tagineri, my local informants in 1992 were Tepinamnip Jikwa, Jirvambo Kogoya, and Pinde Jikwa who shared information about tool manufacture in that area.
Figure 401. The Nendagabuk River (modern Tagime), source of the quarry stones.
Figure 402. A sweet potato garden and compound next to the river.
Kinds of Stone Goods Produced and Their Classification

Just as at Yeineri, stone axe and adze blades, knives, chisels, and the profane je flat-type display-exchange stones are produced and traded outward from the toolmaking center. The Tagime toolmakers understand my classification of their stone goods [Tagime Style, Flat Style, and Tubular Style axe blades: Tagime Style and Flat Style adze blades: knives and chisels; and flat-type je display-exchange stones (Chapters V and VI)], but in their own classification the Tagime experts make an extremely important distinction between tool blades, regardless of whether they are axes, adzes, knives, or chisels. That distinction is hardness. Toat Jikwa, with a nodded confirmation from the other Tagi hamlet area informants, explained that it is only the harder, more durable rock that the Tagime experts search for within the confines of the quarrying area. Toat confirmed what I had been told by other informants in 1989: it takes a local expert to recognize the desirable core rock versus the softer rock that is found not only in the Tagi River but which is abundantly available nearby in the Gu River and at other known locales. According to the Tagime informants, it is the softer black rock which is aik dlek (too soft and has "no tooth"). Regarding discovery of the hard rock quarry area, my informants said that they only knew that it was discovered by "the ancestors" and that the location and boundaries of the area had not changed during the lifetimes of the informants. The older, retired Tagime quarrymen (estimated ages 55-70 years) maintained that proper Tagime-sourced tools are of a better quality than the jaga (adze) and jaga bilig (axe) green and blue blades that are imported [Author’s note: from Yeineri]. To satisfy market demand for tools of lesser value than the good quality Tagime blades, Toat stated that the softer gu blades were sometimes also produced. I observed in both 1989, the year that I located the quarry area (Hampton 1989) and on a return visit in 1992 (Hampton 1992a), that adult males at the Tagi and Yeineri hamlets owned both Tagime and Yeineri-sourced adze blades, but only Tagime-sourced axe blades. In an informal survey throughout the area, some men agreed with their older leaders that they preferred Tagime-sourced blades versus the green and blue blades that were imported, but other men said they preferred the green and blue blades to their own black blades.

The University of Colorado mineralogists identified the Tagime core material and Tagime Style adze blades as being a black meta-argillite (Chapter V). The major mineral components are quartz and siderite, with chlorite being a minor mineral, and muscovite being an accessory mineral. Quartz, chlorite, and muscovite were identified by X-ray analyses. On the Colorado team’s four-part hardness scale, based on mineralogical and textural considerations (VH, H, M, S; Chapters V and VIII), the team rated the Tagime rock as "VH." By comparison, the Colorado team rated Yeineri-sourced epidote amphibolite as the "hardest" rock type which I had submitted to their scrutiny; the Tagime very fine-grained texture meta-
argillite as "very hard" which, although possibly not as hard as the Yeineri epidote amphibolite, is harder than the Yeineri blueschist and epidote chlorite schist (Chapters V and VIII).

The Manufacturing Process and Quarry Ownership

Seven technological steps are used in the Highlands to produce ground stone adze and axe blades: 1) locate a suitable quarry rock, 2) break the rock, 3) reduce pieces to manageable sizes, 4) shape preform biface blanks at quarry sites by freehand knapping; and, away from quarry sites, in the final knapping process, intermittently 5) dull biface edges and prepare platforms on individual biface blanks as part of 6) fine flaking to produce final bifaces for 7) grinding. In the Tagime manufacturing process, some of these steps are explicitly accounted for while others are combined into separate distinct steps or omitted, as discussed below.

In addition to the technological steps that are used to produce stone goods at Tagime, the toolmakers, within the framework of their own religious ganekhe groups (Chapters IV and VII), conduct rituals at the commencement and closing of quarrying procedures, and at appropriate times during the manufacturing process to propitiate landowner spirits to furnish abundant, good quality stones.

According to oral history, the deceased Tagi (grandfather of one of my informants, Pono Tabuni) and several other contemporary big men of the Tagi era (pre-contact), controlled the river through the heartland of the toolmaking center from about halfway up the Tagi River toward Tagineri (earlier name unknown to me). downstream to a kilometer or so below the junction of the Tagi and Gu Rivers, toward the Grand Valley. The Tagi hamlet informants say that the favorable black rock (meta-argillite) is only present in desirable quantities in the Tagi River, not up-river from the junction with the Gu River. According to informants from both the hamlets of Tagi and Tagineri, the Tagineri people also "quarried" river transported core rock but on a reduced scale compared to the people of the Tagi hamlet area. There was and is no single centralized quarry ownership and control system as found among the Wano people in the Yeineri quarry belt but two independently operated toolmaking areas, which I have named the Tagi hamlet-factory and the Tagineri hamlet-factory. The two factory areas were and are separated by a geographically defined, sociopolitically motivated territorial boundary, about midway between the two hamlets. I visited the boundary area with local informants from both Tagi and Tagineri to confirm its presence and location.

Reportedly, any of the people within the Tagi hamlet sociopolitical domain could go down to the river and seek river core stones within their territorial area on their own initiative, without specific approval of big men leaders. Similarly, inhabitants of the up-river quarry area could gather stones within their territory. According to my informants, to venture outside of the established sociopolitical boundaries prior to approximately the mid-to-late 1960s, was to invite ambush and death. The still-living older (estimated
big men of the Tagi hamlet area said that in former times they were essentially prisoners within their own stone quarrying and toolmaking area because until the mid-1960s almost constant ritual wars and conflict kept everyone defensively within their own boundaries. The Tagi informants said that residents of Belokme and beyond toward the Balem River were their enemies, as were the people up the Tagi River at the hamlet of what is today known as Tagineri. Only the people living along the upper Gu River were friendly. Yet in spite of all these difficulties, a successful tool and je display-exchange stone trade flourished, as is described in Chapter XI.

Searching the river and its banks for new core rock by toolmaking groups under residential leadership, or now and again, by an individual or two looking for a rock from which to make a tool of expediency, is prompted by flash floods. Engineering techniques to break newly-found boulder cores include the use of fire and hurled or handheld hammerstones, used with or without the assistance of fire. Selected boulders, if not too large, were and still are usually carried to riverside compounds for further processing. Sometimes such boulders, estimated to range from approximately 11-65 kg, are stockpiled along the riverbank or within a riverside compound for future use at a more desirable time. If selected boulder cores are too large to be manhandled, they are usually broken in-place. Informants stated that under some conditions, quarry cores can be fired from the top and broken apart with hammerstones while still in the river.

In 1992, Toat Jikwa and the other Tagi hamlet area elders said that the toolmakers preferred to find stones in the river that were of the right hardness and suitable sizes and shapes that they could be ground directly into blades or display-exchange stones without having to further reduce them by knapping. This information corroborated my research data of 1989 when I had first located this toolmaking center and had worked with other local informants. Interestingly, the toolmakers of Tagime think of themselves as grinders and as grinding being their special skill, not as knappers or flaking being the primary skill. Informants related that sometimes talented specialists were paid a fee (cowrie shells during pre-contact times) for custom grinding of tool blade cores that had been found and then brought to them by other residents of the quarry area. Some small stones, already reasonably shaped by natural erosion, require at least minor flaking, however, before grinding is commenced. In 1989 and then again in 1992, I observed that flaking, as done by the Tagime toolmakers, even when reducing a larger core, did not require advanced knapping skills; just the holding of a core rock and, with or without anvil assistance, simply knocking off pieces with a convenient hammerstone. During field research in 1992, Toat Jikwa found two naturally shaped, river tumbled cores which he proclaimed would make excellent jaga bilig (axe blades). One stone was 9.5 cm wide by 31.75 cm long and the other was 11.6 cm wide by 36.8 cm long. Having watched the toolmakers at work at Tagime, I estimated that it would take a maximum of 10 minutes to flake each
stone into a crude preform blank. Toat estimated it would take approximately five weeks for an individual to grind each stone to completion.

If a large but manageable core boulder is found in the river, it might be carried to the river bank or to a nearby habitation compound and placed on a burning fire to break it. Sometimes larger quarrystones found along the banks of the river are broken apart with fires built on or against the stones. Toat said that as soon as a quarrystone is broken, it is known whether or not it will make good blades. If the color is dark gray-to-black, it is a good stone. If too brown, it is no good. Sometimes, due to the shape of a boulder that is selected as a core quarrystone, it is broken by hurling hammerstones at it and a fire is not needed.

One day in 1992, Toat, with his walking stick in hand and a son by his side, searched the Tagi River near his riverside compound for quarrystones (Figure 403 and the upper photograph in Figure 404). Finally, Toat found what he was hoping to find, and was pleased to tell us that it was a very good stone. Two men carried it to shore, then another 50 m to Toat’s compound, lifted it over the compound fence, and laid it in the courtyard. A fire was built and the stone was laid directly on top (Figure 405). For 15 minutes it heated and then exploded into three pieces. Toat came from his house to examine the results. The old expert proclaimed that two of the pieces were a good size for grinding. He selected one piece which he particularly prized (Figure 406) and carried it back to his house.

The shape of the second largest piece was then slightly modified at the firing site by minor flaking with the anvil percussion technique, to quickly (approximately 10 minutes) create a crude preform that was considered ready for grinding (Figure 407). Toat Jikwa said that the next day he would take me to his favorite grinding slab to show me how the stones are shaped.

I asked Toat about the largest core which he had selected from the fire-broken quarrystone. He told me that it “would take a long time to grind that stone” [Author’s note: to make a large Tagime Style axe blade]. Toat said he would invite about 10 men to participate, and they would pass the stone from person to person over a period of weeks while the stone was being ground. His wife would furnish food during this time to whomever was grinding the stone. After about two months, the stone would be smooth and ready to put in an axe handle, and then Toat said he would sponsor a ceremony, sacrifice pigs at a ritual feast, and put the stone in a headnet to display.

The next day, on May 15, 1992, Toat Jikwa, Pono Tabuni, Awan Tabuni, and a group of younger local inhabitants led my exploration team and me to the grinding stone that I had “discovered” in 1989 (Figure 408). This was the same spot where other elderly informants in 1989 had cleared off a mat of jungle organic debris to show me what they already knew was underneath: an important grinding stone of a Stone Age industry that is now almost gone. In pre-contact times Pono Tabuni had used this stone. Before that, he related that he knew that his grandfather, Tagi Tabuni, had also ground stones here.
Figure 404. Quarrymen searching the river.
Figure 405. A selected stone is broken by fire.
Figure 406. Big man Toat is pleased with the results.
Figure 407. Knapping the edges shapes a core for grinding.
Figure 408. The axe blade blank at an old grinding site.
Near the grinding rock are small rivulets of water trickling down the hillside. A small boy was directed to take bundles of grass, dip them in the water and carry the bundles back to the grinding stone as the older men began to grind their blades. One was the rough blade blank that had just been processed to the grinding stage the day before, and another was an almost completely finished, medium size adze blade. The boy knew exactly what was expected of him. He stood next to the men and dripped water, first from one water-laden bundle of grass and then the other onto the places where the dry meta-argillite tool blades were being ground against the sandstone grinding rock (Figure 409); a technique not far removed technologically from the water drip systems that are used on foot pedalled grinding wheels.

My informants pointed out that the use of this grinding site by 2-6 grinders at a time, plus assistants to drip water and to trade off grinding chores, was a common occurrence when the tool-producing center was fully functional, up until about the early 1960s. Toat said there were two other smaller, permanently located grinding slabs within the Tagi hamlet quarrying area, and the toolmakers at the upper end of the quarry belt (Tagineri) also had their own permanently located large grinding slabs, in addition to portable grindstones. I had already examined a permanently located grinding slab alongside the trail by the Tagi River on the outskirts of Tagineri.

Stimulation of Production and Distribution of Product

Demand for Tagime products depended on the personal needs of local inhabitants and on the utilitarian and social needs (for je display-exchange stones) throughout the Western Dani, Dani, and other language speaking groups within the Grand Valley and West region, where all language groups use a mix of Tagime and Yeineri derived stone goods (Chapter V). According to Tagime informants, when there were periods of peak demand for tools, they were usually at times of increased timbering or wood chopping activity in the Grand Valley, perhaps related to the alliance-wide ebe akho when firewood was stockpiled everywhere, or when large, virgin forest areas were cleared to make new sweet potato gardens. They all concurred, however, that regardless of those times of neighborly peak demand, it was the unpredictable flash floods that caused a spontaneous reaction among the quarrymen. When new core source material was deposited and uncovered after heavy rains, it prompted a flurry of activity along the Tagi River. During this time, fires were built, rocks carried for stockpiling near compounds, and knapping and/or grinding increased dramatically. Distribution was always by trade (discussed in Chapter XII) as outsiders were never allowed to collect their own source core stones from the Tagi River.
Figure 409. The grinding commences.
Conclusions

At the time of first-contact, the Tagime quarry system was a stone goods manufacturing center which produced the same kinds of stone tools and the same functional kind of profane je-type display-exchange stones that were produced at Yeineri, but from distinctly different kinds of raw materials. The marketing and use areas for most of the production from both manufacturing centers was the same throughout the broad Grand Valley and West region. The tools produced at both locales included three types of axe blades, two types of adze blades, knives, and chisels. Each type of the four kinds of tools (axe and adze blades, knives, and chisels) from the two manufacturing centers (Yeineri and Tagime) were morphologically similar but lithologically different. The raw materials at Yeineri are metamorphosed blueschist, epidote amphibolite, and epidote chlorite schist; at Tagime, meta-argillite and, to accommodate certain marketing demands, an inferior, softer, less-metamorphosed argillite. Neither center produced objects that were considered sacred while they were being manufactured or traded.

Within the Tagime manufacturing center there were two independently operating adjacent factory areas, separated by a socio-political boundary: a more active and productive down-river Tagi hamlet factory (approximately three square kilometers in area), and an up-river, less productive Tagineri hamlet factory (approximately two square kilometers in area). In prehistoric times, at first-contact, each "factory" consisted of typical Dani and Western Dani architecturally designed and socio-politically organized compounds that were concentrated, but with distance between them, along the Tagi River quarry belt. Both of the hamlet-factories provided, within their socio-political boundaries, ready access from residential houses, to both raw materials from the Tagi River and also to permanently located stationary grinding slabs on which to shape and sharpen finished products.

The original source for both core material for Tagime stone goods and the sandstone grinding slabs is the Kembelangan formation within the drainage area of the Tagi River and its tributaries. Quarried bedrock exposures, open pit quarries, and shaft or drift mining operations are not present in the area and were not used to obtain tool core rock within the Tagime operation. Instead, naturally shaped meta-argillite cobbles and boulders were deposited in the area by geological erosional processes, and eventually selected by the toolmakers for their stone goods. Engineering techniques to break the large meta-argillite boulder cores into manageable size pieces for further reduction included the use of fire and both handheld and hurled large hammerstones. Erratic boulders of sandstone, located at convenient spots within the landscape by geological process were used as grinding slabs.

All of the source rocks are black in their natural state. A few exhibit a yellowish coloring on parts of their outer surfaces. Some manufactured blades, however, are black, mottled with red (Chapter V). The Tagime Style and Tagime Flat Style axe and adze blades were found by thin section analyses to be a meta-
argillite, consisting of quartz and siderite as the primary minerals, chlorite as a minor mineral, and muscovite an accessory mineral. The siderite is thought to be the source for both the yellow and red colors on the Tagime rock. The yellow color on the outer surfaces of some of the natural rock is thought to be limonite, which is a weathering product of siderite in an aqueous environment. The red on the stone tools is caused in a different way and may be a clue to the quarrying process. When a single boulder at a time is placed on an open fire, it is only a matter of a short time before the boulder explodes into several or more pieces, which can then be managed for further processing. The key to the explosion and the red color seems to be the mineral siderite (Ray N. Guillemette, personal communication 1995). The siderite is an iron carbonate (FeCO$_3$). When the rocks are heated on a fire, the siderite decomposes. Carbon dioxide gas (CO$_2$) is driven off, leaving the iron as iron oxide. When the CO$_2$ gas heats up, it expands within the impervious meta-argillite rock but is contained until its pressure overcomes the confining pressure of the rock, causing an explosion and a network of microfractures within the pieces of the exploded rock. The microfractures introduce permeability to the rock, which was previously impervious, allowing oxygen to circulate and oxidize the iron to form the mineral hematite (Fe$_3$O$_4$). The hematite is initially black but with further oxidation becomes red. Thus, the red patchy color pattern forms on the exterior surface of the blades where oxygen circulates freely and along microfractures that provide avenues for the circulation of oxygen into the rock.

It is concluded that the Tagime blades that are black with patches of red on the surface and with thin bands of red color tracing the microfractures in the rock were manufactured with the firing process. Blades that are completely black were either not fired in the quarrying process or have not yet had time since firing for the created hematite to weather to a red color. Seven examples of Tagime-produced axe and adze blades are shown in Figure 410, two of which exhibit red color surface mottling and color bands along microfractures. The scale is in cm. It is interpreted that at least the two mottled red and black color blades were probably produced from boulder cores that had been broken apart by firing. From left to right the blades are: 1) a uniformly black colored Tagime Tubular Style axe blade, 2) a black Tagime Flat Style axe blade, 3) a Tagime Style adze/axe blade with the mottled and banded black and red surface color, 4) a black colored Tagime Style adze blade, 5) a black and red mottled Tagime Style adze blade, and 6) and 7) two uniformly black, small Tagime Flat Style adze blades. Whether or not microfractures that might, during the explosion of boulder cores by the firing process, form lines of weakness that are deleterious to percussion blade durability is not known from my work.

Toolmakers at the "Tagime Quarries" in both the Tagi and the adjoining Tagineri factory areas recognized grinding as a valuable skill. Grinding is labor intensive and takes days, often months, of work to shape and sharpen axe and adze blades to perfection. The grinders were usually the same person who found the quarry core. On very large axe blades, however, more than one grinder was sometimes involved
Figure 410. Tagime-produced axe and adze blades.
to complete a single blade. The Tagime toolmakers preferred (or had the ability) to expend more energy in the grinding process of each tool blade than to carefully shape preforms by fine flaking.

Periods of peak quarrying activity were prompted by torrential rainstorms and flash floods when new raw materials, in the form of cobbles and boulders, were transported from the upper reaches of the Tagi drainage system or exposed by erosion in the river bottoms and along its banks. Increases in grinding activity fluctuated in response to acquisition of new raw materials. Because the informants generally lack interest in the relationship of events to historical time, I must rely on their stated estimates of between approximately one and three significant boulder-exposing flash floods per year as only a general guide. According to them, it took several weeks or months to search for all of the newly exposed boulder cores or naturally shaped smaller core blanks after significant flash floods. Some one or a few toolmakers were almost always down at the river searching for proper stones.

The Tagime stone tool manufacturing center would not be recognized in an archaeological context and no quarries could be identified. There were no exposed bedrock quarry sites, open pits or mines. No centralized large accumulations of either quarrying or knapping debitage would be found. Along the river bottoms and banks, flash floods would have washed away all quarrying waste material. A very small amount of flake waste-to-finished product prevailed in a process where the ratio of waste-flake volume to preform core volume was low. This is due to the fact that the toolmakers were grinders, not knappers. The toolmakers ground crudely shaped bulky preforms to completion, rather than first knapping them to approximate final shape. Perhaps they were not skilled knappers. The permanently located grinding slabs that were a significant part of the manufacturing process could not be distinguished, with our present state of knowledge, from any other similar grinding slabs which were scattered about the cultural landscape but which had only been used to resharpen dulled blades, reshape blades that had been broken in use, or to complete the manufacturing process a considerable distance from the tool quarrying and reduction center. As the tropical forest takes over and the flash floods continue, all signs of a once-thriving quarrying and manufacturing system will vanish without a trace.
CHAPTER X
LANGDA-SELA QUARRIES AND SOURCES OF OPPORTUNITY

The inhabitants of the Yali and East region use a single, internally produced style adze blade (defined as the Langda-Sela Style in Chapter V) and stone knives, but no axe blades or chisels as are used in the adjoining Grand Valley and West region. The majority of these tool blades are produced at a manufacturing center which consists of a cluster of quarrying and production factories near and including the hamlet of Langda (Figure 411), located within Una territory (estimated population 4,600) (Figure 188). A significantly lesser number of blades are produced at a functionally similar but much smaller quarrying and production operation at Sela, within the adjacent Kimyal territory (estimated population 6,500). The stone tools are traded outward across language boundaries to all language groups within the Yali and East region. Only a few of these blades trickle across the regional boundary into the Grand Valley and West region, where they are never used as profane percussion tools but are sometimes converted into sacred objects. *Je*-type display-exchange stones, which are so prolifically used in the Grand Valley and West region, are not produced within the Yali and East region but are imported across the regional boundary from the Dani.

Una Habitat, History of Contact, and Research by Others

The Una habitat is located in a rugged mountainous area of cloud-covered peaks and steep-walled canyons, centered around the Dutch missionary landing strip at Langda (elevation 1,860 m, 139.58° east longitude and 4.39° south latitude) (Figure 411). From the Langda ridge, a slope drops precipitously for approximately 800 m to the Ey (Dutch spelling; Yei, English-Indonesian) rock quarry river (Figure 412), which tumbles its way southward, joining other fast-flowing rivers, which make their way still farther to the south where they then abruptly spill out from the mountain front into a dense, flat jungle swampland. From here, the rivers that originated in the Highlands meander still farther south to the Arafura Sea. It was from this sea that in 1526 the Portuguese explorer Meneses first reported to the European community his discovery of an island of "negroids." Europeans were quick to name this second largest island in the world New Guinea—using an African name because of the black skinned people observed along the coasts. As a backdrop to the north of the Una domain and quarrying area, the Jayawijaya mountains rise to a series of peaks, which vary in elevation from 3810 m to 4645 m.

Dick and Margaret Kroneman, missionary linguists with the Summer Institute of Linguistics (S.I.L.) who reside at Langda as guests of the Netherlands Reformation Church while they work on a translation of the Una language, state that the first Dutch explorers came through the Langda area in 1911 (Dick and
Figure 411. Una house cluster on Langda ridge.
Figure 412. The Ey (rock quarry river).
Margaret Kroneman, personal communication 1992). According to the Kronemans, other explorers came up from the Asmat lowland area sometime in the 1960s. "Some few died and were buried here" (D. and M. Kroneman, personal communication 1992). In 1971, missionaries from the Netherlands Reformation Church established residence with the Una people at Langda, and were supported by helicopter until the present landing strip was officially opened in 1973. The missionaries have hosted foreign visitors since that time, including, in addition to me, researchers Desmond Clark (1991:44-47), Giancarlo Ligabue (1991:36-43), and Nicholas Toth (Schick and Toth 1993:245-251; Toth et al. 1992:88-93).

Geologic Setting

Little is known about the geology of the greater Langda area. At the time of my field work, there were no published geologic maps and I had little time to conduct geologic reconnaissance myself. Outcrops are sparse on vegetation covered hillslopes. Landslide areas and river bottom exposures are difficult to access. A volcanic sequence is known to exist within the area, but based on regional extrapolation from known volcanic rock sequences to the east in Papua New Guinea, these volcanics could be anywhere from Jurassic to Quaternary in age. The stratigraphic relationship of the volcanics to what looks in the field to be outcrops of the Kembelangan formation is unknown. The Kembelangan to the west ranges in age from Paleocene to Cretaceous. I presume that the portable sandstone grinding slabs that have been carried by the Una toolmakers from near Bomela back to the Langda manufacturing area are from sandstone outcrops of the Kembelangan, but I have not visited these locales. Andesite/basaltic rocks from the Langda quarries and from a sampling of Langda-Sela Style adze blades that were collected from throughout the Yali and East region have been identified petrographically (as a part of this project) by Medlin, Munoz, and Swope at the University of Colorado. Metamorphosed volcanic tuffs from samples taken as a part of this project in the Langda area, as well as from Langda-Sela Style knives that were sampled throughout the Yali and East region, have been interpreted by R. N. Guillemette at Texas A&M University.

Langda Manufacturing Center

Within the greater Langda Una residential district there are approximately 26 separate house clusters and hamlets. Eleven of these are hamlets with associated quarries, within which the residents manufacture stone tools. Hereafter, I refer to these as hamlet-factories. The 11 hamlet-factories are concentrated along a 17 km stretch of the Ey River and very short stretches of two tributaries near their points of juncture with the Ey (Figure 413). Each hamlet-factory group owns the quarrying rights to a section of the river and
Figure 413. The Una rock quarry area, centered on Langda.
uses its own labor force for adze blade and knife production. Raw materials for knives and the very few display-exchange and sacred stones that are produced are obtained from hillside outcrops that are located within the geographic boundaries of the area. The hamlet-factories operate within a typical Yali and East region sociopolitical framework of house cluster and hamlet big man leadership (see Sociopolitical Organization, particularly Compound and Hamlet, Chapter VI). The head quarryman of each hamlet-factory, with the assistance of cooperative work parties, locates within the territorial boundaries of his own river-sourced quarry, boulder cores which are reduced to manageable size pieces before being allocated to individual workers for ownership and further processing. A similarly operated hamlet-factory produces the same kind of stone goods at Sela. I refer to the group of hamlet-factories that are centered around Langda as the Langda manufacturing center; and to the quarrying, manufacture, and distribution of products from both Langda and Sela as the Yali and East region stone goods industry. Langda is located approximately 200 km southeast of Wamena in the Grand Valley.

Quarry Ownership

Quarrying rights to adjacent stretches of the river are owned by a single head quarryman in each of the 11 hamlet-factories. The hamlet-factories are, from north to south: 1) Bontamur, 2) Laji, 3) Kinyalingda, 4) Omsong, 5) Langda, 6) Wasumuji, 7) Kikmay, 8) Yablamula, 9) Kiynol/Kerabuk, 10) Aliyji, and 11) Bebekle. The head quarryman of each hamlet (or in some cases a house cluster) who owns the quarrying rights, reportedly inherited the rights from his father, who was the previous head quarryman and who had trained his son or sons to be quarrymen and toolmakers hoping that one son would emerge as the quarry owner at his death. The rights to the quarry area always belong to the head quarryman and not necessarily to the most influential big man of the hamlet, unless they are the same person. Diman Baiyo, who was my primary informant at the Langda hamlet, is both the head quarryman and the most influential big man in the hamlet.

Quarry Boundaries

The river itself forms the longitudinal boundary between individually owned, linear shaped quarry sites. Head quarrymen own the rights to take stones only out of the river from their hamlet sides of the river. For example, on the north end of the quarry area, near the headwaters of the Ey River, quarrymen from the villages of Bontamur and Laji (alternate spelling Larye) own rights on the east side of the Ey River (Figure 413). In former times, quarrymen from Yakai owned the rights to the west side of the river, but the Yakai factory is no longer operational. To the south of Laji, the head quarryman from the hamlet of Kinyalingda (alternate spelling Keynyelengde), owns the rights on the east side of the river below the quarry area that is owned by the head quarryman at Omsong hamlet. Omsong quarrymen also own rights
to the river still farther to the south. Diman Balo at Langda, south of Omsong territory, owns the Langda side of the river, while Kapit (pronounced Kabir) Malyo of the hamlet of Wasumuji (alternate spelling Wasumurji) has the quarry rights on the east side of the river. The quarrymen from Kikmay village, located southwest of Langda, must walk a full day to get to their quarry area on the west side of the river and just down-river from the section controlled by the Langda quarrymen. Kerabuk and Bebeklie are two other villages with quarrying rights downstream, but on the east side of the river. Quarry boundaries are not marked, but the quarrymen and others seem to know precisely where the boundaries are located. With permission of the area owners, quarrymen are sometimes allowed to move outside of their own areas to search for quality stones in territories owned by others.

Scattered throughout the Ey River quarry area are approximately 20 Una house clusters and hamlets which have no quarrying experts or toolmakers and no head quarrymen who own quarry rights. The residents of Yalar, Yalmebiy, Kwilamduba, Kitikne, Bomela, Sumba, Atala, Sumbat, Yuwandalut, Yasulenji, Kabkab, Bebleduba, Kubiyalar, Lukum and Diri trade with qualified quarrymen and toolmakers from active hamlet-factories to fulfill their stone tool needs. My local informants were unable to shed light on how often quarry area boundaries or the number of specifically owned quarries might have changed during recent prehistoric times. Diman Balyo, head quarryman and also hamlet leader at Langda, did tell me in a moment of real sadness on his part that none of his sons were interested in the quarrying business. He greatly fears that he will have no qualified, father-taught son to whom he can pass quarry ownership.

Leadership within the Quarry Area

According to indigenous informants from Langda, Wasumuji, and Kikmay, there has never been a big man with control over the entire quarrying area and stone tool industry--only big men called "swembe," with power limited to their own individual hamlets. All of the big men leaders within the greater quarrying area are presently friendly with one another, with the exception of big men from the quarrying hamlets of Laji (alternate spelling Largi), Kikmay (alternate spelling Kiykmay) and the non-quarrying hamlet of Kitikne (near Bomela). Many Una in the greater Langda area bear battle scars from previous wars. Diman has scars on his head, buttocks, and one leg which he attributes to arrow wounds inflicted by people from both the hamlets of Kikmay and Laji. These previously wounded informants said that fighting between hamlets within the rock quarry area and the absence of one big man with influence over the entire area did not seem to hinder the manufacture and trade of stone tools.
Getting around the Quarry Area

Overland travel within the Ey River quarry area is arduous with steep and usually slippery slopes to climb, descend, and traverse; patches of dense jungle growth to pass through and dangerous river crossings to be made. Under good weather conditions, a person might walk from Langda to the village of Lukum at the south end of the quarry area in about two days. At the north end of the quarrying area one could walk from the quarrying village of Laji (pronounced Larye) to the non-quarrying village of Yakai (alternate, Yalar) in an hour or slightly less. To descend from the hamlet-factory of Langda on steep trails through a vertical drop of about 800 m to the quarry area below might take one hour, but to go from the hamlet of Kikmay to the Kikmay quarry area south of the Langda quarrying area, a journey of a full day is required.

Quarrying Methods and Rock Type

Twelve informants from four different hamlet-factories agree on the standard procedures used for quarrying the rock. First, the expert with a helper nearby, searches up and down the targeted area of the river for just the right kind of rock. Kapit Malyo, a quarry owner from Wasumuji, told me that an expert understands the rocks just like a healer (medical doctor) knows a patient. He has a sensitivity and knowledge of the rock that allows him to select only the proper stones for quarrying. The search is made amid a conglomeration of boulders of varying sizes and lithologies as the searcher roves up and down the river, looking carefully for newly exposed rock in steep embankments, along the water's edge and out in the shallow clear water. If a top quality, large boulder is identified out in the river, a dam might be built and the water diverted around the stone to dry it and create a working area. Depending on circumstances, a wooden platform might be built next to the stone on which a fire can be introduced to heat the rock. When the rock has been properly heated, large flakes might naturally spall off or be broken off by large boulders hurled against the heated quarry rock. Sometimes a fire might be built against or on top of a desired boulder to assist the spalling/breaking process, without the need for a platform. At other times, large flakes of desired sizes can be broken off from a boulder core by hurling a large, rounded hammerstone, conveniently collected from the river or along its edge, against the boulder core. Often, the naturally rounded hammerstone is simply held and pounded against the boulder core without hurling it. Any of the above procedures can be used to also break off pieces of more normally found boulder quarrystone of "mother rocks" along the edges of the river or protruding from the river's steep banks. Sometimes boulders of just the right quality are found out in the river which are small enough to be hand-carried to the shore where they can then be broken up for further sizing and flaking.

The search is for light colored gray-green, tan (very light brown), or blue-gray, fine-grained, very hard andesite/basalt and meta-andesite/basalt boulders that exhibit no open fractures or even healed
fractures which might break during tool manufacture or tool use. Inherent lines of weakness and healed fractures, too faint to detect with the naked eye, are often present and actually can assist the quarrymen in flaking off desired pieces of rock from larger boulders, but it is always hoped that the presence of these planes of weakness will not cause tool blades to break when they are being shaped or used.

Those Who Quarry

Some of the head quarrymen and stone experts who have the right to quarry and the ability to make stone tools in the Una area are Diman Balyo, Kapit (Kabir) Malyo, Iba Deyal, Kol Balyo, Yibik, Nyonyo Nabyal, Derber Nabyal, Kabin Malyo, Bira Malyo, Kubir Malyo, Eram Tegget, and Ngis Malyo. The head quarrymen, who are also the quarry owners, have authority over who goes to the quarry areas and they alone may sometimes grant permission for people outside of their hamlet-factory areas to look for rock, under their close supervision. To this extent, the culture seems pragmatic, at least at this time, about quarry use. It is customary for invited assistants who are not quarrymen but who have requested a stone tool and who accompany the quarrymen to the river, to furnish food while the quarrymen are at work. Families are welcome to join the quarrymen and may go down to the quarries to prepare and serve food and to help carry stones back to the hamlets for shaping and grinding.

Rituals Associated with Quarrying

At Langda and other quarrying hamlets located in the area, the Una say they have a special common god-spirit called Ninje Sunda, which means "something mighty but cannot see it." However, when dealing with the stones and toolmaking it seems (but I am not certain) that, even in former times, neither offerings nor prayers were made to Ninje Sunda but to other lesser special spirits.

There was a time when the Una traditionally placed their dead in trees after wrapping them in Pandanus leaves. Ultimately the skulls were removed and placed in the men’s house (or sometimes in the family houses). The skulls, which contained "great spirit power," had/have the power to provide good stones for quarrying. The skull has the power: the skull is the stone-giver. In pre-contact times there was a shaman in each hamlet-factory who was in charge of traditions, and he was the person who would ask permission of the skulls to quarry the stones. Once every five years or thereabouts, this special shaman big man would call for a major ceremony called yowati, when prayers would be offered to the skulls, asking for permission to quarry the stones and for direction to find "many stones." Supposedly, following this big ceremony, massive stone quarrying operations took place and a major supply of stones would be located and blade blanks stockpiled. Although the missionaries directed burnings of skulls and other objects some time ago, reportedly "a few" skulls are still maintained in hidden places and used in ritual.
Prior to quarrying, supplications, vegetable offerings, and sometimes a pig, were always offered to a female spirit named *Alim Yongnum* (sometimes called *Alim Milmeurum*), who owns the land near the river and to *Murbilik Kue*, the male spirit who owns the stones. While petitioning to these two spirits before a quarrying operation, I was told that prayers were also offered asking for the rains to stop and for the sunshine to appear.

During various sacrificial pig rituals that are held throughout the year, pig fat is sacralized and saved to use at times of quarrying. Boulder cores selected for quarrying are rubbed with the pig fat to make the stones beautiful and to please the spirits that are within the stones. Sometimes at completion of quarrying operations, remaining quarry core rock was rubbed and “blessed” so that good quality stones would be found on the next visit to the quarry.

Prior to quarrying, I was told that large spirit sticks are stuck into the river or into the ground at the edge of the river to both ask the spirits for approval to take stones and to thank the spirits for letting the stones be taken. Such sticks would communicate properly to certain spirits that quarrying operations were in progress. I did not observe the use of such sticks while I was personally at quarry sites, although they easily could have been there without my knowing it.

**Factors That Stimulate Quarrying and Prompt Production**

Informants say that in pre-contact times, just as today, stone hunts and quarrying are triggered by almost any large flood which is thought of as a stone giver. It is recognized that the top quality new core boulders appear after flood waters have receded. In between times of flooding, head quarrymen continue to conduct operations to serve their personal needs as well as to fill requests that have been made by both individuals and groups of people from residential areas that do not have their own quarries and toolmakers. The head quarryman at the Langda hamlet-factory says he rarely quarries to fill “custom orders” during the rainy season (June through October).

**The Seven-Step Manufacturing Process**

Seven distinct technological steps are followed by Una and Kimyal quarrymen-toolmakers in the production of Langda-Sela Style adze blades: 1) Locate a suitable boulder core, 2) Break the boulder core, 3) Reduce large pieces to manageable sizes, 4) Shape preform bifaces, 5) Dull edges and grind platforms intermittently with 6) Detail fine flaking, and 7) Grind finely flaked bifaces to finished adze blades. All seven steps are meticulously followed by Langda-Sela toolmakers in factory production situations, but some of the steps are usually omitted when adze blades are produced at sources of opportunity, which are discussed at the end of the chapter.
In a well integrated and predictable work flow pattern, the first three manufacturing steps are carried out at quarry sites, while steps five, six, and seven are followed at scattered places of convenience which are located within the sprawling habitation sites and gardens of hamlet-factory work groups. There is a single exception to this, being the rare occasions when individual work groups will transport their final-flaked preforms long distances to bedrock outcrops of sandstone for grinding. It is at the quarry sites that the teamwork of work parties are brought to bear, under the leadership of the head quarryman, on the problem of locating suitable boulder cores, breaking them into manageable pieces, and then allocating those pieces to individual ownership of the workers. Individual workers then reduce their allotment of core pieces to biface blanks before departing the quarry work place as a group.

An esoterically understood formula is used by head quarrymen in the allocation of crude core blanks and the division of flaking labor at each quarrying session. The specific work objectives of each quarry visit varies with the motivating factors for the visit and therefore production goals and individual responsibilities vary from time to time. Often the quarrying sessions are part of the annual routine of acquiring and individually stockpiling biface blanks for future use, but at other times, work party visits are motivated to fill requests that have been relayed to a head quarryman or one of the workers for one or more new tools for an individual or group of individuals. According to the quarrymen, both group and individual production expectations are discussed under the leadership of the quarry owner and understood by the workers before a work party is formed and a visit made to a quarry.

A Typical Workday at a Langda Quarry Site

At about 7:00 a.m. on May 6, 1992, my three assistants and I joined Diman Balyo, the head quarryman and quarry owner at Langda, along the Langda ridge, for what Diman said would be a routine one-day stone collecting trip to the quarries in the valley below. My arrival at Langda a few days earlier had come at a good time to observe the quarrying operation because Diman said that he had received recent requests from several residents of nearby hamlets for adze blades and he wanted to collect stone before the start of the rainy season. Diman said that he would seldom go to the Ey River to quarry during the rainy season, the months of June, July, August, September, and October. The rainy season was just beginning, but on May 6, 1992, we were fortunate. We had sunshine for our descent along a narrow trail, slickened by rains during the previous night, and clear skies prevailed throughout the day-long quarrying operation. As we commenced our climb back up the steep trail at the end of the day, it started to sprinkle, and was pouring rain by the time we crested out on the Langda ridge.

Six quarrying experts, including Nyoyom Napyal, Jiwik Malyo, and Kapit Malyo (who owns the quarry rights across the river from Langda), formed a typical work party under the leadership of Diman Balyo, the head quarryman at Langda. Diman’s wife, a teenage daughter, and several children
accompanied us to support the quarrymen by providing cooked food at the quarry site. Diman told us that such support by members of the family of each head quarryman was a normal procedure within the Langda manufacturing center. During the hour-long descent, as we slipped and slid down a rain-soaked clayey trail, one of the quarrymen paused long enough in a thick patch of forest to set a small snare trap at the opening of a mouse hole on the forest floor. The quarryman said that he would pick up a mouse that he was sure would be in the trap on our return journey to the Langda hamlet at the end of the day.

Diman and the other quarrymen preceded me, out of sight, over a cliff face just above the river. I could hear the quarrymen break out in a chant, which I recorded and was later to learn was directed to ancestor spirits, *Alim Yongnum* (the spirit owner of land), and *Murbilik Kue* (the spirit owner of the rock) to alert them that we were coming to look for "good stone." Whatever ritual that might have been celebrated was hidden from me as I was still coming down the difficult trail to the river.

When I arrived at the spot where the men were grouped together, among a jumble of crowded boulders, dense vegetation behind them and the edge of the river in front, they were looking at a large erratic boulder that rose for a vertical distance of about 6 m out of the water. This, I was advised, was *Amalkilkon*, a rock of good toolmaking quality stone but difficult to access. Thinking this might be a guardian spirit of this part of the river because it had been given a name, I questioned Diman, but he did not want to discuss the subject. The other quarrymen in the party just stared straight ahead and said nothing. It was 9:00 a.m. and work was about to begin.

During the course of the day, I would observe a typical Una quarrying and toolmaking crew complete the first four of the seven steps that are sequentially followed to manufacture Langda-Sela Style adze blades (Figure 414).

**Steps 1 and 2: Locating and Breaking Suitable Boulder Cores.** During the brief period of rest and contemplation before work began, Diman and another quarryman sat perched atop a large boulder of good-quality quarrrystone which they had previously identified and worked in 1991 (upper photograph in Figure 415). This and other large quarrrystones—the boulder cores from which the adze blades are made—are called *jaduh* (alternate spelling *jaduk*). In the lower photograph in Figure 415, another quarryman, under Diman’s supervision, examined and tested the top of this *jaduh* with a handheld hammerstone, but the *jaduh* did not break. Diman studied the rock carefully, but he already knew it well. Diman explained that on a large *jaduh* such as this one, if there were no cracks in the rock to facilitate the breaking process then a fire must be used to assist. As soon as wood was gathered, a fire was built on the back, top side of the *jaduh* (upper photograph in Figure 416). The fire was continuously fueled and allowed to burn for about an hour before Diman selected a heavy, river rounded hammerstone. He then climbed onto the top of the *jaduh*, well in front of the heated portion of the rock. A heavy *dabim* (hammerstone) was handed up. Diman carefully positioned himself over the spot he wanted to break, laboriously raised the *dabim* over
Figure 414. Four steps of adze blade manufacture at quarry site.

Step 1  Locate a suitable boulder core

Step 2  Break the boulder core

Step 3  Reduce large pieces to manageable sizes

Step 4  Shape preform biface
Figure 415. A previously worked quarry boulder is selected and tested.
Figure 416. After the rock is heated a large hammerstone is used.
his head and hurled it down onto the *jaduh*. A few chips flew but nothing else happened. Twice Diman repeated the procedure to no avail. Then he selected another *dabim* (hammerstone), oblong in shape, and repositioned himself over the place he wanted to strike (lower photograph in Figure 416). Straining every muscle in his body, he raised the *dabim*, pounded downward and struck the quarry rock while hanging onto the *dabim*. A large slab of the quarry rock broke along what appeared to be a fracture plane but did not separate and fall to the ground. Diman and a helper walked around to the side of the *jaduh* and were able to pull the slab off (Figure 417). Pleased with the one slab from *jaduh* ("mother" boulder core rock), a second quarryman stepped up to the side of the boulder core and with another large *dabim*, hammered off a second slab from the *jaduh*. These two pieces would be further broken down into manageable sizes with handheld (not hurled) hammerstones before the smaller resultant pieces would be shaped by yet smaller hammerstones into rough blade blanks called *ja temen*.

For the moment, the two pieces of rock from the *jaduh* were abandoned while Diman went off searching a short distance down-stream for another quarry rock. A few men followed. Soon a shout of glee went up as Diman found a round boulder out in the river that he judged to be of good toolmaking quality and which he therefore called *jaduh*. With great effort, Diman singlehandedly lifted this *jaduh* and carried it back onto the bank. This boulder core had weathered yellow on the outside but later when broken open was seen to be the usual light gray-green color of tool rocks from this quarry. Once on shore, Diman and several of his helpers gathered around this particular *jaduh* and discussed how to break it. Then the *jaduh* was placed just the way that Diman wanted it, laid over an underlying boulder before Diman stood on an adjacent, slightly higher boulder with a large *dabim* in-hand (Figure 418). Three times he arched up and came down with all of his might, hurling the hammerstone, or *dabim*, onto the *jaduh*. If one looks carefully at the lower right photograph in Figure 418, one can see the *dabim* flying off the edge of the *jaduh*. After several unsuccessful attempts to break the *jaduh* in this manner, another quarryman selected yet a third *dabim* hammerstone, changed positions relative to the *jaduh* and again raised up and came down hard, hurling the *dabim* against the *jaduh*. On the second attempt, amid shouts of success, the *jaduh* split into two pieces. In the upper left photograph of Figure 419, the quarryman who broke the stone, spontaneously points to the "good break," while Diman Balyo, hunkered in a typical squat position nearby, clapped his hands amid his own shouts of pleasure. For this particular boulder core (*jaduh*), Step 2 of the seven-step manufacturing process had been completed.

**Step 3: Reducing Large Pieces to Manageable Sizes.** Other quarrymen gathered around the two pieces of broken *jaduh* to help each other break these stones into yet smaller, more manageable pieces with handheld *dabim*. A team of four worked diligently and rapidly in a small work area of only approximately 3.5 m² to break up the boulder core. Each member of the team knew well his role in the cooperative effort. Individual training and know-how was obviously important so that the job would be
Figure 417. A broken slab is removed for further reduction.
Figure 418. A hammerstone is hurled to break a selected boulder core.
Figure 419. Large pieces are reduced to manageable sizes for knapping (A).
well done, without causing an accident, where one worker might hit another’s hand (who would be holding an anvil-supported core while the knapper struck it) or be hit by flying bits of debitage. Diman Balyo, the head quarryman, seemed to be everywhere at one time within the group—simultaneously giving his workers encouragement with complimentary noises of enthusiasm, consulting, giving advice, and at the same time examining the work and identifying rejects.

The small work area was, for the brief time of 30-45 minutes, a beehive of activity where the workmen, with quick, deft strokes of handheld large hammerstones, struck core pieces that were usually braced against anvil supports. Interestingly, one quarryman disappeared into a stand of dense foliage alongside the river, to soon return with twigs and leaves. He and another worker fashioned a simple bed of leaves onto which they rolled the piece of jaduh on which they were working, proceeding to break it up with their dabim (Figures 420 and 421). During this part of the process, the workers would sometimes prop an end of a boulder core off the ground by laying it across pieces of wood that had been picked up from the water’s edge (Figure 421). Soon the jaduh had been reduced to pieces of suitable size for handheld freehand rough flaking.

The individuals worked together with a spirit of camaraderie as they cooperated amid much friendly advice-giving, shouts of joy at accomplishment, and help to one another. I was impressed by the mobility of the workers as they shifted about in the rather small work area while remaining in a basic squatting position. All the workers used both their arms and hands and their legs and feet in a seemingly effortless rhythm to break up the core pieces. At times it seemed as if the workers were using their feet with almost the same dexterity and control of movement as their hands to hold and support core pieces in coordinated efforts with their partners. During all of this activity, Diman Balyo continued to move about the men, encouraging and being helpful.

With an experienced eye, Diman was constantly checking the work. Note in the lower right photograph of Figure 419, Diman scrutinizes a piece of core rock to either reject it or approve it as a core piece suitable for the next stage of the reduction process. In the lower left photograph of Figure 419 and in the upper right photograph of Figure 421, use wear on hammerstones can be observed.

While the portable boulder core was reduced by four quarrymen to manageable pieces for freehand knapping (Step 3: Figures 419-421), the previously obtained two slab-like pieces of core (Figure 417) were similarly reduced by the other two quarrymen.

Step 4: Shaping Preform Biface Blanks. Next, the quarrymen squatted on the ground in a casual manner, not in any particular arrangement, to further shape the crude core blanks by freehand flaking. Details of the knapping process and the creation of quarry-made biface blanks can be gleaned from the 24 photographs that are presented in Figures 422-431. For the process, each toolmaker used 2-3 hammerstones (called ja wirwin) that had been selected from an abundance of stones along the edge of the river, plus
Figure 420. Large pieces are reduced to manageable sizes for knapping (B).
Figure 421. Further reduction with a large hammerstone.
Figure 422. Biface blanks are shaped by rough flaking.
Figure 423. The knappers concentrate and are pleased with their work.
Figure 424. A knapper shapes an adze blade biface blank.
Figure 425. As one biface blank is finished, work commences on another.
Figure 426. A knapper starts to accumulate quarry-made biface blanks.
Figure 427. Each worker makes four or five biface blanks.
Figure 429. A quarryman eats sugar cane and a sweet potato.
Figure 430. A woman prepares to steam vegetables for a midday meal.
Figure 431. The quarrymen eat a midday meal.
sometimes a short piece of crude biface (*jauna*). The description and detail of use of these knapping tools is discussed in the next section which covers Steps 5 and 6 of the toolmaking process. While flaking, individuals would often stand up, move about, smoke, visit, eat a refreshing snack of sugar cane and/or a cold steamed potato (Figure 429) and then maybe sit back down at another spot to continue work. The work place was casual and enjoyable. Just as when breaking the original core (*jaduh*) and its relatively large pieces had delighted them, the quarrymen-knappers would shout yips of glee whenever a flake would break off a core in a particularly advantageous way.

During a period of about two hours each quarryman had knapped 3-5 crude biface blanks that were ready to be transported out of the quarry (Figures 426-428). The longest biface blank that I was able to measure was 30.5 cm long, by 10 cm maximum width, by 6.5 cm maximum thickness. The shortest was 14 cm long, by 5.0 cm maximum width, by 1.3 cm maximum thickness. The mean dimensions of 14 blades that were measured was 20 cm long, by 7.3 cm maximum width, by 4.0 cm maximum thickness. The two side by side lower photographs in Figure 428 show the dorsal view of one of the better shaped crude bifaces on the left and the ventral view on the right. The blade is 27 cm long, by 8.5 cm maximum width, by 5.4 cm maximum thickness. The structure of this rough flaked blank is approaching the structure of the finely flaked final blades before grinding and the ultimate shape of the Langda-Sela Style adze blade (Chapter V). Little waste material was left on this crude biface for final reduction before grinding. The view of the blade (#1) shown in the upper left photograph of Figure 428 is ventral and the view of the blade (#4) to its right is dorsal, again showing examples of the toolmakers' production of crude bifaces with arcuate dorsal surfaces and flat ventral surfaces. This structure holds through final steps of flaking and grinding to produce blades that can be securely bonded to flattened sockets in the hafting process (Chapter V).

**Food Preparation at the Quarry Site.** When we first arrived at the quarry site, while the men went to work on the boulder cores (*jaduh*), the two women and the older children quickly gathered firewood, rocks for heating, and grasses and leaves for a small steam bundle. They had carried sweet potatoes, yams, and greens from their hamlet to cook for the men. One of the quarrymen cut a short limb, stripped the bark from it, and split one end to create rock tongs with which to move hot rocks from the fire to the steam bundle. A fire was built over the pile of rocks that had been collected and, approximately three meters from the fire, a mat of grasses and leaves were laid as a ground cover on which to place the vegetables. After they were placed, more grasses and leaves were laid on top, and then doused with water from the river. Once the rocks had heated, they were moved with the rock tongs onto the grass bundle (Figure 430). About the time all the men had completed their tasks of shaping biface blanks, (approximately 2:00 p.m.), the steam bundle was pulled apart and the men, then the women and children,
individually selected food and began to eat (Figure 431). A red *Pandanus* fruit had been carried to the quarry, the juices to be used as seasoning for the sweet potatoes (lower photograph in Figure 431).

The men spread out among the riverside rocks to eat individually, some seemingly in quiet contemplation, while others visited animatedly with whomever was sitting nearby. Diman’s wife and teenage daughter sat and ate together, part of the group and yet in a sense separated from it. The children snacked as they dashed about, ever playful and full of laughter. Without giving it a thought, they were absorbing knowledge about the operations of a stone quarry and how they would probably live their lives when they became adults. By the time the men and women had eaten, the biface blanks (*ja temen*) had been divided among the adults for carrying out of the quarry site.

**Conclusions.** In approximately five hours of work at the quarry, six men had produced 25 biface blanks. The head quarryman, Diman Balyo, said that a normal load of stones such as these, to be carried up the steep hillside to Langda, was between 3-5 blanks per man, but in the cases of stones the size of the largest of these (30.5 cm long, by 10 cm wide) or larger, usually only 1-3 stones were carried per man. Sometimes one or a few of the men would even stash blanks at a permanent house shelter by the nearest sweet potato garden (about 400 m away), to be fine-flaked at times of leisure when the men might be down at the garden.

Before leaving the quarry, Diman Balyo quickly bathed in the Ey River and quietly mumbled some incantations. Upon being questioned about a “closing ritual,” he matter-of-factly said that in former times the partially used mother-quarry core rock would have been rubbed with sacred pig grease.

During knapping and upon abandonment of the site, no attention was given to waste flakes (*jatukul*), unwanted larger pieces of boulder core rock, or hammerstones that had been selected from along the edges of the river. Intermittent flash floods would eventually wash this material away, leaving only a few flake scars on large boulder cores as artificial remnants of the quarrying operation. From time to time, each quarryman-toolmaker would carry a hammerstone that he particularly liked from a quarrying operation back to his place of residence to be used there in the fine-flaking process.

**Three Manufacturing Steps Undertaken away from Quarry Sites**

Three technological steps are performed away from the quarry site to produce a finished ground stone adze blade from a quarry-made biface blank (*ja temen*) (Figure 432a). Step 5 (edge dulling and platform grinding) and Step 6 (detail fine flaking), although distinctly performed different mechanical steps, are quickly and intermittently executed as an on-going mental and technological continuum in the knapping process. A completely flaked blade called a *keilaba* is produced for grinding.

**Knapping Tools.** The Una and Kimyal toolmakers use three kinds of platform preparation, edge dulling, and striking tools in the knapping process. Each knapper, squatting in the traditional position, with
Figure 432a. Three steps of adze blade manufacture away from quarry site.
buttocks touching the ground, or actually seated on the ground (or on a board) will have 2-3 naturally rounded hammerstones (called *ja winwin*) conveniently laying next to him in addition to a rectangular piece of core rock (may be a discarded broken biface blank) called a *jauna* (edge abrader). One, or in some cases, two of the *winwin* are river-tumbled hammerstones of approximately the same hardness as the biface blanks which are being worked. One of the *winwin* is a softer hammerstone that is, in the cases I observed, a buff-tan colored, hard argillite or metamorphosed tuff. When the sharp edges of the biface core are rubbed with the softer *winwin*, a yellowish or gray residue is left on the sharp edges of the core rock.

**Knapping Process and Tool Use.** Men knapping adze blades may work alone or in small groups, usually outside near their houses, but sometimes farther away in a house cluster courtyard, or even away from the hamlet at a house shelter that is located near a sweet potato garden. There is not a specifically designated place for this kind of work. It is simply done at places and times of convenience.

When working in groups of two or more, the men squat or sit casually, in no particular arranged pattern. There are, however, taboos against passersby walking on the right hand side of right-handed knappers or on the left hand side of left-handed knappers. I was told that this practice was to help protect the spiritual peace and skillful work of the toolmaker, not to protect the onlookers or people passing by from flying chips. Right-handed knappers hold the core tool blades in their left hands and work with the knapping tools in their right and vice versa for left-handed knappers.

When commencing a knapping process, a toolmaker first rubs a core blank blade (*ja temen*) with one of his hard rounded hammerstones (*winwin*). He says that this is to get a feel of the stone on which he is working, to “feel out” a striking platform, and also to select by feel the precise spot on the rounded hammerstone with which he wants to strike the blade blank on his first downward blow. Two knappers at two different flaking sessions told me they are feeling for a very small, but important flattened spot on the hammerstone (*winwin*) with which to strike the biface blank (*ja temen*). When struck with the right spot on the *winwin*, the *winwin* will not "slip" at contact and a good flake should be produced. Slightly oblique blows from the *winwin* near the edge of the *ja temen* causes flakes to fly off in a manner desired by the toolmaker. When a particularly good blow is struck and a piece flakes off in just the desired fashion, the knapper gives a shout of joy—"arok" or "hayak"—which I suppose in the esoteric language of the group tells each person just what has happened. Sometimes the others momentarily join in, repeating the same brief shout of glee. The entire operation is quite verbal with communication about the up-to-the-minute results of the work, often voiced above the background sounds of the grinding and the click and clack of the blades being flaked and rubbed.

The toolmakers work rapidly, picking up first this hammerstone and then another one. Every so often they pick up a *jauna* (edge abrader) stone and rub and make dull all of the sharp edges on the *ja*
The toolmakers said that this was a defensive procedure to protect their hands. Holding the ja temen (core tool blade) while knapping causes cuts on both palms and fingers as the ja temen is struck with the hammerstones. After one knapping session the quarrymen showed me their cuts. Sometimes an argillite or tuffaceous winwin would be quickly picked up to abrade a biface core (ja temen). Residue from the winwin would be rubbed off onto the ja temen. This clay residue seemed to "mark" the ja temen as well as to coat the sharpened edges.

At each of three different tool knapping sessions it became evident that certain toolmakers could knap much faster and better than others; although they were all known in the area as qualified experts. It took one man just 30 minutes to fine flake a biface blank to finished form, while it took another man 42 minutes to shape a similar sized blade, but interruptions due to the knappers visiting among themselves made it difficult to correctly estimate actual knapping time.

The small waste chips created during the knapping process are called jatukul. They are treated casually, left where they fall, and not picked up or sorted through for pieces that might be usable for small cutting tools (knife-like) or otherwise.

As the knapping process progresses on a particular ja temen blank, it is transformed into the finished product called keilaba. The keilaba are long, slender blades with parallel sides and one slightly convex shaped, bevelled end for cutting. Although already quite sharp and nicely shaped from just the knapping process, the Una and Kimyal do not consider their blades ready for use until they have been ground, to reportedly make them more durable.

Steps 5 and 6: Dulling Edges, Grinding Platforms, and Fine Flaking. A pictorial essay of details of the fine flaking process (Steps 5 and 6) is presented in Figures 432b-439. In Figure 432b, Diman Baliyo strikes a biface blank with a relatively large "hard" river-sourced hammerstone (ja winwin). At his feet, one can see a buff colored "soft" oblong argillite or tuff hammerstone (ja winwin), lying next to an elongate-rectangular andesite/basalt crude biface hammerstone (jau na). Diman uses these three kinds of typical Una and Kimyal hammerstones alternatively in the freehand knapping process. In the upper two photographs of Figure 433, Diman smooths the sharp edges of a biface with a jau na as he prepares to strike it with a winwin. In the upper photograph of Figure 434, a jau na tool is used to dull sharp edges and grind a platform (Step 5, Figure 432a) before the platform is struck with a hard, rounded hammerstone (winwin, Step 6, Figure 432a). In Figure 435, five biface blanks (ja temen) lay on the ground as the knapper fine flakes a sixth biface blank. In the upper photograph a platform is smoothed before the core biface is struck, as seen in the lower photograph. In Figure 436, a small chip strikes a knapper from his own work. The knapper rubbed his eyes and forehead before going back to work. His knapping partners, including the head quarrymen, paid little attention to the incident as they continued with their own knapping work. In Figure 437, the author watches as Diman prepares to strike a core with a full swing. In Figure 438, l
Figure 432b. Diman Balyo shapes a biface for grinding.
Figure 433. Ballyo flakes with three kinds of tools.
Figure 434. An edge dulling tool and hammerstones are used.
Figure 435. Biface blanks from the quarry are shaped for grinding.
Figure 436. A small chip strikes a knapper from his own work.
Figure 437. Author watches as Balyo knaps with a full swing.
Figure 438. A biface breaks during the knapping process.
Figure 439. After fine-flaking, bifaces are ready for grinding.
was concentrating on Diman Balyo, with the camera set on a near-ground-level tripod. When Diman
suddenly shouted "Mati" ("dead" in the Indonesian language) and with a look of surprise dropped his
hammerstone to the ground, holding two pieces of the blade that had just broken in his hands. Diman said
that the stone was sick—it had just died, and there were no bad spirits involved, the stone was just simply
sick and died. Diman discarded the smaller of the two pieces and promptly went back to work shaping
the other piece.

In the upper and lower photographs of Figure 439, the typical linear, crestal positioned flake scar
that often extends from the high point of the convex arch on the dorsal side of each blade to the cutting
edge, can be seen. This single scar might be thought of as a signature in the stage of process. It identifies
a step in fine flaking, just before final chipping shapes a blade for grinding. A completely chipped blade
that is ready for grinding is called a keilaba. Up to this point in the fine flaking process (Step 6), it has
taken a skilled knapper to do the work. All keilaba are shaped so that they will take relatively little
grinding (compared to Yeineri Style and Tagine Style blades) to further shape, smooth, and sharpen each
blade for utilitarian use and aesthetic perfection.

Step 7: Grinding. Throughout the Langda manufacturing center, portable, fine-grained sandstone
grinding slabs are carried distances of two to four days walking time (round trip) from sandstone outcrops
to the scattered hamlet-factories. Within the Langda hamlet-factory, the toolmakers maintain approximately
seven of these portable grindstones.

Sometimes toolmakers from Langda will carry finished flaked stones (keilaba) for a one day journey
over the mountain between Langda and Bomela to overnight for several days while the workers grind their
stones to the finished ja keten. I could never define how much actual grinding time it takes to grind the
various size keilaba to finished products. The head quarryman at Kinyalingda said it took him about five
weeks to grind and sharpen a 25 cm long blade. Lamek Napyal, Ngis Malyo and Yan Molingi Balyo at
Langda agreed that it took about 10 days to grind to completion a big (25 cm) blade. Kabit Balyo says
that he can grind the short blades, 7.5-18 cm long, to a finished state in one-to-three hours of continuous
work. The toolmakers all agreed that there was quite a variance in grinding time depending on just how
much grinding was done per blade other than just sharpening the bevelled, cutting edge of each tool.

For the grinding process the toolmakers like to be near water but on some occasions they set their
grinding stones down by the front of their houses and add water to the surface of the grinding stone from
water gourds. At other times, several men will carry their grinding stones out to a marshy area, squat
down with water puddles all around them and go to work while enjoying a continuous chatter of
conversation (Figure 440).

A to-and-fro motion is used to sharpen the bevelled cutting edge of a tool blade and a sideways
motion to smooth sharp side edges and to polish the stone to an appealing aesthetic value (Figure 441).
Figure 440. Finished, chipped bifaces are ground on portable slabs.
Figure 44. Water is used in the grinding process.
Once the grinding commences, a beneficial slime paste soon develops containing micro particles from the core stone, sand grains from the grinding rock, and water. In the Una process, the blades are rarely ground to remove all flake scars as is done in the Grand Valley and West region.

**Stone Knives.** According to Langda informants, although a small percentage of total knife production is sourced from the same quarries as the Langda-Sela Style andesite/basalt and meta-andesite/basalt adze blades, most of the knives produced at Langda come from what is described as thin layers of rock found within the volcanic sequence at various locales uphill, away from the river-centered adze blade quarries. I have not visited knife blade source areas but have no reason to be suspicious of information from indigenous informants. As discussed in Chapter V (Yali and East, Knives), the mineralogy of knives collected throughout the Yali and East region, including one in a grinding stage of production at Langda, is compatible with the possible volcanic tuff sources for knives as described by informants.

For a discussion of a variety of tuffaceous stone objects that are used by the Una, Kimyal, and Yali in sacred contexts and which are likely produced from within the same volcanic sequences as the knives, refer to Miscellaneous Sacred Stones in the Yali and East Region, Chapter VII.

**Conclusions: Langda-Sela Quarries**

In Una territory, a stone goods production center is localized along a 17 km stretch of the Ey River, which concentrates by erosional processes the raw materials for adze blade production (Figure 413). Seven explicit technological steps are followed to produce adze blades of the same morphological style from the same kind of core rock by each of 11 independently operated hamlet-factories within the manufacturing area. Each factory produces the same kinds of products, which include the Langda-Sela Style adze blades (refer to Langda-Sela Style Adze Blades, Chapter V), knives and non-utilitarian objects (refer to Yali and East, Knives, Chapter V, and to Painted Display-Exchange Type Stones and Sacred Boards in the Yali and East Region and to Miscellaneous Una Power Stones, Chapter VII). Langda is one of these hamlet-factories. Whether the original discovery of the favorable concentration of raw materials for tools was made by migrants and then the area settled, or whether the original settlers were in the area for other reasons and then discovered and developed the use of the raw materials is problematic.

Each hamlet-factory is an integrated operation in which a skilled labor force lives within the confines of the hamlet, in addition to one head quarryman who owns and operates a nearby riverside quarry which is the source of raw materials for the adze blade production of that particular factory group. There are no bedrock cliff face, open pit quarries, or shaft or drift mining operations from which raw materials are procured for the production of adze blades. The head quarryman (who is also the owner of the quarry)
may or may not be the overall most influential leader in the hamlet. The head quarryman supervises all quarrying operations within his quarry area and has authority to allow people outside of his hamlet-factory group to accompany him to the quarry to collect core rock.

Few knives are produced from the andesite/basalt and meta-andesite/basalt boulders of the riverside quarries, which are the single source of raw materials for Langda-Sela Style adze blades. Instead, the quarry sources for knives and "other objects" are reportedly away from the river bottom quarries and located at special places along sparse hillside exposures of lamellar tuff sequences. It is concluded that the raw materials for all of the stone products of the Langda manufacturing center are sourced from within the same geological volcanic sequence.

Not far west and along a geologic trend from Langda, a similar hamlet-factory at Sela in Kimyal territory produces the same kinds of stone goods and in the same fashion as at Langda. The combined independently manufactured and distributed stone goods from the Langda and Sela manufacturing centers comprise what I define as the Yali and East region stone goods industry. As discussed in Chapter V, the products of this industry are pervasively used throughout all language groups in the Yali and East region instead of adze/axe blades and knives from the adjoining Grand Valley and West region.

Engineering techniques to break the large volcanic boulder cores at the quarry sites into manageable size pieces for further reduction include the uses of fire and both hurled and handheld hammerstones. Biface blanks are always produced at the quarry sites and then carried to the hamlet-factories for fine flaking and grinding. There are no permanently located sandstone grinding slabs within the factory areas as there are at the Tagime factories in the Grand Valley and West region. Portable, but stationary grinding slabs are carried to factory sites from sandstone outcrops of the Kembelangan formation, which are located a two-four day round trip journey away from the different Langda-centered hamlet-factories, but within territory that is controlled by Una language speaking people.

The Una and Kimyal are excellent knappers, who through two phases of freehand knapping, first by the creation of biface blanks at the quarry sites and then final shaping before grinding by fine knapping, create knapped blades of uniform structure before the grinding phase is commenced. Less grinding is required among the Una and Kimyal to produce finished ground stone adze blades than among any of the toolmakers in the Grand Valley and West region.

The understanding and ability of each toolmaker to create a seemingly cloned structure in finished adze blades, regardless of their length, is covered by data presented under the heading Langda-Sela Style Adze Blades in Chapter V (see Figure 233). By way of a visual conclusion of the mental and mechanical process that is at work, refer to Figures 442 and 443. The upper photograph in Figure 442 shows a dorsal view of eight blades at four stages of production and, in the lower photograph, a ventral view of these same blades. The two blades on the left side of the two photographs are biface blanks (ja temen) as they
Figure 442. Dorsal-ventral views at different stages of biface reduction and grinding.
Figure 443. Adze blades at different stages of biface flaking and grinding.
came out of the Langda quarry site. Next to them are two blades in which fine flaking has been completed (keilaba) and the blades are ready for grinding. The next two blades have been slightly ground, and the two blades on the right have been ground almost to the point of being ready for hafting (ja keten). In Figure 443, the left blade is a biface blank, the next two are completely flaked blades that are ready for grinding and the two blades on the right are ground blades showing the results of edge smoothing and bit grinding. The structure of the blades have not changed dramatically from crude bifaces to the completed ground stone tools.

The photographs in Figure 444 show the ventral view of a large biface blank from the Sela quarry, versus a typically shaped large Langda-Sela Style adze blade of approximately the same size that would be produced from such a blank. The finished blade on the right was found being used by the Yali near Angguruk.

Within the Una belief system there are spirit owners of both the land near the quarry sites and of the rock that are propitiated through ritual to furnish good quarry stone.

Quarrying waste and thedebitage from biface blanks that are made at quarry sites are continuously washed away by river floods. In an archaeological context, the quarry sites would not be recognized. Stable, large accumulations ofdebitage are not known to exist within any of the hamlet-factory areas.

The value and distribution of the stones is discussed in Chapter XI.

Sources of Opportunity

In addition to stone goods that were generated at the Yeineri and Tagime manufacturing centers in the Grand Valley and West and at the Langda and Sela manufacturing centers in the Yali and East regions, I estimate—really an educated guess—that at the time of first contact approximately one percent of the percussion and slicing tools being used in the area of the combined regions, originated at what I call internal "sources of opportunity." From field observations of the structures and lithologies of adze/axe blades and knives in use in the two regions, I further conclude that only a significantly smaller percentage of all stone tools in use had filtered into the regions from the outside. Sources of opportunity are those places where a tool user might pick up a stone that catches his attention as a potential adze/axe blade or knife by its shape and perceived hardness. When fording rivers or following riverside trails, especially after flash floods, in the routine of daily travels or when on a journey for special reasons (trade, gathering raw materials from the forest, hunting, socializing or attending funerals, to name a few) such stones might catch a traveller’s attention. Usually such stones, once picked up, are discarded after careful visual examination, or after a minor amount of rough flaking and/or grinding is done and the stone breaks or is
Figure 444. The size of a quarry biface blank necessary to make a large adze blade.
found to be too soft to hold a good edge, or for some other unexplained reason, the owner loses interest in the stone. A lesser number, however, is successfully processed and becomes part of a finder’s tool kit.

As I travelled about the landscape, I observed that most Highlands men, not just skilled toolmakers, understood rudimentary elements of knapping and many could flake rough blade blanks for grinding. None that I observed, however, other than knapping experts, understood freehand knapping and only shaped crude biface blanks found at sources of opportunity by anvil-supported flaking or by striking a hand-held core against a stationary slab. Although the flaking process was often crudely done, finished ground blades were usually shaped well and, within the limitations of hardness, finished tools were quite functional. Indigenous inhabitants, in both the Grand Valley and West and the Yali and East regions, showed me locations, usually along rivers, where they would reportedly go from time to time to fill a pressing need when a factory-produced tool had broken. It is tools of the diverse lithologies, so acquired and those that are fashioned from stones just picked up as incidents of happenstance, that comprise the “sources of opportunity” category of blades that are present in the overall “assemblage” of tools present within the research area.

In Figure 445, two Yali men are shown rough flaking and grinding two calcareous siltstone adze blade cores which they had just collected from along the edge of a river. This source of opportunity is about a 45 minute walk from the men’s habitation site, and a place the men said that others, including their ancestors, had used from time to time. In the lower left photograph, one of the men shapes a biface blank by holding the core and striking it against a hand-supported stationary slab. At the same time, his partner was shaping another adze blade blank by using the more conventional percussion anvil technique. When satisfied with their individual work, they joined as a team to cooperate in the work of grinding their core blanks. First, the men quickly collected moss from the shady underside of large boulders along the outer edge of the riverbed to be used like a sponge. At the start of the process, a large clump of water-laden moss was set on top of the boulder so that water would run from it over the grinding area (upper right, Figure 445). After a short time, the men stopped this procedure and took turns, one dripping water from a handheld clump of the moss sponge onto the grinding rock, while the other ground a blade (lower right, Figure 445). About one and a half hours later, they had two, roughly ground bifaces, which they said they would finish grinding back at their habitation site.

During the course of my field work, while being led to many sources of opportunity, I recognized that the approximate one percent of tools of unusual lithologies that I was identifying in habitation site "assemblages" could be accounted for by rock types present at such sources. The only tool blade that I found in use, for which I could not identify a possible lithologic source, is an axe blade that, although shaped like a Yeineri or Tagime Style blade, is of a different lithology, being a hard quartzitic—almost an
Figure 445. Two preform bifaces are shaped at a source of opportunity.
orthoquartzite-sandstone. The axe blade is 26.6 cm long, 8.5 cm maximum width, and 4.2 cm in maximum thickness. It was being used by a Dani, not far from the entrance to Wosolimo cave, in May of 1982. From a literature review, I have found nothing to indicate a Papuan New Guinea source for this or any other blades present in the "living assemblages" of the research area.

**Conclusions: Sources of Opportunity**

The relatively few tools that are in use in both the Grand Valley and West, and the Yali and East regions that are made from rocks of distinctly different lithologies than those of most of the tools that are in use in those regions, originated at local sources of opportunity, rather than being traded or filtering through time into the regions from one or more distant external sources. Implications of this scenario to archaeological interpretations are manifest.
CHAPTER XI
TRADE

Trade is the exchange of one kind of object for another kind of object. To make these transactions, raw materials and manufactured goods are moved from areas where those materials occur naturally or are manufactured in a particular way to people in areas where they do not occur or are not manufactured. To understand the movement of goods and the associated transactions of trade, archaeologists, other anthropologist specialists, pre-historians, and economists continue to study the related substantive issues of value-setting, geographic trade networks, and trading mechanisms.

For my discussion of these issues in the Highlands of Irian Jaya (Figure 446), I use the term "trade" to refer to all movements of an individual product and inter-personal transfers of manufactured products and raw materials that are unaccompanied by ceremony. Trade is private and without ceremony where traders stress material benefit rather than sociopolitical gain. Although trade is an underpinning of social ritual and economic aspects of the cultural systems within the Highlands of Irian Jaya, I do not consider "trade" to be a system unto itself, as has been interpreted for coastal trade in eastern Papua New Guinea, especially the Kula trade ring, as presented by Malinowsky (1922) in his classical work _Argonauts of the Western Pacific_. Trade in the Highlands is an open-ended affair for which there is no closure. The term "exchange" is used as an abbreviation for "ceremonial exchange." Exchange transactions stress sociopolitical benefit more than material gain and involve prestige and status. Such transfers of material goods are usually between relatives, are often channelled by or through a leader, and are public and ceremonial. Big men leaders instigate the exchange ceremonies at which they then redistribute the exchange goods (Chapter VI). The term "barter," which is the payment of specific goods, one for the other, excluding the use of money, in this case is not used because cowrie shells were used as money in at least some parts of the Highlands and by using my definition of "trade," this term becomes unnecessary.

In the Highlands of Irian Jaya, stone goods from manufacturing centers, other kinds of finished products (such as salt, fiber nets, and shell necklaces), and raw materials moved at pre-contact times along a vast trading network from points of origin to user areas. Within use areas, goods continued to trade from owner to owner and valuables were kept in a constant state of recirculation by exchange. The patterns of trade (and exchange at rites of passage and other ceremonials, Chapter VI) account for the distribution of material goods while the mechanisms of trade (which are discussed in this chapter) and exchange account for the behavior that moved the material goods (raw materials and manufactured objects) from points of origin to and within use areas. Both the geographic patterns of trade and exchange and the mechanisms of the related processes are important from ethnoarchaeological and ethnogenesis perspectives.
Figure 446. The quarries in their regional setting in Irian Jaya.
The Traders

In the Highlands of Irian Jaya, men dominated the production, transfer (between individuals and between groups), and consumption of trade goods; although women were strongly involved in production. Men manufactured the stone goods; harvested forest products, which, in addition to wood and bamboo, included whole birds and bird plumage, cassowary bone, and marsupial furs. Women played a supportive role in furnishing food for these endeavors, produced most of the salt that was traded, played a major role in raising the pigs, manufactured nets and skirts (that were traded locally), and collected medicinal plants, some of which were traded. Sea shells were traded into the Highlands from the lowland coasts, used mostly by men to sew onto ornamental necklaces and bibs; in addition to which cowrie shells, sewn onto fiber string exchange bands and also maintained loosely, were used as money.

The trading networks along which goods flowed were made up of social linkages of male members within primarily single patrilineages, with a fewer number of trading partnerships extended by distance or maintained in the entirety among social male friends outside of kinship. Within the study area there were no professional traders like Pospisil (1956:224-226) described among the Kapauku to the west, although men traded goods locally on their own account when opportunities presented themselves. Women also traded locally for and with foodstuffs, medicinal plants, fibers for string, orchid and palm fibers, skirts, and nets, but they were not part of trading networks that moved goods over longer distances.

Two of the longer individual trade linkages of kinsmen, of which I was aware in the Highlands study area, covered distances of approximately 35 and 45 km, respectively. Using ground checks, I was able to confirm a Wilil mid Grand Valley Dani dialect patrilineage linkage over a distance of approximately 35 km from the mid Grand Valley language group to the northern Yali dialect of the Yali language group, in the Pass Valley-Landikma area (Figure 447). Another similar linkage over an approximate distance of 45 km extended from the mid Yali language dialect area of Angguruk to the southern Yali dialect area of Korupun (Figure 447). The principal obstacle to individual movement within a trade linkage was not physical distance but the presence of enemies: the more densely settled an area, the more restricted the movement of an individual or group carrying trade goods because of the presence of more enemies.

Trade goods moved in a series of chain-like steps from producers to the consumers. The goods followed routes of social linkages to move into, through, and around enemy territories, rather than by the most direct physical routes. Any given user area might actually be the territory of an enemy group of the originator of the goods or of the last member of the trade link that was moving the item (or items). At various points within a trading linkage were intermediaries who usually used the durable goods while they had them. Often such items (stone goods and shells primarily) continued to circulate within local groups before being moved on, along a regional gradient. Most of the kinds of goods which moved rapidly
Figure 447. Trade routes in the west and east use-regions.
through intermediaries were perishables, special bow staves and spear woods, fiber products, coloring pigments, and sometimes salt. (Even coloring pigments [chiefly red ochres] and salt were often stored in the houses of intermediaries for varying periods of time, while part was traded for local use before the remainder was traded on.)

Risk of injury, loss of life, and the expenditure of time for the trader travelling often arduous routes, did not seem to be reflected in any measurable way in the exchange rates of goods that were transported. The energy of labor in such endeavors was cheap, with little differentiation in value of goods relative to distance from points of origin.

**Trade Routes and Flow of Goods**

An overprint of trails and routes, some well travelled and easy to follow and others less used and often difficult to discern even for indigenous local inhabitants, connected the habitation sites of the Irian Jaya Highlands one to the other, regardless of intervening language boundaries and different sociopolitical affiliations. Within this web of trails and routes that had been built up through millennia, the people were connected to the origins of raw materials as well as to the manufacturing centers for stone goods. As would be expected, there was a radically reduced number of routes to both the north and south lowlands from the central mountain core and across aprons of lowland swamps to both ocean coasts due to the difficult terrain.

By the time of first contact with modern outsiders, at least five trade routes of ingress and egress existed between the north and south coastlines and the central Highlands of Irian Jaya, any of which might have been routes for the migrants who first entered the central mountain core (see Getting to the Highlands of Irian Jaya, Chapter III). It was along these routes that sea shells traded from their points of origin into the interior: 1) Nabire to Enarotali, 2) Uta and the Kokenau-Mimika area to Enarotali, 3) Agats area through the Baliem Gorge to south of Wamena, 4) Agats area up the Brazza River to Sela, and 5) Mataboor (mouth of Mamberano River) to Dabra area and by a western fork to the Yeinei area and by an eastern fork to the Bokondini area (Figures 1, 188, and 446). Routes up the Fly River from the south coast and the Sepik River on the north coast probably also furnished trade linkages from the oceans to the central mountain core near the Irian Jaya-Papua New Guinea boundary, but these routes have not been confirmed by research. By all routes, points of ingress from the coastlines were at the mouths of rivers (except at Nabire) connected to arduous overland routes at the base of the central mountain core. In addition, an inter-regional trail which follows a series of topographic lows connects Enarotali on the west with the Ilaga-Mulia area on the east and hence from the Mulia area by dispersing routes into Western Dani territory and ultimately the Grand Valley (Figures 3 and 446).
Within the Highlands and on the flanks of the central mountain core, physiographic barriers to trail and route networks were high elevation (cold temperature), steep relief, and/or rivers. These natural features were also constraints to the development of population centers. In the flat lowlands, the rivers were the arteries for travel and therefore trade, and often became the loci for habitation sites along their banks.

Although the flows of raw materials and manufactured goods were initially away from points of origin, once goods reached population centers, the flows became the sum effects of countless transfers of goods that took place in all directions. Local trade transactions occurred virtually everywhere. Redistribution within sociopolitical groups by rites of passage and other ceremonial exchanges fuelled continual circulation of valuables (Chapter V). Flows tended to funnel into population centers before moving outward again and the preponderance of goods in use at any given time in the Highlands was in the population centers. The majority of recipients and ultimate users of durable manufactured goods who were located two or more trading links away from a point of origin, rarely knew the point of origin or how the goods had gotten to them; they generally only knew their own source.

Trading activity, like accumulations of material objects, was nucleated within concentrations of population, rather than at stone goods or salt manufacturing centers per se. Where more people were concentrated, more trading transactions occurred. Although the incidence of economic trade transactions increased at times and places of large pig-killing ceremonies (rites of passage rituals and other sociopolitical ceremonials), it would be incorrect to classify these occasions as proto-markets. In addition to the ceremonial exchanges that were the business of the gatherings, dyadic trade transactions occurred both before and after the primary business of "exchange," but routine continual trading activity in the hamlets, which was not associated with special group events, accounted for the trade of more items.

Trade Goods

The simple classificatory lists that follow are meant to serve the ethnoarchaeological purpose of this analysis of the trade of stone goods by aggregating broadly.

Durables

Stone Goods. The following kinds of stone goods were traded in the Irian Jaya Highlands at the time of first-contact: axe blade blanks and finished axe blades, adze blade blanks and finished adze blades, manufactured display-exchange stones, knives, chisels, chert nodules, portable grindstones, and red ochres and pigments. For detailed discussions of the quarrying, manufacture, typologies, and uses of these kinds of stone goods, as well as of some natural stone objects that may have been traded, refer to Chapters IV-X.
Shells. At the time of first-contact, three kinds of sea shells were considered as valuables and used principally as money or ornaments across the Irian Jaya Highlands: primarily one species of cowrie shell (*Cypraea moneta*), the bailer shell (*Melo hueteri Perry*), and the nassa shell (*Nassarius sp.*) (Chapter IV). It was the cowrie that was used as currency and which, as a durable, probably had a stabilizing effect on trade when other valuables or perishables were in short supply. In addition to its use as money in the form of loose shells, the cowrie shells were used as valuables and sewn onto narrow fiber exchange bands (*jerak*, mid Grand Valley Dani dialect, Figure 262, Chapter VI). The relatively large bailer shell (Figures 77 and 78, Chapter IV) was cut into sections and used for necklaces. Gardner said that the bailer was "an object prized above almost all others by the Dani, who cut them into irregular saucers to wear as necklaces and exchange for pigs or other wealth" (Gardner and Heider 1969:5). The small nassa snail shells were sewn onto fiber string chest bibs and worn as ornaments, and, like the bailer shell necklaces (*mikak*), also used as valuables and presented sometimes at ceremonials as items of exchange (Figures 76 and 77, Chapter IV).

From his early work (1941 and 1942) with the Kapauku at Enarotali (Figures 1 and 3) and from an exploratory trip to the Moni in the extreme western part of the study area, Christian missionary explorer E. H. Mickelson said that "the cowrie shell has an important place in the economy of these mountain people" and that, when discovered, the "Kapauku were using cowrie shells as the medium of exchange" (1966:31-33). In a photograph, Mickelson (1966:299) demonstrated that the dorsal side of a Kapauku cowrie shell had been cut off and ground in the same fashion as all the cowrie shells in use that I observed during my research in the Highlands east of Enarotali (1982-1993). In Kafiuana rockshelter, located eastward, nearly the entire length of the central mountain cordillera of the island of New Guinea from Enarotali, not far from Kuk Yuku (Figure 5) in the Central Highlands of Papua New Guinea. White (1967:279-280, 297) found four "money" cowries that were some 9,000 years old, three with their dorsal sides also ground off, as they are today across the entire New Guinea Highlands. Pospisil (1956:206), doing his doctoral studies in the Enarotali area, stated that the Kapauku economy was a money economy and that cowries provided the standard currency. Pospisil (1956:207) found that the "old" Kapauku cowries differed according to shape and size and that there were six uniquely described cowries, each having their own value. Pospisil added that intertribal trade was made possible by the universal acceptance of cowries as currency (1956:226). [Author's note: However, their value varied from area to area.]

To the east of Enarotali within my study area, O'Brien (1969:42), working with the Western Dani in the Konda Valley (near Bokondini, Figures 3 and 446), noted that "Cowries form the basic Dani currency, either singly or sewn onto braided string bands, and they may also be worn as ornaments." Heider (1970:289), working southeast of O'Brien's area, at a location northeast of Wamena that is centrally located within the present study area (Figure 3), noted that the cowrie shells used by the Dani reached the Highlands in precontact times by an intricate trade network and although the Dani differentiated colors and
shapes of shells, they did not have an intricate system of classification like that used by the Kapauku, located 500 km to the west at Enarotali.

**Salt.** Sodium chloride salt was a luxury for the indigenous inhabitants of the Irian Jaya Highlands and was highly valued as a trade commodity. Processed salt was in the form of manufactured cakes (or balls) that hardened like rock salt, which when wrapped with banana leaves and tied tightly with strips of rattan could be stored as a durable for future use or trade (Figure 21). From interviews of older informants (60-80 years) throughout the central Highlands research area, at select possible points of origin on both the north and south coasts of Irian Jaya, and also from a literature search, I have concluded that no salt was traded up into the Highlands from the coastlines as were sea shells. Instead, the points of origin for the salt cakes or salt “balls” that were traded extensively in the Highlands were from manufacturing centers at brine pools as discussed in the previous section entitled Brine Pools (Salt). Chapter III (Figures 17-21).

**Red Ochre and Hematite.** Red pigment was a significant trade item in both the Grand Valley and West, and the Yali and East regions. Although an orange-red clay that was used for body-mudding throughout the research area was available in both regions, indigenous informants reported that the origin for the highly regarded red pigment that was used for sacred purposes was located within Yali territory (Graphic and Plastic Art, Chapter IV and Painted Display-Exchange Type Stones and Sacred Boards in the Yali and East Region. Chapter VII, Figure 379). Heider (1970:87) noted that the red pigment that was used in a sacred context throughout the entire Grand Valley came from the Yali. Although I have not precisely located the Yali point or points of origin for the "sacred red," I was told by indigenous inhabitants while near the Yali hamlet of Ninia in 1987, that the source was one-two days walking time from Ninia (Figure 447). Even though lacking more definitive evidence at this time, I utilize such a location for trade analyses.

Archaeological excavations in Papua New Guinea have shown that red pigment has been used in the greater New Guinea Highlands for more than 6,000 y. Level seven, which contained red pigment and red-stained grindstones at Kiowa rock shelter east of Mt. Hagen (Bulmer 1966:97-98, 108a), has been dated to older than 4,150±140 B.C. (Y-1370) (Bulmer 1966:108b). Red pigment has also been found to be present in level three at Yuku rock shelter, which yielded a radiocarbon date of 4,760±265 B.C. (GX-3111A) (Bulmer 1974:32) (Figure 5).
Non-Durables

Finished Products. The following list is not meant to be all-inclusive, but to highlight those items that my indigenous informants felt were significant to the continual flow of goods by trade mechanisms within their cultural systems at contact time. By quantity, fiber nets that were manufactured by different people, with different net-making skills and using different techniques for decoration, were the single most-traded non-durable, finished product (Chapter IV). Different styles of women's reed and fiber string skirts were traded locally between the women (Chapter IV). Hardwood arrowheads, sometimes bone tipped, were traded by men interregionally as well as penis gourds from local gourd arbors that were traded intraregionally.

Raw Materials. The trade of raw materials was a significant factor in the maintenance of life-style strategies of different sociopolitical groups. Forest products moved from areas of relatively sparse population (usually located in landscapes of rugged terrain) to areas of dense population where nearby forests had been largely exploited. In general, the people who controlled the forest sources for raw materials practiced extensive horticultural subsistence versus the prime user populations who practiced a more intensive form of horticulture and were relatively "pig wealthy." Raw materials that were traded from the forests included: special woods for spears and bow staves; bark and bark fibers for string; rattan; certain live birds (especially cassowaries); cassowary feathers and plumes; bird of paradise plumes and feathers; parrot, cockatoo, egret, and miscellaneous feathers; dead birds; bat wing bones and cassowary femurs; marsupial and rodent fur; seeds; orchid and palm fibers; and certain medicinal plants.

Pigs. Pigs are the primary wealth item in the Highlands of Irian Jaya (Animal Husbandry, Chapter IV). As Heider states (1970:48), "Pigs are basic to Dani culture." According to O'Brien (1969:47), "Anthropologists have suggested that the values centering around pigs and the roles played by pigs in Highlands culture are comparable to the cattle complex of East Africa." Domestic pigs are the nexus of Highlands subsistence, wealth, and life-styles and are a principal factor in trade and exchange. Details are found elsewhere in this document.

Value-Setting

If there was a common denominator for the value of stone goods across the research area at the time of first contact, it would have been pigs and cowrie shells. Since pig breeding constituted the primary way to generate wealth, it is understandable that pigs would not only be the most traded commodity in the Highlands, but also the item against which the value of all other material goods would be measured. Every
adult male who had been involved with trade and exchange could have related, by quick mental calculations, the value of his material goods to pigs and cowrie shells, relative to his particular area. As Pospisil (1956:214), in his study of the Kapauku people in the Kamu Valley near Enarotali (Figure 1), so succinctly stated:

All articles of trade have a customary price from which the actual price may differ due to the factors given. A moral value is attached to the customary price. It is regarded as a fair price and the man demanding it is considered honest. . . . The fluctuation of price because of temporary imbalance of the supply-demand level is rather infrequent. . . . The factor of kin and friendship ties between the parties tends to lower the price. . . . Competition between two sellers has a lowering effect on the price, and . . . a political leader often is given a commodity for a lower price than normal because the seller expects future favors from such a man.

During the course of my field research, I found no contradictions while among the people of either the Grand Valley and West or the Yali and East regions to any of the principles of pricing as stated by Pospisil.

While visiting the widely separated Yeineri, Tagime, and Langda stone goods manufacturing centers, I found that each toolmaker set the "customary price" which he anticipated receiving from a local trade or which he perceived he might receive by an ultimate trade to a user who was living at a distant location. At the stone goods factories, it was explained to me that it was only the expert quarryman-toolmaker who understood the details of the quality of the rock and the workmanship done on a stone at that point in the process when the stone was to be first traded. During the course of my research, I found, in general terms, little discrepancy in the "customary prices" quoted to me by elder quarrymen (55-75 years) at the stone factories and "customary prices" quoted to me by elder users (55-75 years) at diverse locations and different distances from quarry sites. In all cases, I asked my informants to tell me the value of different kinds of stone goods when traditional trade was still a routine part of each informant's life. It was never difficult to get a consensus among informants at either factory or use sites regarding the value of large axe and adze blades and display-exchange stones, but it seemed that in practice small adze blades, knives, and chisels traded for so many different kinds of objects that a consensus of value relative to pigs or cowrie shells could never be reached.

As a reasonable value throughout the Grand Valley and West region, whether at the Tagime or Yeineri manufacturing center or a considerable distance away in user areas, one "good quality" large axe blade generally equated in value with one large pig. Both manufacturers and users also placed a customary value for a "good quality" je display-exchange stone as one large pig. Within the range of subjective variances of "long" cowrie shell bands (approximately 5.0 m to 7.5 m), "good quality" bailer shell neck pieces, and "large" nassa shell chest bibs, these objects also individually equated in value to one "large" pig. To esoteric traders there were, of course, significant variances in the absolute value of both medium
and large size pigs that were based on absolute size, the general health of a pig, an old versus a young pig, male or female, and if the pig was pregnant.

Perhaps the most meaningful relationship of stone goods and other valuables to the value of cowrie shells relative to pigs, comes from Archbold. When he first entered the Grand Valley in 1938, Archbold found that he could purchase 10 kg of sweet potatoes for one "average" cowrie shell, and "6-10 good ones would purchase an ordinary pig" (Archbold et al. 1942:253).

In the Yali and East region, the indigenous inhabitants similarly equated the value of a quality, large Langda-Sela Style adze blade (approximately 24-28 cm long) and a quality sie (or siengga) display-exchange stone to one "big" pig.

Movement of Goods

Trading patterns in the Highlands were complex. To analyze the movements of stone objects within overall patterns that accounted for the distribution of stone goods as they might be found in the archaeological record, summary statements from indigenous inhabitants and modern researchers at 14 scattered control points of information are presented. Perspectives from the manufacturers of stone goods at points of origin and from traders and users scattered throughout the area are included. The data are presented from control points from west to east across the Highlands area. Figures 446 and 477 serve as map references.

Enarotali Area

In the Enarotali area, Pospisil (1956:222-223) reported that intra-regional trade between different sociopolitical groups consisted of net bags decorated with boar tusks and orchid fiber wrappings and pigs from the Kamu Valley traded in exchange for "charm stones," bright colored feathers, cassowary feathers and femurs, bundles of inner bark for string manufacture, resin, and carcasses of marsupials and rats from other areas. For those areas that did not have desirable local products, the only intensive trade with the Kamu Valley was the transfer of pigs.

Regarding inter-tribal trade, Pospisil (1956:224-225) reported that the Kamu Valley near Enarotali is a segment in a chain of trade which starts in the Uta-Mimika-Kokenau coastal area to the south and ends some place in the interior of the mountainous valleys northeast of Kapauku territory. According to Pospisil (1956:224-225):

The inter-tribal trade can be compared to a chain reaction. It starts at the coast and follows the road north and east. It involves many regions and tribes whose traders exchange commodities, carry them a relatively short distance, then trade them with their colleagues from the north, receiving goods which thus go in the reverse direction. . . . Shells move along the
trade route by pulsation of the chain reaction from the coast to the interior. From the interior comes red ochre, palm wood, and stone axes and knives. The stone tools are said to be produced in "Kajaa country," located some place near the Baliem Valley.

Ilaga

Although Larson (1987:17-18) made few comments about trade, he did point out that the main trade route (on which Ilaga was located) which connected the Grand Valley with the south coast via the Enarotali area, went through the southern half of the "Dani tribe." Large bailer shells, small nassa shells, and salt were traded from the west into the "North Baliem" [Author's note: west of the Grand Valley] in exchange for Dani pigs and cowries. The salt cakes were made at the Homeyo salt springs, located not far from Ilaga. Larson (1987:18) stated that, "Western Dani parties . . . worked their way west on the same trails carrying small pigs and highly valued cowrie shells traded from further east, and even herding large pigs over the trail, some as far as Ilaga; others on to one of the Moni salt springs farther west."

Mulia

At contact time, the Mulia area was an important locus for trade in the western Irian Jaya Highlands. It was located along the same east-west trade artery as Ilaga and due south of the Yeineri stone goods manufacturing center. Mulia was the southern connection of dispersal of stone goods coming out of Yeineri and moving onward via kinship linkages, eastward into the North Baliem region to trade for pigs and westward toward Enarotali to trade for shells. The Mulia area possessed sandstone grindstones and, in a sense, was a grinding center for biface blanks that were traded from the Yeineri quarries and ground in the Mulia area before being traded onward to users into both the east and west. Informants at both the Yeineri manufacturing center and within the Mulia area stated there was a brisk movement from Yeineri to the Mulia area of both ground finished blades and flaked but not ground, biface adze and axe blade blanks, as well as je-type flat display-exchange stones, knives and chisels. Some men in the Mulia area who were known as "grinders," said that occasionally they would travel to Yeineri not to trade for finished blades or flaked bifaces but to quarry their own biface blanks. During that time, they reported trading pigs, cowrie shells, and salt to the Wano for stone goods. They considered most of the stone goods to be in-transit to Western Dani and Dani user populations to the east and to Damal, Moni, and Kapauku to the west. In this instance, the Mulia area grinder-traders could be considered true middlemen in the in-transit flow of stone goods.
Yeineri Stone Goods Manufacturing Center

At Yeineri, the Wano quarrymen-toolmakers stated that they often traded both finished, ground stone axe and adze blades, knives, chisels, and flat je-type display-exchange stones, as well as larger numbers of not-ground, flaked biface axe and adze blades outward in all directions except due west into sparsely settled Wano territory. Stone goods, they said, moved southward into the Mulia area, eastward toward the Bokondini area, and occasionally to the lowlands to the north in the Dabra area. Yeineri quarrymen-toolmakers traded primarily for pigs and cowries to the south and east. When they wanted salt, they reportedly made combined trading missions and salt-making journeys to the Homcyo salt pool, not far from Ilaga, rather than trade their stone goods to residents of the Mulia-Ilaga area for salt. Although on rare occasions Mulia area people came to the Yeineri area to quarry their own stone, the Yeineri Wano disagreed with Hayward’s (1992:16) comment that, "... parties of Dani men from Mulia regularly travelled to the area to quarry stone axe blades."

In all Highlands cases (trade to the south, east, or west), the quarrymen-toolmakers said that trade was initiated from time-to-time by traders at either end of a particular kinship (or trading friend) linkage. Rarely did quarrymen-toolmakers set out to travel past the first two links of a trading network, but most quarrymen specialists had been on one-to-three such missions during their lifetimes. The presence of enemies was the primary reason given for the restricted movement of traders into other territories, not language boundaries or geographic distance.

Konda Valley-Bokondini Area

O’Brien (1969:43-46), working in the Konda Valley west of Bokondini, stated that:

The stones used for tools and for jao (exchange stones) have a single center of origin, a quarry located on the Kembe River [Author’s note: Yeineri quarries] approximately 50 miles west of Karubaga. No Dani in the Konda Valley has visited the quarry site. ... The Konda Valley Dani receive stone blanks as well as finished celts and jao stones from people living closer to the Kembe Quarry in valleys to the west and northwest to whom they trade pigs and cowrie shells.

O’Brien (1969:44) further stated, relative probably to tool stones moving to the south to the Mulia area that, "The rocks are roughly shaped by men living at the quarry but the final grinding, polishing, and shaping into artifacts is usually done by Dani living in valleys south of the quarry who import stones from the Kembe Valley." O’Brien (1969:44-46) pointed out that via a trade network, stone goods were traded to the Konda Valley for pigs and cowries; pigs and stone goods were traded onward from the Konda Valley to Bokondini for cowries; pigs, shells, and stone goods were traded via linkages to the Grand Valley for cowries; and the Konda Valley Dani received bailer, nassa shells, some cowries, and salt from an Ilaga source for pigs and cowries. The Konda Dani regarded Ilaga as the western terminus of their trade routes.
and were unaware of the network stretching on through the Enarotali area, to the ultimate source of sea shells. Even Konda myths failed to reveal knowledge of the ocean.

Since Tagime stone goods were known to be present on all sides of the Konda Valley (Karubaga, compounds to the north, Bokondini, and Kelila), I presume that they were also used by the Konda Valley Western Dani, even though it was not mentioned by O'Brien (1969) (Figure 24).

Tagime Quarries

From the Tagime manufacturing center, stone goods were distributed by trade directly into densely populated user populations of Western Dani in the greater Karubaga-Bokondini area to the north and northwest, and southeastward to the Dani in the Grand Valley. Axe blades, large adze blades, and je flake-type display-exchange stones were traded for pigs and other items of wealth including bailer shell necklaces (mikak), nassa shell bibs (walima), cowrie shell exchange bands (jerak), and head-back nets (nogen). Small adze blades, knives, and chisels traded for an assortment of lesser valued items. Quarrymen informants in both 1989 and 1992 stated that most of the stone goods traded outward from the manufacturing center via trade linkages were to users who were often separated from the quarrying center by warring factions. The quarrymen-toolmakers said rarely did any of them leave Tagime territory to trade their goods because they were surrounded by enemies. Much of their trade was custom ordered by people who sent in messages through nearby enemy territories for what they wanted produced. These messages were sent through families from hamlet to hamlet until the last member of a trade linkage would get the order to Tagime. Finished products moved outward along the trading linkages to buyers who received their products and sent back payments to the toolmakers. Ownership of an artifact did not transfer to a buyer until the toolmaker had received payment. Informants at the manufacturing center said there rarely was much bargaining, and usually both parties to a transaction were satisfied with a trade. It was said not to be unusual for live pigs to be moved through enemy territory in order to make a payment.

During times of peace, the quarrymen could recall when men came directly to the quarrying center from habitation compounds and hamlets such as Wolo, Muliana, Magi, Pyramid, Kelila, Bokondini, and Karubaga to order tools and make trades. Headmen Weak at Mebagaima and Silimeke at Pokhe on Sekan Ridge told me that when representing their people they both sent orders via kinship linkages to Tagime. They also said that most of the men in the Sekan Ridge area (along the east margin of the Grand Valley, southeast of Aikima, Figure 6) had never been to Tagime but all of them had tools from Tagime quarries and knew with certainty the difference between Tagime and Yeineri-sourced blades.
Wamena-Grand Valley

At Hupainma, north of Sekan Ridge (Figure 6), Wali recalled that he often initiated trades for his constituents through linkages with Tagime, but during the period of incessant ritual and revenge warfare up into the mid and late 1960s single traders could never, without the assistance of trading networks, consummate trading transactions with Tagime toolmakers. He concurred that large axe blades and "good" *je* stones usually traded for a "big pig."

Yeineri stone goods traded from their point of origin into the Grand Valley by short-distance trading mechanisms via kinship linkages along two primary routes: 1) the northern route from Yeineri to the Karubaga area into the Bokondini area and hence south and southeastward into the Grand Valley and 2) by a southern route from Yeineri to Mulia and hence east and southeastward via the Tiom area into the Grand Valley (Figures 446 and 447). North-south trade from numerous points along these two east-west trending lines of direction supplied all inhabitants from Yeineri eastward into the Grand Valley with Yeineri-sourced stone goods.

As discussed in the previous section, Tagime stone goods often moved in response to buyers' requests to many parts of the Grand Valley (Figure 6). Once in the Grand Valley, both Tagime and Yeineri products recirculated locally while more of those same products continued to accumulate. I saw mixes of the two tool types and of display-exchange stones that originated at both Tagime and Yeineri in habitation sites all the way from the Baliem Gorge at the south end of the Grand Valley to Pyramid and Belokme located at the north end of the Grand Valley (Figure 6). Even the Tagime toolmakers owned Yeineri-sourced blades, in addition to their own Tagime adze and axe blades, knives, and chisels.

The two most valuable trade commodities that were produced within the Grand Valley were pigs and salt. At the root of successful pig production, relative to other less-densely settled areas within more rugged terrain, was the abundance of sweet potatoes which the horticulturists fed their pigs. Indigenous informants, who lived great distances both east and west of the Grand Valley and who had never been there, said that to many people the Grand Valley was a place of almost mythical proportions for its abundance of pigs. Pigs circulated within the Grand Valley as both valuable trade and exchange items and also were exported as items of trade to people outside of the Grand Valley. It was because of the Grand Valley production of salt and pigs, primarily pigs, that it became the center for the largest accumulation of durable valuables in the entire study area.

Within the Grand Valley, all members of the Guteulu Alliance, especially those people who lived within the Guteulu Dloko-Mabel Confederacy, enjoyed a trade advantage because the source for salt from the Ileukaima salt pool was located in the hills east of Jiwika (Figures 6 and 447). The area around the Ileukaima salt pool was a manufacturing center for producing durable salt cakes [see Brine Pools (Salt),
Chapter III]. Two other known brine pools in the Grand Valley were of little consequence as producers of salt for trade purposes because of their small size.

From his work among the Mugogo sociopolitical group between Wamena and the Baliem River and with the Siep-Gosi and Itlai-Hadlu groups north of Wamena and the Baliem River (Figures 6 and 447), Peters (1975:1, 70-74) made important observations regarding the movement of material goods. He stated that pigs, shell strings (jerak), long flat stones (je), nets (su), cowrie shells (jettekegen), bailer shells (mikak), and nassa shells (walimoegen) traded among the Dani within the Grand Valley and that pigs, salt, and tobacco were traded by the Mugugo southward and then to the west inter-regionally for stone axes ("probably from a stone pit near Mulia"), salt cakes, nassa shells, orchid-fibers, nets, and cassowary feathers. Peters (1975:72-73) further stated that the Mugugo, the Siep-Gosi, and the Itlai-Hadlu had trade relationships with the Yali to the east and primarily traded pigs and tobacco to the Yali:

For bows of dark coloured wood; very fine nets and cords for women's skirts; little bamboo knives; cassowary feathers; feathers from the bird of paradise; heisan, a kind of tree fiber from which the Dani make dibat; gamy, corky wood which is used for magical purposes; sago; and hedaly, a type of resin. Also used for magical purposes.

Heider (1970:27-28) pointed out that the flanking forests of the Grand Valley had been regularly searched and hunted for many years and were no longer productive for the large population, consequently, raw materials of the forest were mainly imported from Yali territory. These imports included: fibers from bushes: a thick bark cloth; bamboo (especially for knives and containers); a laurel (Lauracea actinodaphne) for light-colored fighting spears; feathers from cassowary birds; birds-of-paradise, cockatoos, parrots, and others; femurs from cassowary birds that are used for knives to split the red Pandanus fruit; and red mineral pigments. In addition to forest products, Heider (1970:29) concluded that cowrie and nassa shells were imported into the Grand Valley from the Yali, as well as "it being conceivable" that at least some bailer shells also entered the Grand Valley from the Yali. Yali-made fine nets and elaborately barbed and decorated arrow points were also imported from the Yali.

Since there was significantly less continuous warfare between Dani and Yali factions than between groups on either side of the Dani-Yali language border, and because people on both sides of this language boundary desired goods the other had to offer, it is understandable that brisk, continuous trade existed between the two language groups.

**Boundary between Grand Valley and West Region and Yali and East Region**

Although most kinds of material objects moved by trade mechanisms across all language boundaries in the Highlands study area, certain kinds of finished stone goods (and a few other objects) circulated only in clearly defined areas and did not trade in large numbers across the Grand Valley and West and the Yali
and East regional boundary. Relative to this boundary, Yeineri and Tagime Style and Flat Style axe and adze blades, knives, and chisels required for utilitarian purposes were used only in the Grand Valley and West region. As commodity counterparts and relative to the same Highlands' boundary, Langda-Sela Style adzes and knives traded and were used as utilitarian tools only in the Yali and East region (Figure 446), although some traded southward from the Una and Kimyal down the Brazza River drainage into the Asmat. From both archaeological and ethnogenesis perspectives, the cultural behavior associated with this boundary has important implications. Indigenous elderly informants (55-70 years) living on both sides of the boundary present insights helpful to these perspectives.

**Dugum Dani Neighborhood and Gutelu Salt Pool.** At Hupainma, Wali Wilil and other elders stated there had always been considerable trade between Dani of the Dugum Dani neighborhood and Yali in the Pass Valley, Landikma, and Apalapsali areas. This trade was along a kinship network of Wilils that extended from the Grand Valley to Apalapsali (Figures 6 and 447). As "big man," Wali said that he initiated most of the trades for the Dugum Dani and during his lifetime he had gone on several trading missions, visiting and staying with relatives as far away as Apalapsali. While visiting the Pass Valley area, I confirmed there were people with the name Wilil living in the northern Yali territory.

Wali and other Dugum Dani elders concurred that the Dani traded pigs, salt (from Gutelu-controlled Ileukaima salt pool), and tobacco to the Yali for string nets, rattan, bamboo, gami (special medicinal and magical bark), red mineral pigment, bird-of-paradise and cassowary bird feathers, cassowary leg bones, wood (probably laurel) for long spears, both hardwood and bamboo arrow tips, and cowrie shells. On the few trips he made, Wali said that because the trail was difficult, his party took only small pigs, never large pigs, because the men had to carry the pigs in head-back nets. Often, women made these trading trips with the men, but only the younger women went, the older women were considered too weak to travel such a long and arduous distance. The women did not carry pigs, but were responsible to carry food for the journey and to prepare it.

Wali said he never initiated trades to the Yali with Dani stone goods because he did not want to give up his je display-exchange stones or puluen and the Yali would take pigs and salt in trade instead. As far as he knew, the Yali did not want Dani axe or adze blades, but they liked je and puluen for exchange or religious stones. Likewise, Wali and other Dani men never used Yali-sourced stone tools. When asked about this, Wali, after much thought and discussion with several advisors, replied that Yali adze blades were more difficult to haft than Dani blades. Since this is mechanically not true (possibly the converse), I concluded that it was probably a case of having ancestors who never used Yali stone tools. In response to the same question, other Dani and Western Dani scattered throughout the Grand Valley and West region replied that either they just continued to use the tools that they had inherited because they liked them or that they did not know about the Yali kind of tools.
Wali and other Dugum Dani said Yali men would come to their area when they wanted salt but the only ones who came to trade had relatives here. According to Wali, traders on either side of the boundary always had relatives or trading friends with whom they could stay.

Daoke Mabel (oldest son of deceased Gutelu Mabel) told me that his father initiated many trades with the Yali, for the same kinds of raw materials and manufactured goods for which Wali and other Dani traded. Gutelu often traded both pigs and salt to the Yali, and on rare occasions, he was known to have traded je-type display-exchange stones. When asked, Daoke did not know why his father in particular and Dani in general did not use Yali-sourced stone tools, or perhaps he was not inclined to share this information with me.

Pugima and Kurima. In a similar fashion, I found that the older informants in the Pugima and Kurima areas I spoke with had enjoyed trade relations with Yali as did the Dugum Dani and the Gutelu Mabels (Figure 447), but these older residents (55-65 years) also did not have an answer as to why Dani did not use Yali adze blades or knives. Some people replied that they guessed they only used Dani-type tools because that is the way it had always been.

Pass Valley. At Pass Valley there was a mix of Yeineri, Tagime, and Langda-Sela types of tools, as well as Yeineri and Tagime-sourced je-type display-exchange stones and puluen (Figure 447). Stone goods flowed into the area via different trade networks ending at a physiographical regional funnelling of communication routes between the Highlands on the south and the lowlands to the northeast. Trade kinship linkages were identified that extended to the northwest, west, and southwest to Walak and Dani territories and to the east and southeast farther into Yali territory (Figures 188 and 447). Determining whether this is an area with vigorous trade caused by physiographic circumstance in conjunction with being located along a dividing line of regions with great product contrast is problematic without additional research. Farther east, at Apalapsali, only Langda-Sela type stone goods were used.

Angguruk Area. The flow of Langda-Sela Style adze blades and knives was from their points of origin at Langda and Sela into the central part of Yali territory in the Angguruk area primarily along two connecting sets of trade networks (Figure 447). Stone goods moved from the manufacturing centers via kinship linkages into the Korupun area and from the Korupun area along other trading linkages to the Angguruk area. Petrus Sama and seven other elderly informants (55-70 years) at Angguruk and nearby Pasikni, stated that many people in the Angguruk territory had kinship roots in the Korupun area. Their trade for Langda-Sela type adzes and knives and for cowrie shells was primarily along kinship linkages to Korupun, some by-passing Nisikni and others passing through Nisikni. The Angguruk Yali traded pigs primarily, less often Dani-sourced salt, and sometimes Dani-sourced je-type flat display-exchange stones (sie in Yali language). These items were traded eastward for the Langda-Sela Style adze blades, knives and cowrie shells.
Two Yali men at Pasikni told me that they thought cowrie shells were some kind of a nut that came from a tree. They did not know that their cowrie shells, obtained from the Korupun area, or their nassa and bailer shells, traded from the Dani at Kurima, were products of an ocean, about which they knew nothing.

The elderly informants of the Angguruk-Prongkoli-Pasikni area stated that on occasions during their lifetimes, they had travelled to the Korupun area and stayed with relatives while they were on missions farther south at lower elevations into the Seng to gather rattan for skirting material. They said that most trading of Langda-Sela style adze blades and knives into their area was initiated from the Korupun end of the trading linkage.

In the Angguruk-Prongkoli-Panggema triangle, Langda-Sela adze blades and knives traded from Angguruk, via relatives, to Panggema for pigs and Dani salt, which the Panggema men reportedly traded in addition to nassa shells, bailer shells, and Dani display-exchange stones from Pugima. Angguruk also traded Langda-Sela originated tools eastward to Kosarek for specialty forest products and nets which they moved along in trade to the Dani at Kurima. During at least one long period of time there was reportedly no trading activity because of war between the people of Angguruk and Prongkoli, although Panggema and Prongkoli continued to trade. Angguruk, Prongkoli, and Panggema all had trade relations with the Dani with whom they exchanged forest products for pigs, "Gutelu salt," shells, and je-type Dani display-exchange stones and puluen, which they called sie.

Although Koch’s (1967:115-116, 125) research in the Angguruk area was entitled Conflict and Its Management Among the Jale People of West New Guinea, Koch made several important statements in his dissertation relative to the movement of goods and trade among the Yali:

Polished, flat, oblongated stones, known as sie and traded from Hövolama [Author’s note: Dani], have no utilitarian use but rather represent valuables chiefly transferred as marriage and death considerations. . . . Unlike in other parts of New Guinea, trade in Jalémó [Author’s note: Yali territory] is not a commercial enterprise pursued to gain wealth. While most intra-regional trade follows lines of kinship, trading partnerships connecting two persons of different, especially distant regions, are usually based on friendship ties created by a mutual interest in exchanging goods. Trade relationships are often perpetuated by the children of original partners. The use of kinship terms between family members of trading partners is indicative of the permanency of these arrangements.

Langda and Sela Manufacturing Centers. Diman Balyo and the other head quarrymen at quarry-factories within the Langda manufacturing center, said that in addition to direct trade of their stone goods to people at nearby habitation sites who did not have quarrying operations of their own (Figure 413 and Quarry Boundaries, Chapter X), they also traded by kinship linkages and “trading friends” to Bime, Tanime, Eipomek, Nalca, and Bomela and by kinship linkages past Bomela into the Sela-Nalca-Korupun-Dekai trading networks. These quarrymen knew that their stone goods were sometimes traded outward
from the ends of these networks, but they had no knowledge of details. The informants agreed that usually trades were initiated by people who wanted the tools and came directly to the manufacturing center but also trades were initiated through their trading networks by people at more remote locations. In exchange for their stone goods, the quarrymen-toolmakers said they usually received pigs, shells, fine nets, and arrows. On rare occasions women were traded. In such instances, they stated it took five or six "good" stone axes plus an undefined number of nets and arrows to trade for one woman. Such trading was distinct from presentation of bride-wealth at times of marriages.

The Langda area manufacturing center trade network connected into trade networks that were channelled down the Brazza River to the Dekai area and on southward into the northern Asmat of the lowlands (Figure 447). Langda-Sela Style adze blades have been identified at Dekai as well as at other points farther south along the Brazza River by my colleagues. I suspect, but have not confirmed, that some sea shell exotics which I observed in the Langda and Sela areas were traded up the Brazza River, along with cowrie shells from the south.

Conclusions

At first-contact the study area was covered by a network of trade routes which extended from coast to coast. This network consisted of a web of overlapping personal trading connections, each of which were created by individual men of patrilineage membership and occasionally extended to non-related trading friends. Each personal network was an open system. Within the overall pattern of the flow of goods, individual items were traded beyond the limits of activity of individual traders. Ceremonial exchange was restricted to sociopolitical units within language groups. Trade, combined with ceremonial exchange that took place within defined sociopolitical systems, accounted for the distribution and redistribution of material goods in the Irian Jaya Highlands. Ritual exchanges building up to and including the great 4-5 year climax of the ebe akho ceremonial cycle, utilized like goods (Chapter VI), whereas trade utilized unlike goods. Social linkages (kinship and trading friends) which comprised the trading networks and the flow of goods that moved through them extended across physiographic, ecological, sociopolitical, and language boundaries. When certain kinds of material goods, such as the Langda-Sela-sourced stone tools of the Yali and East region and the Tagime and Yeineri-sourced stone tools of the Grand Valley and West region stopped moving at the regional boundary, it was not because one type of tool or entire tool kit was technologically superior, but for the reason which I call "cultural habit." Distance from points of origin, physiographic obstacles, or language boundaries did not directly determine the boundary which distinctly separated the two stone tool use regions. Trade networks were in-place across the same boundary line, and other stone commodities (je-type display-exchange stones and puluen from the Grand Valley and West to
the Yali and East) and numerous other kinds of items readily traded across the boundary. Indigenous inhabitants who lived on each side of the boundary stressed that they liked the tools their ancestors had used and were comfortable with the stone tool technology which they had inherited. Since there is a significant difference in the structure of the Langda-Sela adze blades and the Tagime and Yeineri axe and adze blades (Chapter V), the choice becomes more understandable to the outsider. The relative value of the large Langda-Sela adze blade and the Tagime and Yeineri axe blades was apparently about equal to all the users.

Within the two stone tool use regions and outward from points of origin, regardless of distance to the Grand Valley and West and the Yali and East regional boundary, the distribution of tools related to the distribution of population, rather than to distance from manufacturing centers. In the Grand Valley and West region, almost all of the axe and adze blades that left the Yeineri manufacturing center as finished-flaked but not-ground tools were ground and polished before they reached the Grand Valley.

The distribution of accumulated wealth of pigs and other durable artifacts related directly to the geographic distribution of horticultural production rather than to the location of different kinds of raw materials. The relatively productive Ileukaima salt pool near Jiwika enhanced the opportunity of the people in that area, along with their successful sweet potato production, to accumulate greater wealth than people living in any other locale within the study area.

At each of the stone goods manufacturing centers in the Highlands study area, it was the quarrymen-toolmakers who set a "customary" value on each stone product before it left the factory area and it was this value which traders in the trading linkage would use to bargain with as stone objects travelled along the way to ultimate buyers.
CHAPTER XII
SUMMARY AND CONCLUSIONS

Through an ethnoarchaeological approach, all cultural artifacts were described and visually documented; their manufacture, uses, and associated behavior discussed (and illustrated); and their systemic importance analyzed. The data were formatted and presented not only to follow an ethnoarchaeological theme, but also so that the data would be amenable to both use and scrutiny from any future ethnogenesis perspective. A highly visual (photographs, pen and ink drawings, and graphics) presentation was used to facilitate object identification and to provide any researcher with the kind of detail that is desirable for comparative studies and theoretical manipulation.

A focal point of the research was the documentation and analysis of the complete cycle of quarrying, manufacture, trade, and uses of stone tools, and profane symbolic stones and from the profane stones the creation and uses of sacred symbolic stones and sacred stone tools within the cultural systemic framework of the 18 nonliterate, adjacent-living, different language groups in the study area. The transformation from the profane to the sacred was explicitly explained and visually shown. Field work was done before acculturation obliterated the Stone Age aspects of the user populations.

A multidisciplinary approach was used: archaeology, cultural and visual anthropology, general geology, stratigraphy, mineralogy, petrography, botany, and medicine. The project could not have been completed in the fashion it was without applied expertise from these fields. I conclude that at the level of expertise and the complexity of data available today in numerous pertinent natural science and anthropological fields, that studies such as this one can be most advantageously conducted with the commitment of a multidisciplinary effort.

Specific questions that confound archaeologists every day relative to stone goods were addressed in the dissertation (Chapters VIII–XI). What stimulates production? Who owns the quarries and has the right to quarry stones? How are tool and symbolic stones shaped and for what purposes? How long does it take to make a particular tool? Who establishes the value of different kinds of finished tools? How do processed stone tools get from the quarries to users? What kinds of trade mechanisms are at work? Do stone trade networks function across language, political, and religious boundaries? Within production and user systems, are there any predictable relationships between tool blades and symbolic stones? Are there circumstances when tool blades and/or symbolic stones are valid geographic markers of cultural systems?

In a better effort to understand and define the evolutionary technological and cognitive stage of the Highlander contemporary Stone Age inhabitants, their prehistory had to be examined (Chapter II). To look at the prehistory of the island of New Guinea, I went to the archaeological record in Papua New Guinea, for that is where all the archaeological work has been done. In Irian Jaya, there is only one rock shelter
surface site that has been dated, with charcoal at 5,000 ya on the north flanks of the Carstenz Mountains (Jaya Crest, Figure 3) (Hope 1977). From archaeological evidence in Papua New Guinea, it seems likely that, upon first arrival there ca. 40,000 ya, humankind had begun to manipulate the surroundings prior to evolving through the stages of nurturing, to replanting, to intensive horticultural activity, with an accompanying evolution of a flaked blade Paleolithic type tool to a "Neolithic" tradition with finely ground and polished blades. In one profile at Kosipe (Figure 5), at what has been interpreted as a seasonal hunting camp dated between 16,000 ya and 9,000 ya, a polished adze/axe blade was found in the upper soil but no polished blades in the lower soil (White et al. 1970:63). In the most recent layer of early occupation at Yuku (Figure 5), the first flakes of polished adze/axe blades were present in a layer over 10,000 years old. It would appear that the less efficient tools were replaced with functionally improved implements to meet the technological challenges of change from a primarily hunter-gatherer subsistence to horticultural and animal husbandry. The stage was set for a rapid phase of cultural evolution in the Highlands, when humans would express themselves as engineers, builders, and horticulturists, who practiced pig husbandry. Humans would ultimately lace the entire New Guinea Highlands with suspension bridges, fences, well constructed buildings in compounds and open clusters, irrigation ditches, and tuber gardens that would become highly productive.

By the times of first contact within different parts of the Irian Jaya study area (1905-1960s), the Highlanders had been through a technological change from primarily flaked stone tools to ground stone tools but had not yet been introduced to metal tools. Due to the remoteness and rugged topography of the area, protected from New Guinea coastal traffic by broad aprons of near-impassable swamplands, the indigenous inhabitants' way of life, which had disappeared from Europe and most of Asia thousands of years ago and from Africa centuries ago, remained nearly intact.

The early prehistoric humans could have entered the study area in the Central Highlands of Irian Jaya from any or all four of the cardinal directions: from the west, from both the north and south coasts of the present-day configuration of the island of New Guinea, or from the east, working their way through the central mountain core, all the way from the earliest dated habitation sites at the east end of the island. Some of these routes of early migration, arduous as they were, later became trade routes between the Highlands and the north and south coasts.

The natural environment of the Highlands inhabitants consists of a large segment of the 150 km-wide central mountain chain that extends the length of the island of New Guinea as a band of jumbled peaks and valleys that rise abruptly from near-sea-level elevations to peak crests that often exceed 4,000 m and locally exceed 5,000 m in the study area (Figure 1). Rock strata that are often severely folded, faulted and crumpled are of diverse ages and lithologies (Chapter III). This composite of diverse stratigraphy and complex tectonics comprises the geologic terrain on which the indigenous people lived. From the rock
outcrops and boulder erratics, the people located and identified those kinds of rocks that were best suited for their tools and symbolic stones. Within the terrain of mostly steep hillsides and narrow valleys, the people changed from hunting and gathering to a predominantly sedentary horticultural and animal husbandry method of subsistence.

Surrounded by a melange of small "islands" of people practicing horticulture in rugged terrain, the centrally located Grand Valley (approximately 315 km²) became a wealthy population center due to the peoples' ability to raise large crops of sweet potatoes and hence healthy herds of pigs on the flat valley floor. Here, the people practiced intensive horticulture versus a more extensive form of horticulture on steep valley hillsides throughout most of the study area. The Grand Valley is an oblate-shaped flood plain at an elevation of 1,600 m above sea level, with surrounding mountains rising to heights of 2,500-3,000 m. while farther mountains rise to heights of 4,000 m and more. The people in the Highlands live at elevations which range from approximately 900 m above sea level to an upper limit of approximately 2,900 m. above which temperatures are too cold for the near-naked inhabitants. The absolute temperature range at Wamena in the Grand Valley is between 6°C (42°F) and 29.5°C (85°F), with a mean daily range from 14°C at 6:00 a.m. to 24°C at noon. Floods are not uncommon in the steep-walled canyons of the Central Highlands, and from time to time sweet potato gardens in parts of the Grand Valley are flooded by high water from the Bariem River.

Salt was precious to the Irian Jaya Highlanders; its consumption was a luxury and it was used as a significant trade item. It was not traded up to the Highlands from coastal areas but was produced internally from natural brine pools. Within the study area, there were two major supply points plus three smaller brine pools which satisfied the hunger for salt locally for the closest habitation sites plus a few travellers when they passed by. In the Grand Valley near Jiwika, the Ileukaima brine pool was a major source of salt for not only most of the Dani in the Grand Valley but also as a valuable interregional trade item. Much farther west, near Ilaga in the western part of the study area, another major brine pool furnished salt via trade linkages all the way eastward to the Dani in the Swart Valley region (west of the Grand Valley) and as far to the west as the Enarotali area at Paniai Lake. Control of the Ileukaima brine pool in the Grand Valley was an important factor of economic life.

Understanding the cultural landscape of the indigenous inhabitants and a full appreciation of the importance of sacred symbolic stones and empowered sacred stone tools is a prerequisite to a full understanding of the "systemic" nature of the inhabitants' cultural systems (Chapter III). The indigenous inhabitants lived in a cosmos that consisted of living and non-living entities in both a seen and an unseen world with which they were interfacing routinely and constantly. Regarding the cultural landscape, which was the environment in which the indigenous inhabitants adapted, the difficulty for outsiders has been identifying and understanding the hierophanies (things wholly different from the profane that manifest
themselves to be sacred) within a complex environment of seen and unseen entities. The plants, animals, rocks, and other natural entities (other than human beings) in the landscape of the Highlands of Irian Jaya were not thought to be conscious and willful in themselves, but were the hosts for spirits that were and, in addition, any of them and their source areas might have been imbued with supernatural power which made them sacred and worthy of respect.

Through their own world view, the inhabitants of the Highlands have accounted for the origin of the physical world around them as well as all life, both seen and unseen therein. The narrations that relate the totality of creation, as passed on by different storytellers throughout the Highlands, have commonality of substance, but often have singular differences. According to Highlands world view, the original ancestors of all people emerged from caves, crevices, or holes in the ground, followed by all life forms, thus it is understandable that all caves are considered sacred places and are not to be entered by the uninitiated. All that is within the cosmos of the inhabitants of the Highlands was believed by them to have been created within the short time span of 3-12 generations.

The Highlanders' world consisted of the seen and the unseen. Humans, animals (in the broad sense of the term), plants, the sun, moon, stars and planets were "the seen" and had personality. Other phenomena, like rainbows, clouds, and fog were also part of the seen world but did not necessarily possess personality. Souls, ghosts, spirits, and other powerful beings of the spirit world were "the unseen." Ghosts and spirits were both ancestral and nonancestral. Ancestral ghosts and spirits were derived from the souls of human beings. At death, the soul matter (akotakun) transformed into a ghost which departed the body to roam about and was greatly feared by the living. After an only esoterically understood period of time, certain ghosts went through a metamorphosis and became ancestral spirits. From among the hierarchy of spirits, certain male spirits (especially those from deceased humans who were men of influence, leaders, or admired warriors during their lifetimes) were selected by core religious groups of men to be installed, by sacred sacrificial rituals, into profane stones (or rarely into other kinds of objects), which objects were thereby transformed to the sacred and were henceforth maintained and propitiated by periodic rituals as supernaturally powerful personified ancestor spirit entities. In cultural intercourse the Highlanders did not separate the seen natural from the unseen supernatural phenomena, so to any outsider not attuned to their world of added living entities (or other-than-human-persons), Highlander life seems complicated.

Ghosts and spirits abounded everywhere in the landscape and nearly always had to be placated. It took the leadership and shamanic powers of the big men, with their in-depth knowledge of the unseen living entities, to protect the people from malevolent actions, and to keep Highlander societies from falling into states of chaos. In addition, there were also numerous places (rivers, certain forests, and mountain areas) within the landscape that were imbued with supernatural power—all of which added to an already complex cultural landscape. It was within certain caves and rock shelters that the secrets of supernatural
powers were often discussed by men's groups, human skeletons maintained, and special sacred paraphernalia kept for ritual purposes. Unusual rock formations were perceived as places where spirits might reside so they were considered sacred and were, therefore, hierophanies. Small rocks and river-worn pebbles of unusual shapes and/or colors were often picked up and saved because they could be stones with potential for supernatural power. Some were later selected and transformed through ritual to become objects with supernatural power to be used for special purposes. In the sense that any profane appearing objects and places either are, or at any time could become hierophanies, the entire landscape of the study area in the Highlands of Irian Jaya must be treated with due respect. If there is an archetypal paradigm here to help us interpret the archaeological record of the Stone Age, it is that the entire cosmos can be a hierophany and that all archaeological objects and places should be scrutinized from such a perspective.

The Highlanders' languages, like their cultural landscapes, are complex (Chapter IV). As recently as 1992, Welsch et al. (1992:569) state that, "... it is almost hackneyed to say that hundreds of mutually intelligible languages spoken in Melanesia indicate that the southwestern Pacific is both linguistically and culturally one of the most diverse areas on earth... and that the North Coast of New Guinea is one of the most linguistically differentiated parts of Melanesia." The Irian Jaya Highlands appears to be little less linguistically complex. Within the study area alone, Silzer and Clouse (1991:25-30) itemize the following language groups. The population figures shown with some of the language groups are approximate but should at least indicate relative population size between the groups: 1) Damal (14,000), 2) Western Dani (129,000), 3) Grand Valley Dani, three dialects (100,000), 4) Hupla (3,000), 5) Walak (3,000), 6) Nggem (3,000), 7) Yali, three dialects (30,000), 8) Silimo (5,000), 9) Nduga (10,000), Wano Isolate (3,000-3,500), 11) Yale (2,300), 12) Nipsan (1,500-5,000), 13) Nalca (9,000), 14) Kimyal, two dialects (6,500), 15) Una (4,600), 16) Eipomak (3,000), 17) Kentengban (11,000), and 18) Dem Isolate (1,000). In addition to the dialect diversity noted by Silzer and Clouse (1991:25-30), Larson (n.d.:24-27) noted that within the Western Dani language speakers there were at least four "sub-dialects," and O'Brien (1969:3) noted that among Dani speakers, "there is a tremendous range of dialect diversity." The complexity of language barriers that had to be contended with by the indigenous inhabitants of the Highlands in social and political relationships and when conducting trade was formidable, although I noted as I moved about from one language group to another that some of the indigenous inhabitants were multi-lingual.

All of the people in the just-defined language groups are small in stature, with a range of approximately 137-179 cm for males and 137-152 cm for females. Sun-exposed skin color is brown, with a variance from light brown to black. Hair is normally dark brown to black with some elderly (estimated 50 years and older) developing gray or gray-white hair. Degrees of hair curliness varies. Both men and women are muscular.
From an outsider's perspective, the physical abilities of the Highlanders seem normal and their health generally good. Details were discussed in Chapter IV. From traditional perspectives, the Highlanders conceptualize health and sickness, as Karl Heider (1970:226-227) describes it

in terms of edai-egen, which is more psychical than physical . . . . The strength of an individual lies in his edai-egen, and the state of his physical and psychical health is indicated by his edai-egen . . . . The unfavorable condition of the edai-egen is caused by ghosts, and at the same time the individual is particularly vulnerable to further damage from the ghosts . . . . Under stress the edai-egen diminishes and retreats into the body while the akiotakun [Author's note: its related soul-like entity] is in danger of flying out of the body.

In my work, I found that specific diagnoses by curing specialists, and also by the people in general, account for these adverse actions against the edai-egen by a multitude of causative, often not mutually exclusive factors: 1) intrusion of malevolent ghosts or spirits, 2) breach of taboo, 3) soul-like (akiotakun) loss, and 4) sorcery induced intrusion of potentially death dealing objects. Additionally, for certain illnesses and injuries, the contributory role of naturalistic causes was sometimes recognized and accounted for in both diagnoses and treatment. The Highlanders and their healer specialists thought about, identified, and acted upon disease and injury causes in the same way that Clements (1932), in a spatial and temporal cross-cultural, worldwide study, classified disease causation for comparative purposes into five categories, to which Rogers (1976) later related examples of treatment (Moore et al. 1980: 194-195). Since the medical system of the Highlanders fits the cause-and-treatment patterning of the worldwide studies of Clements (1932) and Rogers (1976), it is plausible that the paraphernalia (artifacts)--at least symbolically--and behavior used by the Highlanders to treat diseases has advantageous degrees of predictable similarities to medical systems of extinct cultural systems that are being interpreted from archaeological data.

In the Highlands of Irian Jaya, patients and healers both felt that if diseases were basically caused, in one way or another, by supernatural powers, therefore, they must be treated by the manipulation and application of other supernatural powers (Chapter IV). Although dealing with the unknown, the people needed something tangible--something which itself was indestructible and contained great supernatural power which could be advantageously manipulated on their behalf. To effect countermeasures and cures, an endless assortment of religio-medical kits with their included power stones and assorted other paraphernalia were and are used. Trancing was/is sometimes practised, a variety of heat/burning treatments effectted, and multiple blood-letting procedures used, plus a variety of applications of medicinal plants. The emic philosophy of Highlands medical practice was broad and detailed, the choice of material objects and behavior to effect cures assorted. The totality of mental diagnoses of disease and the range of multiple types of attempted cures define the evolutionary cognitive stage of the Highlanders' medical system.

The Highlanders in the research area recognize the human life-cycle--from birth to death--with both its positive and negative effects on individuals and community. Their cultural response was and is an
evolved system of rites of passage. Of Van Gennep’s (Haviland 1993:338) rather comprehensive list of rites of passage which includes “rites that help individuals through life crises such as birth, puberty, marriage, parenthood, advancement into a higher class, occupational specialization and death,” the Highlanders respond personally and as organized systemic groups to: 1) puberty (adulthood), 2) marriage, and 3) death, all with a significant ritual. Birth is noted, but mostly on a personal basis. For girls, menarche is also discreetly handled, but without formal ritual. Marriage is a grand rite of passage, looked forward to and enjoyed throughout the entire Highlands area: pigs are sacrificed, feasting takes place, wealth exchanges hands, and families are united in rather complex obligatory relationships that are formalized by the exchange of material goods. But the most complex and most important rite of passage is the funeral. It lasts through several stages, over a period of years and serves to placate the ghosts and spirits, purge grief, and contribute through wealth exchange to a viable economy.

In addition to rites of passage that are such a significant part of the cultural system of the Highlands, certain rites of intensification are also important. These include rituals at wartime to protect the warriors and improve the likelihood of success, rituals to stop the rain when there is too much of it, rituals to encourage good crop yield, and rituals to improve the health of a community. The uses of sacred symbolic stones and empowered sacred tools are especially important at these times.

For those who reach old age (estimated 50 years and older), an established cultural pattern is in place for continued community activity for both males and females, as responsibilities for arduous physical activities dwindle (Chapter IV). The only artifact of culture that is characteristic of old age is the walking staff that is used by all elderly people.

Death, whatever the cause, initiates immediate action. Plans are set in motion for a series of funeral rites that extend over several years, the first of which usually commences the day after death. The immediate goals are to dispose of the body, purge the grief of kinsmen and loving friends, placate the ghosts of the deceased, as well as ghosts in general, and reinforce kinship ties (Chapter IV). The funeral process is accompanied with the exchange of great quantities of material goods, including the display-exchange stones (Chapter VI).

Within all of the Highlands part of the study area, bodies of the dead are disposed of by cremation. Physical data from human skeletal remains in the Highlands cultural systems, as we know them today, are sparse for this reason and few skeletal remains are being relegated to the archaeological record. Ashes and remainder small burned bone fragments are easily destroyed by organisms, weathering, and erosion processes. The Highlanders profess to not knowing why they cremate their dead or when the practice started, but it is presumed by me to have commenced after the hunter-gatherer ancestors became settled horticulturists. Archaeological evidence from the practice of cremation is not likely to survive destructive processes for many years in the present equatorial climate of the area.
In addition to the apparently rare custom of the preservation of body parts for religious purposes (Chapter VII), the presence of three soot-blackened, pig-grease-rubbed mummies are known in the Grand Valley, but I suspect there are more. The three known mummies were maintained as sacred objects and were treated as "spirit bones." being the bodies of personified ancestral spirits that had been installed by sacred ritual. The method of mummy desiccation, maintenance, and use was discussed in Chapter IV. The meaning of the few human skeletal remains that are known to be in scattered crevices, rock shelters, and caves was discussed in Chapter IV, as well as a theoretical analysis of the Highlanders' treatment of the deceased.

Ancestor worship among the Highlanders is the core of the religious aspects of a complex belief system. The people fear but respect ancestor spirits which are propitiated and manipulated in numerous rituals on behalf of all manner of social causes. Both live, bloody sacrifices and bloodless sacrifices are offered to ancestor spirits in a continuum of deeply-rooted cultural rituals. The people also go to varying degrees of effort to pacify and avoid the multitude of other-than-human originated spirits. In addition, some of the Highlanders, in at least a large part of the Grand Valley and West region, conduct religious ritual to propitiate and manipulate the spirit of the sun (and some, the moon spirit) just as they do to propitiate and manipulate their own ancestral spirits.

Both blood and bloodless sacrifice were integral parts of Highlander religious worship (Chapter IV). Ritual cannibalism was practiced, even after the arrival of modern outsiders. Finger and finger joint amputation ("part-for-the-whole") was common in the Grand Valley and to the west among some of the Western Dani, primarily among females but in some areas among males as well. The subject was discussed in detail in Chapter IV. Although a similar practice has not been reported elsewhere on the island of New Guinea, its practice was described on the Tonga Islands in Polynesia (Frazer 1968:81-83). Both men and women in the Grand Valley and West region (not observed in the Yali and East region) sliced off the upper edge of an ear, primarily as an act of grief and to placate ghosts at the loss of a near relative. Around the world, the most common bloody sacrifice to propitiate or avert the anger of supernaturals are animals, and in Irian Jaya that animal has been the pig. The fundamental significance of the pig to the cultural systems throughout the Highlands is paramount. From the viewpoint of the Highlanders, the climaxes of the pigs' lives are their deaths, as they are used as necessary sacrifices at carefully orchestrated ritual events. The continuum of "pig ceremonies" at which pigs are sacrificed is a cultural binder that in one sense could be considered to give meaning to cultural life as a system.

Many pigs are chosen soon after birth to be raised as sacred (wasa) pigs, and later to be sacrificed to specific ancestral spirits, others in a similar manner to be sacrificed for other ritual purposes. Many of the pigs defined as sacred are fed sweet potatoes from time to time that have been blessed at sacred rituals.
In this way, the pigs themselves are participating in sacrament while alive. When they are ultimately killed at a religious ritual, they are sacrifices of an empowered entity to a supernatural entity (Chapter VII).

Bloodless sacrifices of sweet potatoes are a common accompaniment of pig sacrifices at a multitude of different rituals. I have not identified these as offerings of first-fruit as is common practice worldwide among agriculturists. Instead, in the Irian Jaya Highlands, "first-fruits" are often purposefully left to rot in the gardens for the "creator spirits." Among the Grand Valley Dani, a ritual sweet potato offering can be a complex affair.

Cannibalism, pig sacrifice, and sweet potato offerings are practices that crossed language boundaries within the research area (Chapter IV). It seems that part-for-the-whole sacrifices of digits from the hands and pieces of outer ears of humans were restricted to certain parts of the Grand Valley and West: only rarely if ever practiced in the Yali and East.

Although all Dani men, women, young girls, and boys openly display their grief at the death of a loved one, it is the adult women who are the most emotional and obvious in displaying their sorrow. The women, more often than the men, coat their bodies with white or yellow clay to display sadness to both the living and to ghosts in the world of the unseen. At any time, a scattering about the cultural landscape of these living female mud-colored symbols of death, grief, and ghost-placation are a visual attestation to death in the Highlands. In one sense, this period of mourning is a form of sacrifice to the ghosts. It is definitely a symbol of appeasement.

The men often adorn themselves with bright feathers and all manner of paraphernalia to make themselves look like colorful birds, but a man’s basic dress in the Grand Valley and West is simple: a gourd to cover his penis, a bark fiber string charged with supernatural power called a *dibat* worn as a necklace to protect his throat from malevolent ghosts/spirits and/or a supernaturally powerful spider web necklace for the same purpose, and a single vegetal strand or string hanging from a waist cord over the buttocks to whisk flies away and to keep marauding ghosts or spirits from entering the anus (Chapter IV). In the Yali and East, all men also wear penis gourds, but none wear the empowered fiber string necklace. Additionally, many of the Yali men wear coiled loops of rattan as hoop skirts, that rattle when they dance and furnish a measure of protection against arrows during wartime. The men's dress code is explicit: a man would never give it a thought that his testicles are always exposed but he would be mortified if his penis were seen.

The men are considered the beauties of the societies and spend much time grooming themselves. With the exception of fancy hairdos and ring beards on their faces, the males generally find hair on the rest of their bodies repulsive and untidy. Hair is diligently removed from the arms, legs, chest, back, and from around the scrotum by plucking with hands or twig tweezers.
A woman's dress and adornment, although not as colorful as the male's, serves to protect a female's modesty, offer a degree of protection against ghosts and spirits, and provide utilitarian carrying space in which to carry babies, piglets, produce, and personal items. Since the most vulnerable spots for the entrance of malevolent entities from the unseen world are through a woman's throat, anus, and vagina, she needs to protect all three openings. To provide this, a woman, like a man, wears an empowered fiber string necklace and always covers her genitals and buttocks with a brief skirt. One or more head-back nets hung by straps from the head and down across the back and over the buttocks not only cover the lower back and buttocks, but serve as a functional part of a woman's attire. Although Dani women would be embarrassed to have their mid and lower back, or buttocks exposed, no coverings of the breasts are worn.

All the leaders are men (Chapter IV). Leaders are called big men (abgoktek in the mid Grand Valley Dani dialect) who rise to their positions of influence by a combination of skill in warfare, accumulated wealth (control of gardenland, pigs, wives, and material valuables), size of household, political charisma, perceived (by the public) ability to manipulate supernatural power, and general cleverness. To achieve a high level of influence, a big man must not only acquire and maintain items of wealth, but his leadership stature is also measured by how many pigs he owes and his demonstrated ability to move pigs and other items of wealth within the cultural system. Leaders (big men) are present at all levels of social and sociopolitical organization, from the smaller habitation compounds and house clusters, to the larger hamlets, to political confederacies and alliances. Relative positions of influence are achieved by political maneuvering and, ultimately, public consensus but not by inheritance. The big men have no absolute power, just varying degrees of influence. In the final analysis, public action is initiated by leadership, but confirmed by public consensus.

All Highlands big men have the ability to manipulate sacred power. In mid Grand Valley Dani dialect, this is known as wusahun. It is said that the big men have wusahun and are wusahun. (In the context of my research, I have defined this as shamanism.) Big men can delegate this special power to those around them so that select individuals can carry out responsibilities with a full range of culturally desirable profane and sacred power to accomplish the delegated task or on-going responsibility. Just as big men rise to different levels of political influence, so do different big men rise to different levels of shamanistic prestige among their constituencies. It takes demonstrable degrees of skill in both the profane and sacred aspects of life for men to become leaders who rise to high levels of sociopolitical influence. I have concluded that within the Highlands cultural systems, both the profane social and political aspects of life and leadership merge with the sacred to produce individual religious-sociopolitical leaders, who are the big men of the Highlands.

In addition to the big men, who are all shamans, with reputations for varying degrees of ability to manipulate supernatural power, there are other shamans (with wusahun), some of whom are female, who
are healing specialists but who do not have social influence. These healers obtain *wusahn* from big men as a delegated power, but in some cases they might obtain their specialist training to be a healer from another healer who could not give them "the power."

With only simple wooden paddle spades and digging sticks, the horticulturists cultivate complex ditched and mounded gardens on both hillslopes and valley floors. The mature gardens that are maintained today with only wooden tools were presumably originally cleared in the prehistoric past with stone adzes and cultivated then as they are today, with only wooden tools. No stone tool blades that might have been used as hoes or spades have ever been recovered in modern times within the study area.

The people cultivate (or manipulate within the forest) at least 15 different kinds of plants. The staple food is the sweet potato, although the Highlanders cultivate and eat three different kinds of tubers: sweet potato, yam, and taro. Of the three, it is thought that some varieties of taro were present upon arrival of the first migrants (ca. 40,000 ya). The yam might also be indigenous, at least it was free growing in greater Malaysia and could have been transported by early settlers. Of the three, the sweet potato is the late arrival, possibly not being present until 300 ya from South America via the Philippines (Cavalli-Sforza 1994:346). The fact that the taro is planted and tended in a different way than the sweet potato, may indicate that it is a representative of the evolutionary process from Paleolithic hunter-gathering to the early stages of horticulture, when the taro was first manipulated and then actually domesticated. I believe that the *Pandanus* nuts, which were available at the earliest arrival of humankind in New Guinea (Chapter II) may have been, along with taro, breadfruit, sago, and yams, among the earliest foods whose growth was encouraged by forest manipulation. The *Pandanus* nut is still a significant supplement to the staple sweet potato diet of some of the Highlanders. Behavior associated with the *Pandanus* palm and its fruits today furnish a tangible link of information to interpreting the prehistoric past when the same species of nut may have been one of the most important food staples among the hunter-gatherer ancestors of today's horticulturists.

In the upper reaches of the Biliem Gorge and to the south, the archaeological skeleton of the horticultural system with its interspersed habitation sites, is composed of walls and ditches of stone rather than fences of wood and ditches of mud, as it is in the more populated area of the Grand Valley to the northwest (Chapter IV). This is significant from an archaeological perspective because upon abandonment of the sites, the stone remnants would more likely be preserved in the archaeological record than the wooden skeleton which would soon rot and be gone, especially in the present Irian Jaya equatorial climate. What would be lost is evidence for the intensely practiced horticultural system at the center of the most populated area in the Irian Jaya Highlands, and what would be disproportionately preserved relative to population distribution would be rock ruins within a less populated area. Further, due to the shape and placement of some of the stone features in the Biliem Gorge, it is likely that if found in the archaeological
record, the features would be interpreted as fortifications against enemy attacks, when in fact, the maze of structures merely denotes an adaptation of the culturally same horticulturists to variable materials that are naturally scattered about the landscape. None of the features in the Baliem Gorge were built as fortifications.

Whereas Rappaport (1984:162, 408-410), in his classical book *Pigs for Ancestors*, reached the conclusion, in a particular area of the Maring in Papua New Guinea, that the cyclical mass-killing of pigs in social ritual is a mechanism to control pig population, I contend that this mechanism of social control probably does not apply to the Irian Jaya area, where pig movement seems to be adequately controlled by the intricate network of fences and walls, and where the availability of pigs for required rituals is often in short supply. Pigs are both the primary wealth items and the living sacrificial entities that are raised to be an essential part of a myriad of ancestor worship ceremonies, curing rituals, rites of passage, war preparation, and war indemnity ceremonies.

At first-contact, the Highlanders were observed to be adept architects, engineers, and builders. They designed and built fenced and walled living space with central courtyards, adjacent gardens, circular men’s and women’s houses, rectangular cook houses, pig sties, after-cremation bone enclosures and ghost houses. Perhaps the most challenging engineering feats were the large suspension bridges built across rivers throughout the entire area. In the Grand Valley, the watchtowers were ingenious creative constructions to allow men to view approaches to their frontiers and potato fields, thus furnishing forward lookouts for ambushes and raids. The multiple designs of valley gardens with their labyrinths of ditches, fenced or walled hillslope gardens, with both earthen and rock lined ditches and erosion controls, attest to the land use skills of the horticulturists.

At first-contact (variable 1905-1950s across the research area) warfare was chronic and incessant (Chapter IV). Every man always carried his bow and arrows to defend himself against sudden attack or to be ready to assist members of his community in a sudden outbreak of fighting. In the Grand Valley and West, the weapons of war were the long jabbing spear, shorter throwing spears, bows and arrows, and on occasion, adzes. In the Yali and East region, the fighting weapons were bows and arrows and adzes but not the long jabbing spear.

The raw materials used in Highlands technology included rock, wood, bamboo, rattan, bone, grass, feathers, shell, *Pandanus* palm leaves, banana leaves and banana trunks, reeds, gourds, orchid fiber, palm fiber, and seeds. The variety of tools made from materials other than rock is impressive. Those of wood and bamboo are culturally the most important. Their *visualization* and development was an important—maybe even essential—part of the evolutionary step that the Highlanders made some millennia ago from a hunter-gatherer cultural stage to a plant and animal husbandry stage. By extending the shaft of stone adze/axe blades from the length of their own arms and hands to a more powerful and mechanically efficient
chopping tool by adding extended wooden shafts, fixed at advantageous angles to the cutting edges of the stone blades, the people were able to deforest large areas in which to concentrate the growth of food plants. With fire-hardened digging sticks which vary in length from approximately one to two and one-half meters, the horticulturists were able to manipulate the soil within the newly deforested areas, and to create a complex of gardens with irrigation and drainage ditches. The women, who never carried bows and arrows like most men routinely did, both as weapons against sudden raids or to be ready for spontaneous hunting opportunities, had the digging sticks as their near-constant companions. They were used by the women not only in the daily routine of planting, weeding, aerating the soil, and harvesting, but also as formidable weapons of defense against surprise attacks. With the introduction of pigs to the island of New Guinea some 6,000-2,000 ya (Cavalli-Sforza et al. 1994:346), the horticulturists, who were probably already growing taro and yams, included pig husbandry into their strategy of subsistence. With the new, improved wooden handled, stone chopping and adzing tool, the people were able to cut and adze very large quantities of lumber with which to build their efficiently designed houses and to fence living communities and gardens to control their domesticated pigs.

In a creative adaptation to the raw materials available within the environment, the people added the bamboo knife to their tool kit of ground stone and bone knives, which are not as sharp as the bamboo knife (Chapter IV). The surgical sharpness of the bamboo knives were advantageous, if not essential, for the castration, disarticulation, butchering, and skinning of pigs as their animal husbandry practices became a featured aspect of this newly developed way of life. Additionally, the bamboo knives were the only kind of knife used for surgical procedures on human beings. The bamboo knife took the place of obsidian [which is superior in almost every way to modern surgical scalpels (Haviland 1993:79)], chert, and orthoquartzite knives that are found so pervasively in the archaeological record in other parts of the world and which are often interpreted as having been used for surgical and/or animal disarticulation, skinning, and butchering procedures. The Irian Jaya Highlanders had no supply of obsidian, orthoquartzite, or an adequate supply of large-enough chert nodules from which to make stone flake or ground stone knives of the desired sharpness.

The inclusion of the bamboo knife into the Highlanders’ tool kit makes a strong statement about the cognition of the implementors who recognized the capability of the organic knife in the absence of the right kind of rock materials. The impact of the possible uses of bamboo knives for skinning, disarticulation, and butchering of medium and large size animals, as well as for surgical procedures on humans, must be included in our interpretations of the archaeological past. Just as killed-animals can be processed with bamboo knives and without the necessity of stone, so can animals be killed with bamboo spears or projectile points. It is probable that the uses of bamboo knives predated the evolutionary development of the ground stone chopping tools (adzes and axes) and knives as used by the Highlander horticulturists and
may even have been a tool of choice used by our hominid ancestors *Homo erectus* from as long ago as approximately 1.5 million to 200,000 years. One idea that has been put forward by a few archaeologists is that "early Asians may have relied on tools that they made from raw materials other than stone, and since these are seldom preserved at archaeological sites, we simply lack a balanced appreciation of their accomplishments" (Pope 1994:163). Ever since 1943, when the archaeologist Hallam Movius of Harvard published data identifying what his colleague Carleton Coon later named the "Movius line." separating the westward distribution of Acheulian tools from the eastward (southeast) Asian distribution of less standardized "chopper-chopping" tools, there has been increasing indirect evidence that relates this distribution to an alternative use of bamboo tools in Asia east of the Movius line and the more widespread distribution of the Acheulian-type tool west of the line (Pope 1964:162-166). Although it is outside the scope of my document to review the indirect evidence for the uses of bamboo as alternative tools within the areas of the natural distribution of bamboo, the included ethnoarchaeological documentation of the uses of bamboo in lieu of stone strengthens such suppositions for the use of bamboo tools in the archaeological record.

Fiber string became another featured item of use in the Highlanders life style and may have been the most pervasively used natural product. In addition to the many profane uses of string, the ritually empowered fiber string necklace, called *dibat* by the Dani, is of cultural significance not only to protect both men and women in the Grand Valley and West from harm from unseen entities but also for its similar use at spirit installation and renewal ceremonies of sacred objects.

The many other kinds of non-stone tools that were described in addition to those listed above and the Wano bamboo-stone-striker fire-starting tool, reflect in totality some measure of the cognition of these Highlands horticulturists and the diversity of their tool selection at a cultural stage when they also had an impressive assortment of stone tools. The details concerning material goods (in addition to those made of stone), and related behavior provides an ethnoarchaeological baseline of data against which interpretations of material goods found in the archaeological record can be analyzed and possible associated behavior considered.

Both profane and sacred graphic and plastic artworks, although with variations across the entire study area, are associated with and imbedded in various substructural components of the cultural systems (Chapter IV). The most expressive graphic art form used in the Highlands is finger and plant stem and leaf paintings on human bodies. Additionally, both cultural themes and individual emotions are expressed by "mudding." The carefully thought out compositions of multi-media adornment used by the men on themselves are each an individual three-dimensional art piece. Religious statements are made by sacred red pictographs on cliff faces and rock overhangs in at least one area. The decorated profane display-
exchange stones make important cultural statements from an artistic viewpoint, whereas other three dimensional works of art are sequestered as religious objects.

Music, simple as it is in the Highlands, is a significant part of community life. It is used to elicit emotions and also to alert ghosts and spirits as to what is being done on their behalf. Dance, likewise, is very much a part of community life. Like music, it is quite simple: only rhythmic up and down steps with the feet, running back and forth or in circles by crowded dance groups, or just energetic jumping up and down. Both singing and dancing are done without the accompaniment of instrumental music. The Highlanders have only one indigenous musical instrument: the individually played "bamboo mouth harp," which is actually a *pithe* reed.

Within the study area six kinds of ground stone tools are used (adzes, axes, knives, chisels, permanently located and portable stationary grinding slabs, and handheld grindstones) in addition to unground chert flakes, hammerstones, and anvils (Chapter V). Within one language group an unusual stone-striker-bamboo-fire-starting kit is present. Permanently located stationary grinding slabs showing characteristic grinding wear that are scattered about the landscape attest to this area as being a place where ground stone tools were at least a part of the peoples' tool kit. The unretouched chert flake tools are quite important to the Highlander—out of proportion to their small sizes (most 1.5-2.5 cm long). They are of particular importance in the manufacture of bamboo tools and other bamboo objects.

Two adjacent ground stone tool use and trade regions are geographically defined by the distribution and uses of mutually exclusive kinds and styles of profane ground stone tool blades (Chapters V and XI). In the Grand Valley and West region, ground stone axe and adze blades, knives, and chisels are manufactured and traded outward from the Yeineri and Tagime quarries for profane uses, to the exclusion of adze blades and knives of distinctly different styles that are manufactured and traded within the Yali and East region from the Langda and Sela quarry belt. With the exception of the Pass Valley area in Yali territory, where there is a tool type mix, the profane ground stone tool types of the two regions conform with language boundaries to form the regional border; although other kinds of goods trade across this boundary, including the culturally important profane display-exchange type stone that is manufactured at both the Yeineri and Tagime quarries but not at Langda or Sela. Ground stone tool blades that are sourced at the Yeineri and Tagime quarries trade freely across language boundaries within the Grand Valley and West region. Similarly, Langda-Sela adze blades and knives trade across language boundaries in the Yali and East region. Axes are not used in the Yali and East region; hence, neither axe blades nor the chisels that are used in the Grand Valley and West to drill seating-holes in axe handles are produced within the Langda-Sela manufacturing systems.

The Yeineri, Tagime, and Langda-and-Sela produced lithics are distinctly different from each other by lithology and color. The Tagime and Yeineri outputs are distinctly different lithologically, but alike
structurally and, in both respects, different from Langda and Sela-produced lithics, which are both the same. In the course of the research, 11 mutually exclusive different styles of axe and adze blades, three styles of knives, and two styles of chisels, in addition to display-exchange stones that were sourced at the Yeineri and Tagime quarry systems, were defined. The axe and adze blades, knives, chisels, and display-exchange stones produced within the Yeineri manufacturing system are all made from metamorphic rock: blueschist, epidote amphibolite, and epidote chlorite schist. The stone goods produced at Tagime are metamorphosed argillite. Langda and Sela-produced adze blades are andesite/basalt and either hydrothermally altered or slightly metamorphosed andesite/basalt. Langda-Sela Style knives are produced from metamorphosed volcanic tuffs from within the same volcanic sequence as the andesite/basalts.

Only profane percussion and slicing tools (and profane display-exchange stones at Yeineri and Tagime), not sacred stones as such, are produced and traded outward from the manufacturing centers to use areas (Chapter V). Hafting of the axe and adze blades, different haft types, and the diverse multiple uses of all stone tools are discussed in Chapter V. The ground stone adze is the "workhorse" tool of the Highlands. It is the chopping tool with which the trees were cleared in a slash-and-burn technique of horticultural husbandry. The difference between the axe and the adze is that the cutting edge of the axe blade is hafted parallel to the longitudinal axis of the shaft, whereas in the study area it was found that the cutting edges of adze blades were hafted at 67°-90° angles to the longitudinal axes of the shafts. It is the adze, not the axe, which was used to clear the forest while the people were making the major transition from a hunter-gatherer lifestyle to the extensive and intensive horticultural practices of today. Both the axe and adze are designed to obtain optimum cutting efficiency for their different uses. When using the axe in the Grand Valley and West to split logs that are laying on the ground, an overhead, straight-down motion is used. But to use an axe to cut down a vertically-standing tree, a side-on motion is necessary. The users recognized the disadvantages of this side-angle motion with an axe, which for them did not overcome its theoretical advantage of a longer handle and a heavier blade. All language groups opted for the adze for cutting down vertical-standing trees and parts of trees and other objects that presented themselves at various angles, where smaller, more manageable tools than axes were necessary to be able to use overhead vertical-down strokes. Both mechanical advantage and a controlled blade strike angle with a forceful swing of the tool are enhanced by such direct overhead-down motion.

The largest ground stone tool artifacts in the Irian Jaya Highlands are the sandstone bedrock and large boulder erratic grinding slabs (Chapter V). Many of these look similar to grinding slabs found elsewhere in the archaeological record. On both the permanently located and the portable stationary grinding slabs in the Highlands research area, the linear, V-shaped grinding grooves that are often present are caused by the abrasion of shaping and sharpening bone, wood, and bamboo awls/needles and hardwood arrow tips rather than stone adze/axe blades, chisels, or knives, as one might expect. Concave wear
surfaces on portable stationary grinding slabs in the research area are of similar morphology to wear surfaces present on grinding slabs ("metates") found in archaeological context which have been interpreted to have been formed by plant-food processing. In the Irian Jaya Highlands situations, these surfaces have been formed only by shaping and reshaping and sharpening stone adze/axe blades.

Along with pigs, jerak (long, narrow woven bands adorned with single or more rows of cowrie shells), large stone axe blades, both utilitarian carrying and strapless ceremonial woven nets, and loose cowrie shells (jeraken), the display-exchange stones (called je by the Dani, jao by the Western Dani, and sie or siengga in the Yali and East region) are among the most important wealth items (Chapter VI). Within most, if not all, of the language speaking groups within the study area, they are necessities for marriage and funeral presentations and important as usual parts of war indemnity payments. In fact, in the Grand Valley, informants say that a war cannot be stopped without the payment of large numbers of je. The exchange of ownership by public display and presentation of the je (and other wealth items) not only fuels the economy by the repayment of debts and the establishment of new obligations, but it appeases the ghosts and the ancestral and other spirits in the unseen world who are thought to be observing and listening to the proceedings. The many formal displays of these stone items of wealth before distribution also establish social prestige—when both humans and ghosts/spirits are alerted to the donor’s identification by loud pronouncements by ceremonial leaders. It is the presentation of pigs and the exchange of je display-exchange stones at marriage and funeral rites and for indemnity payments that fashions the continual circulation of wealth items within most of the Irian Jaya Highlands. [Author’s notes: Una and Kimyal informants stated that large Langda-Sela Style adze blades could be used in lieu of the display-exchange stones at their ceremonials.]

From the multitude of profane display-exchange stones and stone tools (adze and axe blades, knives, and chisels) that are in use and a plethora of naturally shaped stones from the landscape, the indigenous inhabitants select from time to time certain stones to be converted during sacrificial ritual to sacred objects. Personified ancestral spirits are installed into some of the stones to make them sacred and supernaturally powerful ancestor stones (Chapter VII). Non-specific spirit power is installed in a broad variety of other stones to convert them into power tools, with which to deal with the many problems which are believed to be caused by entities of the "unseen" world. To paraphrase Eliade (1987a:11-13), all of these sacred stones remain stones with nothing from the profane point of view to distinguish them from all other stones, but for those to whom the stones, through metamorphosis are revealed as sacred, their immediate realities are transmuted into supernatural realities. They all become hierophanies. It is the sacred symbolic ancestor stones that are used to focus the Highlanders’ religious belief system and the empowered special tools which are used to deal with the myriad of problems and social ills with which the people constantly contend.
Ancestor worship, at the core of the complex Dani belief system, is manifest by the way these ancestor stones are empowered, maintained, and utilized (Chapter VII). These are the most sacred and powerful of stones (with the exception of the sun spirit stones) kept within the granekhe cabinets and are treated ritually with the highest regard. It is these stones that are propitiated and manipulated along with all other spirit stones to maintain daily life and keep the people healthy, happy, and successful. Wars are fought and won and warriors kept safe with the assistance of spirit power directed through ritual with empowered stones. Wounds and illnesses are healed with the assistance of healing powers from power stones that are maintained in religio-medical kits. Successful births and the encouragement of healthy, large litters of the all-important pigs are encouraged with specially designated sacred stones. Too much rain is discouraged and the disappearance of flooding rains is mandated through ritual with stones. Sweet potato and other crops are fertilized and growth encouraged with stones imbued with supernatural power.

The recognition and routine uses of these stones with supernatural power is just as fundamental to ways of life among the Irian Jaya Highlanders as the use of profane stone tools and the raising of sweet potatoes. Similar sacred uses of what appear to be profane stone tools in extinct populations would have significant impact on the interpretations of the archaeological record. I estimate that about 25-40 percent of all stone adze/axe blades and chisels in use in the Highlands study area were hierophanies at the time of first-contact, empowered in sacrificial rituals and used as sacred power objects, rather than as profane percussion implements.

In most Highlander sacred objects, constructed to symbolically represent personified ancestral spirits, as well as in Highlander compositions of supernaturally powered tools, used to deal with the unknown, indestructible rocks were the principle power objects but they were almost always intimately combined with a varied assortment of destructible pieces of string, grass, leaves, and wood. In spirit installation and renewal rituals, sacralized pieces of fiber string and/or grass stems, with or without a leaf or two, were knotted around the sacred objects at the moment of spirit installation (Chapter VII). The symbolic significance of this behavior is powerful; the paradigm for interpretations of the archaeological record significant.

In Chapter VII, I first reviewed Ownership of the Stones and then, to establish a baseline from which general principles could evolve that are pertinent to making interpretations of behavior and belief systems of extinct cultural systems from material goods, considerable detail was presented from an archaeological perspective, regarding the architecture of the place of the stones, spatial relationships of these places to community, the stones themselves, and then the spatial relationships to both sacred and profane objects within place. Finally, the cultural behavior which directly involves interaction of the owners of the stones with the stones, both in those places where the stones were maintained and elsewhere, was reviewed. Pertinent to archaeological considerations as well as any future ethnogenesis perspectives, I point out that
compelling analogies exist between the organization, contents, and uses of sacred space by the indigenous Highlanders to places of worship in the historical religions. regardless of the entities that are being worshipped and the ways those religions are defined. In the Highlanders architectural plan of sacred space, they define "a place for the people" (outdoor courtyard with sacrificial ground altars), a "place for the shamans and practicing members of each ganekhe group" (the men’s house or pilamo wusa), a place for "religious relics." and a place for the "most sacred and powerful religious objects" (the ganekhe cabinet, or power box). Sacralized ferns hang as a curtain across the power box and rows of smoked pig mandibles from sacrificial rituals at its base and to either side are icons of the men’s religious groups.

In an area within the Dani and Western Dani language speaking groups, the culturally most powerful individual kind of sacred symbolic stone is the least known. It is a symbolic spirit stone that is used by those who meet to propitiate the sun spirit, in much the same way that the sacred ancestor stones are used to focus ancestor worship. The control and uses of three individual sacred compounds with "sun houses" to put the people’s relationship with the sun into a cultural systemic perspective were discussed in Chapter VII. Organized group behavior to propitiate the sun spirit is another aspect of the Highlanders’ already-complex belief system.

Almost all of the stone tools and certain kinds of other stone goods that are/were used within the study area originated at four quarry areas and manufacturing centers: Yeineri, Tagime, Langda, and Sela (Chapters VIII, IX, and X). Yeineri, a single, integrated quarrying and manufacturing center included at least nine named quarries that are scattered over a distance of about 15 km (Chapter VIII). The quarries were owned and operated from a single manufacturing center, which was advantageously located within the quarry belt. A variety of axe and adze blades, knives, chisels, and flat style exchange stones were manufactured from rock quarried at different locations within the system. They were then marketed by trade across language boundaries to user groups who lived within other language-speaking cultural systems. Because of the absence in the quarry belt of sandstone for grinding tools, a majority of the manufactured materials were traded as finished flaked biface blades, ready to be ground, rather than as finished ground stone tools. Raw core materials were quarried from surface bedrock exposures and large boulder erratics. No pit quarries, mining shafts or drifts were used in the quarrying process. Engineering techniques for quarrying consisted of the uses of fire, large hammerstones, and wood and rock wedges. Unwanted quarry core waste and flakingdebitage were (and no doubt still are) periodically washed away from steep hillside and river bottom quarries by torrential rains and flooding. It would be difficult to identify the Wano quarries in an archaeological context, and it would take unusual preservation to be able to identify the Yeineri hamlet as a large operational center for a regionally very important industry since large accumulations of fine flaking debitage were not concentrated.
The Wano Yeineri quarry-manufacturing complex was owned and operated at contact time within a Highlands egalitarian sociopolitical system rather than an authoritarian system. Although overall leadership and responsibility for the quarries was assumed by the single big man or a combination of a few such men at Yeineri, ownership of the products of production—the individual stone objects—was with the individual workers who helped in cooperative efforts to quarry the raw materials, took a share of the raw core rock, and individually worked it through to tool completion for local use or trade. Production was stimulated by the needs of individual quarrymen and their kinfolk for tools and exchange stones for personal utilitarian purposes and by a perceived demand of the marketplace.

Whereas the Yeineri quarries and manufacturing center were located in sparsely settled Wano territory and were separated by one or more language boundaries from the more populated primary markets for their stone goods, the Tagime quarries and manufacturing center were located along the banks of the Tagi River in the heartland of the same marketing area (Chapter IX). The Tagime toolmakers were able to supplement the highly desirable blueschist, epidote amphibolite, and epidote chlorite schist stone products from the Yeineri manufacturing center with custom made meta-argillite and, to accommodate certain marketing demands, an inferior, softer (and less expensive) less-metamorphosed argillite.

Within the Tagime manufacturing center there were two independently operated adjacent factory areas, separated by a sociopolitical boundary: a down-river hamlet-factory (approximately three square km in area) and an up-river hamlet-factory (approximately two square km in area). Both of the hamlet-factories provided, within their sociopolitical boundaries, ready access from residential houses, to both raw materials from the Tagi River and also to permanently located stationary grinding slabs on which to shape and sharpen finished products. Naturally shaped meta-argillite cobbles and boulders were transported into the area by geological erosional processes, and eventually selected by toolmakers for their stone goods. There was no quarrying from bedrock exposures, open pit quarries, or shaft or drift mining operations. Engineering techniques to break large meta-argillite boulder cores into manageable pieces for further reduction included the use of fire and both handheld and hurled large hammerstones. Patches of red that are present on the surfaces and along microfractures of some blades may be the result of firing during the quarrying process. Periods of peak quarrying activity were prompted by torrential rainstorms and flash floods when new raw materials, in the form of cobbles and boulders, were transported from the upper reaches of the Tagi drainage system or exposed by erosion in the river bottoms and along its banks.

It is unlikely that the Tagime stone goods manufacturing center, with its "quarrying" area, could be recognized in archaeological context. There were no exposed bedrock quarry sites, open pits or mines. Also, no centralized large accumulations of either quarrying or knapping debitage would be found. Along the river bottoms and banks, flash floods would have washed away all quarrying waste material. A small amount of flake waste prevailed in a process where the ratio of waste-flake volume to preform-core volume
was low. This is due to the fact that the toolmakers ground crudely shaped bulky preforms to completion, rather than first knapping them to approximate final shape. The permanently located grinding slabs that were a significant part of the manufacturing process could not be distinguished from other grinding slabs that were scattered about the cultural landscape, used to sharpen dulled blades, reshape broken blades, or used to complete the manufacturing process at various distances, from the points of tool blade origin.

The last two steps of the manufacturing process (final shaping by flaking and grinding) implemented by the Tagime toolmakers was in contrast to the Una and Kimyal quarrymen and toolmakers at the Langda and Sela quarrying and manufacturing centers located in the Yali and East region, where these toolmakers exhibited considerable knapping skill, carefully shaping the bifaces before investing significantly less time in the grinding process.

The inhabitants of the Yali and East region used a single, internally produced style adze blade, which I defined as the Langda-Sela Style, and also stone knives, but no axe blades or chisels as were used in the adjoining Grand Valley and West region (Chapter X). The majority of these tool blades were produced at a manufacturing center which consisted of a cluster of quarrying and production factories near and including the hamlet of Langda, located within Una territory. A significantly lesser number of blades were produced at a functionally similar but smaller quarrying and production operation at Sela, within adjacent Kimyal territory.

Within the greater Langda Una residential district there were approximately 26 separate house clusters and hamlets. Eleven of these were hamlets with associated quarries, within which the residents manufactured stone tools. The 11 hamlet-factories were concentrated along an approximate 17 km stretch of the Ey River and very short stretches of two tributaries near their points of junction with the Ey. By erosional and transport processes, the rivers concentrated the raw materials for adze blade production. Seven explicit technological steps were followed to produce adze blades of the same morphological style, from the same kind of core rock, by each of the 11 independently operated hamlet-factories within the manufacturing area. Each factory produced the same kinds of products, which included the Langda-Sela Style adze blades, knives and minor non-utilitarian objects. Whether the original discovery of the favorable concentration of raw materials for tools was made by migrants and then the area settled, or whether the original settlers were in the area for other reasons and then discovered and developed the use of the raw materials, is problematic.

Each hamlet-factory was an integrated operation in which a skilled labor force lived within the confines of a sometimes-sprawling hamlet, in addition to one head quarryman who owned and operated a nearby riverside quarry which was the source of raw materials for the adze blade production of that particular factory group. There were no bedrock cliff face or open pit quarries, or shaft or drift mining operations from which raw materials were procured for the production of adze blades. The head quarryman
(who was also the owner of the quarry) was not necessarily the overall most influential leader in the hamlet. The head quarryman supervised all quarrying operations within his quarry area and had authority to allow people outside of his hamlet-factory group to accompany him to the quarry to collect core rock. Cooperative work parties, under the leadership of the head quarryman, located boulder cores within the territorial boundaries of their own river-sourced quarries, which they reduced to manageable size pieces before allocating the pieces to their individual workers for ownership and further processing.

Few knives were produced from the andesite/basalt and meta-andesite/basalt boulders of the riverside quarries, which were the single source of raw materials for Langda-Sela Style adze blades. Instead, the quarry sources for knives and "other objects" were reportedly away from the river bottom quarries and located at special places along sparse hillside exposures of lamellar tuff sequences. I have concluded that the raw materials for all of the stone products of the Langda manufacturing center were sourced from within the same geological volcanic sequence.

Engineering techniques to break the large volcanic boulder cores at the quarry sites into manageable size pieces for further reduction included the uses of fire and both hurled and handheld hammerstones. Biface blanks were always produced at the quarry sites and then carried to the hamlet-factories for fine flaking and grinding. There were no permanently located sandstone grinding slabs within the factory areas as there were at the Tagime factories in the Grand Valley and West region. Portable, but stationary grinding slabs were carried to factory sites from sandstone outcrops of the Kembelangan formation, which were located a two-to-four day round trip journey away from the different Langda-centered hamlet-factories, but within territory that was controlled by Una language speaking people.

The Una and Kimyal were excellent knappers, who through two phases of freehand knapping, first the creation of biface blanks at the quarry sites and then final shaping before grinding by fine knapping, created knapped blades of uniform morphology before the grinding phase was commenced. Less grinding was required among the Una and Kimyal to produce finished ground stone adze blades than among any of the toolmakers in the Grand Valley and West region. The understanding and ability of each toolmaker to create a seemingly cloned structure in finished adze blades, regardless of their length, may be a stage in the evolutionary process of tool design and manufacture.

At first-contact the study area was covered by a network of trade routes which extended from coast to coast (Chapter XI). An overprint of trails and routes, some well travelled and easy to follow and others less used and often difficult to discern even for indigenous local inhabitants, connected the habitation sites of the Irian Jaya Highlands one to the other, regardless of intervening language boundaries and different sociopolitical affiliations. Within this web of trails and routes that had been built up through the millennia, the people were connected to the origins of raw materials as well as to the manufacturing centers for stone goods. As would be expected, there were radically fewer numbers of routes to both the north and south
lowlands from the central mountain core and across aprons of lowland swamps to both ocean coasts (the origin of sea shells), due to the difficult terrain. Although the flows of raw materials and manufactured goods were initially away from points of origin, once goods reached population centers, the flows became the sum effects of countless transfers of goods that took place in all directions. Local transactions occurred everywhere. Redistribution within sociopolitical groups by rites of passage, other ceremonial exchanges, and war indemnity payments fuelled continual circulation of valuables. Although the incidence of economic trade transactions increased at times and places of large pig-killing ceremonies (rites of passage rituals and other sociopolitical ceremonials), I do not interpret these occasions as proto-markets.

The trading network consisted of a web of overlapping personal trading connections, each of which were created by individual men of patrilineage membership and occasionally extended to non-related trading friends (Chapter XI). There were no professional traders as such. Routes of movement of goods followed the networking of kinship-social linkages rather than necessarily the shortest overland routes between different points of exchange. Each personal network was an open system. Within the overall pattern of the flow of goods, individual items were traded beyond the limits of individual traders. The goods most commonly traded were pigs; stone goods; shells; salt; red ochre and hematite; finished products such as fiber nets, string bags, and hardwood arrowheads; plus all manner of raw material products from the forest.

All articles of trade had a "customary price," to which an esoteric moral value was attached, although actual trade prices usually differed slightly from the "customary price" that was initially assigned to an article by its originator. At all of the stone goods manufacturing centers, it was the toolmakers who set the "customary price" which they anticipated receiving for a product. If there was a common denominator for the value of stone goods across the research area at the time of first-contact, it would have been pigs and cowrie shells. In very general terms, the value of one large, good-quality adze/axe blade and je display-exchange stone in the Grand Valley and West region related to one large pig. Similarly, in the Yali and East region, one large Langda-Sela Style adze blade related in value to one large pig.

Social linkages (kinship and trading friends) which comprised the trading networks and the flow of goods that moved through them extended across physiographic, ecological, sociopolitical, and language boundaries. When certain kinds of material goods, such as the Langda-Sela-sourced stone tools of the Yali and East region and the Tagime and Yeineri-sourced stone tools of the Grand Valley and West region stopped moving at the East-West regional boundary, it was not because one type of tool or entire tool kit was technologically superior, but for the reason which I call "cultural habit" (Chapter XI). From the viewpoint of emic analysis, indigenous inhabitants who lived on each side of the boundary only knew they liked the types of tools their ancestors had used and were comfortable with the stone tool technology which they had inherited. Distance from points of origin, physiographic obstacles, or language boundaries did
not directly determine the boundary which distinctly stopped the flow of profane stone tools from different points of origin and which formed the boundary between the two stone tool use regions. Trade networks were in place across the same boundary line, and other stone commodities (je-type display-exchange stones and puluen from the Grand Valley and West to the Yali and East) and numerous other kinds of items readily traded across the boundary. Since there is a significant difference in the morphology of the Langda-Sela adze blades and the Tagime and Yeineri axe and adze blades, the reason for choice, perhaps, becomes more understandable to an outsider. The relative value of the large Langda-Sela adze blade and the Tagime and Yeineri axe blades was apparently approximately equal to all users.

Outward from points of origin within the two stone tool trade and use regions, the distribution and accumulation of tools related to the distribution of population, rather than to distance from manufacturing centers. This is contrary to Colin Renfrew's (1977:72) "Law of Monotonic decrement" where archaeological "finds are abundant near the source, and there is a fall-off in frequency or abundance with distance from the source." In the Grand Valley and West region, almost all of the axe and adze blades that left the Yeineri manufacturing center as finished-flaked but not-ground tools were ground and polished before they reached the Grand Valley. The distribution of accumulated wealth of pigs and other durable artifacts related directly to the geographic distribution of horticultural production rather than to the location of different kinds of raw materials. The relatively productive Illeukaima salt pool near Jiwika enhanced the opportunity of the people in that area, along with their successful sweet potato production, to accumulate greater wealth than people living in any other locale within the study area. The relatively few Yeineri and Tagime-sourced adze/axe blades that trickled eastward across the regional boundary and similarly the relatively few Langda-Sela Style adze blades that trickled westward into the Grand Valley and West region were not hoarded and used in adzes as utilitarian tools but were traded about and ultimately empowered and used as sacred stones. During the fieldwork I observed a few Yeineri and Tagime adze blades, so used, as far eastward as the Una speaking people in the Langda area. If there is a paradigm here for consideration when making inferences about the uses of apparent utilitarian stone tool blades found in the archaeological record, it is that on the outer fringes of a tool type distribution, other than profane utilitarian uses might be suspected for the artifacts. I estimated that the approximately one percent of profane adze/axe blades of different lithologies than those produced at manufacturing centers located within the study area, originated at what I defined to be internal "sources of opportunity" rather than being traded or filtering into the area through time from one or more distant external sources.

From a cultural systems perspective, I conclude and agree with James Peacock (1986) that an adequate understanding of culture may be hoped for only if we take a holistic approach. That is, we must be aware that any cultural system, however complex, is so internally interconnected that if we pull out any
of its components, including its material supports, and disregard that element's embeddedness in the whole, we will fail to understand it.

From an ethnoarchaeological perspective, it became apparent during the course of the study that to desirably improve our archaeological interpretations of just the profane tool stones that are found as cultural remnants in the archaeological record, we must advance measurably our understanding also of the behavioral consequences of sacred power and symbolic stones present in the same record. The missing link that prompts error in some of our interpretations of profane uses is our incomplete understanding of the magnitude of hierophanies that are present in nonliterate cultural systems. (Hierophanies are those things wholly different from the profane that manifest themselves to be sacred [Eliade 1987a:11].)

From the viewpoint of a cultural systems analysis, the cumulative spirit power in the unseen world of the Irian Jaya Highlanders is formidable: hundreds or maybe even thousands of other-than-human-originated individual spirit types abound which all seem to be evil (Chapters III and VII). The supernatural power of the sun is awesome, and the ancestral spirits never die but just increase in number. Both the positive and negative aspects of this power must be considered when people in the seen world are establishing, building, and maintaining social relations with the ghosts and spirits in the unseen world. The strategy of the people was to venerate, propitiate and manipulate ancestral spirits, to propitiate the sun power, and to both placate and take contradictory measures against all malevolent ghosts and spirits. In tactically pursuing this strategy, the shaman leaders—and sometimes members of the religious groups (ganekhe)—would enter the world of the unseen to directly interface with ghosts and spirits to plead the cases of the people. Both bloody and non-bloody sacrifices were made to placate the ghosts and spirits and to attempt to gain favors from them through propitiation. Within the hierophany of the sacred space of the men’s house, its contents, and adjoining outdoor sacrificial ground altar, the presence of supernatural ancestral spirit power manifests itself during ritual in grand proportions in a never-ending continuum or power circle. The individual and cumulative power that is already within the power circle is nurtured and rejuvenated by periodic ritual. At the same time that the power is being moved about in a seemingly complex symbiotic relationship between objects, pigs, and humans, it is being propitiated to commit heroic beneficial deeds on behalf of the religious ganekhe groups which attempt to control the power.

Contributions to Ethnoarchaeological and Ethnogenetic Theory/Research

In an article entitled Ethnogenetic Theories of Human Evolution, John H. Moore (1994:11) states:

Anthropologists, like other scientists, would like to create a single, parsimonious theory of origins that would account, in this case, for world distributions of language, culture, and physical type. As Del Hymes put it in 1964, 'we need a general theory of the nature and dynamics of human life.'
Achieving such a synthesis would be the anthropological equivalent of finding DNA in biology, or writing valid equations for unified field theory in physics.

As we work toward the perhaps idealistic but nevertheless valid goal of a general theory, progressive steps in such a direction are measured by the recently published, worldwide, cladistic-styled work of population geneticist Luca Cavalli-Sforza et al. (1994), and the also cladistically-styled continental works of researchers like Colin Renfrew (1987), Sokal et al. (1991), and others, who have been collecting linguistic, archaeological, and biological data. Relative to these types of works, there is a broad chorus of dissent, not to the use of certain data but, according to Moore (1994:11), "to the nature of the cladistic theoretical framework and the deduction about human behavior that result from applying the framework to the ethnohistorical record." As these dissenting scholars present their own ethnogenetic theories as being advantageously more comprehensive and correct than the synthetic cladistic theories, the opportunity and necessity to meaningfully apply ethnographic examples for critical analyses will be extremely important to the development of an acceptable general theory.

Any researchers, before analyzing the interplay of culture, linguistics, and biology from artifacts and spatial relationships in the archaeological record (and this must be accomplished to justify an acceptable general theory), must first come to grips with an acceptable definition of "culture." In Patty Jo Watson's Distinguished Lecture, entitled Archaeology, Anthropology, and the Current Culture Concept, presented at the 93rd Annual Meeting of the American Anthropological Association in November of 1994 (1995:683-694). Watson first pointed out E. B. Tylor’s classic definition of culture and then reviewed highlights of the evolved relationship between archaeology, culture, and the umbrella term "anthropology":

Culture is that complex whole which includes knowledge, belief, art, morals, law, customs, and any other capabilities and habits acquired . . . as a member of society [Tylor 1871:1] . . . .

According to a recent summary volume [Borofsky 1994], research on or about the culture concept, or 'the cultural,' now ranges from linguistic, cognitive, and psychological approaches to a variety of postmodern and post-postmodern experimental efforts on the literary side to politically, historically, empirically, and/or methodologically oriented work, to that which focuses explicitly on the nexus of biology and culture, of natural science and human science, and to that which concentrates on intercultural encounters in premodern, modern, or postmodern world systems.¹

The culture concept in anthropological archaeology has followed a well-marked but nonlinear trajectory over the past several decades. After a freewheeling and primarily data-free speculative period in the 19th century [Willey and Sabloff 1993:ch. 2], North American archaeology developed around a culture-historical approach parallel to but separate from concurrent processes in European archaeology [Trigger 1989:187, 195].

At this time in North American archaeological parlance, Trigger says a 'culture' was mainly a geographical entity—taxon for one of several synchronic units—because so little was
known about chronology . . . There was no interest in culture per se, although widely used
classificatory units (foci, aspects, phases) were implicitly understood to be cultural units,
possibly reflecting ancient tribes or groups of related tribes. Archaeological cultures in North
America were believed to be conservative, changing slowly, if at all, in response to diffusion
of objects and ideas, and/or to migration of large and small human groups. Walter Taylor’s
detailed critique of Americanist archaeology, published in 1948 and promoting a very different
view of culture to and for archaeologists, was a radical departure from mainstream 1940s
archaeological practise.

Taylor’s argument [1948:Ch. 4] included a view of culture as composed of two concepts.
one holistic—Culture—and one partitive—cultures. Holistically speaking, Cultural phenomena
are distinguished from natural phenomena, both organic (nonhuman biological) and inorganic
(geological, chemical). Cultural phenomena are emergent, more than the sum of the partitive
parts, they are in a realm of their own, a realm created and maintained solely by human
cognitive activity.

Partitively, the culture concept also denotes a specific piece of the whole of human
Culture, a culture. Either way, Culture is a mental phenomenon, consisting of the contents
of minds, not of material objects or observable behavior’ [Taylor 1948:96]. Culture content
is cumulative: ‘The culture-whole existing today owes its form and at least the majority of
its content to what is called the cultural heritage’ [Taylor 1948:98]. The (or a) culture heritage
consists of mental constructs. ‘Mere physical form is extraneous as far as culture is concerned,
being a property of the world of physics and not of culture’ [Taylor 1948:99]. . . . Artifacts
and architecture are the results of behavior, which itself derives from mental activity. . . .

If only the ideas and knowledge in people’s minds are culture and the ultimate source
of culture, then archaeologists who want to contribute to cultural anthropology, the discipline
that studies culture, must address their thrice-removed materials in ways calculated to delineate
past cognitive patterning. The archaeological record can reveal ancient culture—the mental
activities of long-dead people—if skillfully interrogated . . . . The archaeologist as an
anthropologist is uniquely qualified to produce truly cultural information about ancient peoples
and extinct societies throughout time and space.

. . . Lewis Binford’s 1962 American Antiquity article, “Archaeology as Anthropology,”
initiated a period of dominance of processual archaeology, or ‘the New Archaeology,’ as it is
often called. 6 Like Taylor, Binford and the New Archaeologists were intent upon expanding
the goals of Americanist anthropological archaeology beyond those of typology and
stratigraphy. Although Binford insisted that all aspects of past societies could be investigated
archaeologically, in practise he focused almost exclusively upon subsistence and ecology . . .
. . . Binford’s concept of culture, appropriate to the general tenor of New Archaeology and quite
different from Taylor’s, was that of his professor at the University of Michigan, Leslie White:
‘culture is man’s extrasomatic means of adaptation’ [Binford 1962; White 1959:8, 38-39]. . .
. . . In the late 1960s . . . Binford turned the full force of his research into ethnography in
northern Alaska and elsewhere [Binford 1983:100-106]. Largely, although not by any means
entirely, owing to Binford’s influence, ethnoarchaeology became a standard research focus
during the 1970s and 1980s for Americanist and other prehistorians and is now an established,
productive sub-discipline. 7

Meanwhile, in the late 1970s and 1980s, the few anthropological archaeologists who
were not entirely swept away by Binfordian, processualist New Archaeology with its heavy
methodological emphasis, received powerful reinforcement from British and European
advocates of postmodernist (postprocessualist) directions in archaeology, wherein ontological issues were central. The most influential among these—at least in the anglophone world—is usually said to be Ian Hodder (1982a, 1985, 1991a, 1991b). Although Hodder strongly opposes nearly everything Binford advocates, and Binford wholeheartedly embraces their adversarial relations, both are deeply committed to ethnoarchaeology as an essential archaeological technique. Binford, to whom culture is humankind’s extrasomatic means of sustaining themselves in a wide array of physical environments through space and time, documents the interplay of climatic, topographic, floral, faunal, geological, and other natural factors with human hunter-gatherer-forager subsistence and technology. Hodder, to whom culture is mental (symbolic), material, social behavioral, and the recursive relations among all three, takes note of the important roles played by artifacts in the complex, dynamic tensions characterizing human social and societal encounters. He insists on the primacy of archaeology as archaeology and archaeology as history, rather than archaeology as anthropology, and stresses an empathic, particularistic approach to understanding the past, much like that of R. G. Collingwood (1939, 1946). Hodder’s move is clever and strong; but it is in the opposite direction of Binford’s. Hodder begins with the mentalist concept of culture, then takes archaeology from a completely peripheral position with regard to that concept and places it squarely in the center of symbolic-structuralist inquiry. Artifacts—their creation, use, and discard—are ‘symbols [i.e., Culture] in [social] action’ (Hodder 1982a). Hence, archaeology with its primary focus on material culture is very centrally and strategically located in the arena of social theory. Hodder advocates a contextualist archaeology—as did Walter Taylor—but one in which artifacts are not just objectification of culture, they are culture.

As archaeologists, cultural anthropologists, paleontologists, physical anthropologists, population geneticists, ecologists, and linguists work in a multi-disciplinary effort to unravel the complexities of humankind, from about four million years ago to the present, they address the exciting issues elucidated by Patty Jo Watson (1995:690):

Who are we? Where did we come from? What happened to us between origin and now? What is the scope in all its compelling detail of past and contemporary human physical and cultural variation, and what does that variation mean in biological, social, and cultural terms?

In addressing this issue, cladists construct trees of descent which they compare with archaeological data and linguistic classification.

In response, advocates of ethnogenetic theories are objecting to the application of cladistic models to human society. They argue that human societies are not necessarily analogous to biological species in the evolution of language and culture, and that amalgamation or creolization—the rhizotic process—is perhaps equally important (Moore 1994:11-12).

Euro-American archaeology has converged from at least two different theoretical-methodological perspectives on ethnoarchaeology as arguably the single most important way to obtain information that is germane to creating and testing the plausibility of inferences made from archaeological data. Hodder agrees with the symbolic anthropologists that symbol systems are what distinguish the human primate from all other beasts; those symbol systems include and are importantly shaped by material objects and
architectural forms (Watson 1995:687). Hodder primarily pursues the intrinsic meanings with which the artifacts were imbued and the complex roles they once played in social actions and interactions within cultural systems. Hodder delves into these issues of symbolic systems, past and present, via ethnoarchaeology (Hodder 1982a, 1982b).

According to Patty Jo Watson (1995:687):

Ethnoarchaeology can be as simple as collating descriptive and functional details about objects and processes archaeologists frequently encounter—stone scrapers, bone awls, sherds from wheel-made pots, metallic ore, and slag—from archival sources, such as old ethnographies, ancient histories, museum exhibits and collections; or from published or unpublished photos, drawings, paintings. But, classically, ethnoarchaeology means designing and carrying out ethnographic research in one or more locales, chosen for their relevance to some archaeological problem.

Following the "classical" theory as defined above by Watson (1995:687), Binford (1978) worked with the Nunamiut of Alaska because he believed the Nunamiut caribou hunting techniques they practice in an arctic environment were germane to his archaeological interpretation of Middle Paleolithic caribou hunters in arctic western Europe during the Late Pleistocene. Binford also conducted other ethnoarchaeological research in the interest of middle-range theory: "the relationship between statics and dynamics, between behavior and material derivative" (Binford 1981:29; also parts 3 and 4 in Binford 1989).

As we strive in a grand multi-disciplinary effort (population geneticists, linguists, cultural anthropologists, archaeologists, paleontologists, physical anthropologists, and ecologists) to arrive at an acceptable, parsimonious theory of origins which accounts for world distributions of culture, language, and physical types, we need to scrutinize our progress against the "hard" facts of ethnographies [not just synthetic (that is, artificial) studies]. Whether or not a researcher is advancing along the lines of either a singular cladistic or singular rhizotic theory, or developing a paradigm that consists of a blending of the two, a baseline of information derived from multiple ethnographies, against which to measure such a theory is perhaps fundamental to its ultimate success.

In my ethnographic research in the Highlands of Irian Jaya, one control point of information (on a worldwide basis) is fixed spatially and temporarily in the Stone Age, from which facts can be gleaned and hypotheses or theories tested, whether the thrust is along a primarily cladistic or rhizotic line of reasoning, or a combination thereof. My research approach was holistic, so that worldview, material goods, and non-material social traits of adjacent-living cultural systems of diverse language groups can be scrutinized, and the distribution of specific kinds of material goods and social behavior measured against linguistic boundaries. If there was a measure of success in the study, one fundamental reason was that I approached an ethnographic situation from planned archaeological perspectives and then analyzed all material objects from a profound cultural anthropological viewpoint. This approach came naturally to me as I have been
using it for some 30 years. From my felt-success, I do not conclude as did the prominent Harvard archaeologist, Philip Phillips that "American archaeology is anthropology or it is nothing" (Phillips 1955:246-260). I conclude, instead, that for the new generation of ethnoarchaeological fieldworkers, such ethnographies, for the beneficial contribution they can make to our multi-disciplinary effort toward a unified general theory of origins and evolution, fieldwork must be planned with stringent archaeological objectives and then fieldwork carried out with a strongly motivated cultural anthropological underpinning.

I designed my own fieldwork so that the study would furnish us with a holistic model of cultural systems that were functioning at a certain stage of human evolvement in a specific ecological environment, and against which other cultural systems worldwide at the same, or other, stages of evolvement could be measured and, against which, predecessor and later evolved cultural systems could be compared. From the baseline (evolved stage), analyses of specific facets (physical stature; dress; family; leadership; political organization; adornment; subsistence; manufacture; trade; and uses of material goods; belief system; medical practices; warfare; rites of passage; dealing-with-the-unknown; et cetera) can be compared to such cultural materials and traits in similar or dissimilar systems worldwide and through time. Or, the totality of all material goods, related behavior, and worldview can be analyzed to prognosticate degree of cognition and psychological principles that were at play. I believe that it would be presumptuous on my part to presuppose an acceptable theory--I do not believe that one has been presented yet--especially with "the momentum building behind the Human Genome Diversity Project (HGDP), and the opportunities that will soon be at hand for interpreting this massive data base by reference to the broadly synthetic theories being developed" (Moore 1994:12; also, see Roberts 1992:1300-1301). Instead, my work is presented both visually (photographs, ink line drawings, and computer graphics) and with text to serve the purpose of research broadly, but in detail, from which archaeologists, cultural anthropologists, and others can derive data to enhance their own creativity, or against which ideas and theories can be tested. Those seeking a unified theory of origin to account for the separate or co-evolution of culture, linguistics, and physical type can use the same data against which to measure their own theories. Perhaps the data in some small way may contribute to those attempting to flesh out the proper mix of a predominately cladistic model and one built on the amalgamation of rhizotic processes.
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APPENDIX I
CROP AND WILD FOOD PLANTS

(Author's note: Repetition of certain narrative found also in Chapter IV is intended to save a reader, who is interested in botanical details, the inconvenience of having to refer back and forth to Chapter IV for information regarding the uses of plants that are identified in the following list.)

Botanical List

The people cultivate at least 15 different kinds of plants, 14 of which are listed below. All of these have generic names as well as specific names for different varieties. In the following list, the Dani (Grand Valley dialect) generic name precedes the common name and the scientific name. The plants are coded into the text by the numbers listed in front of the Dani generic name.

1. Bain, Yam tuber (*Dioscorea* sp.).
4. Doa, thick-stemmed grass (*Seteria palmifolia*).
5. El, sugar cane (*Saccharum officinarum*).
6. Gijo, gourd (*Cucumis ?*) (*Lagenaria siceraria*). (Note: Not used as a food)
7. Gilu, cucumber (*Cucumis satavis*).
8. Hagi, banana (*Musa* spp.).
9. Hanom, tobacco (*Nicotiana* sp.).
10. Hela, a mallow (*Abelmoschus manichot*).
11. Hibiti (alternate spelling hiberi), sweet potato (*Ipomoea batatas*).
12. Hide, ginger (*Zingiber officinale*).
13. Hom, taro (*Alcoasia* sp.).
14. Wenali, a pea (*Psophocarpus tetragonolobus*).

Plant Uses

The Dani and their Highland neighbors cultivate and eat three different kinds of tubers: *hibiti* (alternate spelling *hiberi*) (sweet potato), *bain* (yam), and *hom* (taro). Of the three, it is thought that some varieties of the taro might be indigenous and were probably present upon arrival of the first migrants (Benjamin C. Stone, verbal communication 1994). It has been thought that even the yam might have been indigenous or at least that it was free growing in greater Malaysia and could have arrived with early settlers. Of the three, the sweet potato is the late arrival.
The staple food of the Irian Jaya Highlanders today is the sweet potato which accounts for about 90% of the diet. There are at least 42 named varieties and possibly more than 70. The sweet potatoes range in size from very small to very large (up to two kilos) in size. Their meat ranges in color from grayish-white to yellow and orange. Some are quite dry and tasteless. Others are moist and slightly sweet tasting; most do not taste “sweet” at all. Small ones are often fed to the pigs. The people eat average-to-large size potatoes every day and all have their favorites. Very large potatoes are used in sacred ceremonies and some are endowed through ritual with special powers and fed only to sacred pigs. Potatoes are either roasted in the coals of an open fire or steamed in a steam pit. I have never seen one eaten raw. The leaves and vines of young plants are often steamed along with the potatoes and eaten as greens. They are delicious and quite high in vitamin A, which may account for a low incidence of certain kinds of eye problems among the Dani and other Highlanders.

Within the study area, the yam usually produces smaller tubers than the sweet potato and the vines are nearly always trained up poles. Rarely did I see sweet potato vines trained up poles. The indigenous farmers always explained that the yam does not do so well if its vines are bunched on the ground. The yam is roasted or steamed, like the sweet potato, before eating.

The taro is scattered throughout the potato fields—just a plant here and a plant there, except for natural stands of taro in marshy areas where the plants can have “wet feet” and even be “standing” in water. Within some Highlander groups, the taro is planted and cared for by the men conversely to the planting, care, and harvesting of potatoes by the women. I suspect there is a taboo against these women working with the taro. Might this custom be a holdover from the days when the taro was only encouraged in a manipulated forest or hunted by men? The taro, like the sweet potato, is roasted or steamed before eating. The large “elephant ear” leaves of the taro are used for wrapping bundles and sometimes as rain hats or just for protection from the sun by both men and boys.

In addition to the vines and leaves from young potato plants for greens, the Dani and their neighbors collect greens from several kinds of free growing plants (especially the young tips of ferns) as well as cultivating the helia (a mallow) and the weni (a pea) to be steamed and eaten from time to time.

Banana is the only cultivated fruit. Clumps of banana (of some 16 varieties) are always found clustered next to huts in the gardens of the habitation compounds, where they grow tall and often furnish shade for the houses. The banana fruit is usually eaten raw, seldom roasted or steamed.

The trunk of the banana and banana leaves have many uses. The cellular trunk is cut and pulled apart, laid to dry in narrow strips, carried to the leuakaima brine pool to soak up the salty brine, again dried, and finally burned to produce salty ash. The dried outer bark of the banana (gisakpel) serves as an all-purpose wrapper. Envelopes are made to transport delicate objects like feathers. Men’s tool kits, healer’s paraphernalia, sacred power kits, sacred stone (ganekhe, alt. kaneke) funeral exchange stones, trade
objects, and even large pieces of pig meat are all neatly wrapped in dried pieces of banana bark called *gisakpel*. Fresh banana leaves themselves are used in the steaming process to wrap chunks of meat before putting them into the "steam pot", and also to help bind the layers of food, leaves, and hot rocks together to keep the heat in. It is strips of banana leaves that are used to bind medicinal leaves over mutilated hands at finger amputations. The green leaves of bananas serve as multipurpose dishes and ground cloths on which to set food at ceremonies and on which to lay the ears and tails of ritually killed pigs.

The Western Dani believe that after creation the first humans brought both bananas and sugar cane, which are two of the Highland food delicacies. When taking brief rests from hard labor, the people chew on sugar cane as a refreshment. On some hillside gardens around the fringes of the Grand Valley of the Baining, I have noted scattered clumps of tall sugar cane growing in potato fields. For rest breaks from their labor, women working the fields retreat to a sugar cane clump to sit in the shade, have a visit, and munch on short sections of the sugar cane stalks. When I was with the Una quarrymen in 1992, they carried both sugar cane and potatoes down to their quarry site to eat during work breaks.

Trees of the *daik Pandanus* which produce large red fruits are sometimes planted in and around village gardens. Sometimes the fruit is harvested from *Pandanus* stands growing in the forest. The juice from the red fruit is used as a flavoring on tubers. I have observed that each habitation compound usually possesses one wooden trough-shaped bowl which the inhabitants freely share as a vessel in which the juice is mashed out of the pith from the *Pandanus* fruit.

Interestingly, the *duge* (or *daluga*) *Pandanus* nut tree is indigenous to the island of New Guinea (Benjamin C. Stone, personal communication 1994). This nut *Pandanus* is found in the study area both wild and cultivated between about 1,900 m and 3,300 m. Each individual tree, even those growing wild in the forest, is either owned, tended, and harvested by a particular man or is within a particular "nuttling" area that is controlled by a specific political group. The edible seeds are quite nutritious and enjoyed on a regular basis by the Highlanders. Each nut cluster is roasted and individual seeds (drupes) are cracked out of their endocarps with simple river rounded rocks used as hammerstones and anvils. These nuts were available at the earliest arrival of humankind in New Guinea (c. 40,000 ya or earlier) and, along with taro, breadfruit, and yams?, may have been among the earliest foods whose growth was encouraged by forest manipulation.

Ginger (*hide*) is the only vegetal food flavoring and is grown in village gardens. It is eaten raw and considered a special treat when eaten with salt to accompany a meal of sweet potatoes.

A small cucumber (*gila*) is grown in gardens and eaten raw between primary meals.

Two related gourds are grown on arbors. One, *Lagenaria sicaria*, is elongated with stones hanging from the ends while the fruits hang down from overhead arbors. This produces the long, thin gourds used for penis coverings (called *holims*). Sometimes the growing gourds are encouraged to grow
with curls of varying degrees to suit the fancies of different wearers. The other kind of gourd (*cucumis?*) produces a squatter fruit used for water containers. Both kinds may be steamed and eaten.

Tobacco (*hanom*), introduced at an unknown time pre-contact, which is grown around the houses in small gardens, is cured and then smoked in leaf-made cigarette wrappers. The indigenous inhabitants say that the more the tobacco is dried, the stronger it becomes. I observed no easily identifiable use of tobacco as a hallucinogen. Both men and women smoke, some incessantly.
APPENDIX II
GUTELU MABEL’S TRADITIONAL PERSONAL BELONGINGS

The following list itemizes personal belongings known to have been owned and maintained by Gutelu Mabel (pro. Kurula) at his residence men’s house at Jiwiki at the time of his death in February of 1990. In addition to these items, Gutelu maintained other artifacts at his sacred compound of Wadongku and possibly at other locations. The inventory was compiled between May of 1991 and July of 1993.

1. Ukulagie—net string cap.
2. Wam aik—boar tusk nose ornament.
3. ______—assorted feathers.
4. Walimo—woven bib of nassa shells worn over the chest by a string around the neck.
5. Mika—necklace made with a large section of a bailer shell which is displayed over the chest from a string around the neck.
6. Three holim—gourd penis coverings.
7. Wako—sanctified pig grease to rub on the body to cleanse it of bad spirits and for other uses as an "anointing oil" for sacred objects.
8. Four segeluk—walking sticks (sometimes a ritually empowered staff of this kind was used by Gutelu as a "staff of authority").
10. Four wim—bamboo knives.
11. I oik—gourd water container.
12. Sege—long, heavy wooden killing spear.
15. Wam male—pig killing arrows.
16. Two jaga—profane stone adzes.
17. One jaga bilik—large stone axe.
19. Five je—display exchange stones; sometimes used as items of wealth for barter.
20. Gutelu "je"—a special ganekhe stone 121 cm. long (refer to Chapter VII for description).
21. Two seken intoak—forked sticks as part of fire-starting kits.
22. Two sekan ade—rattan fire starting thongs.
23. Ganekhe packet with one adze blade.
24. Ganekhe packet with two adze blades.
25. *Ganekhe* packet with two Langda-Sela knife blades and one Yeineri Flat Type adze/axe blade.

26. *Ganekhe* bundle—with seven *akuni intoak* (human jawbones) and three clavicle bones (*akuni innoak*).

27. *Hanom*—dried smoking tobacco.

28. *Hali tik*—firewood actually kept from the ancestor’s time.

29. *Pulu*—rock chisel for making hole in axe handle or for use as a sacred object.

30. Many *wam aga*—pig tails.

31. Several *wam aik*—pig tusks.

32. Many *intoak*—pig mandibles.

33. *Iniok aiv*—sacred stick used as wand to protect people from malevolent spirits and from illness.

34. *Sali*—stick with supernatural powers used for blessing people and to drive out malevolent spirits.

35. *Ihuge eken*—salt water from Gutelu’s controlled brine pool (*Ileukaima*).

36. *Dibat* (alt. *yagat eka*)—special, but commonly used, single strand bark string necklace that is empowered in a special ritual and put on the neck of a person to keep the wearer from harm and "to keep the good spirit inside of the wearer."

37. *Jiwi* leaves (alt. *yibi*)—a special kind of leaf with supernatural power that has numerous uses.

38. Two *migit oak*—bamboo containers in which to keep important objects.

39. *Bagai aik*—mandible of small marsupial (used as profane graver and sometimes sacred).

40. Five *jerak*—long, narrow woven string band; with attached cowrie shells used as wealth items, particularly at funeral and wedding exchanges.

41. One *su walon*—string bag adorned with pig tails from sacred ceremony.

42. Various undisclosed bundles.
VITA

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