Pharmacognosy and the Senses in Two Amazonian Societies

by

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Abstract

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Medicinal plant therapy is a total sensory experience among the Matsigenka and the Yora (Yaminahua) of Amazonian Peru. Cues thought to indicate plant efficacy are sensed through multiple modes: taste, odor, irritation, and vision as well as body/mind sensations induced by emetic, psychoactive, and stimulating plants. Though occupying adjacent territories, the Matsigenka and Yora belong to different cultural-linguistic families and did not interact until recently. A comparative study documented criteria used by both groups to evaluate the healing power of plants. Odor is significant in both groups' cultural constructions of illness and therapy. Both value plants with red juice for blood-related conditions. For the most part, Matsigenka ethnomedicine is allopathic, as medicines act through opposition. Many plants are selected for toxic properties (bitterness, pungency, causticity) that overpower and expel illness. Bitterness is the most frequently encountered medicinal property, and many remedies are administered orally. Yora ethnomedicine is homeopathic in the sense that "like treats like." Medicinal plants are classified according to visible signatures: spiny plants for sharp pains, pink leaves for pinkeye, plants with watery latex for watery diarrhea, etc.. Medicines are rarely taken

internally, but rather applied externally as warm compresses. Bitterness, crucial in Matsigenka models of efficacy, is of little importance in Yora medicine. Different efficacy models appear consistent with different individual and social responses to pain in the two groups. Both groups have suffered severe health consequences and other negative impacts of Western
contact in recent decades. Differences in traditional pharmacognosy contribute to different perceptions of Western pharmaceuticals in the two groups. Despite cultural differences, there are major ecological and taxonomic similarities in the two pharmacopoeia. Sixteen botanical families, mostly understory shrubs and herbs, account for more than 65% of all medicines encountered. Regression analysis demonstrates a statistically significant correlation between the two medicinal flora. This study of comparative ethnopharmacology reveals neither strict cultural nor environmental determinism in medicinal plant selection, but rather a complex interweaving of cultural and ecological adaptations. Medicines, whether natural or synthetic, indigenous or globally distributed, are at the same time empirically active agents and potent symbols of healing power.

This thesis is dedicated to my parents, Glenn and Jean Moye Shepard, for their support, patience and love throughout the years, and to the memory of Marcial Vicente Shamoko: Ige, nokenkiakempi.

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Yoranawa, chipi Xero and other Epashtawo and Ewashtawo. Finally, thanks to Julio Orquilla, for getting us there and back again, many times and in many ways.

Introduction

Do people of different cultural backgrounds living in similar ecological settings discover the same or different plant medicines? An interpretive or symbolic perspective might argue that, since illness categories, body concepts and models of efficacy are culturally constructed, chances are high that non-interacting societies might utilize substantially different pharmacopoeia. A biocultural or materialist perspective might argue that medicinal plant selection would be constrained by the pharmacological activity of plants, and that significant ethnobotanical convergence might be expected despite cultural differences. A third perspective, that of critical medical anthropology or political economy, might argue that no cultural groups are truly isolated from one another, and that myopic cross-cultural comparisons would obscure the importance of powerful external forces, especially European colonialism, affecting health and ethnomedicine even in remote indigenous societies. In this work, I present the three perspectives as complementary, rather than mutually exclusive, and incorporate them within a coevolutionary model of human health.

This study is a controlled comparison of medicinal plant use in two indigenous societies in the Peruvian Amazon, the Matsigenka and the Yora ("Nahua") of the Manu River headwaters. Though occupying adjacent territories, they belong to unrelated cultural-linguistic families (Arawakan and Panoan) and have not maintained friendly relations in recent times. Both have entered only recently into sustained contact with Peruvian and global society. Yet it was the apparent contrast between Matsigenka and Yora attitudes toward Western medicines that provided me with my first clues to the fundamental differences between the two groups' traditional understandings and uses of medicinal plants. This fact underscores the importance of the hybrid perspective adopted in this work.

Anecdotes and the Ethnographic Method

> "I won't take any more pills, I've taken them for three days. They're bitter. Might burn out my insides."
> -- Response of a Matsigenka man to my insistence that he continue with a seven-day course of antibiotic treatment for a urinary tract infection.

> "Those are such pretty red pills. Do you think I could have some?"
> -- Comment of a Yora man looking over my shoulder at a field kit of antibiotics.

Ethnography is an anecdotal science. In the course of conducting fieldwork in a new cultural setting, the ethnographer encounters situations or events that stand out in some way, that seem to capture the essence of what is unique, or what is universal, about life in a human society. Anthropological field notes are lush with such moments of insight, sometimes profound, sometimes despondent, sometimes hilarious. As anecdotes accumulate, the ethnographer begins to detect patterns of relationship among them. With increasing fluency in the society being studied, some anecdotes may be discarded or reinterpreted in the light of new understandings. The ethnographer may develop empirical tests, structured or informal interviews to probe and refine these insights. Field notes may yield valuable data or hearty laughs, and may reveal as much about the person doing the studying as the people being studied. Intuitive, subjective, highly personal, and sometimes plain wrong-headed, ethnographic anecdotes are nonetheless fundamental building blocks in the anthropological study of culture.

The study contained in the following pages was born out of an anecdotal observation, illustrated above in the contrasting statements by indigenous informants about Western medicines. During several years of pre-doctoral fieldwork on the Manu River in southeastern Peru, I conducted extensive research among the Matsigenka. On a few occasions I encountered members of the Yora ethnic group. Despite their spacial proximity, the two groups manifested a number of profound cultural differences, including apparently different attitudes towards Western medicines. Both groups value the life-saving power of Western drugs, especially for introduced diseases to which they

had little exposure until recent times. Yet I found the Matsigenka to be somewhat cautious in their use of Western pharmaceuticals, especially bitter-tasting pills. The Yora, on the other hand, are eager to obtain and consume Western medication, often without regard to proper indications or dosage.

In the course of eighteen subsequent months of field research with both societies, I encountered numerous other anecdotal instances that supported this general observation. For example, several months after a Peruvian physician had given a bottle of daily iron supplements to a Matsigenka woman suffering from uterine bleeding, the bottle was returned, hardly used. Her family explained that she took the pills for a few days but did not want to continue for fear of toxic effects. The blood-red color of the pills may have resulted in a negative association with her illness. Such an occurrence would be unthinkable among the Yora, for whom Western medicines, like manufactured goods and introduced foods such as rice and sugar, are quickly consumed or distributed throughout the village. Furthermore, the red color of the pills would have been an indication for treating hemorrhages according to Yora models of efficacy. The Yora's eagerness to ingest pharmaceuticals has proven dangerous at times. For example, an older Yora man had a headache, but the village supply of pharmaceuticals had run out (a common problem) except for four pills of Aralen, an extremely bitter medicine for malaria. He took all four pills and became extremely ill. Such an occurrence would be unheard of among the Matsigenka, who are cautious when taking any medicines, especially those having a bitter taste. When an overzealous and undertrained Peruvian health care worker gave chloramphenicol prophylactically to a Matsigenka family for a suspected case of typhoid fever[1], they wisely refused to take additional doses, complaining about the extreme bitterness and perceived toxic effects of the drug.

How could differences in the perception and use of Western medicines in these two societies be explained? The Yora entered (or re-entered) into contact with Western

diseases and medicines only twelve years prior to this study, whereas most of the Matsigenka in the principal study village have experienced twenty-five or more years of such contact. This fact likely contributes to such differences. However even in societies with a long history of direct contact with colonial and global forces, indigenous medical concepts have a tremendous influence on the way Western medicines are incorporated into local health care practices (Alland 1964; Etkin 1979, 1992; Crandon-Malamud 1991). Are differences in the way the Matsigenka and Yora perceive Western medicines influenced by disparate traditional medical concepts in the two societies? What criteria are used by each group to select and evaluate medicines, both traditional and introduced? How is efficacy understood? What relationship exists between the administration of medicines and the perceived etiologies of illness? A comparative study of medicinal plant therapy in the two societies was conceived, in part, to answer these questions. This study also provides insights into broader theoretical questions about the cultural construction of illness and therapy, the biocultural processes involved in selecting and administering medicines and the complex adaptations of human societies to their ecological and social environments.

Efficacy: Perspectives from Medical Anthropology

Understanding how plant medicines and other non biomedical therapies heal is among the most fundamental and yet elusive areas of inquiry in the study of ethnomedicine. Even within the supposedly scientific confines of biomedicine, the existence of the placebo effect confounds strictly mechanistic models of therapeutic efficacy (Moerman 1983). The study of therapeutic efficacy in ethnomedical systems embraces the full gamut of theoretical perspectives. Symbolic anthropologist Victor Turner suggests that the use of medicinal plants among the Ndembu has “little empirical derivation” (Turner 1967: 356), but rather is guided by symbolic and religious concerns. Writing from the perspective of chemical ecology, Timothy Johns would likely disagree,

since his aim is “to elucidate the ways humans select and choose plants [medicines and foods] on the basis of chemical constituents” (Johns 1990: 3). This reference to two divergent views is somewhat like the pair of quotations from indigenous informants noted above. Such contrastive anecdotes may serve to highlight significant differences between cultural groups, be they indigenous societies or anthropological schools of thought. The contrasting views expressed by Turner and Johns are representative of the deep theoretical rift between two important perspectives in medical anthropology: interpretive and critical medical anthropology on the one hand, and biocultural medical anthropology on the other.

Interpretive medical anthropology focuses on the symbolic and social dimensions of illness. Symbolic approaches to medical anthropology have been important since the beginnings of the field. Both Rivers (1924) and Ackerknecht (1946) note that, while many traditional remedies are empirically effective, the efficacy of “primitive medicine” cannot be judged in terms of biomedical categories alone. Lévi-Strauss (1963a) suggests that symbols themselves are effective in therapy, bringing order and meaning to the chaotic disruption of illness. Symbolic action may result in beneficial (placebo) or harmful (nocebo) physiological effects (Cannon 1942; Moerman 1983). Healing may address the ills of the social body as well as of the individual body, while reflecting the interests and power structures of the “body politic” (Scheper-Hughes and Lock 1987). The political economy orientation in medical anthropology has focused on how global power relations shape local health systems (Morsy 1990; Singer, et al. 1992). The school of critical medical anthropology examines Western biomedicine as a cultural system, calling into question biomedical assumptions about health, disease and the human body (Scheper-Hughes and Lock 1987; Lock and Scheper-Hughes 1990; Morgan 1993).

This view of illness and healing contrasts with that of biocultural medical anthropologists, who use the scientific methods and categories of biomedicine as a

universal standard for the cross-cultural study of human health (Alland 1970; Lindenbaum 1979; Browner, Ortiz de Montellano and Rubel 1988; Wiley 1992). Several bioculturally oriented medical anthropologists and ethnobotanists have suggested that the efficacy of herbal remedies be evaluated in biomedical terms as well as in ethnomedical terms (Etkin and Ross 1982; Browner, Ortiz de Montellano and Rubel 1988; Johns 1990; Moerman 1991; Berlin and Berlin 1994). Focusing solely on the symbolic, culturally unique elements of efficacy may lead researchers to overlook the empirical bases of ethnomedical practices. Some of the same researchers, however, acknowledge that there is a problem in assuming a dichotomy between symbolic and empirical dimensions of healing. Medicinal plants may be chosen for empirical properties which reflect culturally specific, symbolically potent understandings of illness. For example, Aztec headache remedies contain active chemical ingredients which induce nosebleed, reflecting a model of illness in which headaches are caused by excessive blood in the head (Browner, Ortiz de Montellano and Rubel 1988). While the comparative perspective of biomedicine is important, one must avoid ignoring or falsely diagnosing folk syndromes because they fail to fit biomedical categories.

The ethnoscientific approach offers a rigorous, comparative methodology that nonetheless addresses the meaning of illness and healing in native terms. Several important early studies (Frake 1961; Rubel 1964) have used ethnoscientific methods to analyze folk illnesses in their full ethnographic richness without reducing them to the diagnostic categories of biomedicine. Combining ethnoscience, medical anthropology, and ethnobotany, Brett (1994) deals specifically with the domains of taste and smell in medicinal plant classification and use. He focuses his investigation on empirical, plant-based therapy in Tzeltal Mayan ethnomedicine, while also recognizing a domain of supernatural healing that does not rely primarily on empirical treatment regimes. Etkin (1988b; 1992) discusses how empirical and symbolic dimensions of healing are united in

Hausa ethnopharmacology. The Hausa assign positive or negative therapeutic value to medicines (herbal as well as pharmaceutical) according to specific, empirically perceived properties. Yet in this process, they are guided by culturally constructed understandings of illness that may or may not correspond to biomedical understandings.

A rich body of literature exists concerning the ideological and cosmological bases of Amerindian and Amazonian illness concepts, with a focus on sorcery, spiritual illness and shamanistic healing (Kluckhohn 1944; Lévi-Strauss 1963b; Lévi-Strauss 1963a; Reichel-Dolmatoff 1971; Harner 1972; Harner 1973; Kensinger 1974; Reichel-Dolmatoff 1975; Joralemon 1983; Luna 1986; Gebhart-Sayer 1987; Bennett 1991; Baer 1992). By the same token, cultural ecologists and physicians working in native South America have generated a substantial literature on health, nutrition and epidemiology in native populations (Berlin 1977; Strongin 1982; Flowers 1983; Coimbra 1988a, 1988b). Ethnobotanists, often motivated by the El Dorado of new pharmaceutical drugs, have collected a tremendous amount of information on medicinal plant usage, especially in Amazonia (Lewis 1978; Schultes 1980; Tournon 1984; Vickers and Plowman 1984; Plotkin 1988; Schultes and Raffauf 1990; Berlin and Berlin 1994; Souza Brito and Souza Brito 1996). Laboratory analyses by ethnopharmacologists have demonstrated in biomedical terms the efficacy of many plant medicines used worldwide (Etkin 1979; Browner 1985; Soejarto and Farnsworth 1989; Berlin and Berlin 1994; Callaway, et al. 1994).

An ethnomedical approach to plant efficacy is essential if we hope to synthesize these overlapping areas of inquiry and understand the evolution and maintenance of systems of plant therapy. By understanding the cultural constructions of illness (Kleinman 1980: 144-145) and efficacy (Etkin 1988a), it is possible to address the locus where medical ideas and medical materials join together in therapy: the corpus callosum

connecting the disparate intellectual hemispheres in the idealist/materialist dichotomy that plagues medical anthropology and the anthropological discipline as a whole.

The Comparative Method

During much of its history, anthropology has been characterized as a comparative discipline. Nineteenth century evolutionism, early twentieth century diffusionist studies, and later functionalism and structuralism all depended upon comparison of isolated case studies in order to arrive at general theoretical considerations. Benedict's (1934) comparative study between Zuni and Plains Indians emphasizes the way culture shapes and defines personality. Eggan's (1954) "method of controlled comparison" is a classic statement of scientific methods in cross-cultural comparison. Hammel's more recent (1980) review discusses the successes and failures of the comparative method in selected examples drawn from a century of anthropology. Cross-cultural comparison is especially important in the field of ethnobiology (Berlin 1992). As Nader (1990) notes, the comparative method has fallen out of favor in recent decades. An increasing interest in interpretive studies has led to an emphasis on cultural particularities, rather than generalizations. At the same time, influential works like those of Wallerstein (1974) and Wolf (1982) have urged anthropologists to pay attention to pervasive global systems, while calling into question the boundedness of the social units that anthropologists typically compare.

Due to its tremendous cultural and biological diversity, lowland South America has proven to be an important region for comparative ethnographic, ethnobiological and ecological research. The rich oral traditions of Brazil's native peoples inspired Lévi-Strauss' monumental comparative study of mythology, the *chef d'oeuvre* of structuralist anthropology (Lévi-Strauss 1970, 1973). Later structuralist studies of indigenous

Brazilian social organization also drew on comparative methods (Maybury-Lewis 1979). Shamanism has continued to be an important area of comparative research in the study of Amazonian peoples (J. Wilbert 1987; Matteson-Langdon and Baer 1992; Thomas and Humphrey 1994). In the tradition of Steward's (1968) “cultural ecology” important studies have documented comparative aspects of diet (Gross 1975; Milton 1984, 1991), ethnobiological classification (Berlin 1976; Berlin and Berlin 1979) and resource use (Posey and Balée 1989) among the native peoples of lowland South America. Comparison with indigenous patterns of resource use has led to a cultural critique of Western-style economic development in fragile Amazonian ecosystems (Moran 1980; Norgaard 1981; Posey 1983).

Structuralism and cultural ecology are the two dominant, and in many ways competing, paradigms that have shaped much of the anthropological research done in lowland South America (Vickers 1993). Though they differ in many ways, the two perspectives generally share a Western view of human culture as fundamentally opposed to nature. In structuralism, this attitude takes the form of structural oppositions, inferred from indigenous beliefs, between humans and animals, between village and forest, between domesticated and wild foods (e.g., Hugh-Jones 1980). Cultural ecology in Amazonia throughout the 1970’s was dedicated to testing various hypotheses about how cultural development was limited by environmental factors (Meggers 1971; Gross 1975), implying an almost hostile opposition between nature and culture. Indigenous Amazonian belief systems and economic strategies in fact reflect tremendous fluidity between what Westerners might view as distinct categories of culture and nature (Viveiros de Castro 1992; Descola 1994). Some researchers have hypothesized the role of anthropogenic forces in creating certain “natural” Amazonian ecosystems (Posey 1984; Balée 1989). In contrast to the view of the environment as a limiting factor, Norgaard

(1981) suggests that indigenous social and economic systems have coevolved with Amazonian ecosystems.

Despite significant advances in research over the past three decades, South America remains the “least known continent” (Lyon 1974) both in terms of the history and diversity of its cultural-linguistic groups and in terms of its rich and as yet incompletely documented flora and fauna. Given the rapid social, economic and ecological changes occurring in the region, comparative and interdisciplinary research among Amazonian native peoples is especially important and urgent.

In this work, I present a case study in controlled comparison encompassing a number of distinct but overlapping areas of ethnomedical and ethnobotanical inquiry: demography and epidemiology, illness concepts and classification, criteria for selecting plant medicines, botanical and ecological characteristics of medicinal plants. Furthermore, I suggest how comparative features of ethnomedicine may be related to more general cultural characteristics of the two groups such as contrasting economic and ecological adaptations, culture-and-personality and history of contact with Europeans. In addition to helping answer questions about cultural differences between the two groups, the comparative method provided me with a set of contrast filters, as it were, allowing me to appreciate clearly those cultural features that were unique to each group. Without such contrasts, my understanding of either of the two groups would have been significantly impoverished.

As I discuss in the following chapter, neither study community is in any sense “uncontacted” by other ethnic groups or by global society. However their relative degree of geographical and cultural isolation provides a special and perhaps quickly disappearing opportunity to carry out a controlled comparison of this kind. The Manu National Park is a particularly interesting region for comparative ethnographic and ethnobiological study.

The Manu embraces one of the most well-preserved and biologically diverse rain forests in the world. The region is home to five or more indigenous populations, three of which, Matsigenka, Mashco-Piro and several Panoan groups closely related to the Yora, include substantial numbers who have not experienced direct contact with European society for almost a century.

The two principal study communities (one Matsigenka, one Yora) where most of the research was conducted contain substantial numbers of people who remember the days prior to the availability of Western medicines and the onslaught of Western diseases. Wild plants gathered from the rain forest environment are an important part of traditional medicine in both groups; in fact, the words for 'herb' (M: *inchashi*; Y: *nipei*) are synonymous with the concept of medicine in both languages. The Matsigenka and Yora currently dwell in adjacent, and until quite recently, overlapping territories, providing an excellent opportunity for a comparative study of medicinal plant usage within similar ecological zones. The two groups have not maintained friendly trade relations in recent times, but rather have considered one another to be mortal enemies for at least half a century. Both groups came to know something about the habits of the other as enemies often do, however there was no reciprocal exchange of anything except arrows fired with the intention of killing.

The almost laboratory-like simplicity of this comparative study becomes suspect, however, once one examines the recent history of both groups. External pressure since the rubber boom at the turn of the century forced these and other once geographically isolated groups into spacial proximity and conflict. The very isolation of the two groups appears to be a fairly recent, defensive gesture in the face of interethnic violence in the post-rubber boom era. Furthermore, the health and economy of both groups have been drastically affected in recent times by both introduced Western diseases and biomedicine. Yet recognizing these powerful exogenous forces does not undermine the utility and

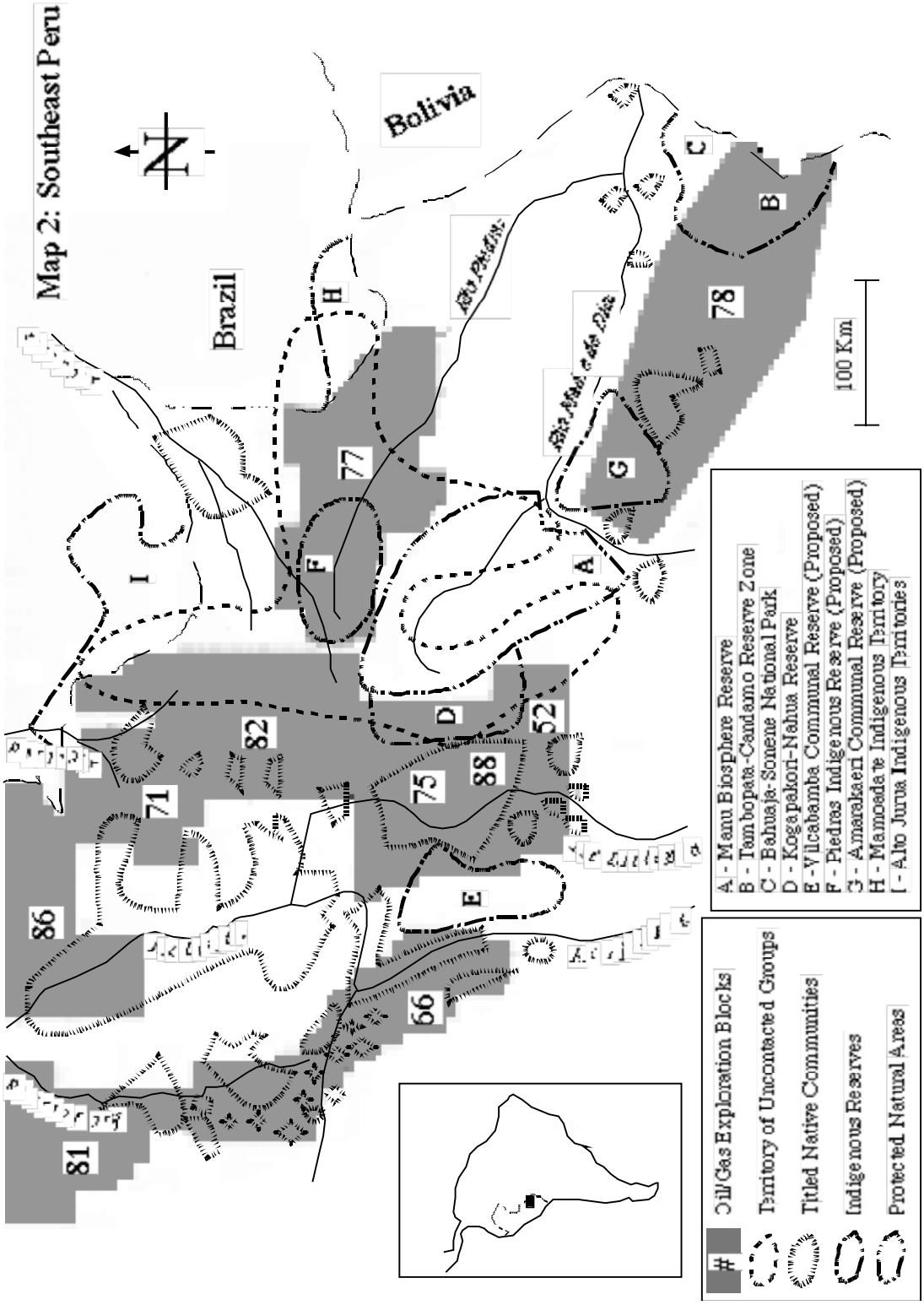
importance of the comparative method described here. Despite the disruptive and largely convergent forces that have affected both groups over the past century, great cultural differences remain between the two. Explaining these differences ultimately depends upon viewing human societies as complex entities that interact and change in response to external forces while still maintaining diverse, endogenous systems of internal coherence: in a word, culture.

Chapter Outline

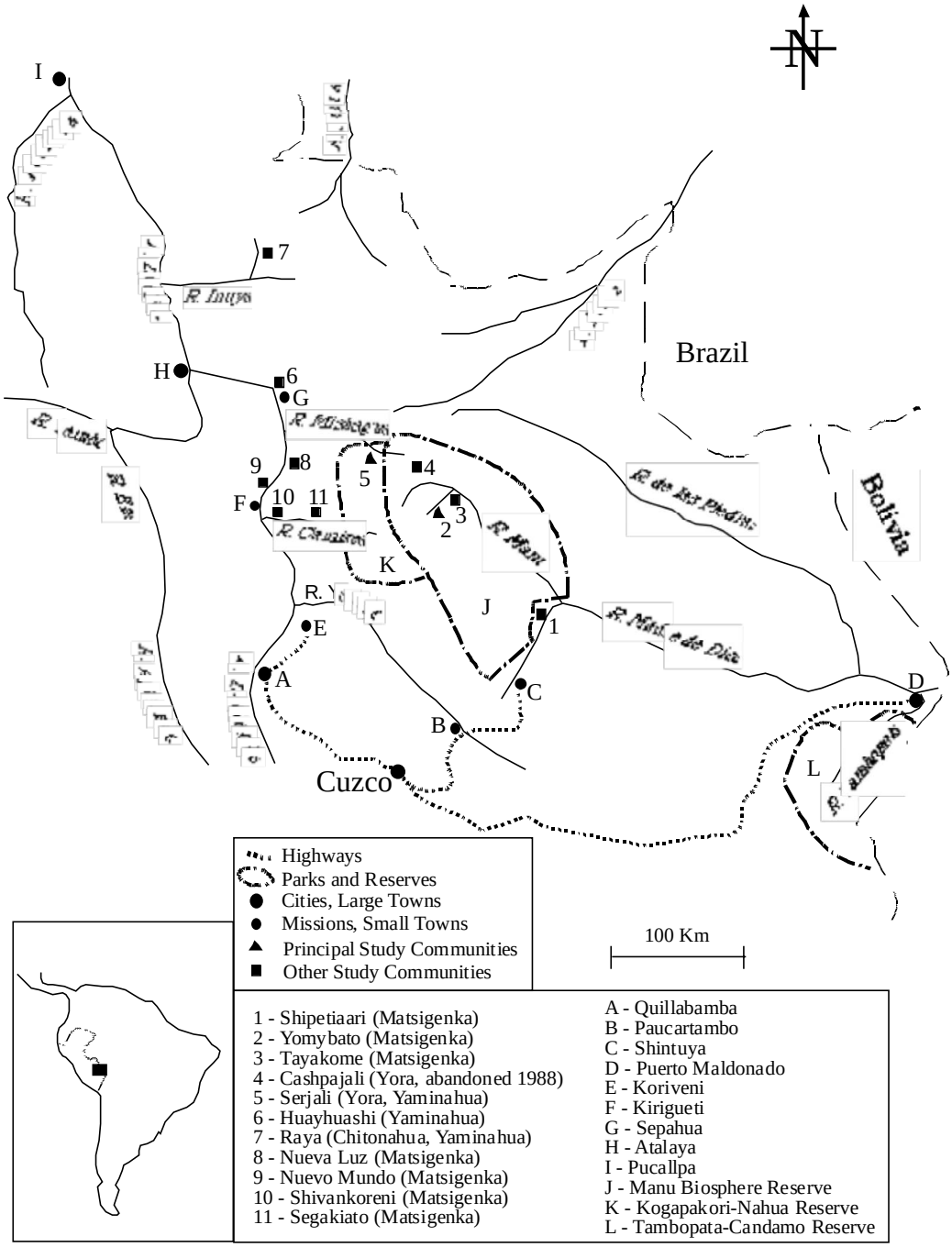
The first chapter outlines the general ecological features of the study region and presents an ethnographic sketch of the two principal study communities. It also explores the comparative history of the two groups, gleaned from oral histories and a selection of the available historical and archeological evidence. Significant in this discussion are the drastic impacts, both direct and indirect, of Western diseases, economies and interventions on the two groups over the past century. The second chapter presents the methods used in the study, and discusses any limitations encountered. The third chapter is an overview of aspects of social behavior, cosmology and belief in the two societies that are relevant to the study of illness and healing. This discussion focuses on how the personal experience of illness in the two societies is mediated through social, cultural and religious forms. The fourth chapter compares illness vocabulary, illness classification and concepts of etiology from the two societies. Only by understanding indigenous illness models is it possible to make sense of how medicinal plants are used. The fifth chapter summarizes scientific research on sensory perception, presents a comparison of sensory vocabulary in the two languages and points out similarities and differences in the way the two groups evaluate, select and administer medicinal plants. The sixth chapter describes the botanical findings of the study. The concluding chapter summarizes the

results and proposes the concept of sensory ecology as a field unifying sensory anthropology with emerging biocultural approaches to human-environment interactions.

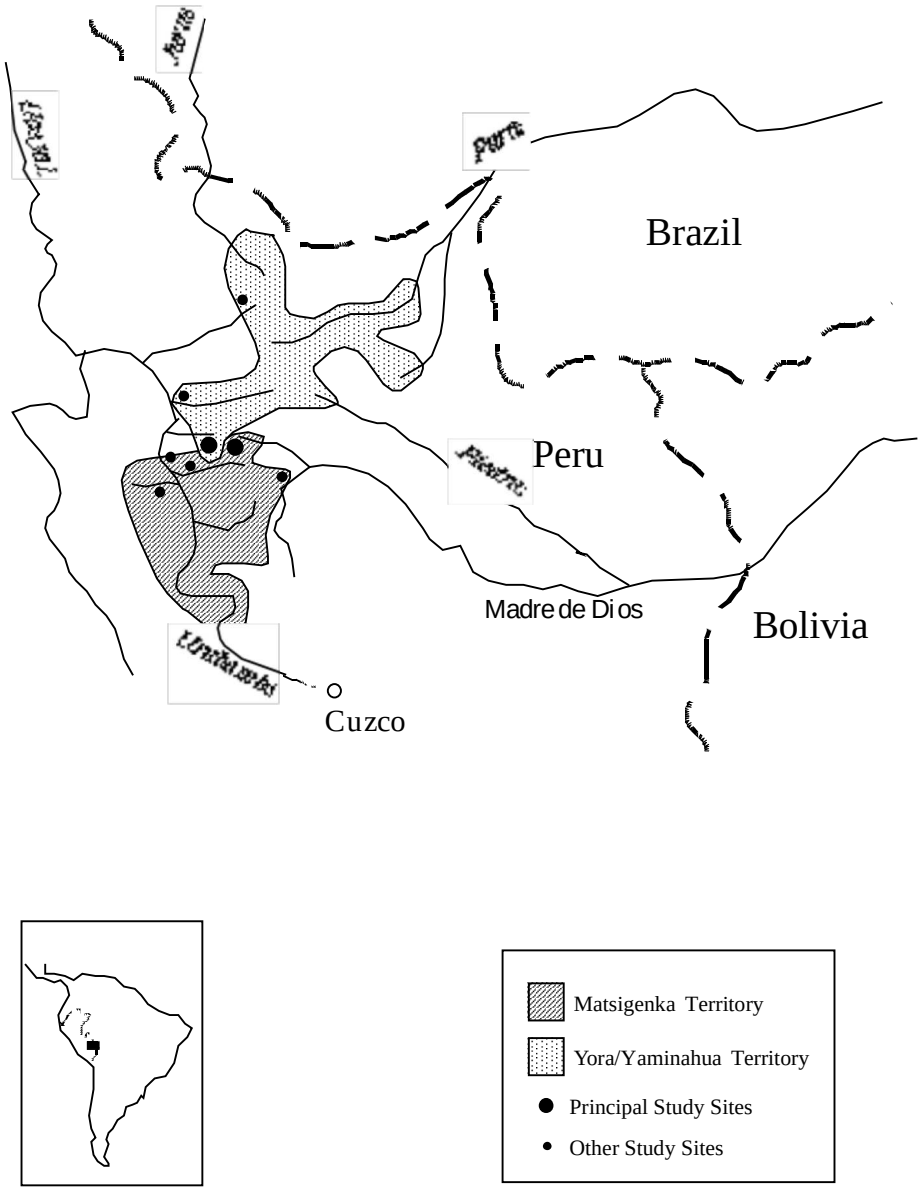
Map 1: Indigenous Territories of Lowland Peru


Map 2: Southeast Peru
N
Bolivia
Brazil
Río Madre de Dios
100 Km
81
86
71
82
77
66
75
88
52
78
A
B
C
D
E
F
G
H
I
Oil/Gas Exploration Blocks
Territory of Uncontacted Groups
Titled Native Communities
Indigenous Reserves
Protected Natural Areas
A - Manu Biosphere Reserve
B - Tambopata-Candamo Reserve Zone
C - Bahuaja-Sonene National Park
D - Kogapakori-Nahua Reserve
E - Vilcabamba Communal Reserve (Proposed)
F - Piedras Indigenous Reserve (Proposed)
G - Amarakaeri Communal Reserve (Proposed)
H - Mamoadate Indigenous Territory
I - Alto Juruá Indigenous Territories

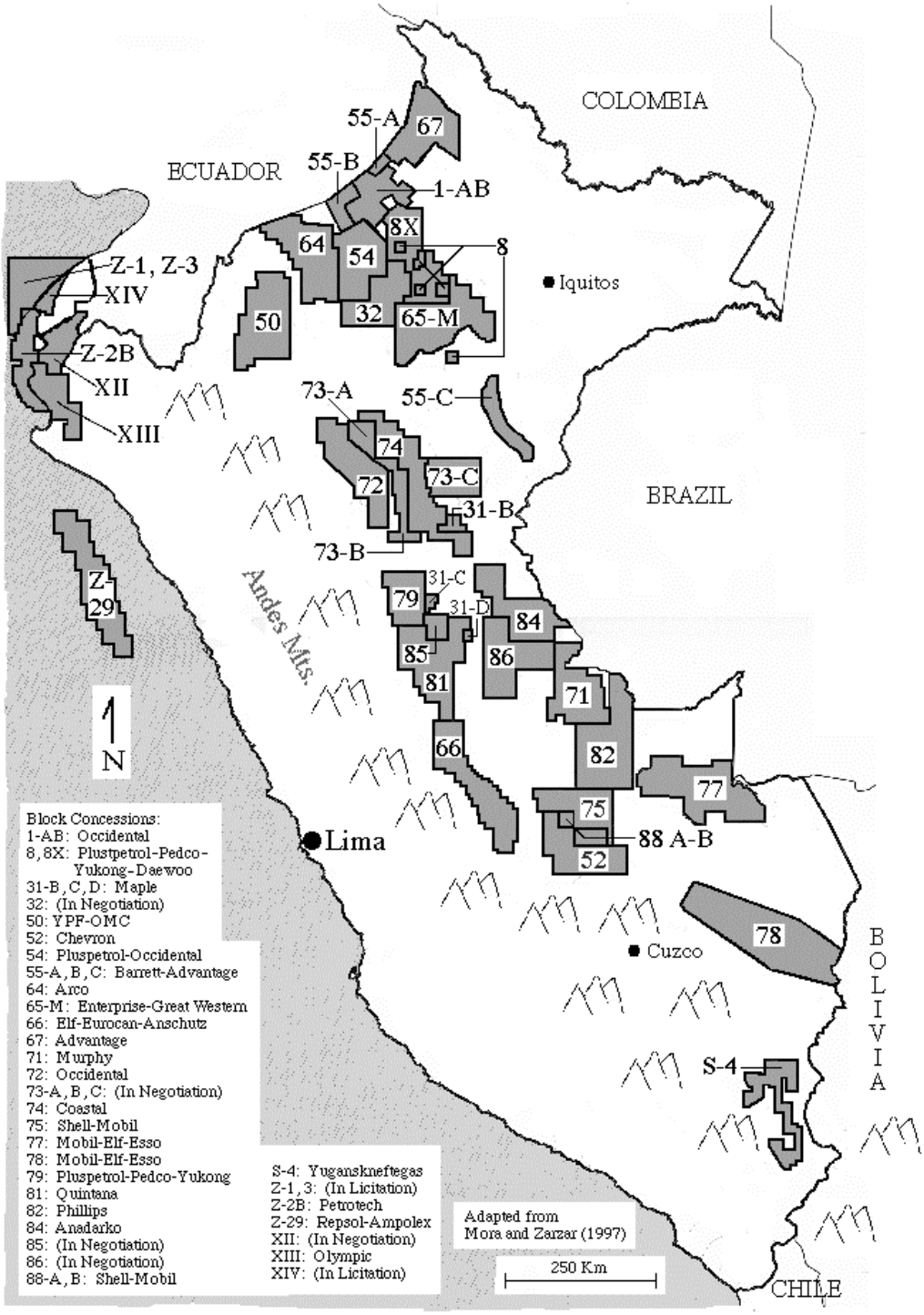
Map 3: Study Communities



Map 4: Matsigenka and Yora/Yaminahua Territories



Map 5: Oil and Gas Concessions



Chapter 1: The Setting: Culture, Ecology and History

This study of Matsigenka and Yora ethnomedicine takes place within complex and interwoven ecological, cultural, historical and political contexts. Like many indigenous Amazonian peoples of the twentieth century, both groups have relatively small and widely dispersed populations. The traditional economy of swidden agriculture, hunting, gathering and fishing requires and contributes to the maintenance of large areas of forest cover, both primary forest and secondary growth in various stages of regeneration. The Matsigenka and the Yora interact with the Amazonian rain forest and its diverse plant and animal species on a daily basis. Their villages are surrounded by forest and built of forest products. Much of their daily sustenance is derived from the forest. Their mythology is lush with accounts of wild plants and animals. Most of their medicines are gathered from the wild, and their medical system is richly endowed with ecological metaphors based on generations of accumulated observation of nature.

Any study of Amazonian peoples must consider the crucial role of the ecological setting. However environmental factors should not be viewed as overly deterministic of human behavior. Responding to a long tradition within the cultural ecology school of viewing food taboos as environmental adaptations, Milton (1991, 1997) points out the tremendous variety of dietary choice and food prohibitions among different Amazonian cultural groups inhabiting similar environments. Cultural diversity is as important as biological diversity in understanding the lifeways of Amazonian peoples. By the same token, the health and destiny of the diverse peoples and environments of Amazonia are shaped by powerful exogenous forces. The conquest of the Amazon by Europeans began in the sixteenth century and continues to the present. Economic development has been characterized by boom-and-bust cycles at various historical moments, usually resulting in violence to indigenous populations and degradation of the environment . For five

centuries, Amazonian peoples have suffered decimation by European diseases and genocide at the hands of intruders (Bodley 1975; Davis 1977; Hemming 1978). In recent decades, however, the plight of indigenous populations and natural areas in the Amazon have been the focus of tremendous international attention by scientists, conservation agencies, human rights organizations, development agencies and other non-governmental as well as governmental institutions. Important advances have been made in protecting threatened environments and safeguarding native people's territorial and cultural rights.

The Manu National Park and Biosphere Reserve, where much of the research for this dissertation was carried out, is a good example of the interplay between culture, environment, history and global economics. The Manu harbors tremendous biological diversity and is also home to six or more distinct indigenous cultures belonging to three language families. The hub of a lucrative and violent international trade in rubber latex at the turn of the century, the Manu today is an internationally recognized bastion of biodiversity conservation, and is also home to numerous indigenous communities. In recent decades, native peoples of Peru have emerged as political actors, seeking national and international support for territorial and human rights and self-determination. The medical practices of indigenous populations in the region can thus be viewed as responses to a complex and dynamic constellation of factors, natural as well as cultural, local as well as global.

Geographic and Ecological Setting

Southeastern Peru harbors some of the most biologically diverse ecosystems on earth: a census of one square kilometer of habitat on the Manu River counted 319 species of birds (Terborgh, et al. 1990); as many as 300 species of trees can be found in one hectare of forest (Gentry 1988); a single tree may contain more ant species than are present in all of Britain (Wilson 1986). Because of this tremendous biological diversity, the region hosts some the world's largest natural protected areas, and has been dubbed the

“biodiversity capital” of Peru. Two protected natural areas of international reputation are found in the region: Manu Biosphere Reserve and the Tambopata-Candamo Reserve Zone.

The 1.8 million hectare Manu Biosphere Reserve is one of the largest protected tropical forests in the world. The Cocha Cashu Research Station along the Manu River has been the site of extensive and important research in the field of tropical ecology (Terborgh 1983; Salo, et al. 1986; Gentry 1988, 1990; Terborgh, et al. 1990). With an elevation of 400 m, a mean annual temperature of about 23 degrees centigrade and annual rainfall in excess of 2000 mm, this site lies near the climatic boundary between Tropical and Subtropical Moist Forest in the Holdridge system (Holdridge 1967; Terborgh, et al. 1990: 214). The research station is located within the 6 km wide floodplain of the Manu River. Much of the surrounding forest is in various stages of succession, due to the constantly changing course of the river’s meanders (Foster 1980).

Both of the principal study communities lie at a slightly higher elevations (about 410-450 m), one on a tributary of the Manu River and the other on the upper course of the adjacent Mishagua River. Unlike the Cocha Cashu region, characterized by large areas of successional forest along the river floodplain, the principal study communities are located in areas of predominantly upland forest along tributary rivers. Here, the smaller rivers and streams run in narrower channels with a more limited floodplain, and most of the habitat is upland forest located on ancient alluvial terraces. This region has not yet been studied thoroughly, and appears to show some important differences in the composition of flora and fauna. A systematic collection of forest plots is currently underway to characterize the botanical composition of the major forest types recognized by the Matsigenka population of Yomybato village (Shepard, et al. 1999). The Yora population formerly occupied the tributaries between the Manu and Mishagua watersheds, but have recently resettled along the upper course of the Mishagua. This region has likewise been

little studied by ecologists, though the botanical and ecological features appear to be similar to those found along the upper Manu.

Cultural Diversity

The Peruvian Amazon is currently inhabited by an estimated 240,000 native speakers of more than forty indigenous languages representing at least twelve language families (Map 1; Mora and Zarzar 1997a). Depending on whether closely related dialects are split or lumped, the number of indigenous Amazonian cultural-linguistic groups varies from forty-two to more than sixty (Chirif and Mora 1977; Ribeiro and Wise 1978; Mora and Zarzar 1997b). Some eleven indigenous languages were extinguished over the past fifty years alone, and another eighteen are considered endangered (Mora and Zarzar 1997b). Southeastern Peru is home to diverse indigenous peoples, including some of the last culturally isolated, so-called "uncontacted" native societies of South America. Lowland language families represented in the study region include Arawakan, Panoan, Harakmbet and Tacana. More than sixty native communities have been granted legal title to some 750,000 hectares of land throughout this area, embracing the Madre de Dios, Urubamba and upper Ucayali basins. The 440,000 hectare Kogapakori-Nahua Reserve was established in 1990 to protect the territorial integrity of isolated indigenous populations and to act as a buffer zone for Manu Biosphere Reserve. A similar reserve was proposed for the uncontacted peoples of the upper Piedras river, though the proposal has remained in a bureaucratic stalemate for several years. The Amarakaeri Communal Reserve and the Vilcabamba/Kutivireni Communal Reserve are large indigenous resource-use areas proposed for this region, and which are also awaiting approval (Map 2).

For the native peoples of lowland Peru, the exuberant diversity of life in the Amazon rain forest is a fact of daily existence. Through lifelong interactions with their environment, native people have accumulated extensive ecological, taxonomic, and

practical knowledge about wild plant and animal species. Indigenous farmers also manage a large diversity of domesticated species and crop varieties in their swiddens: eighty domesticated and semidomesticated plant species have been identified in Matsigenka gardens (A. Johnson 1983); indigenous Amazonian peoples cultivate hundreds of varieties of manioc, many of which have not been studied by scientists (Boster 1984; Posey 1983). The diversity and dynamics of indigenous agriculture seems to mimic that of the tropical forest environment where it evolved. A tradition of long fallow periods and frequent migrations contribute to the regeneration of natural forest diversity and game populations in the abandoned garden clearings (Vickers 1980; Hames and Vickers 1983; Posey 1983; Denevan, et al. 1984).

Indigenous knowledge and appreciation of biological diversity goes beyond utilitarian facts. Myths concerning the origins of biodiversity are a source of both entertainment and philosophical speculation. Animal species are anthropomorphized in folk tales, spiritual beliefs, and personal anecdotes. Metaphors drawn from ecological processes are used to understand the human condition, while human intentions and emotions are projected into the ecological sphere to understand such phenomena as taxonomic saliency and symbiotic relationships between species (Shepard in press-c). Medical practices and concepts among both the Matsigenka and Yora/Yaminahua reflect complex, culturally mediated understandings of local ecological processes. Chemosensory and other attractive or defensive properties of plants (bitter taste, aromatic odor, spines) are central in Matsigenka and Yora/Yaminahua concepts of medicinal plant efficacy (see Chapters 4 and 5). Both groups understand illness and death through the ecological metaphor of predation: just as human predators hunt and kill animals to eat for food, so do certain dangerous animals and illness-causing spirits look upon humans as prey. The spirits of animals that are killed or harmed by human hunters may seek vengeance by causing illness to members of the hunter's family, especially young

children. In the indigenous world view, human populations live in a precarious state of dynamic equilibrium within the cosmos, and are kept in check by powerful natural and supernatural forces. Such beliefs reflect the intricately coevolved and homeostatic nature of rain forest ecological systems (see also Reichel-Dolmatoff 1976).

Study Communities

To carry out this research project, I chose one principal study community for each ethnic group: the Matsigenka community of Yomybato, on a tributary of the Manu River and the Yora community of Serjali, on the upper course of the Mishagua River (Map 3). I had worked in Yomybato and other Matsigenka villages during several years of pre-doctoral research beginning in 1986. In 1986, I first encountered Yora people from the village of Cashpajali of the upper Manu (abandoned in 1988) on their frequent canoe trips down the Manu River. They were suffering from a devastating epidemic of Western diseases, and sought health care, food and other humanitarian assistance. Since that time, the Yora population has resettled a number of times. These two communities were chosen for a number of reasons: their proximity to one another, their relative degree of isolation, the large numbers of monolingual native informants present, an apparent maintenance of knowledge about plant therapy, as well as my own past acquaintances with people of both communities.

I carried out shorter research visits to additional communities of the same or closely related ethnic groups. I worked in the Matsigenka communities of Tayakome on the Manu, Shipetiaari on the upper Madre de Dios, and Shivankoreni, Segakiato and Nueva Luz of the Urubamba drainage (Map 3). In addition to interviewing the Yaminahua people living together with the Yora in Serjali, I also carried out research with the Yaminahua population of Huayhuashi, near Sepahua on the Urubamba River. I made a brief research visit to a recently contacted Chitonahua group of the upper Minuya river, who were living with acculturated Yaminahua in the community of Raya. The

broad base of study communities revealed similar patterns of plant use among different Matsigenka communities, and among the Yora, Yaminahua and Chitonahua, while strengthening my observations as to the marked differences between the two broadly defined cultural groups.

The Matsigenka

The Matsigenka are an ethnic group of some 13,000 people living in dispersed villages throughout the premontane rain forest to the east of the Andes in southeastern Peru. The Matsigenka are of the Arawakan cultural-linguistic family, most closely related to the Ashaninka, or Campa, as well as to the Piro and Yanesha (Amuesha). Matsigenka settlements are found along the Urubamba, Upper Madre de Dios and Manu Rivers and their tributaries. Approximately 85% of the current Matsigenka population inhabits the middle and upper Urubamba River and tributaries (Mora and Zarzar 1997b). The principal study communities of the Manu River belong to a smaller group of Matsigenka inhabiting the northern tributaries and headwaters of the Upper Madre de Dios and Madre de Dios Rivers. They speak a dialect of Matsigenka that is distinct from that spoken on the Urubamba River but is nonetheless mutually intelligible. Most of the Matsigenka of Urubamba drainage were contacted by Catholic or Protestant missionaries over the past sixty years or so, and settled into communities, many of which are now legally recognized. A significant portion of the Matsigenka population inhabiting the Madre de Dios and Manu River headwaters still live in a state of self-imposed isolation, though the exact number of settlements in this condition is not known.

The Matsigenka practice long-fallow swidden agriculture, growing manioc, plantains and bananas, maize, sweet potatoes, cotton, annato, beans, peanuts, chili peppers and a variety of other crops in small gardens cleared out of the forest (A. Johnson 1983). They supplement their diet with fish, game, fruits and other wild foods gathered from the forests and rivers of their environment. The Matsigenka traditionally live in

small settlements of extended families clustered according to a matrilocal (or uxorilocal) pattern of residence: a man marries out of his home village and goes to live with his wife's family (Snell 1964; A. Johnson 1986). In the past, such matrilocal settlements were widely dispersed and highly autonomous. Manioc beer drinking parties were the major events that brought numerous settlements together for brief periods of celebration. Authoritarian leaders, known by the Quechua word *curaca*, have tended to emerge in the Matsigenka social system to serve as intermediaries with powerful outsiders, especially during periods of trade, exploitation or violence. Matsigenka legends describe the role of *curacas* in mediating trade relations with the Inca Empire, while historical records indicate that brutal local leaders served as mediators with slave traders before, during and after the rubber boom (Camino 1977; Alvarez-Lobo 1996).: 274).

As the Catholic Church, Evangelical missionaries and the Peruvian state bureaucracy have penetrated into the hinterlands, Matsigenka families have settled near mission outposts or government school houses, forming more densely populated villages of several hundred people. These serve as centers for evangelization, education and access to valued Western trade goods and medicines. Matsigenka people in more accessible areas have taken up the extraction of lumber and the cultivation of coffee, cacao and other cash crops. Under the aegis of Peru's Law of Native Communities, contemporary Matsigenka communities elect representatives to participate in native federations and engage in political activity. Nonetheless, the traditional matrilocal groups still maintain a high degree of autonomy in making political and economic decisions.

The Matsigenka have been the subject of a good deal of ethnographic study, particularly in the areas of social organization and kinship (Snell 1964; O. Johnson 1986; Rosengren 1987), subsistence economy (A. Johnson 1975, 1983, 1989; Baksh 1984, Baksh 1995) and cosmology (Baer 1984; Casevitz 1991). Studies of the Matsigenka language and collections of folklore have been collected mostly by missionaries of

various denominations (Aza 1923, 1924; Cenitagoya 1943; Snell and Davis 1976; Snell 1978, 1998). Phonology of the Manu River Matisgenka was documented by Solis (1973). Studies focusing on Matsigenka ethnomedicine include Baer's (1992) research on shamanism, Bennett's (1991) comparative study of Huachipaeri and Matsigenka health practices and Strongin's (1982) investigation of Western health care in a Matsigenka village. These and other sources mention the use of medicinal plants in passing, but this work represents the first systematic study of Matsigenka botanical medicines. I have documented aspects of Matsigenka ethnobiology, folklore, cosmology and concepts of illness and health in a number of recent papers (Shepard 1997, 1998a, 1998b, in press-a, in press-b, in press-c; Yu and Shepard 1998;).

The great majority of ethnographic and linguistic research among Matsigenka has been carried out with populations of the Urubamba River drainage. Populations of the Madre de Dios and Manu have received considerably less attention. Despite overall cultural similarities, there are important historical differences among the different Matsigenka populations and dialect groups. To make such distinctions in the text, I will use "Matsigenka" to refer to the Matsigenka ethnic group as a whole. I will use "Matsigenka of Manu" to refer to the more restricted set of communities of the Upper Manu sharing a common history, of which the principal study village of Yomybato is the largest currently accessible community.

Yomybato: A Brief History

Yomybato is a community of about 230 people located on an upper tributary of the Yomybato stream (also known as Quebrada Fierro) along the upper Manu River within the boundaries of the Manu National Park and Biosphere Reserve, in the province of Madre de Dios. The Matsigenka currently living in Yomybato were contacted and settled into the large village by Protestant missionaries of the Summer Institute of Linguistics (SIL) during the 1960's (d'Ans 1981). Using bilingual Matsigenka from the

Urubamba River as their guides, missionaries contacted scattered and isolated communities from various upper tributaries of the Manu and Madre de Dios. Matsigenka came from as far away as the headwaters of the Palotoa river to the west to inhabit the large mission village at Tayakome, near the mouth of Yomybato stream. The SIL established an air strip, set up a bilingual school house, provided health care, and commercialized native products (especially otter, jaguar and peccary pelts) in exchange for metal tools, clothing and other Western manufactured goods. After some fifteen years of missionary work, the SIL left Tayakome soon after the creation of the Manu Park in 1973. The missionaries and their indigenous representatives decided to move to the Camisea River to establish a new community where economic activities and the use of firearms would not be restricted. Attracted as much by the promise of material goods as spiritual salvation, approximately half of the population of Tayakome crossed an isthmus into the Camisea and eventually established the community of Segakiato.

After the SIL left Tayakome, the attractive forces of the community school house, health post and access to Western goods vanished, and the community split into smaller, more traditional extended family settlements. Mostly for fear attacks by the Yora, though also because internal disagreements, a desire to avoid Western diseases, sorcery accusations, and the quest for better hunting grounds, a large group of Matsigenka families abandoned Tayakome and sought refuge along the upper part of Yomybato stream. Throughout the 1970's and early 1980's, Yomybato village grew, as refugees from Yora attacks along the Sotileja and Cumerjali rivers sought the safety of a large, populous village. In 1983-84, Catholic missionaries provided the villages of Tayakome and Yomybato with bilingual Matsigenka teachers from the Urubamba River. Throughout the 1980's, the schools and minimal health services were funded mostly by the Dominican mission. By the early 1990's, the Peruvian Ministry of Education and the

Ministry of Health have become more involved in supporting education and health care in the two communities.

Since the formation of Manu National Park, the Matsigenka of Manu have been both blessed and cursed by a relative degree of isolation. They are prohibited from using firearms or from engaging in extractive economic activities other than traditional subsistence. They are protected from the encroachment of colonists, loggers, and other outsiders but, until quite recently, were greatly limited in their access to cash and the things it can buy, including Western medical care. When I carried out my first research project with the Matsigenka of Manu in 1987, health care was distributed by bilingual school teachers living in the communities, who had little training and only meager medical kits. Professional medical teams funded by the Ministry of Health, the Dominican mission of Shintuya, or the Manu Park itself made sporadic visits, including a yearly vaccination campaign. These did not meet the health needs of the community, however, both in terms of materials and culturally appropriate care (Cueva 1990). Since 1996, medical attention has increased considerably, and health posts have been established by the Peruvian Ministry of Health in both Tayakome and Yomybato villages. However adequate health care in the two communities suffers from problems caused by inexperienced health workers, lack of materials, difficulty of access, and tremendous cultural differences between the urban health workers and the indigenous inhabitants. The health care workers assigned to the health posts have a minimal level of training. Designated as “sanitario,” this level of training is below that required for the nursing profession (“enfermero”). Furthermore, at least the first pair of health workers assigned to Tayakome and Yomybato appeared to be problematic individuals, rejected by other regional health centers and in a sense in exile to the least desirable localities. Both were accused of having sexual affairs with married and unmarried Matsigenka women. Both were absent from their posts for months at a time, and were accused of diverting

medicines, materials and funds of the health post for personal use. Both were eventually removed from the posts at the request of the community leadership, and have been replaced by more responsible individuals. However, Matsigenka women are sometimes reluctant to visit the health post due to past abuses. As one woman said to me

> I don't go to see the *sanitario*. He cannot speak [Matsigenka]. I cannot speak Spanish. He is scary! He might bother me [make sexual advances] like the other one. And he is stingy with medicines. He only gives out sweet water [oral rehydration fluid].

The health care workers rarely make household visits, especially to the more distant houses. Sick people tend to come to the health post only when their illness is severe, and often beyond the means of the *sanitario's* limited training and supplies. Doctors and nurses working with the Dominican mission make short visits (rarely more than two days) to the villages on an irregular basis, giving vaccines and treating sick people *en masse*. Since 1995, people from isolated communities on the Cumerjali and Sotileja have entered into increasing trade relations with Yomybato village, obtaining metal tools as well as colds and flu (Cueva and Shepard 1995). The locally available health services are not adequate to handle the frequent, debilitating epidemics of respiratory infections, especially among the isolated populations.

Over the past decade, the Matsigenka communities of Manu have become increasingly outspoken about their need for better health care, education and economic alternatives. Trade goods most desired by the Matsigenka include clothes, metal items, school supplies for their children and medicines. In 1998, the Matsigenka communities of Tayakome and Yomybato received funding from the German Technical Cooperation (GTZ) in collaboration with the Peruvian Institute of Natural Resources (INRENA) to construct a tourist lodge at Cocha Salvador in the Manu River Reserve Zone, several hours downriver from the community of Tayakome. GTZ has consulted with Peruvian organizations and national and international anthropologists (including myself) on how to best administer a tourism project in such special cultural and ecological circumstances.

Representatives of GTZ and INRENA view the Matsigenka Lodge as a model project in community-based development, and contemplate several years of capacity-building workshops and monitoring of social and environmental impacts. However the project has already precipitated a complex set of conflicts within and between the two communities as well as among several governmental and non-governmental organizations working there. The Matsigenka Lodge Project is still in its infancy, but will certainly generate far-reaching cultural and economic transformations among the Matsigenka communities of Manu.

The Yora/Yaminahua

The Yora language belongs to a closely related group of languages or dialects in the Panoan language family centered around the Purús River. The same autodenomination, *Yora*, meaning "people," is used by all Purús River Panoan speakers: Yora, Yaminahua, Sharanahua, Marinahua, Mastanahua, Chandinahua, Chitonahua and others, with a total population of perhaps 6,000. These different names appear to correspond to distinct populations of what was once probably a single ethnic group of closely related, intermarrying clans or moieties (Townsley 1987). The Purús River Panoan languages are also close, though not mutually intelligible, to Cashinahua and Amahuaca. As is the case for many ethnic names applied to indigenous societies, the names for Panoan peoples are mostly nicknames or disparaging terms applied by outsiders, typically acculturated indigenous people who served as guides to white rubber tappers, missionaries or ethnologists. The term *nawa* means "people of another ethnic group, foreigners," and contrasts with *yora* meaning "true people." Yaminahua (*yaminawa*) means "(other) people of stone axes," Marinahua (*marinawa*) means "agouti people," Sharanahua (*sharanawa*) means "good people," Amahuaca (*ame wake*) means "children of capybara." The whites duly noted these ethnic nicknames in their diaries and

publications, and the names have been passed down in the literature and even adopted by the various ethnic groups themselves.

Because the Yora population had little contact with other ethnic group throughout most of the past century, they have been spared such ethnic nicknames. For decades, missionaries, loggers, anthropologists and local indigenous peoples had been aware of the presence of a substantial indigenous population along the Manu-Mishagua watershed, but all attempts to contact them were met with fierce resistance. The available evidence suggested a group of the Panoan language family, originally suspected to be Amahuaca (D'Ans 1972). The Yora were forcibly contacted in 1984 by loggers, resulting in the decimation of the group by introduced diseases. Since this time, a proliferation of ridiculous names was spawned. The Yora are known in the literature variably as the Yura, the Shara, the Nahua, the X-Nahua and the Parque-Nahua (Zarzar 1987: 99). The odd terms X-Nahua ("X-People") and Parque-Nahua ("Park People," due to their presence in the Manu Park) were coined to indicate that this is a hitherto unnamed group related to other Panoan populations whose names end in "nahua" (Yaminahua, Sharanahua, etc.). The most common name for this group in the anthropological literature is Nahua (Zarzar 1987). This term is entirely inappropriate, however, since the corresponding word in their language, nawa, means "foreigner" or "white person." Local mestizo populations in Sepahua call them the "Yabashta," derived from the word yamashta, a term of endearment heard commonly as a greeting among the Yora. For lack of any appropriate alternative, I will refer to this group with their autodenomination, Yora, "The People."

In this work, I use the term Yora to refer to the population of Panoan speakers who inhabited the Manu-Mishagua watershed until the time of their contact in 1984, and currently form the majority of the population at the study settlement of Serjali. The current Yora population is approximately 250. I use the term Yaminahua to refer to the

Yaminahua proper, with a total population of about 1500, mostly inhabiting Purús River tributaries but also present near the Catholic mission town of Sepahua on the Urubamba River. I use the term Yora/Yaminahua to refer to the two groups together as members of a more inclusive cultural-linguistic unit. It is likely that other Purús River Panoan groups such as Marinahua, Chandinahua, Sharanahua and Chitonahua share many common features of language and culture with the Yora/Yaminahua. For example, the recently contacted Chitonahua of the Inuya River, whom I visited briefly, speak a mutually intelligible dialect of Yaminahua, and appear to have many of the same names and uses for plants (including medicines) as the Yora, with whom they have never interacted.

The Yora themselves have been the subject of only a handful of published studies, notably Zarzar's (1987) "X-ray" of the disastrous consequences of the 1984 contact, and Hill and Kaplan's (1990) brief paper on subsistence. Townsley (1983, 1987) has discussed the impact of historical relations with outsiders on social organization among the Yaminahua. The Yaminahua language, as spoken on the Purús River, has been the subject of an instructional grammar prepared by missionaries of the Summer Institute of Linguistics (Eakin 1991). Other relevant works include studies of subsistence economy, leadership, folklore and traditional medicine among closely related Panoan peoples, the Cashinahua and Amahuaca (Carneiro 1964a, 1964b, 1969, 1974; Siskind 1973a; Kensinger 1974, 1995).

The Yora: "First Contact"

Serjali is a Yora community of about 250 people on the upper course of the Mishagua River, located near the boundary of the Manu Park within the Kogapakori-Nahua Indigenous Reserve, in the province of La Convención. Prior to their 1984 contact, the Yora had a population of some three to four hundred people. Contrary to the report of Hill and Kaplan (1990), the Yora were not an exclusively foraging society prior to this contact. Instead, the severe epidemic of respiratory infections resulting from their

forced contact reduced them to the despondent state in which Hill and Kaplan found them, scarcely able to clear their gardens. According to their own reports, the Yora excavated abandoned rubber camps in the upper Manu River to obtain metal tools, cooking implements and glass beads. During the time they inhabited the Manu River headwaters, the Yora claim never to have used stone tools. Metal tools found in abandoned rubber camps or obtained on raids of Matsigenka and mestizo settlements were an essential part of the Yora lifestyle (MacQuarrie 1991). The Yora cleared and planted gardens of corn and other crops, and also relied heavily on gathering feral plantains that dispersed from Fitzcarrald's plantations (Hill and Kaplan 1990; MacQuarrie 1991).

According to Yora oral histories, ancestors of the current generations' great-grandparents migrated from Purús River tributaries to the north. MacQuarrie dates this migration to approximately the 1920's (MacQuarrie 1991).. The Yora he spoke with in 1987 indicated that Yora left their ancestral territory (probably a tributary of the Purús) to avoid illnesses and incursions by white invaders. Over a period of about twenty years, the Yora migrated and eventually settled in the headwaters of the Manu, apparently after the exodus of rubber tappers from the region. The rubber tappers had not been gone for many years when the Yora arrived, however, because some of the early Yora gardens were planted in areas of secondary growth left behind by the rubber tappers' plantations.

A Yora oral history recorded by MacQuarrie relates a possible slaving raid carried out along the upper Mishagua river some two generations prior to the present, perhaps in the 1930's or 1940's:

> ...It was down [river] that they captured them, with all of the guns. From there they [the Yora] went with the nawa [whites]. They went. They took all of the [Yora] women (MacQuarrie 1991: Chapter 7).

When relating oral histories to both MacQuarrie and myself, the Yora insist that they and their forefathers always attempted to carry out friendly contact with whites, and

only became aggressive after being first attacked. The Yora also insist that the same applies to their interactions with other indigenous populations of the region, including the Matsigenka. One Yora man explained to me:

> We went to visit them, there in the place they made their gardens. They had many things, we had nothing. We asked them to give us their things. Cotton, knives, axes, pots, clothes. We were hungry. We asked them for food. But we spoke to them, and they did not understand. They speak with different words. Then they shot us with arrows, and we shot back.

The Matsigenka, however, tell a different version of the story. According to Matsigenka accounts, the Yora always shot first. After I related the Yora version of these interactions, one Matsigenka man responded:

> It's not true, what they said about trying to talk to us. It is true, we do not understand their words. But they never tried to speak to us. If they had tried to speak to us, if they had asked us in a good way, we would have given them food and all the things they wanted. But they always shot us first. They shot arrows, they killed people. They killed many people! There used to be many Matsigenka, now there are only a few left. [The Yora] killed them all. Later on [after 1985], they got better. They stopped killing us. They asked us for food and we gave it to them. But before, it was not like this.

Whatever the truth, the migration of the Yora into Manu brought them into confrontation with isolated Matsigenka groups in adjacent regions who had migrated from the south as a result of similar pressures. The two groups became mortal enemies. From perhaps the 1930's until 1985, the Matsigenka and the Yora lived in a state of constant conflict. The Yora, fearing foreign ethnic groups but desiring their material possessions, carried out periodic raids on Matsigenka and mestizo settlements of the Manu, Camisea and Mishagua rivers to obtain metal tools, food, spun cotton, cloth and other goods. Dozens were killed and wounded on all sides.

When loggers from Sepahua began entering Yora territory on the Mishagua river in the 1950's, the Yora attacked, and their reputation as fierce warriors became almost legendary. Lumber companies retaliated with punitive raids of their own, causing casualties on both sides (Zarzar 1987: 94). Crews conducting seismic surveys for Shell Oil entered deeper into this territory starting in 1981. Ignoring clear warning signals left by the Yora, Shell camps were raided on several occasions. Using helicopters, Shell

employed an acculturated Yaminahua leader to locate settlements, drop gifts and shout messages by megaphone in hopes of deterring further incidents. The Yora made national headlines in 1983 when they attacked and repelled an expedition of the Peruvian marines led by president Belaunde to the headwaters of the Manu (Zarzar 1987: 94; MacQuarrie 1992: 284), intending to inaugurate construction of the Peruvian leg of a Transamazon highway.

During the early 1980's, the Yora intensified their campaign of raids against the Matsigenka. Attacks on Matsigenka settlements at Cumerjali and Jeringapanko in 1984 and 1985 resulted in numerous deaths on both sides. Close upon the heels of Shell's seismic crews, and driven by the economic boom in the region, loggers from Sepahua continued to penetrate deeper into Yora territory. In 1984, four Yora men were captured by loggers, tied up and taken to Sepahua. The Yaminahua leader employed by Shell was able to communicate with them, and they were showered with gifts from the community, the Catholic mission and the petroleum company. They were taken back to their territory and released, but a month later they returned to Sepahua in the hopes of receiving more gifts.

Soon thereafter, there began an epidemic of respiratory infections (whooping cough, colds, flu, tuberculosis, malaria) that was to change the history of the group forever. Protestant missionaries of the Summer Institute of Linguistics had been interested in the group for some time, and made overflights during the early 1980's with an eye towards eventual contact and evangelical work. In their first medical visit to Yora territory in 1984, missionary doctors treated some 130 patients of whom 40 to 60 died (Zarzar 1987: 95). The missionary group employed acculturated Yaminahua guides to seek out and treat the sick from widely dispersed settlements. The settlements in Manu, farther from immediate health care, probably suffered higher mortality rates.

The Matsigenka have a different explanation for the origins of this fatal epidemic. A Matsigenka man of the Manu river, whom I will refer to as Gavilán, is widely believed to be a sorcerer, which is to say, a shaman who uses his powers to kill, rather than to heal. He is blamed for many unusual deaths in Matsigenka communities over the past twenty years. He spent his childhood among Piro and Ashaninka of the Urubamba River, where he supposedly learned the diabolical arts. Gavilán lost many family members to Yora raids in the headwaters of the Manu River, and was wounded himself. He is believed to have inflicted epidemics of severe illness on the Yora in the mid-1980's, after some of the Yora's most deadly attacks on Matsigenka settlements in recent years. According to local accounts, Gavilán recovered a long bone from the skeleton of a Yora man killed during a raid in the 1970's. He split open a length of Guadua bamboo stem, inserted the bone, applied a mixture of dangerous plants known only to sorcerers, tied the bamboo stem shut, and buried it in a large stand of bamboo. In 1981 or 1982, Guadua bamboo stands throughout the region flowered, fruited, and died, a poorly-understood natural event that occurs at intervals of fifteen years or longer (Nelson 1994). For the Matsigenka, the fruiting and die-back of bamboo was caused by the sorcerer Gavilán, so that the Yora would suffer a shortage of bamboo for arrows and thus stop attacking the Matsigenka. The Matsigenka also associate the fatal epidemics among the Yora beginning in 1984 with Gavilán's act of sorcery.

During the early years of the epidemics, the Yora population was so reduced and weakened that they were hardly able to gather food and plant crops. For the next several years, they continued to suffer from new illnesses, chronic pneumonia and a state of famine. They made frequent trips down river, along both the Mishagua and Manu Rivers, to obtain food from former enemies such as the Matsigenka and the mestizo loggers In the late 1980's, the Yora abandoned the Manu-Mishagua headwaters altogether and resided in squalid and desperate conditions in the mission town of Sepahua on the

Urubamba River. Many orphans were adopted as domestic servants or laborers by mestizo colonists. Eventually, the survivors decided to return to a new community downstream from their former territory along the upper Mishagua. The Yora traditionally buried dead adults under the floor of their houses, and then moved to another settlement some distance away to avoid contact with the ghost. Because the number of deaths was so great in the late 1980's, many of the dead were simply left in the forest or thrown in rivers, to be eaten by vultures. The area is believed to be heavily populated by ghosts, and today the Yora have abandoned the Manu-Mishagua headwater region altogether.

In 1986, as a novice anthropologist on my first field trip to Peru, I witnessed the suffering of a group of some fifty Yora who had traveled in overloaded dugout canoes for more than two weeks down the mosquito-infested Manu River to its mouth in search of food and medical care. They were dressed in traditional attire, their strong bodies naked except for penis straps on men and small skirts on women. Men and women alike wore necklaces of monkey teeth and strings of beads draped over their ears and hanging from a piercing in the nasal septum. The men's hair was painted red with annato, tonsured in the front and hanging down long on their backs. They wore fragrant herbs in bracelets around their upper arms and calves, and the men chewed tobacco in large wads that they shared among themselves and offered to strangers like me. Some wore orange hard hats acquired from Shell representatives or tattered Western clothing. All had severe respiratory infections and depended on local mestizo and native populations for food. The people of Boca Manu were generous with food, clothing and other gifts, but took it upon themselves to cut the hair of several of the Yora men. Men with long hair were teased by both mestizos and acculturated indigenous men, who would comment, "You look like a pretty girl, I think I'll have you!" They grabbed the Yora men from behind and made lewd motions. I found it especially sad how quick the acculturated Indians were to ridicule the Yora's nudity, hairstyle and exotic adornments. As the resident

anthropologist, I preached to local people about the virtues of respect for cultural diversity, but to little avail. Eventually, a medical team came to take the group to a health post and later return them to their home village. In subsequent trips to the region, I have witnessed the cultural demise of the Yora group. Several orphans were taken on as servants by mestizo households, and remain there today, separated forever from their own ethnic group.

In 1996 when I carried out research in the Yora village of Serjali on the upper Mishagua river, I found the population to be transformed. All but a few elders have abandoned traditional dress and hair styles, and most young people now speak Spanish. Several young men have served in the Peruvian army. Most men work in the lumber trade, ironically the same economic activity most responsible for the group's initial contact and decimation. The Yora talk with great sadness about the "terrible illness" (rao chaka) that devastated their population a decade earlier. They still suffer from waves of severe respiratory and gastrointestinal conditions, unknown in traditional times. I witnessed the drastic health consequences of the first chicken pox epidemic in the village, which left many adults with infected, oozing pustules over the entire body.

The community of Serjali is supported by the Catholic mission at Sepahua with school teachers and some medical supplies. Doctors and nurses make visits every few months to treat the sick and update necessary vaccinations. Yora men travel frequently to Sepahua to sell wood, and often return with colds and other infectious diseases. Outbreaks of gastrointestinal conditions have also become increasingly common. Since I carried out my study in 1996, a group of Catholic nuns has established a permanent outpost in Serjali to provide health care, education and other services.

Genealogical interviews carried out in 1996 reveal a mortality rate of 42% during the initial years of contact. The actual rate of mortality was probably higher, since entire family groups died without leaving survivors to remember an accurate body count.

Ninawa, now known as Tomás, was about twelve years old when he, along with three other men, was captured and taken to Sepahua in the definitive contact of 1984. He remembers the ensuing times with great sorrow:

> Many, many people died. Today there is no one left, just a few. It was like barbasco fish poison in the water. People dying everywhere, like fish after a stream has been poisoned. People left to rot along stream banks, in the woods, in their houses. Eaten by vultures. That terrible poison! That terrible illness!

The Yora/Yaminahua word rao means both illness, poison and medicine (see Chapter 3). When talking about these tragic times, the Yora frequently intone the phrase rao chaka, 'terrible illness/poison' in a high, whining falsetto. When addressing one another in friendly conversation, the Yora often use the phrase wero yõshi, literally 'eye spirit,' referring to the lifelike spirits of dead people who live in the sky and are seen in dreams. By addressing one another as wero yõshi, 'eye spirits,' the Yora refer constantly to the epidemic of the 1980's, when the entire population was reduced to a state that was equivalent to death.

The greeting yamashta!, whence the common regional name "Yabashta" for the group, is apparently unique to this Yaminahua sub-group. A Purus-river Yaminahua man offered me a folk etymology for this term:

> I have never heard this greeting with other people before. They're always saying "Yamashta! Yamashta!" Yama means, "finished, there is none" [in Spanish no hay]. Yamashta [with the diminutive -shta] seems like it means "the one who almost died," or "the few who remain." It's like the way they call each other wero yõshi, "eye spirit." It sounds like they are talking to a ghost!

Whether or not this folk etymology is accurate, the Yora, in their own eyes and in the eyes of other local populations, are an ethnic group that has already died, a population of ghosts or walking corpses.

The psychological and cultural impacts of contact are as drastic as the demographic consequences. For at least half a century, the Yora were the fierce defenders and undisputed masters of a large territory. They viewed all outsiders as inferior, almost sub-human. Now, they have learned to look on their past and their

cultural heritage with shame. Mestizo and acculturated indigenous males teased Yora men relentlessly and even threatened sexual aggression due to their long hair and traditional body ornaments, said to made them "look like women." Within a few years of contact, nearly all Yora men had removed traditional body ornaments and cut their hair to a length acceptable to Peruvians. The Yaminahua leader who had guided missionaries and oil company representatives during the years leading up to contact quickly assumed political, economic and social dominance over the Yora group. Recently contacted populations are especially susceptible to manipulation and exploitation by acculturated speakers of their own language. In some cases, the most adamant "civilizers" of uncontacted indigenous peoples are acculturated members of the same ethnic group. Using their knowledge of both European and indigenous language and culture to gain power, such culture brokers may be driven by complex motives. A sincere desire to better the lives of their marginal "little brothers" (as uncontacted groups are sometimes called by acculturated peoples) may go hand in hand with an economic interest in the rich resources and cheap labor available in remote territories. Often, an attitude of paternalism and cultural superiority towards their "savage" brethren belies a projected sense of shame towards their own indigenous heritage, acquired through years of humiliating interactions with "civilized" outsiders. Indigenous Christian converts and bilingual school teachers are among the first outsiders to take up residence in recently contacted villages, providing a powerful stimulus for cultural change. Acculturated natives can be as effective at introducing new illnesses and imposing cultural, economic and political hegemony as any rubber baron. Beier and Michael (1998) have described such disruptive processes among recently contacted Nanti populations of the Camisea River.

The Chitonahua are a Panoan group occupying territories of the Piedras, Juruá and Purús headwaters, who speak a Panoan language or dialect mutually intelligible with

Yora/Yaminahua. Their history of contact is similar to that of the Yora. Several Chitonahua families of the Inuya River were attacked and "pacified" by Peruvian loggers in 1995. The Chitonahua migrate throughout this extensive region and into Brazilian territory, maintaining sporadic contact and/or warfare with other isolated as well as acculturated peoples. One elder man, who died of a cold in 1995, spoke a few words of Brazilian Portuguese, learned during his youth. The Chitonahua group fled Brazilian territory in recent years after being attacked by loggers, whom they had raided to obtain metal tools and food. Several Chitonahua were killed, and survivors bear the scars of gunshot wounds. Returning to Peruvian territory, the Chitonahua also found loggers at work, using large tractors to haul trunks to the river. The Chitonahua raided lumber camps on a number of occasions, until early 1995 when a tractor operator shot a teenage Chitonahua boy in the leg. An acculturated Yaminahua speaker who worked with the loggers treated the wounded boy and was able to communicate with him. Eventually, he convinced the boy and his extended family to emerge from isolation and take up residence in a Yaminahua community downstream. Throughout 1996, this Chitonahua group suffered repeated occurrences of respiratory infections, which killed several elders and children and incapacitated most of the group. Two families returned to the headwater regions near the end of 1996, and the remaining families returned in 1997, possibly taking contagious respiratory infections into the territory of isolated members of the same group. Other Panoan peoples still inhabit the Purús-Juruá-Piedras headwaters region, all refugees of the diaspora from the Purús experienced by the Yora near the turn of the century. One can only hope that steps are taken in the future to protect their territorial integrity so that the tragedies of the Yora and the Chitonahua are not repeated.

The Smell of Steel and The Feverish Winds Of History

Whose illness is this?
the flaming illness of lightning
its hot fire burns

its white smoke
its boiling fever

The owners of metal
the white people from down river
the metal people are burning
the metal knives are burning
the smell of hot steel

What strange people are these?
their illness goes to the far reaches
the headwaters of the snaking river
none can escape the fever

How will we put out this fire?

Excerpts from a Yaminahua healing song.

Throughout most of the twentieth century, Matsigenka and Yora populations have inhabited the Manu River headwaters in southeastern Peru. Though occupying overlapping territories, they belong to unrelated cultural-linguistic families and have not maintained friendly relations in recent times. Only within recent decades have either of them entered into direct and sustained contact with the Peruvian state and global society. Still, it would be impossible to overstate the drastic impact of global forces on the social organization and health status of the two populations. Just as the Matsigenka of Manu represent the extreme northeastern extension of Matsigenka territory, the Yora represent the extreme southwestern extension of Yora/Yaminahua territory (Map 4). Both populations were forced to the fringes of their traditional territory as they sought refuge from slavery, ethnic conflict, epidemic illnesses and other direct and indirect consequences of European contact, especially during the rubber boom at the turn of the century and continuing to the present day.

El Dorado

Since the time of the Spanish Conquest, the rain forests east of the Peruvian Andes have been regarded as an inhospitable and uncivilized frontier promising vast

riches to the fortunate adventurer. This attitude is epitomized in the myth of Paititi, a legendary city of gold said to be located in the jungles of the Andean foothills east of Cuzco. Treasure hunters have explored the rain forests of southeastern Peru from the sixteenth century to this day in search of this tenacious incarnation of the El Dorado myth (Cartagena and Cartagena 1981; Lee 1989). The "rubber fever" at the close of the nineteenth century was a concrete though ephemeral confirmation of belief in the legendary wealth hidden in lowland Peru. Guided by the myth of a vast and empty frontier of unexplored riches, president Fernando Belaunde's conservative government aggressively promoted the colonization of Amazonia again in the mid 1960's, coining the ironically appropriate slogan "the conquest of Peru by Peruvians" (Smith 1982). During this period, Peru welcomed transnational oil companies and other foreign capital to aid in the penetration and subjugation of the Amazon frontier. Gold, minerals, lumber, cattle ranching and agricultural development also promised to yield El Dorado's elusive riches at last. Peru's first Amazonian oil boom ended in 1974 with the flight of foreign capital during the waning years of Juan Velasco's socialist military regime (Pontini 1980). Foreign investment and transnational oil companies returned to the Amazon in the early 1980's with Belaunde's second presidency. However fear of terrorism and the specter of civil war in the late eighties again frightened away foreign capital and aborted Peru's second oil boom. The failed scheme of Amazonian colonization abandoned large populations of migrant poor in a political and economic vacuum, which proved to be fertile ground (both literally and figuratively) for the explosion of an illicit economy in cocaine, the "white gold" for a new generation of jungle explorers.

In each of the El Dorado scenarios, indigenous people have received minimal economic benefits, while suffering severe social and ecological consequences, if not outright extinction. Contagious diseases have decimated indigenous populations since the first incursions of European explorers and colonists. During the rubber boom, the

"civilizers," rubber barons and their local agents, acted out the imagined brutality of the savage Other as they enslaved, terrorized and murdered native laborers (Hardenburg 1912; Taussig 1987). The burst of colonization, road-building, gold mining and oil exploration beginning in the 1960's was carried out with little regard for the territorial or human rights of indigenous populations (Smith 1982; Brown 1984). Missionary groups, both Catholic and Protestant, have viewed native converts as a form of spiritual capital, a wealth counted not in tons of rubber or barrels of oil but rather in number of souls saved. Though guided by ostensibly humanitarian principles, missionaries, too, have contributed to the ethnocide of Peru's native Amazonians (Stoll 1982; Wahl 1987). Numerous indigenous communities were devastated in the warfare between the Peruvian army and insurgency forces in the 1980's. In response to increasingly effective military actions in the coca-producing Huallaga valley, drug traffickers in the 1990's have moved their operations to more remote territories occupied by lowland indigenous populations. As Peru resumes an aborted oil boom in the 1990's, exactly one century after the fateful fever of rubber, the legendary riches of El Dorado seem nearer than ever. Indigenous people once again find their lands and their livelihoods threatened by global forces beyond their control.

Ancient Networks of Trade

The isolated native populations inhabiting southeastern Peru at the end of the twentieth century are anything but "uncontacted." Archeological evidence demonstrates the existence of interethnic contact and long-distance trade between Amazonian and Andean societies centuries before the arrival of Europeans (Lathrap 1973; T. Myers 1981). During the fifteenth century, the Inca Empire was able to subjugate diverse coastal and highland indigenous nations from central Chile to southern Colombia. The Incas attempted to conquer Amazonian peoples but met with fierce resistance as well as an unfamiliar cultural, political and ecological terrain. During the late 1400's, the Incas

built a network of roads reaching into what is known as the montaña, or premontane forest, of the upper Urubamba basin on the eastern slopes of the Andes. The Inca city of Vilcabamba, located strategically between headwaters of the Urubamba and Apurimac Rivers, may have been the capital of an Inca state and the center of trade for the montaña (Savoy 1970). Inca roads also extended into the Cosñipata region (upper Yavero and Madre de Dios Rivers), and trade routes may have reached as far east along the Madre de Dios drainage as the Tambopata River, though the evidence is not as abundant as for the Vilcabamba region (Lyon 1981). Arawakan peoples such as the Matsigenka and the Piro of the Urubamba River served as middlemen for trade between the Inca Empire and lowland Amazonian populations. Copper tools, precious metals, jewelry and other goods of Andean manufacture were exchanged for lowland products such as tobacco, resins, smoked meat, animal skins and bird feathers (Camino 1977; Casevitz 1991). Stone axes, polychrome ceramics and dugout canoes were items likely traded among Amazonian peoples (Varese 1968; Zarzar and Roman 1983). Mineral salt extracted by the Ashaninka from the "Mountain of Salt" of the Tambo-Ene basin was a valued trade item exchanged among indigenous and later Spanish traders (Varese 1968).

Spanish explorers and Catholic missionaries engaged in trade and attempted to subjugate Amazonian peoples starting in the late sixteenth century (Camino 1977; Zarzar and Roman 1983). By the middle of the seventeenth century, indigenous populations throughout Amazonia had suffered demographic and political collapse due to the rapid spread of smallpox and other European diseases (T. Myers 1974; Denevan 1976). The Jesuits began to establish sugar plantations on the upper Urubamba River beginning in the seventeenth century. During the seventeenth century, some Arawakan populations learned from missionaries how to extract minerals and forge iron, the only Amazonian people to smelt metal (Santos Granero 1988). In 1742, a Quechua-speaking migrant named Juan Santos Atahualpa, who came to be known as Tupa Amaru II, gained the

support of several Arawakan populations and led a messianic uprising against the Spanish. The Arawakan and Panoan peoples of the Ucayali basin expelled the Spanish from their territory for nearly a century.

By the mid-nineteenth century, resistance weakened, and the demand in international markets for sarsaparilla, quinine-containing cinchona bark and rubber latex brought European colonizers and traders back to the main river valleys of the region. Through the mid-nineteenth century, Piro traders from the Ucayali and Urubamba basin carried child slaves, smoked fish and other goods to destinations in the Andean foothills in order exchange them with highland populations or Catholic missionaries for metal tools, fishhooks, glass beads, ceramics and manufactured cloth (Camino 1977). Elaborating on what was probably a traditional system of intertribal dominance, powerful tribes of the major rivers captured or purchased slaves among isolated populations inhabiting the smaller tributary rivers and sold them to Europeans as agricultural laborers or domestic servants. At least as early as 1750, Franciscan missionaries in Quillabamba purchased "little infidels" for the ostensibly noble purpose of evangelization, the "price of each soul being an ax of Biscaya" (Colin 1966 cited in Zarzar 1983: 73).

The Fever of Rubber

Slave trading and interethnic violence was driven to a feverish pitch during the rubber boom at the turn of the twentieth century. Charles Goodyear's discovery in 1839 of vulcanization and Dunlop's subsequent invention of the pneumatic tire fueled a drastic increase in demand for Amazonian rubber. Peru's lowland rain forests were suddenly teeming with entrepreneurs ("rubber barons") and their local guides in search of rubber trees and cheap labor. Dominant tribes already engaged in trade served as guides in locating rubber-rich forests and enslaving indigenous labor. Local resistance to such incursions was suppressed brutally. Those who resisted were killed, and their homes and fields were burnt or otherwise destroyed. Rubber tappers raped women and carried off

children as slaves. In 1896, the rubber baron Fitzcarrald and his peons hauled a steamship across an isthmus connecting the Mishagua and Manu Rivers. Accompanied by a flotilla of Campa and Piro guides in canoes, they were attacked by native inhabitants known as "Mascho." In retaliation, Fitzcarrald and his crew are said to have killed more than three hundred Mashco, burning their houses and gardens and sinking their canoes. A rubber tapper who witnessed the fierce battle described the carnage:

> You could no longer drink the water from the river because it was so full of the corpses of Mashcos and rubber tappers, because the fight was to the death (Reyna 1941, cited in MacQuarrie 1992: 59).

In addition to the violence they perpetrated, rubber tappers also brought new epidemics of exotic illnesses such as malaria, measles, smallpox and influenza. Native people who survived such attacks were subjected to terrible work and health conditions under slavery. Von Hassel (von Hassel 1904: 244) estimates that more than 60% died. Despite international protests about the atrocities, denunciations of which were considered before British courts and the United States Congress (Hardenburg 1912; United States House of Representatives 1913), it was not until after the collapse of international rubber prices that slave trading and genocide practiced against native Amazonians actually diminished.

The rubber boom suddenly came to and end in 1917 when British rubber plantations in Malaysia, grown from seedlings smuggled out of Brazil, began producing cheap and abundant latex. However the same routes and brutal techniques used during the rubber boom continued to provide indigenous slaves for the plantation economy, lumber harvest and domestic service in cities at least until the 1950's (Zarzar and Roman 1983; Alvarez-Lobo 1996). Territorial displacement and the collective memory of past atrocities have resulted in interethnic violence, fragmentation, and isolation of indigenous groups to the present day (see Lyon 1976).

Isolated Indigenous Groups Today

In southeastern Peru, from the watershed between the Urubamba-Ucayali and Madre de Dios river basins north and east towards the Brazilian border, lies a pocket of remote rain forest, home to some of the last isolated, so-called "uncontacted" indigenous societies of South America. The area in question stretches like an open hand among the headwaters between Urubamba, Ucayali, Madre de Dios, Purús and Jurua tributaries (Map 2). The northern part of the area appears to be inhabited by speakers of Panoan languages such as Amahuaca, Yaminahua (including Chitonahua, Mastananahua, Roanahua, Neanahua and other "Nahua" sub-groups) and possibly others. The area is contiguous with the territories of recently encountered uncontacted Panoan peoples across the Brazilian border in the Mamoadate Indigenous Area. The southern part of the area is occupied by members of the Arawakan linguistic family: Matsigenka (including Nanti and "Kogapakori" subgroups), Kiriniri, Caquinte, Ashaninka and the entirely nomadic Mashco-Piro. The Mashco-Piro and Kiriniri languages are as yet unstudied, and both populations actively avoid contact with all outsiders. The Nanti language or dialect was only recognized recently as distinct from Matsigenka, after the Nanti entered into sporadic contact with acculturated Matsigenka speakers (Beier and Michael 1998). Only a few Toyeri speakers of the Harakmbet family survived the devastating epidemics and intergroup warfare of the 1950's (Lyon 1976), but some indigenous inhabitants suspect there may be small Toyeri ("Mashco") enclaves in the region as well. There is no certainty as to the exact names, numbers, locations or populations of the groups in question. There is no doubt, however, as to the presence of a large and diverse indigenous population inhabiting the region.

Isolated indigenous groups covet metal tools, which greatly increase the efficiency of labor and the area of land available for agriculture. Matsigenka and Panoan speakers from recently contacted settlements interviewed I interviewed provided first-hand

memories about the days before the availability of steel axes. Using stone tools, it is possible only to clear small swidden gardens in the soft-wooded, secondary growth along stream banks or in landslides or other natural clearings (see also Carneiro 1974). Migratory hunting and gathering over large territories are required. Steel axes allow populations to establish larger, more permanent settlements and clear land in mature forest. When the first metal ax arrived through circuitous trade routes in the 1960's to the isolated Matsigenka settlement of Sotileja, it was shared by a dozen or more families totaling some two hundred people (see Cueva and Shepard 1995). Isolated populations may develop an opportunistic relationship with acculturated indigenous or mestizo settlements, raiding for desired goods or gathering discarded scraps in abandoned campsites. The Yora, for example, collected metal implements other objects from abandoned rubber camps, and carried out long-distance raids on Matsigenka and mestizo settlements. A Chitonawa group, contacted and partially assimilated in 1995, described how they used broken glass from lumber camps to make knife blades. In some cases, isolated groups attack intruders or neighboring ethnic groups for the sole purpose of obtaining metal tools and other desired goods.

While memories of enslavement, violence and contagious disease have forced such populations into isolation, it is often the desire for metal tools and other trade objects that draws them towards the source of their fear: our so-called civilization. Left to their own devices, however, isolated populations maintain a safe distance and seek out trade relations or contact at a slow and careful pace, if at all. Ultimately it is the curiosity, greed or misdirected good intentions of outsiders, including missionaries, anthropologists, loggers, gold miners and acculturated indigenous people, that drive isolated populations into permanent, and often tragic, situations of contact.

The Matsigenka and Yora communities studied have entered into sustained contact with outsiders in recent decades, and only because they were forced to do so by

external events. A number of additional cultural groups, including Matsigenka, Mashco-Piro, various Panoan groups related to the Yora and possibly others, remain in isolation, inhabiting remote regions and avoiding contact with outsiders. All appear to be the fragmentary remains of larger societies, survivors who fled from the holocaust of epidemics and atrocities suffered throughout the past century at the hands of rubber tappers, plantation owners, slave traders and their acculturated indigenous guides (Carneiro 1964b; Townsley 1987). Some isolated groups greatly reduced their agricultural activities or abandoned agriculture altogether, due to the results of depopulation, territorial displacement and perhaps as part of a strategy of high mobility and low visibility to outsiders (Carneiro 1969; Balée 1994: 4, 114). For this reason it is more useful to think of such groups as "forcibly isolated" rather than as "uncontacted." The sad irony is that the headwater regions to which they fled proved to be safe havens due to the very kinds of geological activity that permit the accumulation of oil and gas deposits currently being explored by transnational petrochemical companies.

Amazon Crude

Starting in 1990, Peru began a dramatic rebound from two decades of economic deterioration, political instability and widespread violence. President Fujimori has aggressively pursued foreign investment and promoted a free-market economy. A keystone in Peru's plans for economic growth is the exploitation of the country's oil and natural gas reserves. Vast territories have been leased to such transnational companies as Shell, Mobil, Philips, Chevron, Occidental, Esso, Arco, Elf and others. Thirty-four of the forty-two currently active oil and gas exploration blocks are located in the rain forests east of the Andes, covering more than a third of the total area of the Peruvian Amazon. Virtually all of the Amazonian concessions overlap with the traditional territories of native Amazonians (Map 5), and twenty-six affect native communities directly (Mora and

Zarzar 1997a). Some twenty-four ethnic groups, more than half of the cultural-linguistic diversity of the Peruvian Amazon, are currently affected. Cultural groups in southeastern Peru that remain isolated in the late twentieth century are located in regions of active oil and gas exploration (Map 2). Local people in this region believe that fierce tribes guard the lost city of Paititi and the Inca's hidden treasures in the Andean foothills. Whether or not the legend proves true, isolated indigenous populations live atop the "black gold" sought by petrochemical companies. The burgeoning oil and gas boom is likely to force many or all of these populations into contact with global economy and culture. The environmental, social and economic debacle of petrochemical development in Ecuador is a tragic example of the possible long-term consequences of such activities (Kimerling 1991).

The Status of Indigenous Rights in Peru

Despite numerous threats to their livelihood posed by petrochemical exploration and other aspects of national development, Peruvian native peoples at the close of the twentieth century have a number of important factors working in their favor. Agrarian reform and progressive "Native Communities" legislation passed under the socialist military regime in the late sixties and early seventies opened the legal doorways for recognition and titling of indigenous lands. Indigenous federations in Peru have been pioneers in promoting territorial autonomy, political representation and sustainable development for native communities. Peruvian anthropologists and grass-roots native organizations have been involved in community organizing, territorial demarcation and capacity building among indigenous populations for nearly three decades. Though often criticized for their evangelical work, missionaries of various denominations provided health care, education and political and economic support during recent decades when

government services were largely absent. Over the past decade, non-government organizations working on issues of biodiversity conservation and indigenous rights have proliferated in Amazonian Peru.

Peru's native people have constitutionally guaranteed rights to their traditional lands since 1920. The first Peruvian legislation directed specifically at the territorial rights of "jungle tribes" was passed in 1957 (Decreto Supremo 003), allowing for the titling to individual family groups of ten hectares per family member over the age of five (Mora and Zarzar 1997a: 20). The "Law of Native Communities" of 1974 (Decreto Ley 20653) allowed for the titling of significantly larger territories to politically organized communities. To date, this legislation has allowed for the titling of more than seven million hectares to 930 native communities (ibid.). In the original 1974 legislation, lands held in communal title are considered inalienable and imprescriptible, not subject to sale or private ownership by individuals. Though the Law of Native Communities of 1974 was a significant advance for the cause of indigenous peoples, this law and its predecessor of 1957 implicitly reflect the Peruvian state's rejection of the concept of "indigenous nations" or autonomous ethnic territories within the national boundaries. Because land titling takes place at the level of the family (in the 1957 legislation) or the "native community" (in the 1974 legislation) rather than at the level of the ethnic group, the traditional indigenous territories (Map 1) have undergone considerable fragmentation (compare with Map 2). The 1978 modification of the Law of Native Communities (Decreto Ley 22175) after the end of Velasco's socialist military regime imposed significant restrictions on the land titles held by native communities, limiting title of property to agricultural lands only. Forest lands, the majority of land area in native community titles, are granted not as property but merely as concessions for communal use.

In 1993, Peru became the seventh nation to ratify the International Labor Organization's Convention 169 on Indigenous and Tribal Peoples, a broad-reaching affirmation of the rights of indigenous peoples to traditional lands, resources, cultural heritage, political representation and culturally appropriate education, health care and economic development (ibid.: 22). Paradoxically, in the same year Fujimori's government rewrote the nation's constitution, including articles annulling the inalienable nature of native communities and providing instances in which the government can revoke native communities' use concessions or turn them into state property or private land. In a post-Rio formulation of Peruvian biodiversity laws, the Fujimori government lay claim to virtually all biological, genetic and other natural resources in Peru's territory, with the exception of human genes and cultivated crop varieties. According to current Peruvian legislation, and in apparent contradiction of ILO Convention 169, native peoples are only permitted the right to be consulted about the way resources are extracted on their land, for example, by an oil company or a pharmaceutical firm. They do not have the right to negotiate contracts, receive royalties or reject a given proposal for resource extraction. These provisions have allowed the Peruvian government to exercise its constitutionally-defined sovereignty over sub-surface and other natural resources on communal lands. Forest lands, held by native communities as use concessions, are leased out by the Peruvian government to foreign oil companies without prior consultation or negotiation with the affected communities. Superimposing areas of indigenous territories and protected natural areas in southeastern Peru onto areas of oil exploration makes clear the high priority of petrochemical exploration on the Peruvian government's economic agenda, regardless of the cultural and environmental heritage of the territory (Map 2).

Chapter 2: Methods

The methods used in this study emerge from the ethnoscience tradition. As Frake (1964: 30) describes in a classic statement of the field, the goal of ethnoscience is to understand the knowledge systems of foreign cultures from the native point of view, and thereby arrive at a "sketch map of the world in the image of the tribe." The purpose of such a study is not to merely translate native concepts into English or compare ethnoscience with Western science, but rather to understand "how the Indian himself groups... objects and which attributes he selects as dimensions to generate a taxonomy... [to] learn what these people regard as significant" about a given domain of knowledge.

Based on the assumption that taste/odor classification was significant for both Matsigenka and Yora/Yaminahua plant therapy, my research drew on several recent studies synthesizing chemosensation, chemical ecology and ethnomedical efficacy. Elaborating on Kleinman's (1980) concept of the cultural construction of illnesses, Etkin (1988a; 1992) has demonstrated how Hausa concepts of efficacy rely upon the chemosensory evaluation of both plant medicines and pharmaceutical drugs. Browner et al. (1988) have suggested a method for evaluating plant efficacy in biomedical as well as ethnomedical terms. For example, some Aztec headache remedies were found to contain active chemical ingredients that induce nosebleed, reflecting a model of illness in which headaches are caused by excessive blood in the head. W. Wilbert (1986, 1996) analyses efficacy in Warao phytotherapy according to a pneumatic and allopathic theory of illness in which each medicinal plant is "thought to harbor a therapeutic fragrant odor that upon ingestion displaces the pathogenic fetid odor" (1996: 384).

Brett's (1994) work represents the most thorough investigation to date of the relationship between chemosensation and medicinal plant selection. Among the Tzeltal Maya, Brett found that the great majority of medicinal plants are attributed chemosensory

properties (taste/odor) that are thought to give the plant its healing power. There was a high degree of informant consensus as to the specific qualities of common species, and a high correlation between certain qualities and specific therapeutic categories. There was a positive correlation between the relative "strength" of the chemosensory quality and its ability to fight illness: those qualities that are considered to be "stronger" (bitter, pungent, sour) are more frequently associated with illness thought to be "strong" and dangerous.

Recent anthropological studies of chemosensation (Etkin and Ross 1982; Johns 1990; Brett 1994) have emphasized taste, especially bitterness, as a primary way of assessing foods and medicines. Bitterness may be an important chemical cue for identifying alkaloids and other pharmacologically active or toxic compounds produced by plants. While bitterness is typically avoided in foods, it is often sought out in medicines. The data from the Tzeltal Maya support this argument, since taste terms are much more frequent than odor terms in assessing medicinal plants, and bitterness is the most frequently mentioned property of medicinal plants (Brett 1994: 124). Many of Brett's conclusions, for example, an association between bitterness and medicine, appear to hold true for the Matsigenka populations in my study. However as fieldwork proceeded, and especially once I began work with the Yora/Yaminahua, I became aware of numerous areas of difference with this cultural setting. Odor, which is only a minor concern in Brett's study of the Tzeltal, is as significant as taste in Matsigenka assessment of medicinal plants, and is far more significant than taste in the medicine of the Yora/Yaminahua. I also came to realize that much of the vocabulary used to describe medicines is not "chemosensory" at all. Color, shape, texture and the physical properties of latex or crushed leaves are significant in both Matsigenka and Yora/Yaminahua descriptions of the efficacy (not merely the appearance or identification) of medicinal plants. Furthermore, the spirit owners of certain plants are invoked on occasion to

explain their therapeutic powers. The attribution of therapeutic power to plants according to the "doctrine of signatures" is typically ignored or rejected by ethnobotanists and ethnopharmacologists investigating native remedies. Rather than use the loaded term "doctrine of signatures" I have adopted the term "mnemonic association" to refer to cases in which the external form of the plant suggests its medicinal use: for example, plants with red sap for blood illnesses. Such mnemonic associations may be significant in the process of medicinal plant discovery, and appear crucial in the process of knowledge retention for orally transmitted pharmacopoeia.

In many ways, Brett's work served as a model for this comparative study of the Matsigenka and Yora/Yaminahua. Borrowing from and modifying his methods, I developed a variety of structured and semistructured interview techniques in order to explore various domains of local knowledge associated with illness and plant therapy. A summary of information on informants participating in the various structured interview tasks is found in Appendix 1.

Taste/Odor Experiment

An important part of my research project was to elicit the Matsigenka and Yora vocabulary used in evaluating medicinal plants. Following and elaborating on Brett's (1994: 41) "Taste/Odor Experiment," I took to the field a collection of twenty-four culinary and medicinal herbs, condiments and fragrances purchased in the United States: almond soap (Dr. Bronner's brand, liquid form), bay laurel leaves, ground black pepper, whole cardamom seeds, catnip, cinnamon sticks, whole cloves, unsweetened cocoa powder, instant coffee powder, curry powder (medium hot), dried dill weed, powdered Echinacea root, garang masala, fresh garlic (purchased in Peru), powdered ginger, dried lavender flowers, fragrant mineral oil (Avon Skin-So-Soft), nutmeg powder, iodized salt, sandalwood shavings, dried spearmint, crystalline sugar, Tiger Balm (a strongly mentholated liniment), vanilla extract, and wasabe paste (prepared fresh from powder).

From here onward I will refer to these diverse items as “spices” for the sake of convenience, thought some are not spices in the strict sense. The purpose of the experiment was twofold, first, to elicit a broad range of taste and odor vocabulary and second, to associate the vocabulary with items that would be familiar to American readers. Furthermore, I was able to carry out a preliminary exploration of the relationship between chemosensory properties and medicinal uses. Finally, the experiment was a good “crowd pleaser,” and allowed me to introduce my research project to the communities in a way that was enjoyable to most of the participants, who were curious to experience the foreign substances.

Each item was stored in a numbered plastic film canister and presented to the informant in random order, except for Tiger Balm, which was always given last so as not to contaminate the hands with the strongly scented oil. I explained that these were ‘herbs’ (M: *inchashi*; Y: *nipei*) from my country, that did not grow in their country. For each item, I asked them the following questions: a) “What is it like?” i.e., “What property (taste/smell) does it have?”; b) “If this plant did grow here, would you use it as a medicine? If so, for what condition?”; c) “Is there any plant that grows here that has a similar taste or smell?.” I carried out the experiment with nine informants of each ethnic group, not enough to arrive at a statistically significant correlation among informants, but sufficient to note certain trends. Certain taste or odor terms were mentioned fairly consistently by most informants for a given group, while other terms were mentioned by only one or a few informants. Some informants used more terms than others, and some informants showed idiosyncrasies not shown by others. Strong, clear odors or tastes like those of garlic, ginger, pepper sugar and salt produced more similar responses among informants, while more complex tastes/odors (Echinacea powder, wasabe, dill weed, bay leaf) produced more varied results. In Yora descriptions of bay leaf, for example, two informants described it as ‘fragrant-good’ (*ini shara*), two described it as ‘floral,

aromatic' (ane), one described it as 'fragrant-burnt' (ini nowe), one described it as 'rank' (itsa), and the remaining three likened it to the odor of one or more odorous plants: ako (Amburana), nai rao (Tanaecium) and tama (peanut). As one taste/odor researcher cautions, "According to particular interests [of the investigator], it is possible to emphasize consistency or variability (individual differences) in characterizing the same stimulus" (Harper 1977: 396). With the risk of perhaps overemphasizing similarities among informants and de-emphasizing variation, I present data from the taste/odor experiment in summary form in Appendices 2.1 (Taste) and 2.2 (Odor). I have chosen to include only those taste/odor terms (including components of compound expressions) mentioned by two or more informants. Results are discussed in greater detail in Chapter 5.

Ideally, such an experiment is done with a single informant in isolation from others, to avoid contamination of the data. In many cases, this proved impractical in the field for several reasons. In Matsigenka culture, it is inappropriate for a man to offer aromatic plants to the wife of another man in the husband's absence. This would be reminiscent of the practice of posanga, love magic, in which special fragrant plants are used to enchant the person of their desires. Both Matsigenka and Yora villages are characterized by a generalized lack of privacy (by American standards), especially when I would arrive to visit with a bag of exotic spices. Young and old alike wanted to get closer to witness the experiment or to get a chance to sample the interesting new odors. Some people seemed to be afraid of getting a "wrong" answer, while others intruded on the experiment to corroborate or correct the answers give by others.

Husband and wife pairs in both cultures were especially eager to confirm or correct the assertions of their spouses. Though this could be considered to be a troublesome contamination of scientific data, it revealed an interesting fact about the teamwork between husband and wife in correctly identifying medicinal plants. In both

groups, there is considerable gender segregation of plant knowledge as well as labor. In some cases a woman who is staying at home might ask her husband to gather a specific plant while he is in the forest hunting. She describes the plant to her husband in some detail, and then confirms his identification of the plant when he brings it home. In other cases, a man might ask a woman to gather a specific plant to treat a sick child. In the taste/odor experiment, the complementary nature of gender roles became evident in some cases as spouses intruded on the experiment to make sure that their partner was not making incorrect conclusions about the taste, odor and possible medicinal properties of the novel herbs I had brought.

During the experiment I was also able to observe the manner in which informants assessed novel compounds with their different sense organs. For both the Matsigenka and the Yora, informants generally looked at the material first before trying to taste or smell it. They would try to ascertain whether the sample consisted of leaves, ground bark, flowers or seeds of the exotic plant. Even though I had only intended for informants to offer taste or odor descriptions of the various herbs, some volunteered descriptions of the visual or tactile properties or kind of plant material it consisted of (seed, wood, leaves). Only then would informants very cautiously smell the sample. Even if the sample was pleasant and fragrant, like cinnamon or vanilla extract, people would only smell it briefly, and never indulge in the kind of deep sniffing or inhaling I am prone to when I encounter a new fragrance. If the sample had a noticeable smell, the trial was typically over. Only if the sample had little or no smell, or if the smell was nondescript, would a Matsigenka informant typically take a tiny dab on a fingertip and carefully touch it to the tip of the tongue. On a few occasions I had to request that they take a slightly larger taste, as it was clear from their initial response that they had not gotten enough of the sample to appreciate the flavor. The Yora were even less inclined to taste an unfamiliar substance, especially the older informants.

Thus the experiment revealed an orderly sequence of assessing novel substances, a sequence that I also witnessed in their interactions with local plants: first a visual assessment, then smell, and finally (for the Matsigenka) if there is no noticeably strong property, taste. The Yora, by contrast, do not typically taste plants to ascertain their medicinal properties. It was apparent from this behavior that people in both cultures are extremely careful in their interactions with novel plants. Informants of both groups noted that there are many dangerous plants in the forest, dangerous to taste, to smell, to touch, even to pass near. I was warned on several occasions to be more careful myself in sniffing or masticating various plants in my zeal to take accurate notes on their chemosensory qualities.

"Best Example" Experiment

The taste/odor experiment presents people with a novel substance and requires that they provide a familiar taste or odor term to describe it. In order to better understand this vocabulary, I carried out a second task which works in the reverse manner. Midway through the fieldwork stay, I had become familiar with the basic vocabulary items referring to taste, odor and other senses, but was still somewhat confused as to the exact meanings of some terms. I was especially troubled by apparently overlapping ranges of meaning for some odor vocabulary. I created a list of the most common taste, odor and other properties used in assessing medicinal plants, and asked informants to explain for each term: a) how he or she would describe this vocabulary item to a person who was just beginning to learn the local language; b) what local plant or other familiar substance is the 'best' or 'truest' example of this property; c) what (if any) other properties are similar to this property; d) what kinds of illnesses are typically treated with plants that have this property. Results of this experiment are summarized in Appendix 2.3 and discussed in Chapter 5.

Elicitation and Classification of Illness Categories

As my fluency in both languages improved, I carried out a series of related, semistructured interview techniques related to illness vocabulary. With eight members of each group (four men, four women), I elicited the names of all known categories of illness. Of these, I selected five informants with greater apparent knowledge and willingness to cooperate for a more intensive study of illness categories. For each illness category mentioned, I had the informant answer the following questions: 1) What is the illness like? 2) What part of the body does it effect? 3) Where does it come from, and how does it enter the body? 4) Is it a strong or fatal illness? 5) Was it an illness known in 'prior times' (i.e., before intensive contact with Europeans)? 6) What kinds of plants or other therapies can be used to treat it?. I taped most of the interviews were taped on audio cassettes for later reference, and wrote summary answers on site in field notebooks in the local language. Finally, I selected three informants per group who were somewhat familiar with written materials, if not fully literate. I carried out a modified pile sort using a set of notecards on which I had written the name of all illness names elicited. For those who could not read, I read the name of each illness card (shuffled into random order) and asked the informant if it "belonged with" or "was friends with" any other illness cards already laying on the table or floor. Illnesses that belonged together were placed together in piles, which I later read to the informant to confirm accuracy. When illnesses belonged with more than one distinct illness groups, I placed it between. In this manner, I was able to generate of a grid or web, if not a clear-cut classification, of interrelated illness categories. Data on illness categories are presented in Chapter 4.

The structured interviews concerning illness names, etiologies, and classification were the most tedious and difficult of all the exercises for both the indigenous informants and the anthropologist, due to the large number of illness terms, the detailed knowledge associated with each illness, the length of time required to communicate and document

the data and the warm midday temperatures. We took breaks where necessary, and sometimes continued the session the next day. As one informant noted, “All this thinking and writing is hard work. It gives us both a headache!”

Ethnoepidemiological Census

In order to attain an emic assessment of health status and mortality, I carried out a census, including genealogical interviews, and ethnoepidemiological survey in each of the two main study communities. In collaboration with Peruvian and international health care workers, I was also able to carry out genealogical interviews among two isolated populations: the Matsigenka from the upper Sotileja River (Cueva and Shepard 1995), who have maintained increasingly frequent contact with the community of Yomybato, and the recently contacted Chitonahua group of the Inuya River, who were forced into contact by Yaminahua and mestizo loggers. On other occasions, I assisted Peruvian health care workers during their periodic visits to native communities.

I conducted the census and survey in the respective indigenous languages, usually with the assistance of a bilingual assistant. The interviews were carried out in a somewhat informal manner during the course of social visits to households, after having achieved a high level of fluency in the languages and familiarity with the people of each community. During the survey, I asked adult women or couples about illnesses that had occurred recently or currently (using indigenous time reckoning) in their families. Since greeting behavior in both societies involves asking about the health of family members (though not as exhaustively as in this survey), the method appeared to be culturally acceptable and elicited satisfactory results. I did note, however, a tendency for the Yora to overreport or exaggerate illnesses, often in an attempt to obtain Western medicines, and a tendency for the Matsigenka to underreport or “forget” illnesses, requiring me to be

somewhat more insistent. This contrast is consistent with general tendencies of culture and personality in the two societies, as I discuss further in Chapter 3. Quantitative data from the health survey are still in preparation, and cannot be presented at this time. Firsthand observation of many illness symptoms and therapies made during the interviews, however, inform my discussion of illness categories in Chapter 4.

In conjunction with the census, I carried out genealogical interviews with male and female heads of households. In these interviews, I tried to establish the total number and birth order of siblings and children, and the attributed causes of mortality for those who were no longer living. This procedure also appeared to be culturally acceptable to the people interviewed. Assessing actual cause of mortality was impossible, but relying on informant descriptions, it was possible to arrive at a general comparison of perceived causes of mortality among the various study communities. Preliminary results are presented and discussed in Chapter 4, Figures 4.1 and 4.2. The study made painfully clear the drastic toll of introduced diseases (notably epidemic respiratory diseases) throughout recent decades in both populations. Past warfare between the Matsigenka and the Yora also claimed numerous lives.

Ethnobotanical Collections

Botanical vouchers were collected according to standard methods, stored in alcohol initially and then dried in the herbaria of the University of San Marcos (Lima) and San Antonio Abad (Cuzco). One set of dried plant specimens was shipped to the United States and were identified mostly by the author using the reference collection for Manu created by Robin Foster at the Field Museum of Natural History, Chicago. I made an effort to collect fertile specimens (fruit and flower) when possible, but many plants were collected by necessity in infertile or incomplete condition. Due to the localized focus and broad taxonomic coverage of Foster's reference collection for Manu, it was nonetheless

possible to identify most plants (even those in infertile condition) to the level of species. Botanical collections are summarized in Chapter 6.

For each plant collected, I elicited detailed information in the local languages about the plant's name, medical and other uses, administration and perceived efficacious properties. The information was entered into a database (Panorama 3.0, ProVue Development) for analysis of relations between use categories and attributed properties. Following Brett (1994: 45), I organized the database of plant collections according to pairings of illnesses with plant properties. Results are discussed in Chapters 5 and 6.

The importance of protecting indigenous peoples' intellectual property rights (IPR) and tropical countries' genetic resources has been emphasized by a number of international declarations, including the Declaration of Belem, the Draft Declaration of the Rights of Indigenous Peoples and the Global Convention on Biodiversity (Posey 1994). The legal status of IPR protection is still an area of debate and definition in Peru and other countries. Plants mentioned in this work have been collected as herbarium vouchers and identified scientifically to the level of species where possible. In order to protect Matsigenka IPR and Peruvian genetic rights during this state of legal transition and consultation, medicinal plants in this work are identified only to scientific genus or family, except for those which are widely used and documented in the literature. I am in ongoing consultation with the Matsigenka people and Peruvian authorities as to the status of research with these collections. In accordance with Peruvian law, the botanical species discussed in this work are the genetic property of the Peruvian state. In accordance with numerous international declarations and the spirit of the International Convention on Biodiversity, medical and other knowledge about these plants is considered to be the intellectual property of the respective indigenous peoples.

Notes on Orthography

Throughout this work, words in indigenous and foreign languages are written in italics, preceded by the abbreviations M or Y for Matsigenka and Yora/Yaminahua where necessary. English glosses are noted in single quotation marks. To avoid confusion with indigenous names, botanical genera and species are underlined in the text. In some tables, botanical genera and species are italicized and indigenous terms are written in bold text for greater clarity.

Authors over the past century who have written about Matsigenka and several Panoan languages have adopted a variety of orthographies for transcribing the sounds of the two languages into written form. In this text, I use the practical orthographies described by (W. Snell 1978; B. Snell 1998) for Matsigenka and Eakin (1991) for Yora/Yaminahua, with the noted exceptions. Both orthographies represents the sounds of the language simply, consistently, accurately. Because the pedagogical textbooks developed by these linguist/missionaries of the Summer Institute of Linguistics are used widely in bilingual education programs in many native communities, these orthographies are fast becoming the standard ones for literate native speakers of the languages.

The alphabet for Matsigenka has twenty-two letters: a, ch, e, g, i, j, k, ky, m, n, ñ, o, p, r, s, sh, t, ts, ty, u, v, y (Snell1998: 9). Most vowels and some consonants are pronounced much as they would be in Spanish, with the following exceptions:

u is a complex sound, somewhat between i and e in Spanish. For an English speaker it might be written ui or uy. Example: suretsi 'soul'.

g is pronounced much as in English, but is palatalized before i and e. For example, nogishi [nogʸishi] 'my hair'; nogotiro 'I know it'.

j is softer than the Spanish j, more like an English h. Example: jiraatsi 'blood'.

k is like in English, and like g is palatized before i and e. Examples: kepigari [kʸepigari] 'intoxicating'; kameti 'good'.

ky, ty palatized consonants. k is always palatized before i and e, but may or may not be palatized before other vowels. Examples: okyara 'recently, just now'; tyara 'when, how why'.

sh fricative palatal, produced more towards the front of the mouth than English sh. Example: osheto 'spider monkey'.

ts a brief t followed by s, as in English 'eats'. Example: tsiripeshiati 'small leaf'.

v much like the v or b of Spanish, intermediate between English v and w. Pronounced more like English w (Spanish hu) before a. Examples: koviti 'clay pot'; ivatsa 'flesh, meat, body'.

y varies between a sound like that of Spanish or English y, and a palatized g. Example yaniri [ᵍyaniri] 'howler monkey'.

I have adopted a modified version of the practical orthography developed in (Eakin 1991) for the Yaminahua language. The alphabet for Yaminahua has eighteen letters: a, ch, e, f, i, j, k, m, n, o, p, r, s, sh, t, ts, x, y (Eakins 1991: 15). I follow this orthography for all but one sound, the f, which I write as w as described below. Again, vowels and consonants were selected to represent approximate sounds in Spanish. However many aspects of Yaminahua phonology are very different from their closest Spanish or English equivalents:

e is a complex sound, somewhat like Matsigenka u, but produced by pronouncing a sound like English ee deep in the throat with the lips spread. When occuring at the end of the word, it tends to produce a sound like a guttural Arabic gh. Example: pae 'painful, pungent, strong'.

o is between the o and u English. For example, yora 'people'.

w [f] as described by Eakins, f is a labial (not semilabial) consonant, somewhat intermediate between f and aspirated w in English (for example, 'whale' with a strongly aspirated h). Before o it is nearly like a Spanish j. I have chosen to transliterate this sound as w, for ease of pronunciation for English readers and also because the sound in the Yora and Yaminahua dialects I encountered was more nearly semilabial. Examples: wisti [fisti] 'one'; wexko [fexko] 'frog species'; woe [foe] 'boquechico fish (Prochilodus)'.

k at the beginning of words and after consonants, like an English k. Between consonants, more like a glottal stop ('). For successive occurrences of k between vowels in adjacent syllables, it alternates between the glottal stop and k sound. Examples: waka [wa'a] 'stinging, pungent'; chaka [cha'a] 'bad'; chakakoi [cha'akoi] 'very bad'.

m varies between b, mb (prenasalized b) and m. Pronounced m in nasalized words, b or mb in most other words. Examples: mari [bari, mbari] 'paca'; mekãi 'I'm going'.

n varies between d, nd (prenasalized d) and n. Pronounced n in nasalized words, d or nd in most other words. When occurring in successive consonants, the first is pronounced d and the second n. Examples: nawa [dawa, ndawa] 'foreigners, whites'; winana [widana] 'of the wasp'; nãwai 'Picramnia spruceana'.

r varies between r and l. Example: ro 'howler monkey'.

sh fricative palatal, produced more towards the front of the mouth than English sh. Example: shara 'good'.

x an sh pronounced with the top of the tongue elevated and arched toward the alveolar region. Example: xori ‘ayahuasca’ (Banisteriopsis caapi).

Eakins does not mention tonality in her discussion of Yaminahua phonology. However in the Yora and Yaminahua dialects I encountered, at least two tones (tonemes) appear to be present, and are contrastive with regard to meaning. I collected several tonal minimal pairs: áxó (apparently high or rising tone) ‘Capirona tree’ and axò (low tone) ‘mild vegetative odor’; chíko 'acrid, stench like urine’ and chìkò ‘younger brother of female ego’; ísò ‘urine’ and ìsò ‘spider monkey.’ Similar findings have been noted by Lew Michael (personal communication) for Sharanahua as spoken on the Purús River. In Sharanahua, two tonemes appear to be present, a level high tone and a level low tone, as simple a tonal system as can be found. More distantly related and better-studied Panoan languages such as Cashinahua may not be tonal. It is likely that all syllables in Yora/Yaminahua are tonally marked. Since I have not studied tonality in a systematic way, I hesitate to provide tonal markings for Yora/Yaminahua words. I note possible tonal markings for a few words relevant to this study and for which I was able to gather tonal minimal pairs. Other than in these cases, I omit tonal markings throughout the text to avoid inconsistent or improper usage.

Ethnographic Bias

I have carried out ethnographic and ethnobotanical research with Matsigenka populations of the Manu River since 1986, and in that time have become fluent in their language and well acquainted with their customs, religious practices, mythology and oral history. I first encountered members of the Yora ethnic group in 1986 as well, but engaged in no prolonged research with the Yora population until 1996 during the course of the research discussed here. During approximately six months of field research in Yora and Yaminahua communities, I became fairly fluent in their language. However my

fluency and familiarity with Yora/Yaminahua language, customs and oral tradition are limited compared to my knowledge of Matsigenka language and culture. For this reason, I am able to present more original data on Matsigenka oral history and other aspects of their culture not directly associated with the research questions. I draw on my own interviews as well as other sources (Townsley 1987; MacQuarrie 1991) as indicated, in reconstructing Yora oral history.

I admit to having suffered from a distinct Matsigenka culture bias in my first months of work with the Yora. Accustomed to Matsigenka etiquette, lifestyle, attitudes towards illness and habits for handling plants, I was thoroughly bewildered during my first stint of fieldwork with the Yora. Essentially, I was forced to relearn everything I had come to take for granted after a decade of working with the Matsigenka. The culture shock included such basic items as where to sit: the Yora sleep and rest suspended in hammocks, the Matsigenka on woven mats on the ground. I was accustomed to cool, fermented manioc beer among the Matsigenka; the Yora drink a warm, unfermented corn beverage. My experience of culture shock included more subtle psychological issues such as how to interpret complaints of illness: compared to the Yora, the Matsigenka take a stoic attitude, understating their pains and illnesses. The Yora, by comparison, are more forthcoming, tending if anything towards overstatement rather than understatement of illness complaints.

My bias as an ethnographer was also colored by at least five decades of warfare between the Matsigenka and the Yora. Parents and siblings of my Matsigenka friends were killed or wounded by Yora raiding parties on Matsigenka settlements as recently as 1985. In fact, the leading cause of adult death among the Matsigenka prior to 1985 was Yora raiding. While conducting genealogical interviews with the Yora, I also learned of numerous fatalities inflicted by the Matsigenka in retaliation. Unlike warring groups in other parts of the world, however, both the Matsigenka and the Yora appear to have a

tremendous capacity for forgiving, though not forgetting. The Matsigenka recognize in the Yora's warlike behavior the staunchly defensive attitude of isolated Matsigenka settlements today as well as their own ancestors prior to the days of missionary pacification. The desire to obtain an ax or other metal tools, or simply to be left in peace, justifies aggressive behavior. Both the Matsigenka and the Yora are glad the days of warfare are over, and appear to have no desire to fan the flames of bygone hostilities.

My experience of culture shock among the Yora was an instructive reminder of the tremendous cultural diversity of Amazonian peoples, and the value of comparative research. Though they currently live in nearly identical ecological conditions and share certain basic economic, social and cultural features, the Matsigenka and the Yora are surprisingly different people. The Matsigenka are among the tallest and leanest of Amazonian native peoples, the Yora among the shortest and stockiest (Hill and Kaplan 1990). The Matsigenka staple is manioc, the Yora staple is corn. The Matsigenka sleep on mats, the Yora sleep in hammocks. Both depend on seasonal and long-term migrations to optimize hunting, gathering and agriculture, yet the Matsigenka appear to have been more sedentary, whereas the Yora were more mobile prior to prolonged Western contact. Matsigenka residence tends to be matrilocal, while Yora residence and social structure tends towards patrilocality and patrilineality. Matsigenka matrilocal units are highly independent of one another both politically and economically; meat and staple foods are rarely shared beyond the extended family cluster. Yora villages, like those of other Panoan peoples (see Kensinger 1995) are integrated under the authority of a headman who organizes communal hunts (and in the past, war parties). The headman is expected to distribute the spoils among multiple extended family units. The Matsigenka and Yora also posses a remarkably different ethos. Most strikingly, the Matsigenka are reserved and guarded in revealing emotional and physical pain in most social contexts, due to a belief that the expression of negative emotions leads to ill health (Shepard in

press-a). The Yora, on the other hand, share their pains and ills dramatically as a part of daily social interactions, eliciting empathy and support from the social group. In Chapter 3, I discuss these differences in greater detail and provide examples from my field notes of events that illustrate the contrasting emotional pitches in the two groups.

As discussed in greater detail in the following chapters, the two societies also approach plant evaluation and therapy in very different ways. Not until my second stint of fieldwork among the Yora did I become conscious of my Matsigenka bias in collecting and describing plants specimens. When looking for plants, especially medicines, the Matsigenka typically scrape, crush, smell and taste plant bark and leaves as a matter of habit. If there is no strong, unpleasant smell, Matsigenka informants chew a bit of twig or leaf, typically checking for a telltale bitter taste. They often offer up a piece of scraped or chewed bark to my nose or mouth for me to try myself. I came to adopt this behavior myself as a matter of course when collecting with Matsigenka informants. Interested as I was in taste/smell classification of medicines, it became habitual to hold up a bit of masticated plant material to the nose or mouth of my informants for them to sample and evaluate.

Among the Yora, these habits were greeted with a mixture of bewilderment, humor and consternation. My first day of collecting among the Yora was with Inima, "Fragrant One," a knowledgeable older man considered to be an 'owner of medicines,' *nisaya*. In good Matsigenka fashion, I scratched and sniffed and chewed all the plants he showed me. Each time I did so, he grabbed me by the ear or rubbed my head with a tender, mocking laugh as if to say, "You silly boy." When I tried to offer scraped or masticated plants for him to taste or smell, he swatted the plants away in mock disgust, giggling in a childlike falsetto. I had similar interactions with other informants during my first few collection trips. As I insisted on obtaining a taste or smell property from every plant, Inima and other informants replied in consternation, *mokama, inima, paisma! na*

nipei!, “It's not bitter, it's not fragrant, one doesn't taste it! It's a medicine!” At first I thought informants were being aloof since they did not yet know me well, or because of my minimal linguistic skills. In fact, my habits of handling plants, developed through long-term work with Matsigenka informants, were simply inappropriate in Yora culture. With increasing language fluency and growing numbers of botanical collections, I came to realize that chemosensory properties, especially taste, were simply not as significant in Yora medicine as they were in Matsigenka medicine. The resistance of many informants to inhale, or worse still, taste most wild plants arises from one of the fundamental principles of Yora medicine: illnesses are inflicted on people by spiritually dangerous plants.

Chapter 3: The Cultural Context of Healing

Illness is recognized, identified, labeled and treated through a complex set of processes involving individual and collective perceptions of biological and cultural phenomena. The individual's experience of illness and perception of well-being is interpreted through social, moral and cosmological codes. Medical systems are inextricably linked to particular religious and cultural traditions. In this chapter I present an overview of general aspects of Matsigenka and Yora/Yaminahua social behavior, cosmology and belief that are relevant to the study of illness and healing: medicine as a cultural category; the role of shamanistic healing; emotional aspects of illness and well-being; the contrasting ethos of emotional expression in the two societies; gender-based division of medical knowledge; and the cosmological significance of ecological processes.

Botany and Medicine

Despite popular conceptions of the rain forest as a huge pharmacy, and its indigenous peoples as libraries of medicinal plant knowledge, plants do not play an equally important role in the medical systems of all indigenous peoples. The Harakmbet peoples (Huachipaeri, Amarakaeri and others), for example, live in close proximity to the Matsigenka in southeastern Peru, yet their traditional medicine includes very few medicinal plants (Bennett 1991; P. Lyon, personal communication). Instead, healers sing specific healing songs to cure different illnesses. Fortunately for this comparative study, botany and medicine proved to be important, in fact inextricably related, in both Matsigenka and Yora/Yaminahua culture. The Yora/Yaminahua word *nisa* is the general word for plant, and can also be used in a more limited sense to refer to plant medicines. The word 'plant leaf' (M: *inchashi*, Y: *nipei*), which also refers in a general sense to the

herbaceous life form, is a synonym for plant-based medicines in both languages. In Matsigenka, the general word for medicine is *ampi*, a Quechua loan word, referring to plant-based therapy as well as Western pharmaceuticals. *Rao* in Yora/Yaminahua is a complex concept signifying medicine (plants as well as Western pharmaceuticals), illness and poison.

The term 'medicine' (M: *ampi*; Y: *rao*) is used by both groups in both a strict and a loose sense. Medicine in the strict sense includes substances that are taken for the specific purpose of preventing or treating illness. Neither group considers special plants used to improve hunting or farming ability, dispel social tensions or attract members of the opposite sex to be "medicine" in the strict sense. However well-being for both groups is a concept embracing physical and psychological health as well as successful gardening, hunting and harmonious social interactions. Hunting plants or perfumes are considered medicines in this broader sense, apparently because they contribute to maintaining culturally significant states of well-being. For example, Yora informants on several occasions made an apparently contradictory observation regarding plants used to treat hunting dogs, "This plant is not 'medicine' (*rao*), it is 'dog medicine' (*paxta rao*)." One Yora said of a perfume plant, "It is not medicine. It is 'woman medicine' (*awi rao*) [i.e., to attract women]." Matsigenka informants made similar comments regarding hunting medicines and perfume plants, not considered medicines in the strict sense of curing illnesses, but nonetheless belonging to the cultural category of 'plant medicines' (*inchashi*) in a broader sense. Throughout the remaining discussion and data analysis, I use expressions such as "medicine" and "medicinal plant" in the latter, broader sense. By including a broad range of plant uses under the category of medicine, I challenge the distinction made by Balée (1994: 89) and other ethnobotanists between "magic" and "medicine" in indigenous botanical knowledge. Plants in indigenous societies are used for a wide range of purposes that fall under the local category of "medicine" broadly

conceived. Some medicines are used for purposes a Westerner would agree were strictly empirical, and others are used for purposes a Westerner could only describe as "magical," while other uses would fall in between. To divide plants into "magical" and "medical" creates artificial categories that have little meaning to local people.

Matsigenka in more isolated communities such as Manu do not generally recognize specialized herbal healers. Instead, plant-based therapy is widely shared among the population. Here, the principle division is between 'plants/medicines belonging to men' (inchashi irashi surari), mostly hunting remedies, and 'plants/medicines belonging to women' (inchashi ashi tsinani), principally plants used to prevent and treat illnesses in young children. In the larger, more acculturated communities along the Urubamba River drainage, such generalized medicinal plant knowledge has been lost, apparently because of the increasing importance of Western schooling and economic activities, as well as the work of Protestant missionaries who considered traditional medical practices to be diabolical and sought to eliminate them. In these communities, those who retained knowledge of medicinal plants are now recognized as herbal healers, sought out by sick people and often reimbursed for their services with presents or cash. Herbal specialists are considered distinct from tobacco-shamans (seripigari), though the two are not mutually exclusive. However due to the tactics of the Protestant missionaries, Matsigenka tobacco-shamans now operate in utmost secrecy.

In traditional times, the Yora recognized specialized herbal healers known as nisaya, 'owners of plant medicine,' as distinct from the shamans or 'sucking healers' (kokoti). These healers were mostly men, and often the headmen of Yora extended family units. Like shaman-healers, herbal healers acquired their knowledge through apprenticeship with an older, more experienced man. During the epidemics beginning in 1985, all but three nisaya died (MacQuarrie 1991). Of the three who survived the initial epidemics, the eldest and most knowledgeable, named Nishpopinima, "Eats no Piper,"

died of pneumonia about 1990. During my research in 1996, I was able to work with the two remaining *nisaya*:

Despite the supposed specialized knowledge of *nisaya*, I found that knowledge of medicinal plants was actually widespread throughout the adult Yora population, especially among women. As with the Matsigenka, men and women have separate areas of plant specialization: hunting medicines as opposed to medicines for controlling fertility and treating health problems in infants. One aspect of Yora herbal medicine that was widely shared among all informants was knowledge of plants for treating arrow wounds (*piaki*). On raiding expeditions to Matsigenka settlements, the Yora were often wounded by Matsigenka arrows. The wounded were treated immediately, and the dead were carried to the home village if possible for burial. Though the two groups exchanged no information regarding medicinal plants directly, the Matsigenka became aware of some Yora medicines by observing the trail left in retreat after raiding expeditions. In 1987, long before I worked with the Yora, an older Matsigenka man, Quispe, pointed out to me a Chondodendron (Menispermaceae) species, saying it was a plant used by the Yora. He had observed that the Yora stripped the leaves from the plant, but did not know what they used it for. He had no interest in experimenting with the plant as a medicine, since he feared it might make the Matsigenka become warlike and violent like the Yora. In 1996, when I began research with the Yora, I collected the same Chondodendron species on numerous occasions. It is one of the most common Yora medicines, used in the treatment of arrow wounds.

Shamanistic Healing

Ritual healing and shamanistic religion has been discussed extensively, indeed almost exclusively, in the literature on native Amazonian medicine. The ritual use of hallucinogenic plants has been of principle concern in studies of Amerindian botany and medicine (Wasson 1961; Furst 1972; Schultes and Hoffman 1972; Harner 1973; Reichel-

Dolmatoff 1975; Joralemon 1983; Luna 1986; J. Wilbert 1987; Matteson-Langdon and Baer 1992). Both Matsigenka and Yora/Yaminahua medical practices contain elements characteristic of pan-Amazonian and pan-American indigenous shamanism. Both groups have rich shamanistic healing traditions, worthy of much more detailed treatment than can be included here. I have chosen to limit my discussion for a number of reasons. First, the shamanistic traditions of closely related Arawakan and Panoan peoples have already received considerable attention (Harner 1973; Kensinger 1974; Weiss 1975; Gebhart-Sayer 1987; Baer 1992). Shamanism is viewed by the Matsigenka and the Yora/Yaminahua as complementary to and yet independent from plant-based therapy, which is the focus of this study. Finally, different cultural attitudes towards shamanism between the two groups render a thorough comparative study somewhat problematic.

Shaman-healers in both Matsigenka and Yora/Yaminahua society use hallucinogenic and narcotic plants to achieve a trance state in which illnesses can be treated by singing, massaging and sucking with the mouth. Shamanistic religion and healing are inextricable from medical botany in the two groups for a number of reasons: 1) the shaman depends on specific psychoactive plants to enter into trance; 2) traveling to the spirit world in hallucinogenic trance, shamans in the mythical past are said to have acquired knowledge about medicinal plants and other important technologies; 3) shamanistic religion provides certain fundamental concepts (soul loss, object intrusion, spirit attack and sorcery) to both systems of medicine. This said, both groups recognize a basic distinction between shamanistic healing and plant-based healing. Plant medicines can be gathered and administered by practically anyone, while shamanistic healing involves the intervention of a specialist. Whereas the efficacy of shamanistic healing depends on the spiritual prowess and ritual actions of the individual shaman, the efficacy of plant-based therapy depends on the empirically ascertained qualities of medicinal species, largely independent of personal or ritual variables. Arguably, the ritual setting

influences therapeutic outcome in any medical intervention, including biomedical procedures (Katz 1981; Moerman 1983), yet as one Matsigenka man commented to me:

> Learning plants is not difficult. Even you have learned plants by going to the forest with my father. You listen, he tells you, "Look here! This plant is for diarrhea. This plant is for headache. This is for dripping in your eyes." You go with him two times, three times. Gradually, gradually, you learn the plants yourself. But being a tobacco shaman is different. It is very difficult. Not everyone is able to learn. Only a few.

Both groups acknowledge that certain people have more plant knowledge than others. Likewise, both groups recognize specialized domains of plant knowledge, for example, men's knowledge as opposed to women's knowledge. Generally, however, medicinal plant knowledge is widely shared and accessible to anyone willing to pay attention and learn. Shamanistic healing, on the other hand, is the esoteric domain of ritual specialists.

Kensinger (1974) describes two distinct ethnomedical specialties among the Panoan Cashinahua, who are culturally and linguistically related to the Yora/Yaminahua: 'bitter medicines' (*dau muka*) are the specialty of shamans, who use bitter-tasting hallucinogenic plants to cure spiritual illnesses; 'sweet medicines' (*dau bata*)[2] are the specialty of herbalists who use wild plants to treat more mundane illnesses. In describing herbal medicines as universally 'sweet,' the Cashinahua do not mean sweet taste *per se*, but rather use the term in a more general sense to refer to pleasant qualities, especially the fragrant or aromatic odors of warm herbal baths (K. Kensinger, personal communication). Though Yora/Yaminahua speakers do not make such a distinction between "bitter" and "sweet" healers, a similar pattern is apparent: plant medicines are not attributed strong or unpleasant taste qualities, with the exception of one or two bitter hallucinogens used by shamans to treat supernatural illnesses. As discussed in Chapters Four and Five, this represents a stark contrast with use patterns among the Matsigenka, for whom many medicines are attributed bitterness, pungency and other unpleasant taste qualities. Yet like the Yora/Yaminahua, the Cashinahua and other groups, the Matsigenka distinguish

between plant-based healing and shamanistic healing as two complementary and yet somewhat independent areas of traditional medical practice.

Evolving Techniques of Ecstasy

The use of Banisteriopsis in native Amazonian shamanism has been documented by numerous authors (e.g., Schultes 1957; Harner 1972, 1973; Reichel-Dolmatoff 1971, 1975; Baer 1984, 1992; Luna 1986; Grob et al. 1996). Banisteriopsis caapi is a liana used in the preparation of the hallucinogenic beverage known by various local names: *ayahuasca*, *yagé*, *natem*, *vegetal*, *hoasca*. The Matsigenka name is *kamarampi*, literally, 'vomiting medicine' and the Yora/Yaminahua name is *xori*, both terms referring to the Banisteriopsis liana as well as to the beverage formed by boiling it with a number of other plants. In most published accounts, the pounded Banisteriopsis liana is boiled with the leaves of Psychotria viridis or P. carthagenensis. The principle hallucinogenic component is not provided by Banisteriopsis itself but rather by Psychotria leaves, containing dimethyl tryptamine (DMT). Beta-carbolines in Banisteriopsis inhibit monoamine oxidase (MAO), an enzyme found in nerve synapses that would normally metabolize DMT and render it inactive by oral administration. Taken in a mixture, the two plants act together in a very specific synergism, producing strong hallucinogenic effects.

The Matsigenka have a longer history of using the Banisteriopsis liana in shamanism than the Yora. However, the use of DMT-containing Psychotria species as an admixture to Banisteriopsis was apparently introduced only recently to the Matsigenka of Manu. In the 1960's, the Matsigenka of the Manu River were contacted by fellow Matsigenka of the neighboring Urubamba River. The Urubamba Matsigenka taught the people in Manu how to use Psychotria as an admixture to Banisteriopsis, and for this reason the people of Manu call Psychotria 'Urubamba-leaf,' *orovampashi*. Prior to this time, the Matsigenka of Manu prepared Banisteriopsis by boiling it for long periods of time until it was reduced to a honey-like consistency.[3] Various plants were formerly

added to potentiate the effects of the traditional Banisteriopsis preparation. These include members of the Acanthaceae, Commelinaceae, Oxalidaceae and an unidentified species of orchid. It is possible that some of these may contain trace amounts of DMT or some other psychoactive compound. In some cases, however, their use also appears to depend upon symbolic associations: two of the species have brightly colored venation or markings on the leaves, which the Matsigenka associate with the colorful patterns seen in hallucinogenic trance. The Matsigenka retain their knowledge of these admixtures, and sometimes add them to the Banisteriopsis-Psychotria preparation now in common use. For the most part, however, Psychotria has replaced the prior admixtures, since it is considered to be stronger, more consistent in its effects and more convenient to prepare, requiring only three to six hours of cooking compared to eight or more hours for the traditional preparation.

Psychotria viridis is the most frequently mentioned admixture to Banisteriopsis noted in the literature on Western Amazonian ethnobotany. It is also used by the Yora and Yaminahua in their Banisteriopsis brew. The Matsigenka, however, consider P. viridis to be a dangerous plant, used only by sorcerers of rival tribes such as the Shipibo and Piro. The Matsigenka name for this species is *irorovampashi pijiri*, 'bat Psychotria,' or *yakomamashi*, 'anaconda leaf,' since it is said to cause terrifying visions of fanged bats and snakes. Instead, the Matsigenka use a different Psychotria species, not yet identified botanically. This species, called *orovampashi-sano*, 'true Psychotria,' causes no unpleasant visions of bats or snakes, but only 'good' visions of happy, dancing people. This information suggests that the two species may contain different concentrations or chemical variants of DMT with subtly different psychoactive effects. Various cultural groups perceive and value these distinctive effects in different ways.

Prior to their 1984 contact, the Yora were unaware of the hallucinogenic Banisteriopsis-Psychotria mixture, commonly known as ayahuasca and used throughout

much of lowland South America in shamanistic ceremonies. Instead, the Yora used a bitter-tasting liana of the genus Paullinia known as tsimo (literally 'astringent,' see Chapter 5). It was boiled for several hours to prepare a strongly bitter-astringent beverage, producing nausea, sweating, body pains, blurred vision and hallucinations. The beverage was consumed by the Yora in frequent group ceremonies of shamanistic chanting and healing. The brew is said to produce undesirable, long-term side effects, including skin lesions reminiscent of leishmaniasis, in people who do not follow strict dietary prohibitions before and after consumption. The acculturated Yaminahua leader who served as intermediary throughout the Yora contact was also a shaman-healer. He introduced the Yora to ayahuasca during the early months of contact. Today, the use of the Paullinia tsimo has been completely supplanted by ayahuasca. The Yora claim that ayahuasca is more strongly hallucinogenic yet less toxic than the traditional Paullinia beverage. However the acculturated Yaminahua leader may be the source of these observations. He was critical of tsimo due to its toxic effects, and claimed that it was inferior to ayahuasca in its healing power. He retrained all Yora healers in the use of ayahuasca, helping him strengthen his political, economic and spiritual power over the group.

Though ayahuasca is central to shamanistic healing among the Matsigenka and Yora of Manu, the current form of use is quite new to both groups. These observations underscore the tremendous fluidity of indigenous medical practices, and the speed with which novel practices are adopted. They also support the findings of Gow (1994), suggesting that the widespread use of ayahuasca is a relatively recent phenomenon, an outcome of interethnic contacts resulting from trading and the rubber boom, beginning in the late 1800's.

Seripigari: The Matsigenka Tobacco-Shaman

The shaman in Matsigenka culture is more than a healer. The shaman, *seripigari*, is humanity's direct link to the powerful forces controlling the universe. The word *seripigari* means literally, 'the one intoxicated by tobacco' (see also Baer 1992), containing the same verb root as in *kepigari*, 'intoxicating.' The *seripigari* (also known as *antyavigari*) uses tobacco (*seri*) and other psychoactive substances to cross over into the world of spirits and act on behalf of humanity. In Matsigenka mythology, the world and its great diversity of organisms were created by the magical breath of 'Blowing Spirit,' *Tasorintsi*, who, like human shamans, gained transformative powers from tobacco (Shepard in press-c). In Matsigenka folk tales, the *seripigari* is always the hero, saving humanity again and again from destruction at the hands of evil forces. Shamans were responsible for bringing fire, agriculture, medicine, crafts and other civilizing technologies from the superior beings inhabiting the sky. Shamans in Matsigenka folk tales and oral history are usually male, but include some post-menopausal women. To this day, the Matsigenka believe in the power of the *seripigari* to cure illness that responds to neither herbal nor Western medicines. The *seripigari* can call back wayward souls, confront the sorcerer or demon causing an illness and suck out the intrusive, illness-causing object (usually a bone, twig or needle) from the sick person's body. In addition to their medical functions, the *seripigari* are key figures in the magical ecology of daily subsistence. They have the ability to lure game animals out of their enchanted hiding places, bring new cultivars for failing gardens, change the course of rivers and send lightning bolts to destroy illness-causing spirits.

The shaman's power depends on an ongoing relationship with the *Sangariite*, elusive, luminous beings who serve as the Matsigenka's spirit allies. The name *Sangariite* is derived from the root *-sanga-*, meaning 'pure, clean, clear, invisible.' The *Sangariite* reside in villages in the forest that are perceptible under ordinary circumstances merely as small, natural clearings made by the mutualistic ants *matyaniro*

(Allomerus, Myrmalachista) around the shrub matyagiroki (Cordia nodosa) (Davidson and McKey 1993). When the shaman visits these clearings under the influence of hallucinogens, they reveal their true nature: large villages surrounded by lush gardens, humming with the voices and laughter of the Sangariite. The Sangariite are small, about the size of human children (see also Baer 1984; Rosengren 1987); like children, they are mischievous and non-sexual. They know neither disease nor death. Their gardens tend themselves magically and the game animals of the forest live as pets in their villages. They live in an unending, joyous manioc beer drinking party, uninterrupted by human distractions like garden work or social tensions.

The human seripigari cultivates a relationship with a spirit twin among the Sangariite. When the human shaman prepares an hallucinogenic brew in his village, the Sangariite twin does the same in the invisible village. The twins then drink the brew at the same time, and through the miracle of trance, they ssorcerer places: the Sangariite occupies the shaman's body, while the shaman's soul is free to visit the distant village of his 'brother' (ige). There, the shaman may obtain novel varieties of foods and medicines from the enchanted gardens, renewing the genetic vigor of Matsigenka crops (Shepard in press-c). The shaman may convince the Sangariite to release game animals for the Matsigenka to hunt, or enlist the aid of the Sangariite to heal the sick. When the trance is over, the twins ssorcerer places, each returning to their respective homes. Both the Sangariite and their human emissaries are referred to as Kovutatsirira, 'guardians.' Without their collaborative work, humanity would have been extinguished long ago through illness, crop failure, natural disasters and the continuing assault of the forces of evil.

In keeping with cultural norms of modesty and stoicism, Matsigenka shamans are reluctant to admit their practice openly. Furthermore, to do so could result in accusations of sorcery. During twelve years of ongoing fieldwork with Matsigenka communities of

the Manu, I was told repeatedly by numerous informants that there were no shamans left, that they had either lost their powers through illness, epidemics of introduced diseases or massacres by the Amuvako ("Amahuaca"), the Matsigenka term for the Yora. The only living man initially acknowledged (by others, not himself) to have shamanistic powers is believed to be a sorcerer rather than a healer. He is held responsible for numerous deaths and is ostracized by several extended family groups. Similar comments were made to Bennett (1991) during her work in a Matsigenka community of Madre de Dios. After twelve years of research and repeated visits to the community of Yomybato in Manu, I discovered (through second-hand comments) that in fact numerous shaman-healers are active. Several were people I had worked with closely, and most continue to deny they have such powers. Some have modestly admitted they "know a little," but point towards some other person as the one who "truly knows." That person invariably points back to some other shaman in a circular "passing of the buck." Matsigenka healing ceremonies are carried out in secret. After twelve years of ongoing research in one community, I was only recently invited to attend the frequent ayahuasca sessions held throughout the rainy season to improve hunting skills and general well-being. I have never been invited to an ayahuasca session devoted to healing a patient of a serious illness, though I know such sessions have occurred.

The shaman, an important figure in Matsigenka mythology, represents a model of ideal behavior to which many Matsigenka might aspire. The shaman undergoes great physical privations and spiritual dangers for the good of the social group. Claiming publicly to be a shaman, however, is inappropriate, and in fact a contradiction in terms, much as claiming to "be a saint" might be among Christians. Those who claim openly to be shamans are usually considered sorcerers, seeking to frighten their rivals. Such secrecy concerning shamanism was certainly influenced by the disparaging attitudes towards traditional healing of Protestant missionaries working among the Matsigenka

since the 1950's in some regions. It is possible that shamanism was truly abandoned for a time, and has been enjoying a slow recovery due to the absence of missionaries. In more recent years, traditional healing has been promoted by local indigenous federations and anthropologists (Alexiades and Lacaze 1996). The pattern of modesty is typical of the Matsigenka ethos, and makes me question Bennett's (ibid.) assertion that shamanism has disappeared from other Matsigenka communities. It appears instead that Matsigenka tobacco-shamans have become more secretive than ever.

In acculturated Matsigenka communities of the Urubamba, a new breed of folk healer, the 'steam bath healer' (*tsimpokantatsirira*) has emerged in recent years as an alternative to the more secretive and less publicly acceptable tobacco-shamans. These healers place hot stones in a pot full of herbs and water, causing the water to boil and give off steam (*otsimpokake*). The patient then stands over the boiling pot under a cotton tunic or blanket in order to bathe in the steam. When the session is over, the healer removes the stones and herbs from the pot and, to the surprise of the patient, finds various foreign items that were supposedly introduced into the patient's body by sorcery, and that have emerged with the steam. Commonly mentioned intrusive objects include nails, wires, bicycle spokes, empty medicine bottles and other manufactured goods as well as herbs. By removing these intrusive objects, the healer is thought to relieve the underlying cause of pain and illness. Matsigenka steam-bath healers have learned the technique mostly from Asháninka migrants, to whom they must pay significant amounts of cash to learn the secrets of the trade. The removal of the intrusive objects directly parallels the activity of traditional tobacco-shamans. However steam-bath healers are able to operate without as much stigma as the tobacco-shamans, though some Evangelical converts are beginning to denounce the steam-bath healers as Devil-worshipers.

Kokoti: The Yora "Sucking Shaman"

Yora shaman-healers are known as kokoti, a word derived from the verb root 'to suck.' These ritual specialists, distinct from herbal healers (nisaya), heal by sucking on the patient's body and then spitting, often revealing the presence of blood in their saliva. The blood is a sign that wasp spirits (wina) have stung the heart, causing illness. With successive healing, the concentration of blood in the saliva slowly diminishes. Though many kokoti died during the epidemics of the 1980's, the practice has continued to be an important aspect of Yora medicine, and is now fully integrated with ayahuasca shamanism as learned from acculturated Yaminahua. The Yaminahua are generally considered by the Yora to be more effective healers, especially for novel diseases, but several Yora men also practice this healing art.

In sharp contrast to the Matsigenka, the Yora and Yaminahua are open and even boastful about their shamanistic powers. From the moment I first arrived in the Yora/Yaminahua community of Serjali, I was invited to attend all healing sessions, which are considered public affairs. After learning from acculturated Yaminahua how to prepare the hallucinogenic Banisteriopsis brew, the Yora group prepare and drink it nearly every day. It is difficult to say whether this exuberance with regard to the ayahuasca ceremony is a generalized feature of the Yora/Yaminahua ethos, whether it owes to the very recent introduction of ayahuasca preparation to the Yora group, or whether it derives from the individual personality of the Yaminahua leader who has mediated the group's interactions with the outside since 1984; more likely, it is a result of a combination of all of these factors. Yaminahua shamans in Serjali, and the Yora adepts they have trained, perform healing ceremonies several times a week. To me, their songs became as familiar an aspect of the nighttime ambiance as the chorus of frogs from the forest. Yora/Yaminahua healers eagerly invite the entire village, as well as resident anthropologists, tourists, or other visitors, to witness, photograph, tape-record and film their sessions. Whereas the Matsigenka resort to shamans only after trying other

treatment options (medicinal plants, pharmaceuticals) first, the Yora turn to shamans as a front-line defense against illness. With increasing use of Western pharmaceuticals and an explosion of shamanistic practice following the introduction of Banisteriopsis, the Yora group has almost abandoned traditional plant therapy. They claim that the Summer Institute of Linguistics missionaries who worked with them in the late 1980's told them medicinal plants were "bad," and that pharmaceutical drugs worked better. Yet the missionaries also discouraged them from using Banisteriopsis, and they have certainly not heeded that warning. The introduction of Western medicine, religion and social and economic systems has forced profound changes onto native societies, and yet tenacious aspects of indigenous culture may lead these transformations in unexpected directions.

There are other important differences in the way the Matsigenka and the Yora/Yaminahua use ayahuasca and approach shamanistic healing. The brew prepared by the Matsigenka of Manu has a much stronger hallucinogenic effect than that prepared by the Yora. A Matsigenka field assistant who tried the Yora brew explained that the Matsigenka ayahuasca is stronger (and of course, better) because it is prepared from cultivated Banisteriopsis liana, brought down from the sky by past Matsigenka shamans. The Yora, by contrast, use wild Banisteriopsis. The Yora appear to prefer a milder ayahuasca brew because it allows them to remember and sing their complex healing songs. When the Matsigenka field assistant prepared his own ayahuasca brew, the Yora said it was too strong for their liking, since it interfered with their ability to sing. Matsigenka healing sessions take place in absolute darkness, since even the faintest spark or other artificial illumination is thought to burn the souls of the participants. By banishing ordinary vision in the darkness, Matsigenka shamans open the perceptions to supernatural vision, therby 'seeing truly' (*nesanotagantsi*) the powerful, otherwise invisible forces governing illness and well-being in the cosmos. Yora/Yaminahua healers, on the other hand, often sit near a fire, and are not distressed if flashlights are

illuminated. The Yora and Yaminahua, like most Panoans and certain other Amazonian peoples (see Gebhart-Sayer 1987; Reichel-Dolmatoff 1971) value ayahuasca-induced visions of anacondas, believed to be the spirit-owners or "mother" of the ayahuasca plant. The Matsigenka consider birds, for example, hummingbirds and the screaming piha (Lipaugus vociferans) to be their principle spirit guides, and consider visions of snakes to be evil omens.

The ayahuasca songs sung by the Matsigenka are often difficult if not impossible to translate, since they incorporate many onomatopoeic, archaic or nonsense words. Most songs are improvised or mumbled from within the depths of trance, perhaps comparable to the phenomenon of "speaking in tongues." The songs are said to come from the Saangariite themselves, and are not remembered, rehearsed, repeated or fully intelligible in ordinary states of consciousness. Matsigenka songs seem to derive their power from their acoustic properties, augmented by the hallucinogenic experience itself, than from semantic content or narrative structure.

Yora and Yaminahua healing songs, by contrast, consist of improvised poetic couplets organized into a clear narrative structure. Typically, the healer begins by calling to the demon, animal spirit, and other malignant various forces believed to cause the illness, thereby drawing them together and bringing them under his power. Aspects of Western technology, for example, guns, motors, metal tools and gasoline, are considered to be sources of heat and bad smells, and are therefore invoked in healing songs for treating high fevers and other introduced illnesses. After calling to the objects or spirits believed to cause illness, the healer proceeds to dispel the illness with his own "fragrant songs" (ini wanane). A Yora/Yaminahua healer spends several hours singing songs to the patient, who rests quietly in a hammock and may even fall asleep during the therapy. At several key times during the ceremony, the shaman blows onto a small gourd of a

warm infusion made from wild basil, and offers it to the patient to drink. The healer also sucks or massages body parts that are in pain.

Common Shamanic Themes

Despite the differences, there is much in common between Matsigenka and Yora/Yaminahua shamanism. As in many Amerindian societies, Matsigenka and Yora/Yaminahua cosmology is characterized by an essential duality. The visible, daytime world of ordinary consciousness exists in parallel with the invisible world of spirits, associated with nighttime, nocturnal animals, the dead, dreams and altered states of consciousness. Though evading detection by ordinary senses, the spirit world is where matters of life and death are decided. The shaman's power lies in the ability to mediate between the two worlds through a trance induced by psychoactive plants.

Illnesses that do not respond to empirical therapies (plants as well as Western medicines) are automatically suspected to have a hidden cause, perceptible and treatable only in the parallel world of spirits. Illness involving chronic suffering, wasting, sudden onset, dizziness, pain in the heart or chest and inexplicable itching, swelling or body aches are also suspect. During sleep or when walking alone in the forest, human victims may be attacked by vengeful animal and plant spirits, demons, ghosts or human sorcerers. These malevolent beings may frighten their victims and steal their souls, leaving the body to suffer and wither. Alternatively, malevolent beings may introduce foreign objects (spines, bones, needles, pebbles, stinging insects, herbs) into a person's body, causing pain and illness. No matter what remedies are administered, the painful object remains and the illness continues to get worse. In the case of both soul loss and intrusive objects, only shamans are capable of treating the underlying cause of the illness, and all other treatments are futile until this is achieved. The son of a former Matsigenka shaman-healer explained:

> Ordinary illness hurts, but when you use herbs or take pills, you get better. But if there is something painful inside, you don't get better. No! It hurts even more. Your heart hurts, or your knee hurts, you get tired, you don't eat, you get skinny. As long as the painful thing is there, you don't get better. They say it can be a twig, or a needle, or a bone or herbs. They say sorcerers can shoot them at you like a dart. Or demons, or dead people. I don't know anything about that. Only a shaman knows about those things. They can see where the painful things is when they take ayahuasca, and suck it out, and then show it to you. "Look! Here it is! This is what was hurting you."

'Ordinary illness,' kogapage mantsigarentsi[4], is not distinguished from supernatural illness by any particular symptom, but rather by its chronic and unrelenting nature. The 'painful thing,' katsitankicha, must be removed before healing can occur. The Matsigenka or Yora/Yaminahua shaman is able to call back the abducted soul by singing during the healing ceremony. By massaging and sucking painful parts of the body, the shaman removes the intrusive object, spitting it out to display to the patient.

Emotional Pathology and the Matsigenka Ethos

The Matsigenka take a stoic attitude towards physical and emotional pain in everyday behavior. I have seen Matsigenka men and women laugh at a painful wound rather than shed tears. Infants are given sedative herbal baths to prevent them from crying at night, such crying taken as a sign of spirit attack. Children are taught from a young age not to show anger and to refrain from crying when hurt.[5] They hold back their sobs, tears, and rage with visible effort. Except in the uninhibited context of drinking parties, the excessive display of negative emotions is considered to be a sign of physical and social pathology.

For the Matsigenka, emotional states map directly onto states of physical health and well-being. Sadness and anger are synonymous with illness just as happiness is synonymous with healthiness. The verbal root -shine-, 'to be happy,' in the imperfect form means 'I am happy, pleased, joyous' (noshinetaka). The perfect form noshinetanai means literally, 'I am already happy (again),' and is used to signify 'I am well, I was sick

but am getting better.' The verbal root -kenkisure- means 'to be sad, to grieve' connoting loneliness, nostalgia, and a feeling of longing for someone or something that is absent (Johnson, Johnson and Baksh 1986). The word is derived by combining the verbal root -kenki- 'to think, to consider (among choices), to ponder, to remember, to miss,' and the noun stem -sure, 'soul.' When traveling away from their village, the Matsigenka express homesickness for familiar faces, foods, and places as nokenkiakero, 'I think about it, remember it, miss it.' Profound sadness or grief is described as nokenkisuretaka, literally, 'my soul thinks.'

Dead people, too, 'think about' (ikenkiakeri) their living family members, and may return for their company causing illness and death. Sadness for the Matsigenka represents a condition in which the soul turns away in contemplation, dissociating itself from the rest of the physical and social body. This state is characterized by pensiveness, inactivity, loss of appetite, and wasting away of the body, the same things that occur during illness and death. As the soul separates from the body, the flesh wastes away.

Ivatsa, the word for the flesh or meat of animals and for the human body, is the animate form of the noun stem -vatsa. The noun stems -vatsa and -patsa are used as classifiers (see Shepard 1997a) for animal bodies and for fleshy, viscous, or semisolid substances like fruits (ovatsa), mud (jampovatsa), clay or earth (kipatsi), manioc mash (opatsa shitea), and tobacco quid (opatsa seri). Ivatsa , 'flesh, body,' is also used to refer to a whole person: when inquiring if someone is at home, a Matsigenka might ask, Aiño ivatsa?, 'Is his body there?' i.e., "Is he physically present?," much like the English expression, "Is any**body** home?" The noun stem for soul, -sure, is also used to refer to the core of a living tree and the active ingredients of medicinal plants. When the core of a tree dies and leaves stop growing, the expression is okamasuretaka, 'its core, soul died.' The activity of medicinal plants is described as okitsitingaka novatsa osure, 'its soul infuses my body.' Soul loss caused by the attack of malevolent spirits is indicated by

affixing -sure to the verb -ga-, 'to grab, get, take, have sexual relations': yagasuretakeri, 'it grabbed, assaulted his soul.' Though the soul of a person, animal, or plant is not visible under ordinary circumstances, its presence is manifest in health, growth, and activity.

The Matsigenka dualism between body and soul is somewhat different than the Cartesian model. In some contexts, ivatsa, 'body, flesh,' is used in contrast with isure, 'soul,' referring to the inert body as opposed to the animating soul. In other contexts, however, ivatsa can be used to refer to the soul or life force itself. For example, certain birds are considered to be seripigari, shamans, and serve as spirit guides to human shamans. In the everyday world, one sees only the 'wings' (ivanki) or physical manifestation of these birds. But in the invisible realm of the spirits, the bird has a 'body' (ivatsa) that looks like a human being. Only in dreams or trance states is the true nature, the "body human" of the bird perceived. The soul for the Matsigenka is not an invisible force relegated to the pituitary gland. Rather, the soul is what activates all bodily functions and gives it appetite, manifesting itself as the muscle and fat on a healthy body. Without 'life essence' (yani), the body is merely skin and bones. 'Skin' (itaki, also 'tree bark') and 'bones' (itonki)[6], rather than flesh, are considered to be the inert aspects of the body. The life essence of animals is passed on to those who consume their flesh. Without meat (ivatsa) in their diets, people grow hungry (itasegaka), skinny (imatsataka), and ill (imantsigataka). A sick person or old person who is thin and frail is as good as dead: the soul has already left the body, the flesh has been eaten away, and all that remains are the inanimate skin and bones. A person stricken by sadness likewise loses their appetite, wastes away, and eventually dies due to the flight of their soul.

Many health conditions, especially those associated with emotional disturbances like anger, grief, and passion, are accompanied by 'heart pain' (katsinegitagantsi). The actual heart muscle is niranigaki, 'center of my blood.' Nonegiku, literally 'my center' is

the central location of the body's functions, and represents a combination of the English concepts of heart and chest. It is usually indicated by tapping the sternum. Death is caused when an illness 'goes to the heart' or 'grips the heart' (avitantake negiku). Katsinegitagantsi, 'heart pain,' combines into a single category a number of symptoms that in English would be described separately as "heartburn" (upper gastric upset), "heartache" (sadness, nostalgia, hopeless love), heart palpitations, anxiety, chest pain, pneumonia, and heart attack. People with gastrointestinal and respiratory conditions, as well as those who are sad, anxious, or madly in love, experience a nagging pain in the chest that does not allow them to eat well, breathe well, or sleep well. Katsinegitagantsi is considered to be a serious health condition, and is often treated with emetics and warm plasters on the chest. Tsaronegitagantsi, 'heart palpitations' (literally 'fear in the heart') can be caused by fear (e.g. seeing a ghost), sadness, gossip, sorcery, or passion.

Anger is treated much like an illness in Matsigenka medicine. Kisatsi, 'anger,' is a dangerous social ill. When people become angry, their faces darken, tighten, frown, and flush, itsimaataka. Descriptions of this facial reaction suggests an attempt at verbal and emotional restraint: the face becomes tense and flushed, the lips stay tightly closed, the eyes look down, and the head turns to the side. When a man is angry at another man, for example, 'he does not speak to him' (tenga iniakeri), he refuses to respond to the other's greetings, but rather turns away in silence. Silence is a way of avoiding harsh words which can escalate into violent acts. The term niagantsi, literally 'words, language,' can also signify behind-the-back gossip and verbal arguments as well as physical violence and warfare. When individuals or families harbor feelings of anger towards one another, the situation is described as kisaenga, 'angry vapor,' or tsimaenga, 'frowning vapor.' The Matsigenka believe that epidemic illnesses such as smallpox, colds, and some gastrointestinal conditions are brought by 'intoxicating vapors' (kepigarienga) that rise from the depths of the earth into the sky and fall to earth. Social tensions, too, create an

evil vapor in the air, a palpable atmosphere that is ripe for acts of sorcery or physical violence.

Quarreling spouses or kin are given medicinal plants to eliminate domestic disturbances. One cultivated variety of sedge (Cyperus sp.) is known as kametivenki, 'good sedge,' since it restores goodness and happiness to households or communities disrupted by social tension. It is chewed, rubbed on the hands, and dripped into the eyes of the quarreling party by an elder third person, typically the matriarch or patriarch of the matrilocal settlement. Kamatsirivenki, 'ghost sedge,' is dripped into the eyes to eliminate sadness or bad dreams. Katsinegivenki, 'heart pain sedge,' is ingested to cure 'heart pain' in its myriad manifestations. In more acculturated areas, I have heard of the sedge variety sorarovenki, 'soldier sedge,' used to ensure peaceful encounters with Peruvian army troops or guerrillas. The psychoactivity of ergot alkaloids (chemical relatives of LSD) may explain why the Matsigenka use sedges for controlling anger, dreams, and other emotional states (Shepard 1998b).

The verb root -kisa- 'to be angry' is similar to the root -kisani-, 'to dream,' suggesting an etymological relationship. Both dreaming and anger connote negative emotional states that contribute to social and bodily ills. There is no sharp distinction between dreams and nightmares in the Matsigenka language. Nokisanitaka 'I dream,' is semantically close to nokisanivaigetaka, 'I dream a lot, i.e., have bad dreams, nightmares.' Some dreams are considered to be good, for example, dreams about game animals, but for the most part dreaming is considered to be a negative experience, an omen of illness. The soul leaves the body during sleep, causing unconsciousness. When a person dreams excessively, the soul may wander far afield and be abducted by demons or ghosts. Sorcerers appear in the dreams of their victims, just as lonely ghosts appear in the dreams of their family. Dreaming about a snake is a sign not to go hunting, since the spirit of the snake has already found its human prey, and the hunter is bound to be bitten.

Dreams are one way in which prohibited feelings (sadness, fear, social rivalry) are expressed in Matsigenka culture. Sadness, dreams, illness, and death are part of a continuum of states in which the soul detaches itself from the body in more and more permanent ways.

The dreaming soul is conceived of as a pair of roving eyes that see events occurring in the parallel world of the spirits. The eyes, as well as the nostrils and the crown of the head, are the portals of the soul's comings and goings. Medicinal plants used to treat the condition of 'excessive dreaming' (nokisanivaigetaka), as well to reign in sadness, anger, and extramarital passions, are applied directly to the eyes: nokaokitakempa, 'I apply drops to my eyes.' Eyedrop medicines, known collectively as kaokirontsi, are said to 'hurt' (okatsitake) and 'burn' (otegaka) the eyes, thereby dispelling the harmful spirits causing bad dreams, sadness, and other emotional manifestations. The painful cleansing of the eyes represents a purification of the soul. Kaokirontsi remedies cause a few moments of virtual blindness, like being squirted in the eye with lemon juice or pepper, until tears flush out the irritating substance. These artificially-induced tears could be interpreted as a symbolic replacement of the repressed tears of sorrow for a lost loved one. In addition to chemical irritation and its symbolic associations, some of these plants may provide psychoactive compounds (see Shepard in press b). The eyes provide an effective route for ingesting bioactive agents, and some Matsigenka eyedrop plants may exert activity on the central nervous system that contributes to their perceived influence on emotional states. Toxic compounds induce physiological responses (pain, tears, purging, vomiting) that convey important messages about the body's fight to expel illness and harmful spirits (cf. Browner et al. 1988; Etkin 1988).

Ethos and Pathos

Many of the same basic themes present in Matsigenka illness concepts are also found among the Yora/Yaminahua. Yet the elaboration of these themes according to a

different cultural logic result in surprisingly different medical practices and social behaviors. Where the Matsigenka are reserved in their reaction to pain, sadness and other negative emotions, the Yora/Yaminahua are highly expressive. A few personal observations in particular epitomized to me this difference in emotional tone between the two groups. For example, I was sitting one evening on a rocky beach of the Urubamba conversing with a Matsigenka woman to whom I had given a ride along the river. We began the conversation, as is customary, by asking about the health of one another's family members. She proceeded to tell me the tragic story of how her only daughter, two grandchildren, and several community members were killed when a motorboat overturned in the rapids of the Pongo de Mainique. She talked about the events in emotionless, matter-of-fact tones, almost as if she were talking about someone else's daughter. For this reason, I assumed the event must have occurred many years ago. I asked when the accident had happened. She responded, "February." "Last year?" I asked. "No, this year." It was early April. I was stunned by the apparent lack of expressed emotion in her voice and demeanor, and was reminded in a particularly poignant way of the tremendous power of the Matsigenka ethos over the individual expression of emotion.

This great emotional reserve contrasts sharply with the expressive pathos of the Yora. For example, one day I heard loud moaning coming from the house of Marta. Usually, she was cheery and full of smiles, always ready to make a joke. This day, however, she and several female relatives were crying and wailing the traditional dirge of mourning, "My child is dead! My little Yora child is dead!" They were so despondent that it took me several minutes to understand what had happened. A transistor radio had communicated the news of a commercial plane crash near Arequipa, Peru, and Spanish-speaking members of the community had spread the word. Marta's son and the sons of several other women had been recruited by the Peruvian Army. The women knew that army troops were sometimes transported in airplanes, and they thought that the crash

might have killed their children. I explained to them that the plane that had crashed was a commercial airliner, not a military plane, and that their sons were most certainly alive and safe at the army base. My explanation was of some comfort, but the women continued to cry and wail for much of the afternoon, full of nostalgia for their distant sons. The plane crash had been a reminder of the dangers of the little-known world beyond their village, and had thus unleashed a collective display of sorrow. Such displays turned out to be frequent among the Yora and the Yaminahua as well as the related Chitonahua whom I visited later. Sorrow is most intense after the death of a family member, but similar displays may be triggered by an illness (mild or severe) or nostalgia for a loved one who has temporarily left the village or who died long ago. Men and women alike cry and repeatedly wail a set of ritualized phrases. The principal griever often swings gently in a hammock, singing a mournful melody. Visitors to the household ask questions in a sad falsetto that communicates a shared sense of suffering. Visitors often join in the wailing for the duration of the visit, after which they carry on with their daily tasks. Even when greeting one another on a day-to-day basis, the Yora/Yaminahua discuss recent ills, aches and pains in the same empathetic tone of voice used when mourning for the dead or crying over sick people. The interlocutor responds with sympathy, recounting their own pains and afflictions. Mateo, the Matsigenka assistant who accompanied me among the Yora/Yaminahua noted, “They are always crying!” His Matsigenka sensibilities were shocked by such overt displays of pain and sorrow.

One incident in particular highlighted to me the stark contrast between Matsigenka and Yora/Yaminahua responses to physical pain. One afternoon, Raya, an older Yora man respected for his knowledge of medicinal plants, came to see me. He showed me a small cut on his finger, raised his voice to an empathetic falsetto, and implored me to treat the wound. I had long since giving up asking the Yora to treat minor problems with herbal remedies before seeking medications from me: when a foreigner is

in the community (medically trained or not), he or she is expected to treat the sick. "Isi!" he whined as I applied a topical antiseptic, "It hurts." As I treated him, Alejandra, wife of my Matsigenka field assistant, watched with crossed arms and a contemptuous look. When I finished, she sat down in front of me and snapped, "How is it possible? A grown man, crying about a little cut. Well if you treated that, then treat this!" She extended her foot to me and showed me where she had stubbed her toe. The skin had been ripped off, exposing raw flesh from the tip of the toe to the crease below the second knuckle. I had noticed her limping earlier, but she had denied any serious discomfort. Now, as I prepared to apply the antiseptic, I warned her, "This is going to hurt." As I cleaned the dirt from the wound with Betadine, she giggled hysterically, though it was clear that the treatment was painful.

The stoicism of the Matsigenka appears to be associated with an almost masochistic approach to many medicinal plants, whose bitter, pungent, caustic and other painful properties must be withstood in silence to achieve healing. Expressing pain during therapy is discouraged by the Matsigenka, as it is believed to interfere with the efficacy of the remedy. When I was treated with a scalding and caustic herbal juice for a leishmaniasis lesion, I inhaled sharply and cried, "Aye!" The Matsigenka man who was treating me warned, "Don't cry like that. The treatment won't work." (His advice appears to have helped: the lesion eventually healed.) The Yora, in contrast, show a more hedonic appreciation of the pleasant qualities of many plant medicines, including aromatic or fragrant leaves and warm infusions administered as baths or compresses to the body. I was tempted to borrow Ruth Benedict's (1934) classic characterization of culture and personality among Native North Americans, describing the Matsigenka as "Apollonian" and the Yora as "Dionysian." Yet the ritual catharsis during Matsigenka drinking parties is Dionysian in the extreme. Instead, the Matsigenka can be viewed as a people concerned with *ethos*, so that negative emotions are restrained and released

according to strict social norms. The Yora/Yaminahua, on the other hand, are a people of *pathos*, for whom the public release of pain and sorrow provides personal comfort while contributing to the solidarity of the social group. Not to express such emotions would be a sign of individual and social pathology.

Medical Botany, Gender and Ecological Balance

Though typically sex-positive in their orientation, Amazonian societies also reveal an undercurrent of ambiguity and fear regarding the spiritual and bodily dangers posed by improper sexual relations (Gregor 1985). Matsigenka folklore, like that of the linguistically related Mehinaku studied by Gregor, is replete with stories about the terrible consequences of aggressive sexuality and uncontrolled desire. Demons and animal spirits may appear to men or women walking alone in the forest, taking the form of attractive members of the opposite sex. These beings are said to have huge penises, and they engage in violent acts of anal intercourse with their victims. Succumbing to the temptation of a demonic seducer leads to great misery and almost certain death. Fearing the spiritual and physical vulnerability caused by intercourse, Matsigenka men practice sexual abstention prior to hunting, and avoid any contact with menstrual blood, lest they lose their hunting ability.

Sex, ecology and religion are closely related in the world view of many Amazonian peoples (Reichel-Dolmatoff 1971). Matsigenka and Yora/Yaminahua ethnobotany demonstrate a strong gender-based division of plant knowledge that reflects the importance of balance in sexual as well as ecological relationships. Hunting medicine is an area of male ethnobotanical specialization, complementing women's specialized knowledge of plants used in regulating fertility, controlling menstrual and post-partum bleeding, attending to childbirth and caring for newborn infants. This tendency is especially strong among the Matsigenka, for whom men’s hunting medicines and women’s child care medicines account for more than a hundred species, roughly half of

all medicinal plants used by the Matsigenka of the Manu (see Figure 6.3). Gendered division of plant knowledge reinforces norms of ideal behavior for parents and creates a balance between male and female contributions to subsistence and child-rearing.

Gift of the Harpy Eagle: Matsigenka Hunting Medicines

For Matsigenka men, hunting ability is not a matter of practice, good luck or inherited ability. Being a good hunter and 'having good aim' (*kovintsari*) is achieved solely by the use of special plants that sharpen a hunter's visual acuity, aim, sense of smell, stamina and luck. Dependent as they are on wild game and fish for virtually all of their protein requirements, hunting medicines are a crucial aspect of the Matsigenka pharmacopoeia. Hunting medicines account for more than fifty species, nearly a quarter of the total number of medicinal plants collected (Figure 6.3). These include plants taken by men to improve their own aim as well as plants given to hunting dogs to hone their sense of smell for specific animals.

Spiritual and bodily purity are important to the Matsigenka hunter. Eating spoiled or improperly cooked meat is a sure way of losing one's aim. If a woman allows a pot of meat to boil over and spill into the flames, the meat should be thrown away. If possible, a man should avoid carrying the animal he has killed. A companion, typically a brother-in-law or teenage boy, carries it for him. A man should never eat the head of the animal he has killed; the head is often given to another family in the extended kin group. When a young man kills his first few large monkeys, he is not allowed to eat any of the meat. Unlike sportsmen in the United States, Matsigenka men never brag about their hunting abilities or the size of their kill. Rather, they tend to understate their catch. These practices instill a sense of humility, while ensuring that meat is shared with other families in the social group. Those who disobey these norms lose their hunting skill.

Any contact with menstrual blood or menstruating women also ruins a man's aim. Men often refer to sex in slang by using metaphors from hunting. As among many

Amazonian societies, hunting and sex are linked by metaphorical associations (Siskind 1973b; Gregor 1985), yet in spite of similarity they are also in some sense incompatible. Matsigenka men avoid sexual relations the night before hunting. A promiscuous woman is described as “ruining the aim” of all the men in the village. After a successful hunt, temporarily abstinent couples often leave the children behind and go off to distant garden sites to “do some weeding.” Sexual and dietary taboos establish an ethic of proper conduct between husband and wife. A good wife will be attentive to her cooking and not let meat spoil, burn, remain undercooked or let the pot boil over. She will be careful to clean herself during menstruation and not contaminate other people with her blood. A good husband will be skilled enough as a hunter that if meat spoils, he will not have to eat it out of desperation. These taboos also establish a balance between reproductive and productive responsibilities of the family, between sexual pleasure and the serious business of raising a family.

Matsigenka men apply the leaf juice of numerous plant species (mostly Rubiaceae) to their eyes in order to clarify vision and instill the hunter with the soul of the harpy eagle, *Pakitsa* (Shepard 1998a). These medicines are taken only during the rainy season, specifically to improve a man's aim for hunting monkeys. The eyedrops induce several minutes of intense stinging and virtual blindness. When the pain wears off, the hunter is thought to have "good aim" (*ikovintsatake*) for several days. The active principle, literally ‘soul’ (*osure*) of the plant ‘infuses’ (*okitsitingakeri*) the man’s body, starting with the eyes, spreading through the head and descending into the torso, arms and hands through the muscles and veins. When hunting, the plant’s soul also infuses the bow and the arrow with its power. After some time, the infusion of the plant’s soul weakens. Only by applying a new dose can the hunter renew the hunting spirit of the plant and its absorption in his flesh. The Matsigenka view the eyes as doorways for the

going and coming of the soul; from a pharmacological perspective, active agents applied to the eyes are rapidly and efficiently absorbed into the bloodstream.

My own experience with eye-stinging plants suggests they contain a stimulating pharmacological principle. Mateo, my Matsigenka ethnobotanical assistant, spent one particularly stressful week during our travels because he and his wife Aleja had been quarreling frequently. He also noticed that his daughter was becoming disobedient as a result of this domestic disturbance. He decided to treat the whole family with eyedrops from a particular species of Psychotria. He administered the first dose in the evening, just before bed. He added a few drops of water to a handful of fresh leaves and then rubbed the mass between his palms, producing a greenish liquid. Mateo squeezed the drops into both eyes (right eye first) of Aleja and then his daughter Carmen. Aleja then squeezed drops into his eyes. All rubbed their eyes, full of tears and exclaimed, "Katsi! That stings!" Since I was traveling with them, they decided to treat me as well. "It will be good for you," Mateo joked," it might even give you better aim with a bow and arrow." After an initial period of intense stinging in my eyes, the plant produced a powerful stimulating effect, like strong coffee (Psychotria is in the Rubiaceae, the same botanical family as coffee), that left me somewhat nauseous and kept me awake much of the night.

A number of species of plants with purgative and emetic properties are taken by Matsigenka hunters to clean themselves of sexual, dietary and ritual impurities. These plants come from a wide range of botanical families, most are very bitter, and all induce fits of vomiting or diarrhea of various degrees of severity. The more bitter the taste and the more extreme the purgative effect, the better the medicine. Matsigenka men frequently describe the powerful toxic effects of these plants with an almost masochistic glee, laughing as they remember the physical suffering endured during a recent purge. The idea behind these remedies is to cleanse the body of spoiled or improperly cooked meat and the contagion of menstrual blood. The unpleasant, bloodlike odor (anigarienka)

is associated with the carrion-eating spirit of the vulture (shokentiri), the poorest hunter of the forest. By using purgative plants, the hunter's body becomes infused with the harpy eagle's hunting spirit. Pakitsa, the harpy eagle, is the epitome of hunting prowess for the Matsigenka. Matsigenka tales describe how the harpy eagle, walking the earth in human form long ago, once taught Matsigenka shamans the secrets of its own hunting skill: special plants for sharpening vision, cleansing the body and purifying the soul.

Cultivated sedges, Cyperus spp., are another important source of hunting medicines for Matsigenka men, who chew the root immediately before firing an arrow. Each sedge variety carries the name of the animal species it is used for. The most common hunting sedges are oshetovenki for spider monkeys, komaginarovenki for woolly monkeys and shimavenki for boquechico fish (Prochilodus nigricans). The importance of these three animal species in the ethnobotany of sedges reflects the two salient hunting seasons for the Matsigenka: the dry season, characterized by arrow-fishing for boquechico, and the rainy season, characterized by hunting woolly monkeys and spider monkeys. Every Matsigenka man raises his own sedge varieties, dispersed around his garden in discrete clumps. Ergot alkaloids in fungus-infected the sedges are likely responsible or the perceived improvement in hunting performance felt by Matsigenka men after chewing sedge root.

The hallucinogenic vine Banisteriopsis (ayahuasca) and the solanaceous narcotics Brugmansia, Brunfelsia, Solandra and tobacco are important in Matsigenka shamanism and are also powerful medicines for the hunter. In fact, shamanism for the Matsigenka has as much to do with hunting as with healing. When you ask Matsigenka men why they take ayahuasca, their first answer is usually, "to have good aim for monkey hunting." The purgative effects of Banisteriopsis contribute to its power in purifying the hunter's soul. Most importantly, Banisteriopsis and other psychoactive plants bring the hunter into direct contact with the spirits who control the natural and supernatural spheres.

Transported to the spirit world by hallucinogenic plants, the hunter may convince the guardian spirits to release more of their pets for the Matsigenka to hunt and eat. Local faunal shortages are said to occur when the guardian spirits become upset that so many of their pets are being killed, and therefore hide the animals in distant hillsides to be released at a later date (see also Reichel-Dolmatoff 1976). Ayahuasca is consumed during the rainy season, when trees come into fruit and game animals get fat. Game animals are generally not hunted during the dry season, because they are lean. Instead, fish are the main focus of subsistence. Taking Banisteriopsis is likewise prohibited during the dry season, because fires are believed to burn in the spirit world. Once the rains begin, these fires are put out, and the season of Banisteriopsis consumption and monkey hunting is ushered in once again. Thus ritual, ecological and subsistence cycles are intertwined.

The Revenge of the Hunted: Child Care Medicines

Matsigenka mothers give newborn babies warm baths of aromatic and succulent plants one or more times a day. The fragrance of these plants is thought to dispel certain rank-smelling animal spirits. If the mother does not know the proper plants, or if her husband kills animals he should not, animals can 'take revenge' (*ipugatakeri*) on a baby. There exists a direct opposition between men's hunting medicines, used for killing game animals, and women's baby-bathing medicines, used to defend children from the animals' vengeful spirits. There may be an empirical basis to the "revenge" caused by the meat of certain animals, since nursing babies can have allergic reactions to foods eaten by the mother. Given the high rates of infant mortality, over 25% in isolated communities, these beliefs reflect the general anxiety of parents about the health of their children, especially newborns. The warm baths of aromatic and succulent herbs keep babies clean and may help prevent skin infections. On another level, such practices establish norms of ideal behavior for parents, and create a balance between male and female roles in

subsistence and child-rearing. Finally, these beliefs imply a system of ecological checks and balances in which the role of predator and prey may become reversed as Nature settles its scores with human social groups.

Yora/Yaminahua medicine shows similar concern with the revenge (kopiti) of animal spirits. As is the case with the Matsigenka, the Yora believe that animals with strong odors can cause illness. Eating improper animals can also cause illness due to spirit revenge. As among the Matsigenka, the Yora believe that animal spirits are especially dangerous for young children. Animal spirits may also attack when people overharvest or unduly molest certain animal species, reflecting concepts of reciprocity and retribution with the natural world. The Yora/Yaminahua attribute a great number of illnesses to the malevolent spirits of noxious invertebrates such as wasps (wina) and caustic millipedes (xako; see Chapter 4). When animal spirits take revenge on people and cause illness, the illness can be cured by seeking out plants "owned" by the offending animal spirit. These plants often demonstrate visual or other physical properties (coloration, texture, shape, place of growth) reminiscent of their animal "owner."

Chapter 4: Illness and Etiology

A major function of all human medical systems is to deduce the underlying causes (etiology) of illness from its outward signs. Some health conditions demonstrate a fairly obvious relationship between signs and etiology: wounds, broken bones, an upset stomach after eating spoiled food or the pain of venomous stings or bites. Yet even when the mechanical question of *how* an illness occurred is fairly straightforward, the moral question of *why* misfortune befell that particular person at that time is of concern in many medical systems. For most health disorders, the relationship between manifest signs and underlying etiology is far from apparent. People rely on culturally mediated concepts of body, spirit and society in experiencing, diagnosing and treating health disorders, what Kleinman (1980) has dubbed "illness models."

As I argue in this and subsequent chapters, the selection and use of plants in Matsigenka and Yora/Yaminahua medicine can be understood only by appreciating illness models in the two societies. By the same token, a full understanding of Matsigenka and Yora/Yaminahua illness models was achieved only through systematic study of the criteria used in selecting plant medicines. There is a strict logic to the way both the Matsigenka and the Yora/Yaminahua select and use plant medicines, a logic that reveals the two societies' contrasting models for understanding illness. In this chapter I present an overview of the health problems faced by the two societies. While describing and classifying the biological manifestations of ill health, illness models also mediate the individual's experience of illness and the society's therapeutic response to it.

Figure 4.1: Attributed Causes of Adult and Child Mortality (>5 yrs.)

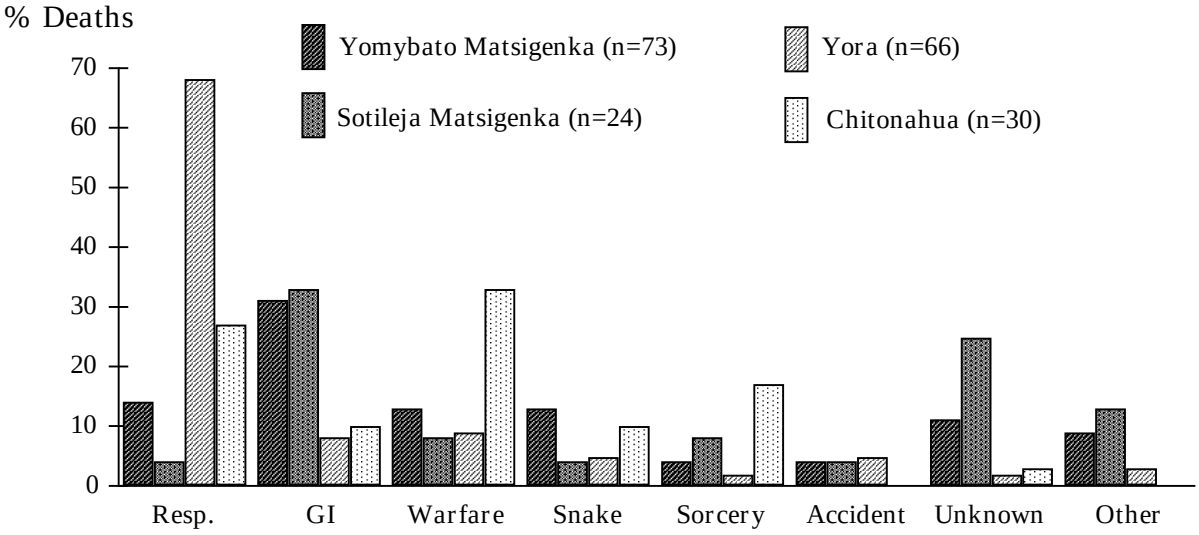
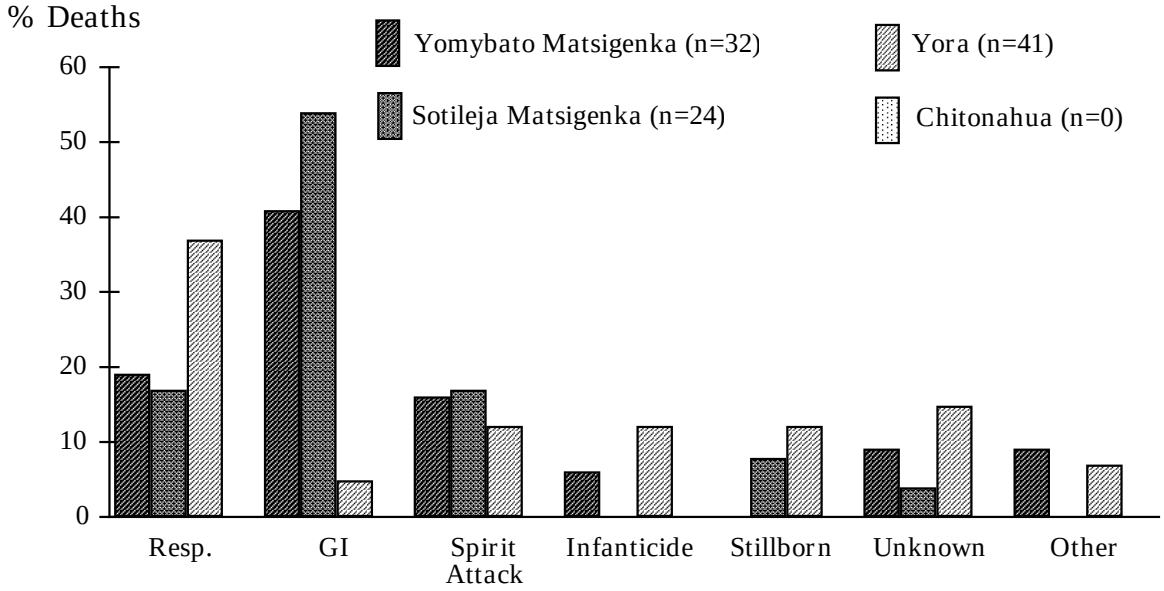


Figure 4.2: Attributed Causes of Infant Mortality (<5 yrs.)



Illness and Mortality

Genealogical interviews were conducted among four indigenous populations belonging to the two cultural-linguistic groups of this study. The Matsigenka cultural group is represented by two populations: Yomybato, the main study community, and Sotileja, a more isolated group that has entered into increasingly frequent contact with Yomybato village over the past decade. The Yora/Yaminahua cultural group is represented by two populations: the main study community of Serjali, and the small Chitonahua group, speakers of a Yora/Yaminahua dialect who were forcibly contacted by loggers in 1995. The census data are not complete, since some households were not interviewed or the results not yet tabulated. Furthermore, it was not possible to confirm the stated causes of mortality. Nonetheless, consistent patterns of perceived mortality appear to emerge when grouped according to general illness categories (Figures 4.1 and 4.2).

The timing, pace, and extent of contact with Westernized populations and epidemic diseases seem to be crucial factors shaping health status and mortality among the four populations. The Yora and Chitonahua, both of whom were contacted forcibly, have suffered from extremely high rates of mortality due to respiratory infections such as colds and flu, especially during their initial years of contact. The Yora suffered from exceptionally high rates of mortality during the first decade of contact. In a sample of the genealogical interviews, I calculated a mortality of 127 deaths among 220 individuals (42% overall mortality) during the period of 1982-1992, mostly due to respiratory illnesses; 68% of all deaths registered in the Yora genealogical interviews were reported as caused by respiratory illnesses. The Matsigenka of Yomybato have experienced repeated epidemics of colds and flu since the 1960's. Though colds and flu still cause many deaths, the rates are lower than of those among the Yora and Chitonahua. The Matsigenka of Sotileja have maintained sporadic trading relations with the people of

Yomybato for the past ten years or more. During this process, they have chosen the pace of contact, eager to acquire trade items such as axes and knives, while wary of the dangers of colds and flu. Visitation between the two groups has become more frequent in recent years, and respiratory illnesses will likely increase among the Sotileja population.

Together, gastrointestinal and respiratory illnesses account for a third to three quarters of all deaths reported by the four populations. Gastrointestinal conditions appear to cause a greater proportion of the mortality in both age categories among Matsigenka populations than among the Yora and Chitonahua. This may reflect the Matsigenka's somewhat more sedentary lifestyle and longer history of contact with outside groups, leading to contamination of the water and soil with intestinal parasites and other pathogens. Respiratory infections claim so many lives among the Yora and Chitonahua, however, that the lower proportion of deaths attributed to gastrointestinal conditions may be an artifact of the presentation method.

Warfare contributed to adult mortality in all four groups until recent times. Both Matsigenka populations were attacked repeatedly by the Yora over the past several decades, causing a total of nine deaths in Yomybato and two deaths in Sotileja, as well as numerous injuries. Six Yora men were killed in warfare during this time by Matsigenka villagers as well as mestizo loggers. Ten Chitonahua were killed in recent decades by Peruvian and Brazilian loggers, representing one third of all adult deaths. Snakebite and other accidents (falling from a tree, drowning) are a significant cause of mortality in all four populations, especially among men. Sorcery was also mentioned consistently as a cause of adult and child death, often invoked to explain unusual illnesses or sudden death, and blamed on outsiders. Spirit attack, namely, the revenge of game animals and other malignant spirits, was mentioned by all four groups as a factor in infant mortality. Because spirit attack shares symptoms in common with other illness categories (for example, gastrointestinal and skin conditions), it is difficult to make an absolute

distinction. A few cases of infanticide were reported among the Matsigenka and the Yora. Among the Matsigenka, severely deformed newborns may be killed because of the belief that they are demon's or sorcerer's progeny. During the apocalyptic epidemics of the mid-1980's, the practice of infanticide among the Yora appears appears to have increased as despairing women saw their families decimated and their livelihood destroyed.

Illness Categories in Matsigenka and Yora/Yaminahua

In the illness elicitation exercise, five Matsigenka speakers named a total of 105 illness terms and five Yora/Yaminahua speakers named a total of 85 illness terms. Many of the terms elicited describe signs or symptoms of illness including fever, inflammation, suppuration, gastrointestinal disturbances, and especially pain in different body parts. Pain and illness are closely associated in both languages, and many illness terms include the verbal root for 'pain' (M: katsi; Y: isi, pae). Simple pain in Yora/Yaminahua is isi, and to be ill is isiniki, literally 'in pain.' Pae refers to strong pain and strong illness. In both languages, the word for 'painful' (M: katsi, Y: pae) is also used to describe pungent, caustic, toxic and other strong and unpleasant chemosensory qualities.

Some illness terms describe multiple signs that occur together in complex illness syndromes. Some of these appear to correspond with Western illness categories such as leishmaniasis (M: tsirivaito; Y: rono), colds and flu (M: merentsi; Y: rao), yellow fever (M: pigarontsi, kepigari; Y: ãna pae), malaria (M: mogekari; Y: choachoaki) and measles/pox diseases (M: saarontsi; Y: rashkishiti pae, toshpo pae). Other Matsigenka and Yora/Yaminahua illness syndromes rely on culturally particular understandings of illness and etiology that are not easily translated into Western terms, for example, 'heart pain' (M: katsinegitagantsi; Y: õitisi), a complex of physical and emotional symptoms involving pain in the heart and epigastric area, and 'spirit revenge' (M: pugasetagantsi; Y: kopiti), a syndrome relating food allergies and other gastrointestinal and skin

conditions to the vengeance of plant and animal spirits. Informants from acculturated communities with a longer history of contact with Peruvian national society (two of the five informants for each language) appeared to recognize and name more illness categories than those from more recently contacted communities, clearly due to the proliferation of epidemic and endemic diseases associated with Western contact. The slightly greater number of illness terms elicited in the Matsigenka language may also be due to the more extensive recent history of Western and interethnic contact, at least in some parts of Matsigenka territory.

Illness Classification

Drawing on the results of the structured interviews concerning illness etiology and classification, I present here a discussion of approximately 60 of the most commonly mentioned and representative illness terms in the two languages. Because of the small number of informants participating in the structured interview exercises, there is no point in attempting to quantify the results. Though there were minor disagreements between informants as to precise etiologies and the placement of some illnesses within the classification scheme, on the whole the results of the structured interviews show a high degree of inter-informant agreement (even between speakers of the same language from distant, largely non-interacting communities), and appear to reflect the views expressed in informal discussions held with a larger number of informants. Furthermore, a comparison between the two ethnic groups reveals many fundamental similarities in nomenclature, classification and understanding of illnesses. Such similarities reflect a common epidemiological setting (past and present) as well as a shared cultural bedrock, apparently of rather ancient historical origin, since the groups in question have no history of friendly contact at least for the past century. The significant differences observed in the two societies' selection and administration of plant medicines appear to represent contrasting variations or elaboration on the same underlying themes.

Both Matsigenka and Yora/Yaminahua informants group illness categories together mostly according to the organ systems or body parts affected. The exception was in the case of illnesses attributed to sorcery, demon attack and plant/animal spirit revenge, where the respective etiologies take precedence over the observed symptoms. To say this in a different way, informants generally classify illnesses with similar signs and symptoms together, despite the fact that similar symptoms might result from different underlying causes. The separation of gastrointestinal conditions, respiratory conditions, body/arthritic pains and skin conditions (Tables 4.1, 4.3, 4.6 and 4.8) is hardly surprising, and similar to the system of illness classification documented by Brett (1994) among the Tzeltal Maya. Gynecological problems such as menstrual pain, excessive or irregular menstrual bleeding and various complications of childbirth were sometimes placed close to gastrointestinal conditions, but are generally considered a separate realm of illness and therapy (Table 4.2). Fevers are treated as a separate category (Table 4.5), though they can accompany most any form of illness. Ear, eye and dental conditions are generally distinguished from other illnesses, but are loosely associated with one another since they all affect the sensitive head and facial region (Table 4.7). Bites and stings of wild animals (snakes, stingrays, ants, jaguars, peccaries) are of major concern to both groups, and are grouped together (Table 4.9). A number of illness signs or complexes are not grouped consistently with any single category, since they accompany a variety of different illnesses and affect multiple organ systems (Table 4.12). For the most part, these conditions (for example, pallor, fatigue, muscle spasms, liver or spleen pain, cardiac arrest) are indicators of severe or prolonged cases of other illnesses.

'Heart pain' is a complex illness category shared by the two ethnic groups and treated apart from other kinds of illness. It has no simple translation into Western terms, but is among of the most frequently mentioned illness categories for both groups (Table 4.4). The categories of animal/plant spirit revenge, demon/ghost attack and sorcery are

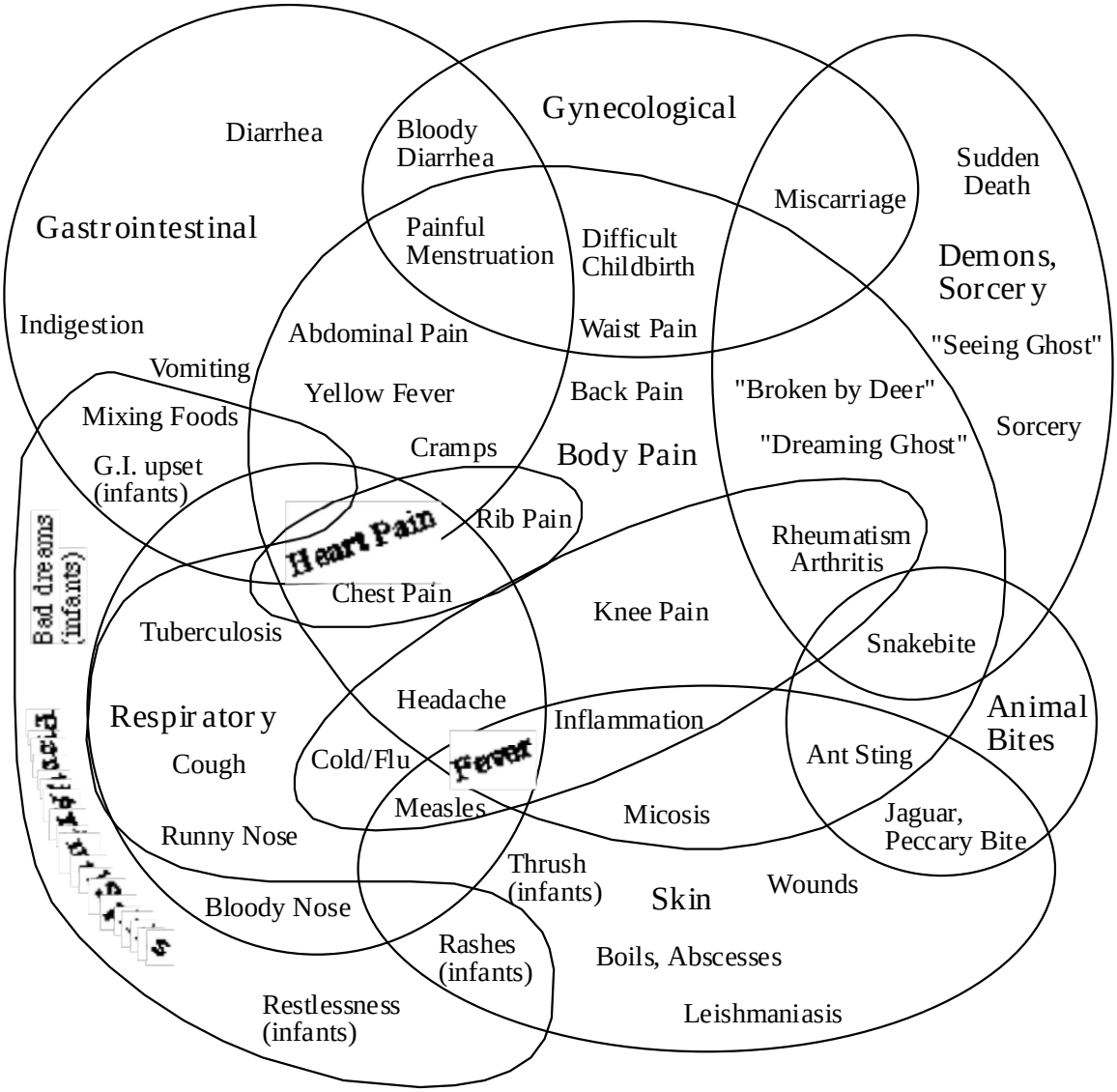
considered distinct from one another as well as from other illnesses by both the Matsigenka and the Yora/Yaminahua. Though all share symptoms with illnesses of specific organ systems, their etiology sets them aside. Together with 'heart pain,' these illnesses are often indicated for treatment by shamans, since their spiritual etiology must be addressed before symptoms can be alleviated. Though loosely associated with one another by indigenous informants, spirit revenge, demon/ghost attack and sorcery are nonetheless treated as separate categories due to the difference in severity and the different classes of malignant beings involved: animal and plant spirits, though feared, are relatively less harmful while demons and ghosts are the most dangerous and cause the most severe of all illnesses.

In the sections below, I discuss the principal illness groups recognized in both languages. Tables summarize names, attributed etiologies and perceived severity in the two cultural groups. N/A indicates an illness term or concept is not present in one of the two languages. Etiology models are presented in tables in summary form, as a more detailed discussion follows. Illness categories within each table are organized from most to least severe. Severity ranking is as follows: "Low," generally not life-threatening, often self-resolving, though potentially painful and unpleasant; "Medium," some cases are mild, others are potentially life-threatening, especially when protracted or combined with other illness symptoms (for example, vomiting together with diarrhea); "High," severe and life-threatening, though potentially treatable by plants, shamanistic healing or Western medicine; "Highest," often fatal, generally not treatable.

For purposes of discussion, illnesses groups are presented separately. In the classification exercises, however, it became clear that illness groups are not mutually exclusive, hierarchically organized taxonomic categories. Instead, illness groups represent "fuzzy sets" of salient health conditions that may belong simultaneously to several overlapping groups. Figure 4.3 is a rough schematic representation of

relationships among principal illness groups and selected health conditions (glossed in English) as perceived by the Matsigenka. Unaffiliated conditions as well as Yora/Yaminahua data have been omitted to avoid unduly complicating the diagram. Throughout the discussion, I will point out similarities and differences between Matsigenka and Yora/Yaminahua illness categories.

Figure 4.3: Matsigenka Illness Groups



Gastrointestinal Conditions

Table 4.1 - Names and Attributed Etiologies for Principal Gastrointestinal Conditions

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Etiology	Name	Etiology	Severity
Yellow fever?, hepatitis?:	pigarontsi, kepigari ("intoxication")	falls from sky yellow sky sorcery	ãna pae ("strong vomiting)	foreigners	Highest
Diarrhea w/ blood	shiarontsi	(as tseritsi) foreigners	imi chixo	(as chixo) animal spirits	High
Diarrhea	tseritsi	falls from sky worms mixing foods dirty, spoiled food	chixo	plants (latex) wasp spirit strong odors	Medium
Vomiting	kamarankagantsi	(as tseritsi)	ãnapaketi	(as chixo) dirty, spoiled food	Medium
Indigestion	sametsi	(as tseritsi)	iso chiko, nowe	strong odors (urine stench, scorched fur)	Low
Stomachache, abdominal pain	katsimotiatagantsi	(as tseritsi)	xakisi	(as chixo)	Low

The most basic gastrointestinal conditions are diarrhea (M: tseritsi; Y: chixo) and vomiting (M: kamarankagantsi; Y: ãnati). These conditions are often announced or accompanied by pain in the abdomen (M: katsimotiatagantsi; Y: xakisi), a general feeling of nausea (M: pochaatagantsi), loss of appetite, bloating of the stomach, gurgling sounds in the abdomen and foul-smelling flatulence or burping. Gastrointestinal conditions are among the most commonly encountered illnesses in Matsigenka and Yora/Yaminahua communities, and account for a great portion of both infant and adult mortality both prior to and after prolonged Western contact. Simple diarrhea or acute vomiting are common and not considered severe. Prolonged cases, however, are considered severe, and vomiting and diarrhea together are known as a particularly lethal combination. Bloody diarrhea (M: shiarontsi; Y: imi chixo) is recognized as a distinct entity, characterized by

painful and difficult defecation and the presence of rotten-smelling blood in the stool. An accurate description of amebic dysentery, this condition is considered more dangerous than simple diarrhea.

Both groups describe similar symptoms indicative of advanced or serious gastrointestinal illness (see Table 4.12). 'Heart pain' (M: katsinegitagantsi; Y: õitisi) in association with gastrointestinal conditions is indicative of a more serious illness, often due to spirit attack or sorcery. The Matsigenka describe fatigue (M: shigopirentsi), pallor (M: kitetagantsi, literally 'yellow coloration') and weight loss (M: matsatagantsi) as resulting from prolonged gastrointestinal illness. Severe muscle cramps (M: tsoritsi; Y: misko; see Table 4.12), a physiological result of extreme dehydration and electrolyte imbalance, are considered by both groups to be a dangerous sign when accompanying gastrointestinal illness, often followed shortly by death. Prolonged inability to defecate (M: tapigagantsi; Y: poitiroma) is considered fatal, probably the result of intestinal blockage or malfunction. Ingesting the seeds of the edible Inga fruit apparently inhibits intestinal function, and I have heard of several cases of Matsigenka children dying of intestinal blockage after eating a large number of the seeds.

Both the Matsigenka and the Yora/Yaminahua recognize that various kinds of gastrointestinal upset can be caused by eating spoiled or unclean food. Intestinal worms (M: tsomiri, tseikintsi; Y: nõwi) are also blamed for gastrointestinal conditions and, in severe cases, intestinal blockage. Yora/Yaminahua speakers mentioned that fruit flies (natsa) and dung flies (naxoa) contaminate food, causing it to ferment in the stomach, thus leading to nausea or vomiting. The Matsigenka, too, describe how spoiled or dirty food ferments in the stomach like strong manioc beer, provoking indigestion, bloating and foul-smelling burps. This syndrome, known as sametsi, can provoke vomiting or diarrhea in extreme cases. The Yora/Yaminahua attribute indigestion to foul smells. The illness iso chiko, literally 'urine stench,' is caused by passing near rancid urine or feces

and inhaling the odor. The illness *nowe*, 'toasted, burnt odor,' is caused by smelling scorched animal fur. In either case, the unpleasant odor enters the nose, mouth and throat, descends to the stomach, and there induces bloating, stomachache, nausea, an acidic taste in the mouth and unpleasant-smelling burps and flatulence. For the most part, such conditions are considered by both groups to be transitory and self-limiting.

The Matsigenka recognize a specific kind of self-limiting gastrointestinal upset caused by 'mixing foods' (*tamampegagantsi*). Certain foods, especially meats, are considered incompatible. Eating forest meats (peccaries, monkeys, tapir) together with fish, for example, is believed to cause transitory indigestion, diarrhea or vomiting. Also, novel foods such as rice, canned tuna, crackers and sweets are thought to cause such reactions in people 'not accustomed' (*terira irampetempa*) to eating them. These reactions to unwholesome mixtures or unaccustomed foods are closely associated with the idea of 'revenge' (*pugasetagantsi*) by plant and animal spirits (Table 4.10). Though not generally severe, 'mixing foods' can be dangerous to people suffering or recovering from some other illness, causing relapse or increased severity of symptoms.

The Matsigenka attribute most acute, nonepidemic gastrointestinal conditions to the presence of 'worms' (M: *tsomiri*) in the stomach and intestines. Though aware of a variety of intestinal parasites, also known as *tsomiri*, the Matsigenka are not necessarily referring to these when they invoke 'worms' to explain the etiology of gastrointestinal conditions. The concept of *tsomiri* is broader, and resembles the Western concept of germs or microbes. The Tzeltal Mayan concept *chan*, 'worm/snake,' is similar; see Brett (1994). *Tsomiri* are often described as being maggotlike, threadlike or invisible. *Tsomiri*, like maggots, are found in ripe fruits, spoiled food and garbage. They enter the body upon ingestion or attach themselves to the skin through direct contact. *Tsomiri* are invoked to explain gastrointestinal illnesses, toothache, fungal skin infections, earache, sexually transmitted diseases and other conditions associated with gnawing pain, itching,

festering or ulceration with no visible cause. The affected body part is visualized as seething with tiny worms, like spoiled food full of maggots. Curing such diseases requires administering or ingesting plants with unpleasant taste qualities, thereby 'hurting' (okatsitakeri), killing and expelling the worms.

The Yora/Yaminahua generally blame persistent gastrointestinal illnesses on the malevolent spirits of plants. Certain latex-containing plants, for example, a wild papaya relative (Caricaceae) and members of the Asclepiadaceae and Apocynaceae (milkweed and dog bane families), are believed to be inhabited by malevolent spirits, yõshi, that attack people walking in the forest. Like the watery latex of their host plants, the yõshi cause watery diarrhea in their human victims. Bloody diarrhea is likewise attributed to the yõshi of plants with red coloration or latex, or whose leaves release a reddish or dark-colored liquid when boiled in water. The same plants, used as warm compresses, cure the diseases they cause, revealing the homeopathic theory basic to Yora/Yaminahua medicine, as discussed in greater detail elsewhere. The vengeful spirits of some wasps (wina) are also blamed for gastrointestinal conditions.

When gastrointestinal and other illnesses occur in epidemic or seasonal patterns, the Matsigenka attribute their etiology to a foul odor or vapor that 'falls from the sky' (oparienkatake), thus affecting many people in the same locality. This concept is discussed in greater detail in the section "Default Etiologies." One of the most serious gastrointestinal conditions recognized by the Matsigenka is known as pigarontsi or kepigari, literally 'intoxication.' It is characterized by severe vomiting (sometimes with blood), high fever, headache, body pains, dizziness and fainting, and is said to have occurred in repeated, periodic outbreaks prior to direct European contact. The Yora/Yaminahua recognize a similar illness, ãna pae, 'strong vomiting,' though they attribute it to foreigners. These native illness categories almost certainly include yellow fever, endemic throughout South America for several centuries and transmitted by

mosquitoes to both human and monkey hosts. The symptoms are also appropriate for hepatitis. The Matsigenka claim this illness is brought by the meteorological phenomenon of 'yellow vapor in the sky' (okiterienkatake) at dawn or dusk, typically seen during the early rainy season. Rain causes the yellow vapor to 'fall from the sky' and contaminate people. The relationship with rainfall is consistent with the mosquito-borne etiology of yellow fever, while the 'yellow skies' may relate metaphorically to the characteristic jaundice induced by yellow fever and hepatitis.

Though gastrointestinal illnesses were common in traditional times, both the Matsigenka and the Yora/Yaminahua recognize that contact with Europeans and acculturated indigenous groups has resulted in new and more severe kinds of gastrointestinal illness. Diarrhea with blood (probably amoebic dysentery), for example, was not known prior to prolonged contact. Severe gastrointestinal diseases characterized by vomiting and diarrhea have also become more common, and intestinal parasites have emerged as a serious problem as populations become more sedentary and water sources become polluted.

Gynecological Conditions

Though menstruation is considered to be a normal part of the female reproductive cycle, the Matsigenka and the Yora/Yaminahua (or at least, the men in those societies) treat menstruation, especially strong or painful menstruation, as an illness. Painful menstruation is considered by both groups to be somewhat affiliated with gastrointestinal disorders, especially bloody diarrhea. In both languages, the word for menstruation (M: voaatagantsi iraatsi; Y: imichapaiki) can be used as a synonym for bloody stool or any other blood flow from the rectum (either sex) or vagina. Some of the same botanical remedies considered effective for painful menstruation or post-partum bleeding are also used to treat bloody diarrhea.

Table 4.2 - Names and Attributed Etiologies for Gynecological Conditions

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Etiology	Name	Etiology	Severity
Retained placenta	terira okontetake iranonta	taboo activities (arrow resin)	N/A		Highest
Difficult childbirth, post-partum bleeding	okatsitake oananekite, voaasetagantsi	no reason taboo activities (bamboo)	imi pae, imichapaiki	plants (red) wasp spirit	High
Miscarriage (fetus)	omechotaira ogairi	sorcery	maxko wake, iso wake ("frog, monkey child")	animal spirit sorcery	High
Miscarriage, induced abortion (early pregnancy)	oseriakotake oananekite	animal spirit induced	imi pae	animal spirit	High
Menstruation (painful, excessive bleeding)	voaasetagantsi katsiri, voaasetagantsi kogapage	no reason sorcery animal spirits	imi pae, imichapaiki	plants (red) wasp spirit	Medium
Menstruation (normal)	voaasetagantsi, seriagantsi	moon	awiwo imitiro	moon	Low

In both groups, remedies for blood-related conditions have red leaves or blood-colored sap or juice. As is common among native Amazonian societies (Siskind 1973b; Gregor 1985), and indeed throughout much of the world, men of both groups consider menstrual blood to be contaminating and dangerous. Menstrual blood is said to have an unpleasant odor like that of raw or slightly rotten meat (M: anigarienka; Y: wiya; see Chapter 5). Matsigenka men believe that any contact with menstrual blood takes away their hunting skill, as the carrion-like odor contaminates their soul with the spirit of the vulture, the poorest hunter of the forest. The Yora/Yaminahua believe that menstrual blood attracts yõshi, harmful spirits of the forest. Both groups associate menstrual with lunar cycles, and describe menstruation as the 'revenge' (M: pugasetagantsi; Y: kopiti) of the moon on women. A Matsigenka folk tale describes how the moon, Kashiri, once

walked the earth in human (male) form, bringing agriculture, sexual reproduction, menstruation, childbirth and death to humanity (see Shepard in press-a).

Women of both groups distinguish between a mild, normal menstruation and a more painful version, characterized by severe abdominal pain, body aches and more bleeding. Both groups also distinguish between normal childbirth and more painful, difficult childbirth. Fatal complications during childbirth were rarely mentioned in genealogical interviews. An apparent low birth weight of babies contributes to the relatively quick and uncomplicated births I have witnessed among the Matsigenka. Some of the possible complications mentioned by Matsigenka informants include failure of the fetus to emerge (*terira ikontetira*, 'he doesn't want to come out'), retained placenta (*terira okontetira iranonta*) and postpartum bleeding. If unresolved, all can be fatal. A Matsigenka husband must observe strict behavioral norms during his wife's pregnancy to avoid such threats. Most importantly, he should avoid handling noxious and urticating plants (especially tobacco and bamboo), and is prohibited from hunting or even 'bothering' (*yoveraakeri*) spiritually powerful animals, lest they take revenge on his wife and unborn child.

Matsigenka informants also described several forms of spontaneous and induced abortions that can be life-threatening. In the early months of pregnancy, abortions may be self-induced by inserting a long stick in the womb, or may result from accidents like falling down. A man who kills or molests an eagle or hawk may provoke the animal's revenge, terminating his wife's pregnancy in a sudden flow of thick blood. A miscarriage produces what is considered a non-human fetus. Depending on its stage of development, the fetus is likened to a bird egg, frog, river dolphin, peccary or monkey. Such cases are blamed on sorcery practiced by an envious man or former lover whose affections for the woman were spurned. Yora/Yaminahua informants blame miscarriages on the influence of malevolent *yõshi* spirits.

There are no specialized midwives in either Matsigenka or Yora/Yaminahua society, and generally a woman's mother or other older female relative attends during birth. Herbal preparations are given before and after childbirth, and special dietary precautions are practiced by both parents throughout pregnancy and during the early months of the child's life. The most important plants used by the Matsigenka in attending childbirth are the cultigen Brugmansia (jayapa in the Manu River dialect, saaro in the Urubamba) and special cultivated varieties of Cyperus (ivenkiki). Brugmansia is a natural source of tropane alkaloids such as atropine and scopolamine. Small oral doses of the plant are given during difficult births, recalling the use of scopolamine in American hospitals to induce "twilight sleep" during childbirth. Ergot alkaloids, likely present in Matsigenka Cyperus cultigens (see Plowman, et al. 1990), are known in Western medicine to constrict blood vessels and alter uterine contractions. Such activity is consistent with the Matsigenka use of the plant to ease childbirth and reduce postpartum hemorrhages.

Women of both societies know a number of wild plants they claim can cause permanent or reversible sterility. Other plants are used to recover fertility. Men, too, know of plants used to treat impotence or increase sperm production. Both groups practiced selective infanticide in pre-missionary times, especially in the case of deformed infants or twins, believed to be the product of sorcery and demonic attack. During the apocalyptic initial years of contact, infanticide among the Yora group appears to have been exceptionally common. With entire families dying before their eyes, young mothers were too full of sorrow to bring new lives into a hostile world.

Respiratory Conditions

Both the Matsigenka and the Yora/Yaminahua experienced respiratory conditions of varying severity prior to the most recent European contact. Sneezing, runny nose, sore or scratchy throat and cough were all familiar conditions. A condition known literally as

‘abscess/boil in the throat’ (M: sompotsanotagantsi; Y: testomera iroma), characterized by inflamed lymph glands and pus, likely refers to tonsillitis. The Matsigenka attribute these conditions either to the mixing of incompatible meats or foods (tamampegagantsi) or to illness-causing vapors that ‘fall from the sky’ (oparienkatake) during the rainy season. Spontaneous nosebleed is likewise attributed by the Matsigenka to mixing incompatible foods, for example, tinamou meat and chili peppers, or to eating novel foods such as found in Peruvian mestizo cuisine. Throat pain and abscesses may also be caused by wounding the esophagus or choking on bones or other food.

Table 4.3 - Names and Attributed Etiologies for Principal Respiratory Conditions

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Etiology	Name	Etiology	Severity
Bloody cough, tuberculosis	voreagantsi iraatsi	foreigners	imia oko	foreigners	Highest
Cold, flu	merentsi	foreigners	rao	foreigners	Highest
Throat abscess (tonsillitis)	sompotsano-tagantsi	falls from sky mixing foods accident	testomera iroma	wasp spirit	High
Cough	voreagantsi	falls from sky mixing foods foreigners	oko	millipede plants (pilose) foreigners	High
Sore throat	katsitsanotagantsi	falls from sky mixing foods accident	testoki, xako xea	wasp spirit millipede plants (pilose) animal spirits	Medium/ High
Nasal congestion, runny nose	shirinkasetagantsi	no reason	recho pae	no reason foreigners	Low
Nosebleed	voaatagantsi iraatsi girimashiku	mixing foods	rechoinimiki	animal spirits	Low

As is the case for most illnesses, the Yora/Yaminahua attribute some respiratory conditions to the malicious spirits (yõshi) of plants and animals. Wasp spirits (wina) are

sometimes invoked to explain the etiology of throat inflammation and swollen lymph glands. Most respiratory conditions are associated directly or indirectly with a millipede known as xako. Xako is a hard-bodied, short-legged millipede probably of the Order Spirobolida or Spirostreptida. It is said to leave behind an irritating (xoa pae, waka pae) substance on surfaces it touches, consistent with observations among Spirobolid millipedes of caustic secretions known to "raise large blisters on human skin" (W. Shear, personal communication). Eating food or drinking water contaminated by xako's secretions causes itching in the throat, coughing and the production of bloody phlegm, a condition is known as xako xea, 'millipede swallowed.' These symptoms may represent an endemic form of cold or flu virus, perhaps acquired during contact with rubber tappers at the turn of the nineteenth century. The same symptoms are said to be produced by the malevolent spirits of certain vines and herbs characterized by pilose, bristly and/or rubbery stems, mostly Acanthaceae, Apocynaceae, Asclepiadaceae and Gesneriaceae. Known collectively as 'millipede medicine/illness' (xako rao), the flexible, hairy stems are reminiscent of the millipede's body and indicate that these plants 'belong to xako' (xakona). Because they cause sore throat and cough, they can also be used as warm compresses to cure the same symptoms. Though not as severe as the cold and flu epidemics of recent times, and generally not associated with fever, 'swallowing a millipede' (xako xea) was considered serious, and could be fatal if left untreated.

Respiratory conditions acquired since the most recent European contact have proven far more virulent, and account for many deaths in both groups, especially in the initial years of contact but even today. The Matsigenka have a unique word for colds and flu, merentsi, while the Yora/Yaminahua refer to them as rao ('illness, poison, medicine'). Both groups recognize two degrees of severity in colds, a milder and a 'strong' (M: shintsiri; Y: pae) variety. One Matsigenka informant described the milder strains of colds as having a more local origin such as 'falling from the sky' or coming

‘from garbage’ (kajaraseku), while the ‘strong’ (shintsiri) varieties are said to come ‘from downstream’ (kamatitya), or ‘from the land of the gringos’ (itimira virakocha). The latter probably represent new viral strains that arrive with visitors from the outside, or when members of the community visit major population centers and return home. Lacking immunity to the new strains, indigenous people quickly succumb to secondary bacterial pneumonia, a leading cause of mortality. With repeated viral respiratory infections, a significant portion of the population remains in a state of chronic pneumonia. Signs recognized as indicating severe respiratory illnesses include chest pain, fatigue and difficulty breathing (Table 4.12). ‘Coughing with blood’ (M: voreagantsi iraatsi; Y: imi oko) or ‘painful cough’ (Y: oko pae) are symptoms possibly associated with tuberculosis. This illness, too, was unknown prior to European contact. Brought by foreigners from ‘downstream’ (M: kamatitya; Y: maikiri), it is considered even more life-threatening than colds and flu.

Heart and Chest Conditions

Table 4.4 - Names and Attributed Etiologies for Heart/Chest Conditions

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Etiology	Name	Etiology	Severity
Chest pain	kentarontsi, kitsogirontsi	animal spirits demons, ghosts	xochisi	demons	Highest
Heart pain, epigastric pain	katsinegitagantsi	bee spirit demons, ghosts sadness falls from sky mixing foods	õitisi	wasp spirit plants (spiny) sadness	High
Heart palpitations	tsaronegintagantsi	fright love filtres demons, ghosts	N/A		High

‘Heart pain’ (M: katsinegitagantsi; Y: õitisi) is a complex concept, combining under a single category symptoms that in Western nosology might be divided among

respiratory, cardiac and gastrointestinal as well as emotional or psychological conditions: angina pains, pain in the chest or ribs, difficulty breathing, heart palpitations, "heartburn," epigastric pain, "heartache," sorrow and anxiety. Though it accompanies many serious illnesses, 'heart pain' is treated by both ethnic groups as distinct from other illness categories.

For the Matsigenka, 'heart pain' (katsinegitagantsi) is an illness owned by the spirit of the bumble bee, yairi. When the bumble bee spirit takes 'revenge' (pugasetagantsi) on a person, he or she feels a needlelike pain in the heart or chest. The actual heart muscle in Matsigenka is iraanigatsi, 'center of the blood.' Negitsi, glossed loosely as 'heart/chest,' represents a combination of the English concepts of heart, chest and epigastric area. It is usually indicated by tapping the sternum. Negitsi is the central location of the body's functioning and harbors the life force or 'soul' (suretsi) of every person and animal. Death is caused when an illness 'grips the heart' (avitantake negiku) and causes the soul to depart. Though 'owned by the bumble bee' (irashi yairi), 'heart pain' is also associated with emotional disturbances like anger, grief and unrequited passion. 'Heart pain' frequently follows dreams about the ghosts of recently dead family members. People with gastrointestinal and respiratory conditions, as well as those who are sad, anxious, or frustrated in love, experience a nagging pain in the heart that does not allow them to eat, breathe, or sleep in peace. The illness can also 'fall from the sky' as a vapor or emerge in people who mix incompatible foods (tamampegagantsi).

Associated with 'heart pain' is kentarontsi or kitsogirontsi, literally 'piercing pain' or 'stabbing pain,' which traverses the chest from side to side or front to back like an arrow through the heart. Attributed to sorcery or attack by the spirit of the bird aroni (probably a cowbird), it is a potentially fatal condition, and may refer to angina pain. Tsaronegitagantsi, literally 'fear in the heart' refers to heart palpitations, believed to be caused by fear (e.g., seeing a ghost), sadness, anxiety, gossip, sorcery or love filtres. The

Matsigenka blame foreign ethnic groups such as the Piro and Shipibo for having introduced sorcery and the herbal technology of love filtres to their communities, giving rise to socially disruptive feuds and passions.

The Yora/Yaminahua consider 'heart pain' (õitisi) to be an illness 'owned by wasps' (winana). Furthermore, a number of spiny plants from diverse botanical families (Flacourtaceae, Phytolaccaceae, Rubiaceae and others) are believed to harbor malevolent spirits (yõshi) that stick the heart with their spines, causing pain in the heart, chest and epigastric region. Known collectively as õitisi rao, 'heart pain medicine/illness,' the same plants also cure such pain when applied as warm compresses. As among the Matsigenka, 'heart pain' can occur when people become sad and 'remember' (shinatiro) family members who are absent or who have died. 'Chest pain,' xochisi, is a more severe condition, much like the Matsigenka concept of 'piercing pain' (kentarontsi): a sensation through the chest like being struck by an arrow or knocked out of breath by a sharp blow. The Yora/Yaminahua say 'chest pain' is caused when a malevolent spirit (yõshi) strikes one in the chest with a war club. It is often a fatal condition, and may represent heart attack or other cardiac conditions.

Fevers

Table 4.5 - Names and Attributed Etiologies for Fevers

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Etiology	Name	Etiology	Severity
Shivering, chills (malaria)	mogekari, shigekari	(as kovaagantsi) foreigners	choachoa pae	plants foreigners	Highest
Fever w/ chills	anatiri, janatiri	(as kovaagantsi) cold weather	saki	wasp spirit plants (aromatic)	High
Fever	kovaagantsi	falls from sky demons, ghosts	yonati	wasp spirit no reason foreigners	Medium

Fevers are treated as a separate category by both the Matsigenka and Yora/Yaminahua though they can accompany almost any form of illness. Fevers are most frequently mentioned in association with headaches, body/arthritic pains and skin conditions, especially swelling and inflammation. Both groups recognize three kinds of fever: simple fever, fever with chills, and malarialike conditions causing violent shivering. In Matsigenka *kovaagantsi* means literally 'boiling,' and is often described as being like a fire within the body causing the skin to turn red and to sweat. The same term can also be used to describe the warm temperature of skin near an infection or inflammation or after prolonged exposure to the sun. Simple fevers often occur alone or in association with skin conditions, in which case they are not considered particularly dangerous. Fever epidemics (probably arboviruses) are believed by the Matsigenka to 'fall from the sky' as vapors. More dangerous fevers are associated with dreaming about ghosts. Seeing a ghost in daylight or being attacked by a demon can cause an intense, high fever that leads quickly to death. The Yora/Yaminahua term *yonati* is similar, referring to high temperatures, sweating and a feeling like fire in the body. It is often associated with inflammation and swelling of the skin. The Yora/Yaminahua attribute such fevers to the attack of wasp spirits or simply for "no reason." Stronger fevers were brought from downstream by the whites.

'Fever with chills' (M: *anatiri*, *janatiri*; Y: *saki*) is considered a more serious condition, often accompanying severe gastrointestinal or respiratory illnesses. Like simple fevers, fevers with chills for the Matsigenka can be caused by dreaming about a ghost or worse yet, seeing a ghost during the day. Cold spells with fog (in Spanish, *friaje*) lasting several days occur during the dry and early rainy season. The Matsigenka name this kind of weather *anatirienka*, 'fever/chills vapor' because it is believed to bring illness. The Yora/Yaminahua attribute fever with chills to wasps and to the spirits of

plants such as Annonaceae and Araliaceae having aromatic, eucalyptus odors. Both groups recognize strong fevers and chills as being a characteristic of the virulent respiratory conditions introduced since European contact.

Both groups describe a more severe condition (M: mogekari, shigekari; Y: choachoa; saki pae) characterized by cyclical fevers with strong chills and shivering that certainly sounds like malaria, though it could refer to other illnesses such as typhoid fever that produce malarialike fever symptoms. In both languages, the illness terms are derived from onomatopoetic expressions, suggesting shivering and chattering of the teeth (M: moge! moge!; shige! shige!; shite-te-te-te!: Y: choa-choa-choa-choa!; saki-ki-ki-ki!). The Yora group describe an illness that was known prior to direct European contact, characterized as "fever and chills in the afternoon, feel fine by morning, fever and chills again the next afternoon." It was also associated with a brownish color of the eyes and pain in the liver. Conklin (1989: 92) describes a similar illness recognized by precontact Wari´ in Brazil. The descriptions are consistent with endemic malaria, probably brought to remote areas during the rubber boom or earlier. Ironically, one Yora informant attributed the malarialike illness to the malevolent spirit of an herb whose leaf "looks like the leaf of the rubber tree" (wi pei õitsa). Others attributed it to wasp spirits or other plant spirits. Both the Matsigenka and the Yora/Yaminahua recognize that the new malaria and other epidemic fevers brought by foreigners in recent years are even more dangerous.

Body Pains

The principal distinction made by both groups is between pains resulting from trauma, such as falling down or carrying heavy loads, and those from less apparent causes. In both societies, men sometimes suffer serious injuries or fatalities falling from trees while climbing to reach hung arrows, dead game animals or edible fruits. In such cases, the Matsigenka administer a large oral dose of jayapa (Brugmansia) as a last resort

(Shepard 1998b). The hallucinogenic trance takes the victim to the realm of the benevolent spirits, the Sangariite. If they cannot save the patient, no one can. The Matsigenka also use Brugmansia as a plaster or in small ingested doses before setting broken bones (karaari). Atropine, present in the plant, is a known muscle relaxant administered in American hospitals to calm reflexive muscle contractions in order to set bones. Knee pain (M: katsigeretotagantsi; Y: ratoko isi) and back pain (M: katsitishitagantsi; Y: kate isi) are commonly mentioned by both groups as examples of body pains owing to injury, fatigue, carrying heavy loads, repeated use ("walking so much") or old age.

Table 4.6 - Names and Attributed Etiologies for Body Pains

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Etiology	Name	Etiology	Severity
Bone pain, rheumatism	shinkogiitagantsi	demons, ghosts sorcery	xao isi, kishi xaomera	wasp spirit plants (aromatic)	High
Body pain (back, knee)	katsipagetagantsi (katsitishitagantsi, katsigeretotagantsi)	trauma old age demons, ghosts	yora isi pae (kate isi, ratoko isi)	trauma old age wasp spirit plants (aromatic)	Medium
Headache, migraine	katsigitotagantsi	falls from sky demons, ghosts w/ fever	mapoisi, woxkaiki	wasp spirit plants (aromatic, spiny, red) w/ fever	Medium
Rib pain	katsimeretagantsi	trauma bee spirit	tawiwa	trauma wasp spirit	Medium
Waist, kidney pain	katsitsakitagantsi, tsatsakirontsi	trauma demons, ghosts falls from sky w/ urinary pain	chirishpisi	trauma w/ urinary pain	Medium

'Body pains' (M: katsipagetagantsi; Y: yora isi pae) or aches that do not result from trauma often occur together with fevers and inflammation of the joints. Headache

(M: katsigitotagantsi; Y: mapoisi) is frequently mentioned as a precursor to or a result of fevers. Both groups recognize a milder form of headache and a more painful form with migraine-like symptoms (Y: woxkaisi, literally 'skull pain') that may last for several days: pounding or splitting sensation deep in the skull, half-head or whole head involvement, numbness in the face, sensitivity to noise and light, piercing pain and redness in one or both eyes. The Yora/Yaminahua name this kind of eye pain wero pae, 'strong pain in the eye,' considered distinct from simple 'eye pain' (wero isi) and conjunctivitis (Table 4.7).

The Yora/Yaminahua attribute headaches, arthritic pains and other body pains not associated with injury to the yõshi of wasps, male game animals and/or plant species. Some plants believed to cause (and cure) headaches and body pains have red coloration, release a dark liquid when boiled or have spines or prickles, all signs that the plants 'belong to wasps' (winana). Other plants that cause/cure pain, like those for fever, have rank or menthol-like odors (Annonaceae, Myrtaceae), likened to the strong musk odors of male game animals such as the male capuchin monkey (shino wene), believed to take revenge on hunters. The Matsigenka frequently attribute unexpected headaches and body pains to 'bad dreams' (kisanitagantsi), that is, dreams about recently dead family members (see Table 4.11 and discussion). Headaches with simple fevers are said to 'fall from the sky.'

Both the Matsigenka and the Yora/Yaminahua describe a condition translatable as 'rib pain' (M: katsimeretagantsi; Y: tawiwa) which comes as a sudden, sharp pain or cramp in the ribs or side. Sometimes it happens while carrying heavy loads, while in some cases it is said to occur for no apparent reason. In the latter case, both groups consider the pain to be similar to 'heart pain,' only superficial and not as dangerous. Like 'heart pain,' such rib pain is blamed on the spirit of the bumble bee (M: yairi) or wasp (Y: wina). Both groups recognize a condition consistent with rheumatism, characterized by 'bone pain' (Y: xao isi), fever and swollen joints. The Yora/Yaminahua attribute

‘bone pain’ to the malignant spirits of wasps and some aromatic plants. The Matsigenka describe the condition as producing a tingling sensation or numbness in the extremities (ampatagantsi), and a burning pain as if the leg bones were being roasted over a fire (M: shinkogiitagantsi). For the Matsigenka, this kind of pain is caused by ghosts, demons or sorcery practiced on the victim’s footprint (see Table 4.11). Both the Matsigenka and the Yora/Yaminahua describe a pain in the waist/kidney area (M: katsitsakitagantsi; Y: chirishpisi). Sometimes, pain in this region is due to accidental trauma, such as falling down or carrying heavy loads. In other instances, it may be associated with ‘painful urination’ (M: katsitsinetagantsi; Y: iso isi), indicating urinary tract or kidney infection (see Table 4.12).

Ear/Eye/Dental Conditions

Table 4.7 - Names and Attributed Etiologies for Ear, Eye and Dental Conditions

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Etiology	Name	Etiology	Severity
Earache (w/ pus, abscess)	sakempitagantsi, sompokempita-gantsi	hygiene worms foreigners	pacho pae, pacho iroma	hygiene foreigners	Medium/ High
Earache (simple)	katsikempitagantsi	hygiene worms falls from sky	pacho isi	hygiene	Medium
Toothache	okatsitake itsi (jitsi)	worms food	xeta isi	worms food plants (spiny)	Medium
Eye pain, infection	katsiaari	hygiene accident falls from sky foreigners	wero isi	hygiene accident plants (red) foreigners	Medium
Eye opacity (cataracts? trachoma?)	tsororoaari	old age animal spirit accident	weroki namia, wepono	old age	Medium
Eye pain w/ headache	N/A		wero pae	wasp spirit plants (red)	Medium

Ear, eye and dental conditions were not clearly affiliated with any single illness category, though some informants grouped them together loosely since they all affect the

head region. Others included one or more of these illnesses under the category of 'body pains' (M: katsipagetagantsi; Y: yora isi pae).

Both groups recognize two classes of earache: simple 'ear pain' (M: katsikempitagantsi; Y: pacho isi), characterized by itching and inflammation in the external part of the ear; and more severe , 'strong ear pain' (Y: pacho pae) affecting the inner ear, resulting in pus formation or an 'ear abscess' (M: sompokempitagantsi; Y: pacho iroma). Though not considered life-threatening except in unusually severe cases, internal ear infections are considered extremely painful and present the risk of partial or complete deafness. Both groups recognize that earaches can be caused by wax buildup, foreign substances (insects, tree bark) entering the ear or by scratching the ear with an unclean finger or bird feather. The Matsigenka describe how dirt and foreign objects cause invisible 'worms' to enter the ear, causing the itching, gnawing or throbbing pain of external and internal earache. The Matsigenka place a single larva of a small palm weevil (pijiro) into the ear for a few minutes to clean out accumulated earwax and thus avoid earaches. Both the Matsigenka and the Yora/Yaminahua have experienced a new kind of inner ear/sinus infection associated with colds and flu since European contact.

Many hunting medicines used by the Matsigenka are administered as drops to the eyes in the belief that they 'sting the eyes' (oteaatake) and thus improve vision. Both groups recognize two principal kinds of eye conditions, conjunctivitis or 'eye pain' (M: katsiaari; Y: wero isi) and cataracts or other whitish opacity of the eye surface (M: tsororoaari; Y: wepono, 'eye latex,' weroki namiai, 'eye flesh'). Prior to European contact, both groups experienced nonepidemic conjunctivitis caused by "getting dirt in the eye" or injuries to the eye by tree branches or a bow or bowstring that snapped while being drawn. Though not life-threatening, eye infections or severe injuries are considered painful and can result in blindness. Since European contact, both groups have experienced epidemics of infectious conjunctivitis (pinkeye), which the Matsigenka claim

now ‘fall from the sky’ at regular intervals. Both groups recognize cataract formation and progressive blindness as conditions associated with old age. Furthermore, opacity of the eye’s surface is said to result from prolonged eye infections, perhaps including trachoma. River blindness, caused by filarial parasites that are transmitted by small biting flies, has been documented among the Yanomami of the Brazil-Venezuela border area (Py-Daniel 1997), and was probably brought to southern Venezuela during the rubber boom by migrants of African descent. Though river blindness has not been documented for Amazonian Peru, symptoms of cloudy opacity in the eyes and progressive vision loss described by both the Matsigenka and Yora/Yaminahua are suggestive of this disease. Furthermore, the Yora/Yaminahua describe ball-like lumps (iroma, see “Skin Conditions”) under the skin on the chest and back that are reminiscent of symptoms of filarial infections, including river blindness (V. Py-Daniel, personal communication).

In addition to conjunctivitis and opacity of the eye, the Yora/Yaminahua describe a distinct condition known as ‘strong pain in the eye’ (wero pae), associated with migraine headaches and characterized by red or bloodshot eyes, piercing pain in the eye and extreme sensitivity to light. It is attributed to the vengeance inflicted by wasp spirits and plants with red, pink or purple leaves, especially Gesneriaceae.

The Matsigenka attribute toothache to the consumption of foods such as guava, sugar cane and palm fruits that contain fly or other insect larvae. The larvae (tsomiri, literally ‘worms’), or scarcely visible worm relatives, are said to enter the fleshy interior of the tooth where they gnaw and fester, causing pain, caries and pus formation. This belief is reinforced by observations of white, threadlike objects, probably nerve endings but interpreted as ‘worms,’ that are barely visible in large caries or teeth that have been removed. The Yora/Yaminahua attribute caries to eating rich foods such as liver, or to the vengeance of caterpillar (sano) spirits and the spiny plants that ‘belong to caterpillars’ (sanona). The pain of a toothache is likened to the chewing action of caterpillar’s

mandibles. Both the Matsigenka and the Yora/Yaminahua have suffered a drastic increase in dental disease since European contact, which they attribute to consuming processed sugar and salt.

Like other Panoan peoples, the Yora/Yaminahua chew on the fragrant stems of Piper, known as ane rao ('aromatic medicine'), turning the teeth black, "like tapir's teeth." This practice appears to serve as a form of adornment and a breath freshener as well as creating a protective coating against caries. The Matsigenka also use some Piper species for treating toothache, however they select different species with different sensory properties from those used by the Yora/Yaminahua, reflecting different constructions of efficacy in the two societies. Whereas the Yora/Yaminahua seek out Piper species for their pleasant odor and the black coloration they give to teeth, the Matsigenka value species with painfully pungent taste. The Matsigenka explain that 'painful' (katsi) Piper species are applied to caries to 'hurt' (okatsitakeri) and kill the 'worms' believed responsible for the pain.

Skin Conditions

Remedies for skin conditions of various kinds make up one of the largest therapeutic categories of medicinal plant use in both societies (Figure 6.3). Skin conditions are further divided in both groups among four categories: 1) wounds and wound-like conditions characterized by pus formation (mostly bacterial in origin); 2) rash-like conditions characterized by inflammation and itching (mostly fungal or allergic in origin); 3) blisters, ulcers and thrush infections of the mouth, especially significant among children; and 4) measles/pox conditions, characterized by high fevers, epidemic patterns, pestilential nature and association with "foreigners," namely Europeans and Westernized indigenous groups.

The first category of skin illnesses, consisting of wounds, pustules and other suppurating conditions, is often attributed by both groups to poor hygiene, such as dirty

wounds, unclean clothing or insect bites. The resulting skin infections (apparently bacterial) are common health conditions especially among infants. Infants frequently suffer from pimple-like pustules and scabs covering large areas of the scalp (Y: machapoa, 'head pustule'). Although usually not serious, such infections left untreated may contribute to overall poor health and possible death in infants, especially if compounded by other illnesses.

Table 4.8 - Names and Attributed Etiologies for Skin Conditions by Category (Terms preceded by hyphen indicate affixation of body part classifier).

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Etiology	Name	Etiology	Severity
Wound-like:					
Abscess, boil	sompotsi	insect bite botfly larvae wound	koyo	plant spirit wasp spirit hygiene botfly larvae	High
Cut, wound (arrow wound)	teretsi	wound hygiene	reteki (piaki)	wound hygiene	High/ Medium
Sore, leishmaniasis	tsirivaito, katsinori	insect bite insect spirit	rono, tsewe	snake spirit millipede	Medium
Pustule, infected wound	shomporentsi	falls from sky insect bite wound hygiene	shamo, -chapo	from water insect bite wound hygiene	Medium
Burn, blister	saatagantsi, meregagantsi	heat, friction	toshpo, -cho	heat, friction	Medium/ Low
Scab	(teretsi)	wound	roro, -chapo	wound hygiene diet animal spirits	Medium/ Low
Inflammatory:					
Inflammation, swelling	nonarontsi	no reason w/ infection, fever	iroma, waraxika	wasp spirit millipede w/ sore throat, fever	High/ Medium
Hives, urtication	kepigise-tagantsi	plants (urticating) animal spirits mixing foods	(waraxika, xoa pae)	wasp spirit millipede	Medium
Peeling, shedding of skin	patsaatagantsi	falls from sky wounds hygiene	rashkishiti	millipede foreigners	Medium
Rash	piikitagantsi, pirikitagantsi	hygiene plants (urticating)	(waraxika, waka pae)	wasp spirit millipede	Medium
Itching (mycosis)	kaenitagantsi, tsomiri	worms water foreigners	xoa pae, waka pae	worms millipede foreigners	Low-Medium
Scabies	patsetsi	foreigners	roati, “caracha”	foreigners	Low

'White spots' (mycosis)	kutatagantsi	no reason worms	pexeti	no reason	Low
Oral (esp. in Children):					
Candida, mouth sores (thrush)	kotsetsi	no reason animal spirits w/fever	awo	no reason plants (pilose) w/ fever	Medium
Fever blisters	patsaavagante-tagantsi, terevagantet-agantsi	(as kotsetsi)	atoshpo	w/ fever	Medium
'White tongue' (thrush)	kutanenetagantsi	(as kotsetsi)	N/A		Medium
Measles, Pox:					
Measles, smallpox	saarontsi, "sarampion"	demons foreigners	rashkishiti pae	foreigners	Highest
Chicken pox	morokisetagantsi	animal spirit (cowbird)	toshpo pae	foreigners	Medium

Arrow wounds were a significant source of injury and fatality for both groups during the decades of Yora raiding on Matsigenka settlements. Boils and abscesses are also fairly common, attributed by both groups to insect bites (including botfly larvae) and other hygienic problems. The Yora/Yaminahua attribute some types of boils to the yõshi of certain wasp or plant species.

Mucocutaneous leishmaniasis, a protozoan disease transmitted by Phlebotomus sand flies and producing lesions of the skin or nasal mucosa, is recognized and named by both groups as distinct from other skin conditions. Both recognize leishmaniasis by the localized itching and purplish-red "halo" that precede and later surround the lesion, and by the characteristic deep, ulcerating nature of the sore. Both groups recognize two classes of leishmaniasis, one producing a broader, more superficial sore and the other producing a deeper, initially narrow lesion resembling a perforation. These descriptions correspond in part to subtle clinical differences noted between lesions produced by two different protozoan species, Leishmania brasiliensis and L. guianensis. The Matsigenka attribute the two varieties of leishmaniasis to two different insects, one flying and one

crawling. The insects and the disease bear the same name, tsirivaito in the Manu dialect, katsinori in the Urubamba dialect. The illness and the insects believed to cause it are unitary concepts: it is difficult to tell whether the insect was named for the illness or vice-versa. The flying, 'blinking' (porekankicha) variety of the "leishmaniasis insect" is said to resemble a lightning bug (shiketsi), probably belonging to the Order Lampyridae. The insect lands on the skin of people who are sleeping outdoors, usually during manioc beer drinking parties. Its incandescence enters the flesh, begins to itch and results in a superficial lesion. The kind that crawls 'on the ground' (saviku kipatsiku) is a click beetle (Ilateridae)[7] whose pincer-like tail is said to dig into the flesh causing the deeper, more painful variety of lesion. As in the case of the lightning bug leishmaniasis, contagion occurs by means of direct contact, after which the empirical properties of the insect in question (incandescence, pincer tail) continue to act on the body through invisible means.

The Yora/Yaminahua believe that leishmaniasis is owned by snakes (ronona) or millipedes (xako). Snakes inflict leishmaniasis indirectly by means of their malevolent spirit (yõshi), causing a slow-healing sore like that produced by snakebite. The millipede leaves its caustic venom on objects it touches thereby contaminating people's skin. The broader, more superficial variety of leishmaniasis lesion is named rono, literally 'snake,' while the deep, narrow lesion is known as tsewi, a term also used to describe the slow-healing wounds produced by stingray stings. Both groups claim that the incidence and severity of leishmaniasis has increased in recent years, probably due to increased agricultural clearing as well as drug-resistant strains associated with improper dosage of Western pharmaceuticals in local health clinics.

The Yora recognize a specific kind of slow-to-heal skin lesion similar to leishmaniasis known as roro or rachapo, 'knee scab,' since it frequently occurs on the knees or ankle. The lesion is caused by disobeying dietary prohibition of specific meats (capybara, spider monkey, peccary, catfish and others) during and after consumption of

the hallucinogenic Paullinia species known as tsimo. The lesions thus produced form scabs but may never fully heal. This reaction suggests a physiological toxicity perhaps associated with the circulatory system, since it occurs in joint areas of the legs. The Yora claim to have abandoned use of the Paullinia beverage in favor of ayahuasca (Banisteriopsis) due to the unpleasant side effects noted.

Both groups distinguish inflammatory skin conditions as being characterized by itching, redness (without pus) and swelling like that produced by urticating plants. 'Foot itching' (M: kaenivonkitagantsi; Y: tae xoa pae) and 'white skin spots' (M: kutatagantsi; Y: pexeiti) are common, mild and localized conditions, apparently of fungal origin. The Matsigenka attribute such conditions to invisible 'worms' (tsomiri) inhabiting certain kinds of mud, or else to the abrasive action of sand and water on the skin caused by prolonged exposure. The Yora/Yaminahua attribute fungal infections and other inflammatory skin conditions to the caustic secretions of the xako millipede or to earthworms (nõwi). Children commonly suffer from diaper rash (M: piikitagantsi; Y: waka pae, 'strong stinging'), attributed by both groups to dirty or urine-soaked wrappings.

Both groups recognize a virulent, recently introduced condition (probably fungal) producing itching of the groin, torso or entire body and causing the skin to 'peel off' (M: patsaatagantsi; Y: rashkishiti; Spanish rasca-rasca). Severe cases can lead to secondary, pus-producing infections (M: shomporentsi; Y: shamo), high fevers and possible death. A milder condition with similar symptoms was known in traditional times, caused by poor hygiene. Scabies (M: patsetsi; Y: roati; Spanish sarna, caracha) is a condition resulting from European contact that is especially prevalent among the Yora group. I suspect that the high prevalence of scabies among the Yora when compared to the Matsigenka has a behavioral basis. The Yora sleep in hammocks, and the host traditionally invites a guest to lounge in his or her own hammock during a visit. Because

a hammock is not often washed, it could easily come to harbor the scabies parasite and transmit it to all who lie in it. However the degree of contact with outsiders is also a factor: the relatively more isolated Matsigenka of Manu do not suffer from scabies nor have a name for it, while those of the Urubamba have come to name it as a health condition through experience.

More generalized inflammation or swelling (M: nonarontsi; Y: waraxika) of limbs or the whole body can occur in conjunction with fevers or infections. In Matsigenka, the same term (nonarontsi) is used to describe hard lumps (tumors, cysts) under the skin and swollen lymph glands (sonkipego). In Yora/Yaminahua, hard lumps or swollen lymph glands are named iroma. Some Yora/Yaminahua describe an illness characterized by round, ball-like lumps under the skin on the chest, abdomen and back, which could refer to tumors as well as filiarial cysts associated with river blindness or other filarial diseases. The Matsigenka attribute inflammation, lumps and swollen glands to fevers, infections or merely for 'no reason' (kogapage). The Yora/Yaminahua recognize the same association with fevers and infection, but also attribute inflammation to the malignant spirits of wasps. Hives and other allergic reactions are likewise attributed by the Yora/Yaminahua to wasp spirits or contamination by the xako millipede. For the Matsigenka, allergic hives (M: kepigisetagantsi, literally 'urtication') can be caused by improperly 'mixing foods' or by the vengeful spirits of some animals. The Matsigenka recognize the individual nature of food allergies, describing how some people 'are not accustomed' (tenga irametempa) to eating certain foods, while others can eat the same foods without a problem. For the Matsigenka, children are especially prone to hives and rashes. While gastrointestinal upset in children is blamed on the vengeance of game animal spirits (see Table 4.10 and discussion), skin conditions in children are often attributed to the carelessness of the father in handling or brushing against bristly or urticating (kepiri) plants.

Both the Matsigenka and Yora/Yaminahua recognize and name a variety of conditions of the mouth, lips and tongue, especially common among infants. These include thrush and accompanying mouth sores (M: *kotsetsi*; Y: *awo*), fever blisters (M: terevagantetagantsi, 'mouth wound'; Y: *atoshpo*, 'mouth blister') and 'white tongue' (M: *kutanenetagantsi*). These are conditions considered to be inherent to infancy, occurring for "no reason" or in association with fevers. Sometimes, the Matsigenka attribute mouth sores to the vengeance of game animals or birds. The Yora/Yaminahua compare the hairy or bristly leaf surfaces of some plants (Acanthaceae, Apocynaceae, Asclepiadaceae, Gesneriaceae, Solanaceae) to the texture of the tongue, and resort to these plants as the cause/cure of thrush in infants. Fever blisters and mouth sores are not considered dangerous to adults, but can interfere with an infant's ability to breast feed. Untreated, thrush in an infant can lead to malnutrition and, in severe cases, death.

Both the Matsigenka and the Yora/Yaminahua fear measles (M: *saarontsi*; Y: *rashkishiti pae*) as the most dangerous illness brought from "downstream" by Europeans and acculturated native people. Both describe the high fever and burning, red aspect of the skin as similar to being "burnt by fire" or "scalded by hot water." Matsigenka *saarontsi* means literally 'scalding,' while Yora/Yaminahua *rashkishiti pae* means 'strong peeling of the skin.' Due to their relatively recent contact, neither the Yora group nor the Manu River Matsigenka have direct experience with smallpox in recent times. However folk tales in the Matsigenka and Yora/Yaminahua languages tell of terrible epidemics in the past that could be either measles or smallpox .

Chicken pox is known to the Matsigenka as *morokisetagantsi*, 'small dark spots.' It is considered similar to measles, though not life-threatening. The Matsigenka associate outbreaks of chicken pox with the irregular arrival of the bird *moritoni*, a cowbird species (related to blackbirds and orioles). The bird is said to 'carry the vapor/odor' (*imaenkatakero*) of the illness from the foreigners downstream. The cowbird occurs in

association with cleared areas and large human (i.e., European) settlements, making it an appropriate harbinger of the illness.

The Yora experienced their first chickenpox outbreak in 1996 during my stay in the community of Serjali. Children were affected with mild symptoms much like American children, however adults who had never experienced the illness were stricken with severe symptoms reminiscent of smallpox: large pustules over the entire body, high fevers, pocklike scabs and scars that persisted for some time after the illness resolved. No one died from the outbreak, but several adults suffered severe secondary bacterial infections of the skin that could have proved serious without the daily alcohol swabbing, herbal baths and antibiotic treatment I provided, in the absence of professional health services in the community. The Yora dubbed the illness toshpo pae, 'strong blisters,' and recognize it as coming from "downstream."

Animal Bites and Stings

Table 4.9: Names and Attributed Etiologies for Animal Bites and Stings. (-- indicates accidental cause).

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Etiology	Name	Etiology	Severity
Snakebite	maranki yatsikanti	bad dream demon	rono chachia	--	High
Jaguar bite	matsontsori yatsikanti	accident sorcery	ino chachia	--	High
Peccary bite	shintori yatsikanti	--	isawo chachia	--	Medium
Spider bite	jetyo yoganti	--		--	Medium
Stingray sting	inaro ikentanti	accident bad dream	iwi chachia	--	Medium
Paraponera ant sting	mushi yoganti	--	nowi chachia	--	Low
Caterpillar sting	soromai iporonganti	--	sano chachia	--	Low
Wasp sting	sani yoganti	--	wina chachia	--	Low

Treatments for snakebite and other venomous and nonvenomous bites is a significant category in traditional plant medicines. Animal stings and bites are treated by both groups as a separate set of conditions, allied with wounds and skin conditions on the one hand and body pains on the other. The principal distinction made is between venomous and non-venomous bites. Peccaries can slash men and especially dogs on hunting trips, resulting in serious injury. The Matsigenka have a few remedies especially for treating dogs slashed by peccaries. Jaguars are feared and respected by all lowland indigenous peoples. The Matsigenka attribute some jaguar attacks to the work of sorcerers or shamans, who are believed to convert themselves into jaguars to defend themselves from their enemies. Some ghosts are thought to turn into jaguars as well (see Table 4.11 and discussion).

The most dangerous animal bite known to both groups is that of poisonous snakes, especially Bothrops and Lachesis. For the Matsigenka, being bitten by a poisonous snake is anything but accidental. Poisonous snakes with their broad, triangular heads are likened to the broad bamboo arrow points (serikota) used for hunting large game animals. The snake (maranki) visible in the forest is merely the arrow of a demon, Maranki: "Snake" with a capital 's,' as it were. Maranki is a hunter who looks upon human beings the way human hunters look on tapirs, peccaries and other game animals. He hunts humans with his poisonous arrows, the snakes, for him and his family to eat. Matsigenka men who dream about snakes or fanglike objects (needles, fishhooks) desist from hunting the following morning, or else take special precautions to avoid being bitten. Red annato paint or the fern Asplenium radicans can be painted onto the face and legs to ward off snakes. The unique odor of these applications is thought to frighten snakes from a distance. Furthermore, the extended rachis tip of the fern is said to resemble the tail of a snake, hence its name irishipini maranki, 'tail-plant of the snake'.[8] In Matsigenka mythology, snakes are associated with the moon, Kashiri, responsible for

death and the decomposition of dead bodies. Kashiri, too, looks on human beings as game animals, especially tapirs, to be slain and eaten. Seeing a tapir soon after a person in the village is bitten by a snake or while he or she is suffering from some other serious illness is a bad omen, since it means the moon may already have turned the person's soul into a tapir to hunt and devour.

Stingray stings are also considered painful and serious but not usually life-threatening, causing a slow-healing sore likened by the Yora/Yaminahua to one form of leishmaniasis (tsewi). Spiders, Paraponera ants, stinging caterpillars and some wasps have painful stings that may produce fevers and inflammation lasting a day or more.

Animal/Plant Spirit Revenge

Table 4.10: Names and Symptoms Associated with Animal/Plant Spirit Revenge

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Symptoms	Name	Symptoms	Severity
Animal, plant spirit revenge	pugasetagantsi	GI fever skin conditions (children only)	kopiti	all illness categories (all ages)	Medium
Wasp illness	N/A		wina pae	heart pain skin GI	Medium
Mixing foods (animal spirit revenge)	tamampegagantsi	GI illness	N/A		Low

Both the Matsigenka and the Yora believe that animals can 'take vengeance' (M: ipugatakeri; Y: kopitiro) on people who bother them, often by attacking their children. The same verbs are used when people "get even" or "settle scores." Vengeful animals are said to 'steal the soul' (M: yagasuretakeri) of young children, causing a wide range of illnesses including sleeplessness and crying, skin rashes, nosebleed, upset stomach and even crib death. This notion is widespread in the Peruvian Amazon and is known in mestizo Spanish as cutipado, derived from a Quechua word meaning "to pay, settle

scores." In some cases, the parents must have eaten the meat of the animal in question for their child to be cutipado, in other cases merely 'bothering' (M: yoveraakeri) the animal is sufficient to result in revenge upon a newborn child. Both Matsigenka and Yora/Yaminahua parents follow certain dietary and behavioral restrictions for the first few months of a child's life to avoid such illnesses. When young children become ill, it is almost inevitable that some aspect of their parents' behavior can be blamed for the illness. The illness category of 'spirit revenge' is considered by both groups to be close to gastrointestinal conditions, because many animal spirits are believed to inflict gastrointestinal upsets. However, not all animal spirits take revenge upon the gastrointestinal tract. Other vengeful animals or harmful plants are believed to cause skin conditions, dizziness, fevers and other illnesses. For example, a Matsigenka father avoids making arrows during his wife's pregnancy because the adhesive resin used to fletch the arrows can 'take revenge' and cause the placenta to adhere to the womb. Bamboo, used in making arrow points, can 'take revenge' on the pregnant wife by causing severe bleeding during childbirth. During the early months of his child's infancy, a Matsigenka father must avoid bamboo, spiny palms and other plants with urticating hairs, as these plants can 'take revenge' by causing the child to break out in a rash. Likewise, the father must avoid tobacco snuff, as the 'painful' powder is believed to cause eye infections in infants. In all of these instances, it is impossible to separate the empirical from the spirit-based or magical elements of the belief. Clearly, urticating hairs could physically cling to a man's body and come in contact with the baby's delicate skin. However in many instances, physical contact with an urticating plant is not necessary to cause 'revenge': merely passing near the plant could cause it to harm one's child.

Beliefs about the 'revenge' of plants or animals reflect Matsigenka and Yora/Yaminahua beliefs about the non-individuated nature of the bodies among members of the same nuclear family or extended kin group. If the father or mother eats the meat of

a ‘vengeful’ animal, the child becomes ill. A materialist might argue that toxic or allergy-producing substances could be passed through the mother’s breast milk, providing an empirical basis for these beliefs. However the fact that the father, too, must obey dietary restrictions brings into question such reductionist explanations. The Matsigenka and Yora/Yaminahua view the nuclear family, and in fact the extended kin group, as sharing a single body. Harmful substances or spirits that come into contact with one body affect the bodies of all.

The Matsigenka consider gastrointestinal conditions caused by ‘mixing foods’ (M: *tamampegagantsi*, Table 4.10) to be a special case of ‘revenge’ (*pugagantsi*). Again, it is impossible to separate what Westerners might call spiritual from empirical aspects of these beliefs, since the concept of the ‘soul’ (M: *suretsi*) or malignant spirit (Y: *yõshi*) of an animal or plant encompasses the nutritional, toxic or medicinal properties obtained upon ingestion. To say that certain foods are incompatible, or that certain organisms are vengeful, is both a nutritional and a moral judgment. For example, a person recovering from diarrhea who eats piranha may be stricken with bloody diarrhea. From a nutritional standpoint, piranha meat is considered oily and of inferior taste and quality. However piranhas and other carnivorous fish have sharp teeth, and thus their spirit or soul is said to “bite the intestines” when ingested.

Both the Matsigenka and the Yora/Yaminahua attribute ‘heart pain’ to the vengeful spirits of stinging insects: for the Matsigenka, the bumble bee (*yairi*) and for the Yora/Yaminahua, a number of wasp species (*wina*). These beliefs may share a common origin in widespread aspects of South American folklore, associating wasps and bees with a variety of mythical forces (Lévi-Strauss 1973: 34-35, 55). Whereas the bumble bee etiology among the Matsigenka is restricted to the case of heart pain, wasp etiology is pervasive in numerous illness groups among the Yora/Yaminahua. At first, this etiology model confused me, because I could not tell whether informants were referring to

physical wasp stings or to an invisible, spiritual process. For the Yora/Yaminahua, the physical wasp and the wasp spirit are almost indistinguishable. Atsawananima, a young Yora man now known as Jaime, explained to me in a mixture of his native tongue and broken Spanish:

> It isn't the wasp that stings us, it's the wasp's *Madre* [Spanish, 'mother' i.e., "mother spirit"]. The wasp gets mad when we bother it, when we pass by. Stings us. Gets mad, that's all, for no reason, when we walk past. It has its *Madre*, its 'genie' [Spanish *genio*], its *yõshi* [Yora/Yaminahua, 'malignant spirit'] that comes and stings us like a wasp. We're just walking past, that's all, and it gets mad. "Damn!," says the wasp, "I'm going to kill that guy!" Whoever happens to be passing, the wasp can kill. But every wasp has its plant.

At this point the Yora healer and village headman Nishpopinima, now known as Curaca, continued the explanation:

> The wasp gets mad and wants to kill us. But every wasp has its own plant, its own leaf. If we can't find the wasp plant, the wasp kills us. But if we know the right plant, the one belonging to the wasp, we go and get it and make a warm compress, and soon we get better.

'Wasp plants' (*wina nisa*) are mostly Fabaceae lianas and shrubs, especially of the genus Machaerium, characterized by spines or prickles on young branches and blood-red latex or leaf juice. The plant "belongs to" the wasp because it exhibits physical characteristics reminiscent of wasps and wasp stings. Both the wasp and its plant are believed to cause illnesses associated with inflammation, pain and bleeding.

Demon Attack and Sorcery

Demon attack and sorcery are considered the most dangerous categories of illness for both the Matsigenka and the Yora/Yaminahua, and are treated separately from other illness classes even though the symptoms may be similar to those of mundane illnesses. The 'revenge' of plant and animal spirits is considered to be similar in its mechanism to demon attack and sorcery, and the distinction is somewhat arbitrary. The Yora/Yaminahua word for 'demon' is the same as that for the malevolent spirits of plants and animals (*yõshi*). However informants of both groups pointed out that illnesses caused by plant/animal spirit revenge are usually not as severe, and often treatable either by herbs

or shamanistic healing. Demon attack or sorcery are invoked as etiologies for serious illnesses which are often fatal, and only treatable by shamans, if at all. Illness attributed to demons or sorcery is characterized by either sudden and drastic onset or chronic suffering.

Table 4.11: Demon Attack and Sorcery.

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Symptoms	Name	Symptoms	Severity
Demon Attack:					
Sudden death, demon attack	komutagagantsi		yõshini retea		Highest
Rape by demon (deer)	itsitanti kamagarine (maniro)	high fever, body pains, severe illness, wasting death	N/A		Highest
Demon, ghost (seeing)	tsavitetagantsi	high fever, body pains, severe illness, quick death	waka mese	high fever, body pains, severe illness, quick death	Highest
Demon, ghost (hearing)	amumpava	high fever, chills	N/A		High
Demon, ghost (dreaming)	kisanitagantsi	headache, fever	N/A		Medium
Epileptic fit	kamakamatagantsi	eyes roll back, foam at mouth, fainting	nisõ	eyes roll back, foam at mouth, fainting	Medium
Sorcery:					
Footprint sorcery	ampaseri, gagitetagantsi, shinkogitagantsi	swelling, numbness in legs, legs turn black, leading to death	N/A		Highest
Sorcerer	matsikanari	severe or chronic illness	yõwe	severe or chronic illness	Highest

Sudden death is said to occur when a demon attacks a person with a lethal blow. The Matsigenka term komutagagantsi means literally ‘to become confused.’ The Yora/Yaminahua term is yõshini retea, ‘slain by a demon,’ as it is believed that demons

kill people with their war clubs. Both say the condition comes on suddenly and causes immediate death. The person is sitting and conversing, apparently healthy and happy, then suddenly they get a confused or frightened look in their eye, they stop talking in mid-sentence, and foam or blood comes out of their mouth. These symptoms are consistent with those of cerebral aneurysms, and perhaps also of strokes or heart attack. Both groups also recognize the symptoms of epileptic fits, and attribute them to the malevolent intentions of demons or (for the Yora/Yaminahua) plant spirits. Epilepsy is generally not considered fatal unless a fit results in a fatal accident, for example, drowning or falling from a tree.

The Matsigenka are especially fearful of apparitions of demons and ghosts. The more direct the encounter with the harmful being, the more serious the illness. Dreaming about a demon or ghost results in fevers and headaches that are not necessarily life-threatening, as long as they are treated quickly. Dreaming about a recently dead person (*kisanitake kamatsiri*), always a close family member, is the Matsigenka definition of a nightmare (*kisanitagantsi*). Sometimes, people walking alone in the forest hear the voices of people talking, though they know they are near no known Matsigenka settlements. These mysterious voices (*amumpava*) are said to belong to groups of demons or ghosts who inhabit remote parts of the forest. Hearing their voices represents a closer kind of encounter with dangerous forces, resulting in high fevers and other serious illness. Seeing a ghost while awake, *itsavitetaka*, literally ‘to become lost, confused,’ is the most serious illnesses recognized by the Matsigenka, leading to almost certain death. Matsigenka funerary customs impose strict limitations on both the time and the intensity of mourning for a dead family member, thereby minimizing the destructive power of the dead person's soul (Shepard in press-a). Medicinal plants, protective body painting, and other preventive measures are used to defend the souls of the living from the attack of the dead.

The Yora/Yaminahua believe that when people die, their soul divides into several parts. One part of the soul, the 'eye spirit' (*wero yõshi*) maintains the physical appearance of a healthy person and goes into the sky, where it may be visited by living people in their dreams. The Yora often greet one another affectionately with the term *wero yõshi*, 'eye spirit,' apparently making reference to the past decade of epidemics when all members of the group saw one another in a deathlike state of severe illness. Another part of the soul, *waka*, 'ghost' may wander in the forest and frighten the living with its cries of anguish and its pale, wraith-like apparition. Other parts may turn into animals or demons. Unlike the Matsigenka, the Yora do not fear dreams about dead people, but rather consider them to be a good omen. Instead, the Yora/Yaminahua fear ghosts that reside in the forests or villages near where people have died, especially when they were not buried properly (i.e., under the floor of their former house). For this reason, the Yora have not returned to their former village sites on the Upper Manu. The epidemics of 1985-1990 left so many dead that the forest will never be safe.

Both the Matsigenka and the Yora/Yaminahua believe in the ability of sorcerers (M: *matsikanari*; Y: *yõwe*) to cause illness. The sorcerer uses the same powers as the shaman-healer, only the sorcerer uses those powers for evil purposes. However all shamans, regardless of their stated intentions, may be suspected of committing sorcery by rival factions. The Matsigenka believe that some sorcerers carry out their evil deeds using the footprint of the intended victim. The sorcerer may take an impression of a dried footprint using beeswax or tree resin, or simply takes a bit of dried mud from within the footprint. The sorcerer boils the footprint with one of several dangerous plants. This kind of sorcery is said to cause the victim to be stricken by a tingling or burning pain in the bones of the feet and legs, numbness (*ampatagantsi*) of the limbs, and rigidity or cramps in the leg muscles. If the sorcery continues, the leg swells and blisters as if burnt by fire, and eventually turns black, leading to death. It is difficult to assign a Western

diagnosis to this condition, apparently a form of gangrenous infection that may be associated with European contact. Leprosy (causing numbness) and filariasis (causing swelling of the legs) are possible candidates. Four adults of Yomybato are said to have died in this way in the 1970's, after the people of Yomybato split from the mission community of Tayakome. A Matsigenka man who had lived among the Piro and Asháninka was blamed for the death, and was forced to leave Yomybato village under the treat of death. The Matsigenka of Manu also claim that in prior times, the Harakmbet-speaking Toyeri enemy used to place special plants along Matsigenka paths, causing a similar illness.

The most commonly mentioned 'foot sorcery plant' (*ampaseripini*) is a yellow-flowered herb of the Acanthaceae, Justicia rauhii, and other members of the same family including Ruellia and Pachystachys. These are among the plants most feared by the Matsigenka. They refuse to touch or come near these plants, and repeatedly warned me not to collect or handle the plants or discard pieces near any household. Yet after many cautious collections, I found that these plants had no noxious chemical qualities that I could detect. Furthermore, other members of the Acanthaceae, for example, Justicia pectoralis and Aphelandra species, are included in the fragrant herbal baths given daily to infants. It remains a mystery to me why the Matsigenka are so adamant in their fear of certain, apparently inoffensive Acanthaceae, while they use similar-looking plants of the same family to treat the most fragile members of their society. Coloration may be a factor: yellow is frequently associated with illness, and the yellow-flowered Acanthaceae are the most feared. Other plants thought to be used by sorcerers, however, are more obviously noxious, for example, caustic Hura crepitans (Euphorbiaceae) and rank-smelling Leguminosae trees.

Yora sorcery produces a variety of symptoms, especially fevers, body pains, swelling and itching. It is said that sorcerers in the past acquired the urine or feces of

their victims, mixed them in a clay pot with chili pepper and tobacco, put a hole in the side of the pot and chanted over the mixture through a bamboo tube.

Both the Matsigenka and Yora of Manu claim that sorcery was rare prior to their recent contacts with outsiders. Both say that in the past there were "one or two sorcerers only." Both say that the incidence of illness caused by sorcery has increased drastically since the recent contact with Europeans, Andean populations and acculturated lowland peoples. The growing concentration of populations, proliferation of new diseases and increased inter- and intra-ethnic competition have apparently contributed to the growing number of sorcery accusations. Many recently acculturated indigenous groups blame the sudden increase of novel, unusual illnesses on sorcery (cf. Lindenbaum 1979), and in some cases sorcery accusations lead to intraethnic violence and homicide (Chagnon 1968; Harner 1972).

Some Matsigenka feel that Christian missionaries' discouragement of shamanistic practice has contributed to the rising incidence of new illnesses, including apparently psychiatric conditions (depression, psychosis, anxiety) as well as such bodily diseases as polio, leprosy, yellow fever, measles, whooping cough and hepatitis. The Matsigenka believe that rival native groups (for example, the Piro, Asháninka and Shipibo) perpetrate acts of sorcery. In addition to sorcery, it is thought that foreign ethnic groups have introduced the magical technology of *pusanga*, 'love potions,' giving rise to socially disruptive passions within Matsigenka communities. The Yora likewise blame outside ethnic groups, especially the Quechua and Cocama, for a host of new illnesses that afflict their communities. Both groups feel that the sorcery practiced by outside ethnic groups is stronger than that known in traditional times, and that the shamans of their own ethnic group are unable to combat such powerful sorcery. In cases where sorcery by outsiders is suspected, both the Matsigenka (especially those of the Urubamba River) and the Yora/Yaminahua seek out shamans among the Asháninka, Shipibo, Piro, or Cocama,

hoping that their healing powers will be a match for the new kinds of sorcery. However seeking treatment from an outside healer is a two-edged sword, since the foreign shamans are also believed to have the power to inflict sorcery, for example, if they are not satisfied with the payment received.

These observations run contrary to a simple interpretation of sorcery beliefs as characteristic aspects of "traditional" or folk medicine. In prior times, the Matsigenka and Yora/Yaminahua likely enjoyed better health than they do today. Epidemic diseases, chronic ill health, economic uncertainty and interethnic conflict pose new kinds of physical and psychological ills that traditional cultural practices are inadequate to resolve. Where people formerly blamed sudden illness on the attack of predatory animal spirits of the forest, they now blame them on members of their own and foreign ethnic groups who are typically serving as intermediaries with Western economic interests: the predators in a global ecology of capital.

Miscellaneous Signs and Conditions

A number of symptoms and conditions do not seem to group consistently with any single illness category. Cramps (M: *tsoritsi*; Y: *misko*) were grouped by some informants with the category 'body pains' (M: *katsipagetagantsi*; Y: *yora isi pae*; see Table 4.6), and by some informants with gastrointestinal conditions. Cramps are not considered severe when caused by simple muscle fatigue or overexertion. When accompanying gastrointestinal conditions, however, cramps are considered to be a very dangerous sign.

Table 4.12: Names and Attributed Etiologies for Miscellaneous Illness Signs and Conditions.

	Matsigenka		Yora/Yaminahua		
Illness Gloss	Name	Etiology or Associated Illness	Name	Etiology or Associated Illness	Severity

Heart failure, cardiac arrest	vitantagantsi negiku	w/ severe respiratory, GI, heart illness	õitiniki, õiti pae		Highest
Muscle cramps	tsoritsi	trauma falls from sky w/ severe GI illness	misko	trauma w/ severe GI illness	Highest (w/ GI) Low (alone)
Pallor (‘yellowness’)	kitetagantsi	w/ severe GI, heart illness	N/A		High
Fatigue, difficulty breathing	shigopirentsi	w/ severe respiratory, GI, heart illness	atsana	w/ severe respiratory illness	High
Liver pain	katsiriraapana-tagantsi	N/A	taka isi	plant spirit sun spirit	High
Spleen pain	taratagantsi	trauma w/ severe fever (malaria)	natsaiki	trauma	High
Urinary pain, STD’s	katsitsinitagantsi, tsomiri	no reason foreigners	iso isi iso pae	termite spirit foreigners	Medium

The Matsigenka condition kitetagantsi means literally ‘yellowness’. The color yellow is associated with illness throughout Matsigenka medical beliefs: yellow vapor in the sky is considered an omen of illness, yellow-flowered Acanthaceae are thought to be sorcery plants, and a ‘yellow’ or pallid skin color is thought to be a sign of illness. However kitetagantsi does not necessarily refer to jaundice, since it is used most often to describe the pallor associated with malnutrition (i.e., anemia). Kitetagantsi is closely linked with ‘fatigue’ (shigopirentsi), and is often said to be the result of prolonged gastrointestinal illness or a lack of meat in the diet. ‘Fatigue’ (M: shigopirentsi; Y: atsana) in both languages can also refer to the shallow breathing caused by severe cardiac or respiratory conditions. In the most severe cases, the heart ‘seizes’ (M: vitantagantsi negiku; Y: õiti pae) and fails, causing death.

Liver pain (M: katsiriraapanatagantsi; Y: taka isi) and spleen pain (M: taratagantsi; Y: natsaiki) were mentioned infrequently by informants of both groups. Both describe spleen pain as resulting from trauma (falling down, blow to the side) and causing extreme thirst.

Both groups describe urinary tract infections with the term 'painful urine' (M: *katsitsinitagantsi*; Y: *iso isi*). In prior times, the Matsigenka say mild urinary tract infections were caused by poor hygiene or simply for "no reason." The Yora/Yaminahua blamed such infections on termite spirits: if one urinated on a termite mound, the termite would take vengeance and cause painful urination. Both groups associate sexually transmitted diseases (STD's) with European contact. These diseases are said to have similar symptoms to simple urinary tract infections (i.e., "painful urination") but are more severe and long-lasting. The Yora/Yaminahua make the distinction in this way: *iso isi*, 'painful urination (simple)' as opposed to *iso pae*, 'strongly painful urination.' The Matsigenka of the Urubamba River give the name *tsomiri*, 'worms,' to recently introduced STD's such as gonorrhea and syphilis. These diseases were apparently brought to the Urubamba region by Shell employees and proliferated in Shell-sanctioned brothels that operated during seismic studies of the Camisea Gas Fields in the 1980's. The Matsigenka of Manu are not familiar with STD's.

Discussion: Modes of Contagion

Within each group of related illnesses, and even for a single illness term in either language, informants often mention a range of possible etiologies, often corresponding to different degrees of severity:

1) accidents and physical trauma (falling from a tree, getting cut by a sharp branch, being stung by an ant);

2) "filth contagion," somewhat like Western "germ theory," namely, the idea that certain organisms (worms, insect larvae, dung flies) or substances (garbage, human excrement, unpleasant odors) are inherently filthy and repulsive, so that touching, ingesting or inhaling them contaminates the body and causes illness;

3) "sympathetic contagion," akin to sympathetic magic and the so-called "doctrine of signatures," in which salient organisms or noxious substances are believed to cause

illness symptoms through invisible or indirect contact with the victim (for example, cutting down or passing near a pilose or urticating plant causes rashes in one's children; eating piranha meat causes blood in the stool; stinging insects have spirits that cause needle-like pains and inflammation);

4) spirit attack, in which animal spirits, demons, ghosts or human sorcerers "steal the soul" or introduce noxious objects into the body by invisible means;

5) contagion from foreigners, mostly epidemic illnesses directly associated with Western contact.

These etiologic categories are not entirely distinct from one another, for example, the Matsigenka belief that 'worms' (tsomiri) and insect larvae cause skin and gastrointestinal conditions involves both filth contagion and an empirical perception of worms' seething, burrowing behavior (sympathetic contagion). Illnesses attributed to the revenge of animal spirits invoke both spirit attack and sympathetic contagion. Yet the different kinds of contagion and etiology tend to reflect different degrees of involvement of the visible and invisible worlds central to both groups' cosmologies, and thus result in varying degrees of severity. Accidental trauma is a common problem and the severity varies, though generally the most severe accidents (snakebite, falling from a high tree) are blamed on supernatural causes and presaged by dreams. Illnesses resulting from poor hygiene or eating dirty food (filth contagion) are matters of the mundane, visible world and tend to be transitory and self-resolving. Sympathetic contagion, notably the revenge of animal or plant spirits, involves both mundane perceptions of noxious plant or animals and invisible activity within the spirit world, and results in more severe, though seldom fatal illnesses. The attack of sorcerers and demons takes place almost entirely in the invisible realm, and causes among the most severe of the illnesses. Illnesses introduced by contact with outsiders are also considered severe and often fatal. In the early years of contact, these illnesses were blamed by both groups on sorcery and demon attack or

understood through the metaphor of poisoning. With increased experience, acute, epidemic illnesses such as colds and flu are perceived as “belonging to” or “coming from” foreigners unintentionally. Certain chronic or permanent illnesses (hepatitis, polio, socially/economically motivated anxiety and depression) are attributed to the malevolent intentions of sorcerers among foreigners and acculturated indigenous groups.

Illnesses caused by poor hygiene, dirty food or other mundane etiologies (“filth contagion”) are generally transitory and self-limiting, though they may be treated symptomatically. Illnesses that are sudden, severe, or induce prolonged suffering demand a moral explanation in the invisible realm of spirits, and can be addressed only by shamanistic intervention, if at all. Illnesses that are in some way intermediate between these two extremes, neither obvious and trivial (nausea upon eating spoiled food), nor cruel and apparently malicious (sorcery, spirit attack), form the majority of common ailments and inspire the majority of herbal remedies.

Botanical medicines tend to treat the invisible mechanism of illness by means of the observable, sensory properties of plants. Many of the illness categories and etiology concepts described by the Matsigenka and Yora/Yaminahua are similar. Yet fundamental differences are found in the ways the two groups select medicinal plants and ascribe their efficacious properties. Matsigenka plant therapy is allopathic in the sense that medicines generally act through opposition. Many plants are selected for strong or toxic properties (bitterness, pungency, causticity, strong odors) that overpower and expel illnesses. Yora/Yaminahua ethnomedicine is homeopathic in the sense that “like treats like”: medicinal plants are most often classified according to visible signatures related to their therapeutic uses: spiny plants for “sharp” pains, pink leaves for “pink eye,” plants with watery latex for watery diarrhea, etc.. When I describe Yora/Yaminahua medical concepts as homeopathic, however, I use the term only in the literal sense of “like treats

like" without implying other principles of homeopathic medicine such as therapy by means infinitesimally small doses.

Default Etiologies

During structured and informal interviews about illness etiology with Matsigenka and Yora/Yaminahua informants, I noted the presence of a "default etiology" for each group. When informants are at a loss to provide a clear mechanism for a particular illness, they fall back on a formulaic or "default" answer. The default etiology given by many Matsigenka informants is, 'it falls as a vapor/odor from the sky' (oparienkatake). The default answers for the Yora/Yaminahua is, 'it comes from plants, from the forest' (nipeinoax, nimeranoax) or alternatively, 'it is owned by wasps,' (winana). Appreciating the difference between these etiology concepts helps us understand the different approach to plant therapy in the two groups.

For the Matsigenka, many illnesses are conceived of as foul-smelling or brightly colored vapors that rise from the bowels of the earth. Probably inspired by the intense geological activity of the Andean foothills, Matsigenka folk tales describe sulfur or gasoline odors, foul-smelling and boiling waters, subterranean rumblings and hellish flames that emerge from certain mountains (Shepard in press-b). For the Matsigenka, these phenomena are evidence for the presence of demons and illnesses residing in mountains and deep underground. Landslides, rock falls, earthquakes, eruptions and other geological events release illness into the atmosphere in a gaseous or vapor state. Rainbows and unusual coloration of the sky at dawn or sunset, for example, 'yellow vapor in the sky' (okiterienkatake), are believed to be visible manifestations of these illness vapors. Bennett (1991: 185) likewise mentions rainbows and various sky colors (kiterigiteri, 'yellow/red sky,' kiningaro, 'blue lines in the sky') as omens of illness among the Matisgenka of Huacaria. With rainfall or mist, unwholesome vapors 'fall from the sky,' oparienkatake. The same verb, incorporating the noun stem -enka,

‘smoke, vapor, steam, odor’ (see Chapter 5) is used to describe light rainfall, mist and fog. In a gaseous state, the illness-causing vapor/odor adheres to the skin or enters the body through the nose, mouth and eyes. It is considered especially dangerous for children to go outdoors after rainbows or ‘yellow skies’ for this reason. The concept of illnesses falling from the sky requires direct contact with or ingestion of the illness-causing substance, and implies an almost germ-like form of contagion. Furthermore, this illness model is consistent with the epidemic patterns and seasonal cycles observed in some illnesses, especially since prolonged European contact. A germ-like theory of contagion is consistent with the allopathic model found in Matsigenka plant therapy: strong-tasting or strong-smelling medicines counteract and expel illness-causing substances from the body.

The Yora/Yaminahua default etiology is quite different, and implies a different mode of plant therapy. For the Yora/Yaminahua, most illnesses come ‘from plants’ (nipeinoax), come ‘from the forest’ (nimeranoax) or are ‘owned by wasps’ (winana). Plants and forest animals are thought to be inhabited by malignant spirits, yõshi, that attack people for “no good reason,” in much the way that some wasp species swarm and sting anyone who comes near their nest. Medicinal plants generally exhibit physical characteristics that relate metaphorically to the illnesses they cause. Plants that have watery latex are believed to attack passers-by and cause watery diarrhea; plants with blood-red leaves or sap are believed to cause bloody diarrhea and painful menstruation; plants with pink leaves are believed to cause “pinkeye”; plants with bristly, pilose stems or leaves are said to cause skin rashes; plants with long spines are said to cause ‘heart pain.’ To cure such illnesses, it is necessary to apply a warm compress of the same plant species that caused the illness. Wilting of the plant’s leaves in the warm water, darkening of the liquid and steam coming off the sick person’s body are signs that the illness has returned to the forest whence it came. If one plant does not work, another species of the

same illness class is tried until the proper plant/illness combination is achieved. Federico, an acculturated Yora/Yaminahua who served as my guide and assistant, explained to me that a medicinal plant is like a magnet, drawing the illness out by virtue of its similarity. This is an almost exact translation of the homeopathic practitioners' motto: *Similia similibus curantar*, "Like treats like." Like the wasp and its respective plant, a medicinal plant is both cause and cure of a specific illness. This conceptualization is encapsulated in the Yora/Yaminahua word *rao*, meaning both 'medicine' and 'illness.'

Worms and Insect Etiologies

Worms and insects figure prominently in the etiology models of both cultural groups. The spirits of stinging insects are believed by both groups to cause body pains of various sorts. For both groups, worms, maggots and millipedes evoke a sense of disgust and revulsion, making these creatures candidates for the etiologic category I have dubbed "filth contagion." 'Worms' (M: *tsomiri*; Y: *nõwi*) are significant in both groups' concepts of illness etiology, similar to popular Western conceptions of "microbes". Despite an overall similarity between the two groups, there are marked differences in the way they approach therapy for illnesses caused by 'worms'. For the Matsigenka, worms are often perceived as tiny organisms present in the diseased part of the body, and are treated through allopathic means by applying noxious substances to kill the worms. For the Yora/Yaminahua, worms operate more on the principle of sympathetic contagion: the worm is not conceived of as actually inhabiting the diseased part of the body, but rather as affecting that part of the body by virtue of indirect or invisible means. As is typical in Yora/Yaminahua medicine, therapy proceeds through the homeopathic principle of similarity, rather than an allopathic model of opposition. Plants whose physical properties are reminiscent of worm or millipede species (flexible stems, pilose or bristly parts, rank odors, latex) are 'owned' by the corresponding creature and thus used in therapy.

Odors in Illness Causation and Therapy

Odor is a fundamental aspect of how the Yora/Yaminahua understand illness and approach plant therapy. When smelling a strong odor of nearby urine, feces or flatulence, the Yora begin to spit and blow their noses conspicuously, calling out, "Hey! Who's the stinker? Who fouled up my path?" as they change direction to circumvent the odor. The stench of urine and feces, as well as that of scorched animal fur, is believed to enter the body through the nose and mouth and descend to the stomach where it causes stomachache and diarrhea. Spitting and blowing the nose helps remove the offensive odor and prevent illness. Unlike the Matsigenka, who prefer to defecate in a discreet location shared by an entire household at the edge of a garden clearing, the Yora prefer to defecate and urinate in or alongside streams or rivers so that the offensive odors are carried downstream. While this custom may have been practical in prior times when population densities were lower and migrations frequent, it has proven to be an important source of water contamination in the current, more permanent and densely populated village of Serjali.

Fragrant odors are important in the Banisteriopsis ceremony introduced to the Yora group by acculturated Yaminahua. Throughout the ceremony, the shaman invites participants to inhale the odor of a basil-like herb (Scutellaria), dispelling harmful spirits and counteracting the bitter taste of the Banisteriopsis brew. The shaman may sing the names of fragrant plants and spirits in order to gain access to their healing powers. These excerpts from a Yaminahua healing song illustrate how pleasant fragrances emanate from the good spirits and fight against the forces of evil, the 'people of the night':

ewe iska wanane	Thus is my song
ewe ini wanane... my fragrant song...	
ewe wana ranoi	They fear my song
na nete yorawo	the people of the night
ori kame iwaini	there they go!
i kame aito	They run away from
ewe ini wanane	my fragrant song

noko xoma chipiwo	Our sisters the Xoma
ewe wana ini pae	like them, my song is strongly fragrant (ini pae)
ato ini raoti	their fragrant adornments
ini raoti wawe	their fragrant adornments come to me
ato yame iniki	I am fragrant as they are
ato yame raweno	I walk among them
noko xoma chipiwo	our sisters the Xoma

The Xoma are the epitome of pleasant fragrance (ini). Humanlike in appearance, their skin and hair are permanently fragrant. In opposition to the fragrant Xoma are the malevolent and foul-smelling Yõshi, demons that frighten people and make them ill with their unpleasant odor, like that of rotten meat (wiya). By wearing bracelets stuffed with fragrant plants, the Yora/Yaminahua surround themselves with a perfumed aura that keeps unpleasant odors and illness at bay. Nonetheless, fragrant bracelet plants are not considered 'plant medicine' (nisa) or 'medicine/illness' (rao) in the strict sense, because they are not 'owned' by illness-causing spirits. Yet the word rao appears in the names of several perfume plants: nai rao, 'sky medicine,' and ami rao, 'woman medicine,' names applied to fragrant Bignoniaceae lianas used as perfumes. Because of this naming pattern, and because of the importance of fragrance in Yora/Yaminahua concepts of health and well-being, I include perfumes in the category of "medicinal plants," broadly defined.

Illness and odor are also closely linked concepts for the Matsigenka. The Matsigenka describe certain contagious illnesses as traveling through the air like an odor or gas. The root -enka- ('odor, vapor, smoke') is incorporated into certain verb expressions to indicate illness contagion. For example, when describing how one catches a cold from another person, the Matsigenka say, ipa-enka-takena, 'they give me the odor/vapor' or yama-enka-take, 'they bring the odor/vapor'. Demons and animal spirits that 'take revenge' (ipugatakeri) on young children have foul odors, as do the vapors believed to rise up from the bowels of the earth bringing illness. Matsigenka women bathe their infant children daily in fragrant herbs, thus surrounding the fragile body and

soul with a protective aura of pleasant odor. Harmful spirits cannot come close because they smell the child's fragrance from a distance, become frightened, and run away. Likewise, remedies used to avoid snakebite depend upon their strong fragrance to frighten the snake at a distance.

Poisons and Pills: Responses to Western Medicine

Fundamental differences between Matsigenka and Yora/Yaminahua theories of efficacy appear to contribute to the differences in the way the two groups understand and use Western medicines. The Matsigenka, accustomed to bitter plants and their associated degrees of toxicity, are somewhat cautious in their use of bitter-tasting pharmaceutical pills. Most Matsigenka herbal medicines are administered only once or twice a day for a maximum of three days, since any more might risk a dangerous accumulation of toxicity. It is difficult to get a Matsigenka patient to take a full course of antibiotic pills. After a few days, they may refuse to take more pills on the grounds that the bitter compounds will "burn" their insides.

In the early days of their first epidemic in 1985, the Yora/Yaminahua refused to take antibiotics because of their bitter taste. They quickly learned the life-saving efficacy of Western medicines. To this day, the Yora take pharmaceutical pills enthusiastically, with little regard to dosage or indications. In part, this enthusiasm is an outgrowth of the devastating toll of epidemic illnesses, and the miraculous ability of antibiotics to cure them. On another level, however, I suggest that their relative lack of experience with bitter, ingested herbal medicines may contribute to this phenomenon. Also, a certain homeopathic rationality seems to be at work. The Yora/Yaminahua claim that their traditional medicines worked in the old days for the diseases that came from the forest. They have largely abandoned their traditional herbal medicines today, however, because only 'white man medicines' (nawa rao) work for 'white man illness' (also nawa rao). This attitude contrasts with the response of Matsigenka to novel diseases such as

tuberculosis, malaria and sexually transmitted diseases. To treat theses “stronger” illnesses, Matsigenka have experimented with stronger, more bitter plants to fight the new ills.

Shamanistic healing among the Yora/Yaminahua has not suffered the kind of atrophy that herbal healing has. Instead, healers have incorporated the images of European technology and power into their healing songs. They call to the burning odors and hot temperature of gasoline, shotguns, outboard motors and airplanes in order to gain power over the feverish diseases these objects and their European owners have brought from downstream. Words and ritual have proven more flexible than plants in the Yora/Yaminahua's adaptation to a changing epidemiological and social environment.

Chapter 5: Sensory Evaluation of Medicines

> Après la mort des êtres... l'odeur et la saveur restent encore longtemps, comme des âmes à attendre, à espérer, sur la ruine de tout le reste, à porter sans fléchir, sur leur gouttelette presque impalpable, l'edifice immense du souvenir -- Marcel Proust, *Du Côté de chez Swann*.

Evaluating and administering medicinal plants is a total sensory experience among the Matsigenka and the Yora/Yaminahua. Cues to medicinal value include a broad range of sensory qualities (taste, odor, color and texture) as well as bodily and psychological manifestations induced by toxic or psychoactive plants. Appreciating the sensory qualities of medicinal plants helps clarify native models of illness and efficacy. In this chapter, I explore the vocabulary used in the two languages to describe the sensory properties and therapeutic effects of plant medicines. As I collected information about illnesses and the plants used to treat them, I was interested in answering one question in particular: What is it about this plant (and not some other plant) that makes it effective in treating this (not some other) illness? Members of both societies were able to articulate the efficacious properties and precise modes of activity of many plant medicines. Sensory evaluation is central to both Matsigenka and Yora/Yaminahua understandings of efficacy.

This chapter begins with a brief overview of physiological and cross-cultural research on sensory perception, and its relevance to the Matsigenka and Yora/Yaminahua vocabulary. I propose a classification of pharmacognostic vocabulary in Matsigenka and Yora/Yaminahua according to sense modes, an organization that is faithful to both Western and indigenous concepts: taste, odor, irritation, visual and tactile sensation. The two cultural groups are found to place different relative values on the various sense modes when evaluating medicinal plants. Sensory vocabulary is analyzed in greater detail in the second half of this chapter. For each ethnomedically significant sensory term

I provide a comparison of meanings between the two languages, a discussion of its significance in evaluating medicines and a summary of results from the structured interviews (taste/odor experiment, “best example” experiment, plant collections database) concerning each vocabulary item.

Chemosensation

A thorough discussion of scientific research on chemosensation is beyond the scope of this work. Brett provides an excellent overview of this literature in his chapter on “Chemical Perception” (1994: 102-147). The following material summarizes the findings most relevant to this discussion. Chemosensation among humans proceeds according to three modalities: taste, odor, and detection of irritation. Though the physiology of chemosensation remains poorly understood, the three modalities (taste, odor, irritation) appear to operate by way of separate receptors and neural pathways. Nonetheless, significant interconnections among these pathways cause sensory experiences to be perceived holistically (Green and Lawless 1991). In the technical literature, the terms “taste” and “odor” are generally reserved for the pure chemical sensations, while “flavor” and “smell” are used to indicate holistic sensations. Chemical taste as well as odor, temperature, and texture contribute to the holistic flavor of foods, while chemical irritation (e.g., ammonia, chili peppers) contributes to the holistic perception of smells (Cain 1990).

Taste

In an adaptive sense, taste is involved in evaluating the presence of electrolytes (salts, acids) and organic compounds (sugars, proteins, fats, toxins) in the environment, presumably to help an organism decide which things should be ingested as food and which should be rejected as potential hazards (Scott and Plata-Salaman 1991). Despite its immediacy and intimacy as a sensation, the neurophysiology of taste is still poorly

understood. Taste buds are located on the tongue, palate, pharynx, larynx and epiglottis. Though some areas may have greater densities of taste buds or be more sensitive to specific tastes (Bartoshuk, Cain and Pfaffman 1985), detection of particular tastes (sweet, sour, bitter, salty) does not appear to be restricted to certain areas of the tongue or mouth, as was hypothesized in the past. Unlike vision and hearing, there does not appear to be a "taste center" in the primate brain (Pritchard 1991).

An ongoing area of debate is the identification and classification of cross-culturally valid taste "primaries" (Miller and Bartoshuk 1991), as have been demonstrated, for example, in the cross-cultural study of color perception (Berlin and Kay 1969). Drawing on Henning's (1924) classificatory scheme, taste scientists for much of the twentieth century have considered sweet, salty, sour and bitter to be the "basic four" tastes, somewhat analagous to the primary colors. Yet a greater diversity of taste names has been found in many world languages and in studies of taste dating to classical times. Aristotle, for example, cited astringent, pungent, and harsh in addition to the basic four of sweet, salty, sour, and bitter (Miller and Bartoshuk 1991: 206). Others mention rough, urinous, spiritous, aromatic, acrid, putrid, insipid, and alkaline (see C. Myers 1906; Bartoshuk, Cain and Pfaffman 1985). In much contemporary research on taste, however, astringency, pungency, and other flavor elements such as texture, chemical or mechanical irritation and odor are considered to be confounding factors, dutifully avoided in order to focus on pure chemical tastes, which is to say, sweet, salty, sour and bitter. Chemical substances exemplifying these tastes (e.g., sucrose or glucose, sodium chloride, hydrochloric or citric acid, quinine; see Robinson 1970; Doty 1985) are chosen as standards for research, a procedure which takes for granted and reifies the "basic four" as taste primaries, without questioning how many basic tastes there are, or whether taste primaries even exist (Scott and Plata-Salaman 1991).

The study of chemosensation (taste, odor, irritation) has generally been hampered by incorrect assumptions drawn from previous research on visual and auditory perception. In his discussion of taste research among British subjects, Robinson (1970: 375) notes, "Mistakes in the naming of taste qualities are very common and are one of the principal difficulties in carrying out any sort of tasting tests with untrained observers." It is characteristic of earlier research into taste to view individual differences among subjects as resulting from "mistakes" or confusion, based on the assumption that there is some inherently correct taste value to a given substance, analogous to the wavelength of a color or the frequency of a sound. More recent research has challenged these notions, demonstrating the great variability of taste perception even within a single human population (Harper 1977; O'Mahony et al. 1979). Unlike vision and hearing, taste (and odor) sensations arise out of the direct interaction between chemical substances outside of the body and chemical receptors within the body. Because the number of different chemical substances is potentially limitless, the number of different tastes (and odors) is also potentially limitless.

Some important early works documented taste/odor vocabularies and sensitivity to specific substances in various non-Western cultures, highlighting differences with Western populations (Chamberlain 1903; Rivers 1904/1905; C. Myers 1906). To date, cross-cultural studies of taste remain limited in number and scope (Doty 1985). The available evidence suggests certain general similarities, while also highlighting many subtle difference in chemosensory experience across cultures. Some differences are clearly biological. For example, sensitivity to the bitter taste of thiocarbamides (found in kale, cabbage, Brussel sprouts, turnips, and other Brassica species) is genetically determined, varies among populations, and apparently influences cross-cultural variation in dietary preferences for Brassica (Davis 1978 cited in Doty 1985: 679). Yet the social

milieu is also important in facilitating preference and aversion, and individual experience "seems prepotent for development of human taste preferences" (Doty 1985: 681).

Comparing the taste vocabularies in Matsigenka and Yora/Yaminahua reveals similarities as well as differences that are instructive in the cross-cultural study of sensation. Taste assessments of spices by members of the two groups during the taste/odor experiment are summarized in Appendices 2.1 and 2.2. One important difference between the two groups was a relative reluctance among the Yora/Yaminahua to taste unfamiliar substances, especially those with strong odors, a reluctance also found in their assessment of wild plants. The Matsigenka, on the other hand, were more likely to taste small amounts of unfamiliar substances to assess their potential medicinal value, behavior observed both in the taste/odor experiment and in handling wild plants. The "best example" experiment provided further insights into the perception of taste in the two groups, and demonstrated a fair degree of informant agreement within each group concerning locally available plants and medicinal uses that exemplify each taste category (Appendix 2.3). Table 5.1 summarizes major taste terms in the two languages. English glosses are used for convenience in the text, addressing what one might call the "least common denominator" of meaning in the two languages. Taste vocabulary in the two languages is discussed in greater detail in the second half of this chapter.

Table 5.1 - Taste Vocabulary in Matsigenka and Yora/Yaminahua

	Matsigenka		Yora/Yaminahua	
Gloss	Name	Notes	Name	Notes
Bitter	kepishi		moka	also excessive saltiness
Astringent	tine	'to draw together'; considered close to 'bitter'; includes both chemical and physical astringency	tsimo	considered close to 'bitter'; includes both chemical and physical astringency

Sour	kacho	fermented, unripe, acid, also excessive saltiness (implies inedibility)	wokash	fermented, unripe, acid (implies inedibility)
Sweet-salty-tart	pocha	sweet, pleasantly salty, pleasantly tart (implies edibility)	wata	sweet, pleasantly salty, pleasantly tart (implies edibility)
Painful, pungent	katsi	(treated under "Irritation")	pae	(treated under "Irritation")

The taste vocabulary in both Matsigenka and Yora/Yaminahua challenges the concept of the "basic four" or "taste primaries" of sweet, salty, sour and bitter. Both groups use the same term (M: pocha; Y: wata) to describe sweet, pleasantly salty and pleasantly tart tastes. Chamberlain (1903) likewise noted that the same root denotes sour, acid, salt, and sweet in Algonkian languages. Despite the apparently ambiguous vocabulary, both the Matsigenka and the Yora/Yaminahua recognize sweet and salty as being different sensations: informants typically describe sugar as being "pocha/wata like sugar cane" while salt is "pocha/wata like salt." Brett (1994: 143) made similar observations for the term chi, 'sweet/salty' among the Tzeltal Maya. It should be noted that the word applied to sweet and salty in Tzeltal, and to sweet, salty, and tart in Matsigenka and Yora/Yaminahua, is not equivalent to the general word 'delicious' (M: pochani; Y: shara; Tzeltal bujtz'an). For example, both the Matsigenka and the Yora/Yaminahua value fatty foods and consider them to be delicious, but do not describe these foods as pocha/wata (the Matsigenka term ketsirienka, 'fat odor,' is used to described the flavor of fatty foods). Though pocha in Matsigenka and wata in Yora/Yaminahua do not refer to a specific taste sensation, they are also not general hedonic terms (e.g., 'good, delicious'). Rather, pocha and wata refer only to pleasant levels of sugars, salts, or acids in foods and other substances placed in the mouth. There is no simple English gloss for this concept, and constructions like "sweet/salty/tart" prove unwieldy. From this point onward, I will use the gloss 'sweet': pocha and wata are

always considered pleasant (unlike salty and tart in English), and both approximate the English concept of "sweetness" in a broader sense (e.g., "sweetbread," a dish made of pancreas). Nonetheless, I acknowledge the limitations of the simplified gloss, and append the less elegant expression 'sweet/salty/tart' in some instances as a reminder to readers.

Foods are considered pocha/wata by the Matsigenka and Yora/Yaminahua at lower sugar concentrations than those typically considered sweet by Americans. Wild fruits (especially Moraceae) and honeys that would be considered tart, sour, or acid by American standards are described as pocha/wata by both groups. The term 'sour' (M: kacho; Y: wokash) is reserved for unripe fruits as well as fermented foods and often implies inedibility. Yet when consuming introduced foods or beverages (oatmeal, coffee), members of both groups generally add more sugar than would an American: the more sugar, the 'sweeter' and more delicious is the food (see also Messer 1986). The Matsigenka and the Yora/Yaminahua consider high concentrations of salt, however, to be unpleasant. While a moderate amount of salt is 'sweet' (M: pocha; Y: wata) and 'delicious,' an excessive amount of salt renders food and drink inedible. The Matsigenka describe excessive salt as 'sour' (kacho) while the Yora/Yaminahua describe it as 'bitter' (moka). One Matsigenka informant commented:

> A little sugar is pocha, a lot of sugar is pocha, you cannot have too much sugar, it just keeps on being more and more pocha and more delicious the more you add. Salt has a different pocha. A little salt is pocha and delicious, but a lot of salt is kacho ['sour'] and not delicious.

Scientific taste experiments note that subjects often "confuse" sour with bitter tastes and bitter with salty tastes (Robinson 1970; O'Mahony, et al. 1979). While confirming these trends, the Matsigenka and Yora/Yaminahua vocabulary for excessive salt calls into question whether experimental subjects truly "confused" salty, bitter and sour tastes. An alternative explanation is that different concentrations of the same substance are simply perceived as having different taste qualities, and that this perception

may be influenced in part by cultural factors and linguistic habits (see O'Mahony, et al. 1976).

It may seem odd to Westerners that several geographically and linguistically isolated Native American languages use a single term to describe sweet and salty tastes. In French, sweet (*sucré*) and salty (*salé*) are diametrically opposed in the folk classification of crêpes and other foods; in Spanish, fresh waters are described as "sweet" (*aguas dulces*), in contrast to salty or brackish waters. What factors might lead Native American languages to classify sweet and salty tastes together? Brett suggests that there may be an underlying physiological rationale: both glucose and various mineral salts are important but rare nutrients necessary for the survival of humans and other animals. Physiological studies of taste buds in sodium-deprived rats show a response pattern for salt that is similar to the response pattern for glucose in normal rats : in other words, rats who are deprived of sodium may actually perceive salt as tasting "sweet," presumably an adaptation to increase sodium intake and ensure survival (Contreras and Frank 1979; Jacobs, Mark and Scott 1988). Such neurological mechanisms may underlie the unity of concepts of sweet and salty in some languages.

Both the Matsigenka and the Yora/Yaminahua consider astringency (M: *tine*; Y: *tsimo*) to be a taste (e.g., tannin-rich plants) as well as a physical sensation (e.g., that produced by dense leaf hairs or fine powders) affecting the tongue, mouth, lips, or skin. Both groups consider astringency to be closely related to and often associated with bitterness, reinforcing my inclusion of astringency among the taste vocabulary. Compound terms like 'bitter-astringent' (M: *okepishitake otinetake*; Y: *moka-tsimo*) are encountered frequently in the description of bitter and/or astringent substances in both languages. The term used to describe pungent taste in both languages means literally 'painful' (M: *katsi*; Y: *pae*), and can describe piquant taste and strongly aromatic odors as well as physical pain. Since they cross-cut categories of taste, odor and pain perception in

both languages, I have included the terms katsi and pae under the sensory category of irritation (Table 5.6). Yet ultimately, such distinctions are artificial due to the holistic nature of chemosensory perception.

Odor terms such as 'burnt/toasted' (M: tagarienka, shinkorienka; Y: nowe) or 'fragrant' (M: kasanka; Y: ini) are sometimes used in both languages to describe tastes (flavors), likewise underscoring the holistic nature of taste and odor perception. Both languages have specific vocabulary for describing the taste/flavor of fats, meat, fish, and starches. The general hedonic term 'good, delicious' (M: kameti, poshi; Y: shara) is most often used to describe foods, but is occasionally mentioned ing describe the taste or odor of a medicinal plant. Despite many overall similarities in the taste vocabulary of the two groups, some taste terms show subtle differences of meaning. Matsigenka and Yora/Yaminahua taste terms, as well as their medicinal significance, are discussed in greater detail in the second half of this chapter.

Odor

Olfactory sensations arise when odorous compounds dissolve in the nasal mucosa and interact with cilia attached to nerve receptors. The physiological mechanisms are complex and poorly understood. Nerve impulses are processed both within and without the brain, making multiple connections with other sensory and cognitive pathways. Processing outside the brain takes place primarily in the olfactory bulb, sometimes referred to as the "primitive nose" due to its direct linkages with emotion and memory centers. The result is a complex processing of odor stimuli, drawing on other sensory information as well as on prior experience and expectations (Holley 1991). Culture is extremely important in shaping hedonic response to odors (Wysocki, Pierce and Gilbert 1991). Odors that might be considered unpleasant by many (e.g., manure) may have positive associations for some people depending on their experiences (e.g., spent their childhood on a farm). Many odors are significant within specific ritual contexts, or as

markers of social standing (Howes 1987). Odors are often tied intimately to memories (Lenti-Boero 1994).

The case for "odor primaries" is considerably weaker than that for taste primaries, due to the tremendous diversity of odors present in the environment and to the poorly understood nature of odor processing. Plato divided odors into broad categories of pleasant and unpleasant, conceding that "odours admit of no [true] classification, but are distinguished by their painful or pleasant [effect]" (Stratton 1917 cited in Doty 1991: 191). Linnaeus (1765) proposed a seven-category classification of odors (Table 5.2): Aromaticos (aromatic), Fragrantes (fragrant), Ambrosiacos (ambrosial, musk-like), Alliaceos (alliaceous, e.g., garlic, onion), Hircinos (hircine, goat-like), Tetros (foul), and Nauseos (nauseating). Following Aristotle, Linnaeus also recognized two broad, hedonic categories: *Odores suaveolentes* ("pleasant odors") and *Odores foetidii* ("fetid, unpleasant odors"). Fragrant and aromatic odors are considered pleasant, foul and nauseating odors are considered unpleasant, while ambrosial (musk-like), alliaceous (garlicky), and hircine (goat-like) odors are considered pleasant in some circumstances and unpleasant in others (Harper, Bate-Smith and Land 1968).

Table 5.2 - Eighteenth Century Odor Classifications (from Doty 1991: 192)

Author	Categories	Description, Examples
Linnaeus (1765)	1) Aromaticos 2) Fragrantes 3) Ambrosiacos 4) Alliaceos 5) Hircinos 6) Tetros 7) Nauseos	aromatic: laurel flower fragrant: jasmin, lillies ambrosial: amber, musk alliaceous: garlic, onion goat-like: cheese, sweat, rams foul: Solanaceae, coriander, some orchids, some bugs nauseating: putrid plants, rotten meat
von Haller (1756)	1) Suaveolontes 2) Medicae 3) Foetores	pleasant odors: flowers, musk intermediate: medicines, coffee unpleasant odors: feces, animal sweat, decaying corpse
Lorry (1785)	1) Camphoraceous	camphor

	2) Narcotic 3) Ethereal 4) Acid-volatile 5) Alkaline	opium ethyl acetate, acetone formic acid lime
Fourcroy (1798)	1) Weakly odorous compounds 2) Insoluble oils 3) Oils soluble in water or alcohol 4) Aromatics 5) Hydrogen sulfur compounds	faint, herb-like odors: herbs, grass weak odors: jasmin, daffodil fast-releasing odors: thyme, lavendar aromatic odors: vanilla, cinnamon, benzoin rotten eggs

Von Haller (1756), a contemporary of Linnaeus but unaware of his work, proposed a three-point classification of odors. *Suaveolentes* (pleasant), *Medicae* (medicinal), and *Foetores* (unpleasant). Lorry (1784/1785) and Fourcroy (1798) attempted to categorize odors based on classes of chemical compounds. Lorry's classification included camphoraceous, narcotic, ethereal, acid-volatile, and alkaline. Fourcroy's was the first to relate chemical properties (water and alcohol solubility of oils, hydrogen sulphur compounds) to odor quality.

Zwaardemaker (1925) elaborated on the work of Linnaeus and other eighteenth-century scientists, creating a more complex odor classifying scheme. He characterized nine general odor qualities, Linnaeus' six plus ethereal, balsamic, and empryreumatic (burnt), with more subcategories within some of them (see Table 5.3). Henning (1924) depicted odors in the form of a three-dimensional, triangular prism (Figure 5.1, adapted from Doty 1991: 193). The corners of the prism represent primary or salient odors: flowery, fruity, putrid, spicy, burnt, and resinous. All other odors are supposedly located along the edges or faces of the prism or within its space, such that their three-dimensional coordinates describe hypothetical relationships of distance and combination among the primary odors. The "odor prism" was an innovative conceptual tool and generated

testable hypotheses about relationships among odor qualities. Henning's predictions were never borne out by experimental evidence, however.

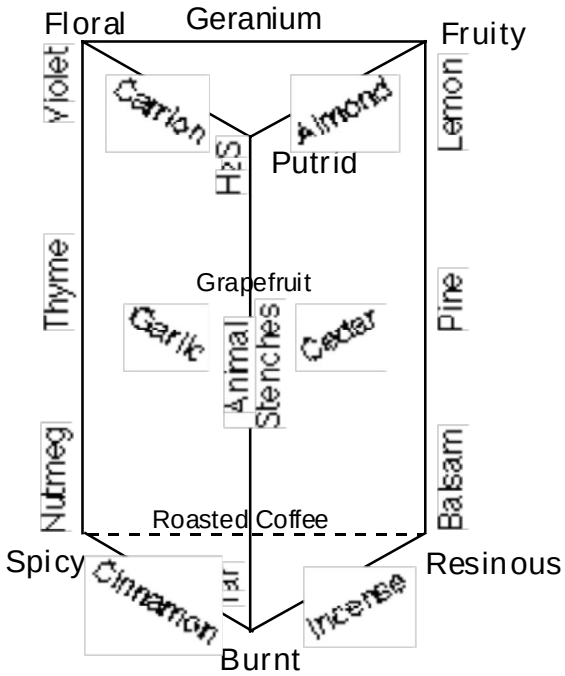
Crocker and Henderson (1927) devised a similar system, based on only four primary odors: fragrant, acid, burnt, and caprylic (goat-like). All odors were to be expressed as a four-digit number, in which each of the primary dimensions was rated on a scale of one to eight. Crocker and Henderson expressed the odor of vanillin is 7122 (seven units of fragrant, one of acid, two each of burnt and caprylic); rose oil was 7423; the licorice odor of anisole was 2577. This system, too, failed to produce consistent experimental results, as subjects assigned similar ratings to different odors, different ratings to similar odors, and failed to categorize the four primary classes into distinct groups (Doty ibid.: 192).

Table 5.3 - Twentieth Century Odor Classifications (from Doty 1991: 192)

Author	Categories	Description, Examples, Observations
Zwaardemaker (1925)	1) Ethereal	acetone, chloroform, ethyl ether, ethyl acetate
	2) Aromatic	
	a) camphorous	camphor, eucalyptol, pinene
	b) spicy	eugenol
	c) anisic	anisol, thymol, menthol
	d) citric	citral, geraniol
	e) amygdalate	almond-like: benzaldehyde, nitrobenzene
	f) others	laurel, resins, lemon, rose, cinnamon, lavendar, mint, marjoram
	3) Balsamic	
	a) floral	jasmine, orange blossom
	b) lily	ionone, violet root
	c) vanilla	
	4) Amber-musk	animal musk
	5) Alliaceous	
	a) garlic	acetyline, hydrogen sulfide, ethyl sulfide, mercaptan
	b) cacodyl	trimethylamine
	c) halogen	bromine, iodine
	6) Empryreumatic	burnt odors: roasted coffee, toasted bread, tobacco smoke, tar... napthalin, anilin
	7) Hircine	goat-like: caproic acid, fatty acids, cheese, sweat, bilberry, cat's urine, chestnut, barberry, vagina, sperm odor

	8) Repulsive 9) Nauseous	suffocating, narcotic odors: Solanaceae, coriander, some orchids, bugs rotten meat, indol, scatol, carrion flower
Henning (1924)	1) Floral 2) Fruity 3) Putrid 4) Spicy 5) Burnt 6) Resinous	Odor Prism: all odors related to the basic six in form of three-dimenstional prism.
Crocker and Henderson (1927)	1) Fragrant 2) Acid 3) Burnt 4) Caprylic	Four-Digit Scaling: all odors can be expressed as a four-digit number by assigning each of four dimensions a value (1-8).
Amoore (1970)	1) ethereal 2) camphorous, 3) musky 4) floral 5) minty 6) pungent 7) putrid	Specific anosmias thought to exist for each primary odor group.

Figure 5.1: Henning's Odor Prism



Amoore (1970) attempted to classify odors into seven primary types: ethereal, camphorous, musky, floral, minty, pungent, and putrid. An important innovation in his approach was an attempt to identify anosmias ("odor blindness," i.e., olfactory insensitivity caused by trauma or other pathology) to groups of odors, thereby relating primary odors to neurological pathways. Again, the approach met with many limitations, and now Amoore believes that if odor primaries exist at all, the number is much larger than seven (Doty ibid.).

In more recent studies, universal classification schemes have fallen out of favor. Instead, researchers have shifted their focus to the development of odor and flavor profiles for use by trained professionals in specific industrial settings, for example, in the evaluation of perfumes, food, drinking water, wine, and other commercial products (Doty 1991: 193). During the seventies and eighties, the French Perfumer's Society developed the following standard terms for describing perfume families: floral, chypre,

oriental/amber, aldehydic, green, citrus/cologne, spicy, fruity, floral, woody, sweet, animal, tobacco/leather, Fougère, and others (Jellinek 1992: 230). Jellinek (1992) proposes a classification of perfumes based on two principal axes (light/heavy; floral/less floral) and four derivative axes (fresh/sultry; exciting/soothing; narcotic/stimulating; erogenous/anti-erogenous) around which are located a number of specific perfume odors: floral, fruity, green, resinous, minty, spicy, woody, herbaceous, mossy, nutty, fecal, and honey-like (Figure 5.2, from Jellinek 1992: 240).

Figure 5.2: Jellinek's Perfume Classification

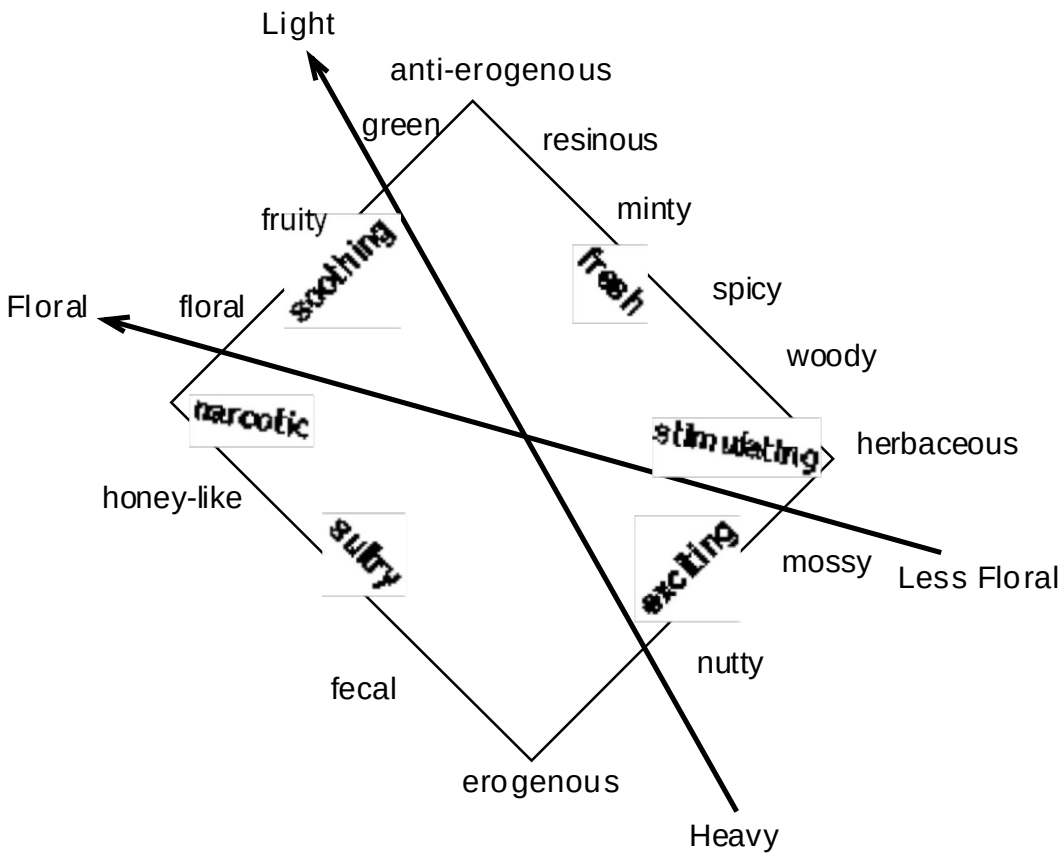


Table 5.4: Norwich Project Standard Odor/Flavor Evaluation Terms

ODORS:		
acid	fruity (citrus)	resinous
ammonia-like	fruity (other)	rubbery
animal	fresh	sharp
aromatic	garlic/onion	smoky
beery	greasy	soapy
broth-like	green	sour
burnt	hay-like	spicy
butyric	honey-like	sulphurous
camphor-like	malty	sweaty
cheesy	medicinal	sweet
diacetyl	metallic	tallowy
(dry/powdery)	meaty (raw)	toasted
earthy	meaty (cooked)	urine-like
estery	minty/peppermint	vegetable-like (raw)
etherish	musk/amber	vegetable-like (cooked)
faecal	musty	warm
fatty	oily	(watery)
fishy	petrol/solvent	waxy
floral	putrid	woody
fragrant	rancid	yeasty
TASTES:		
sweet	salt	
acid	bitter	
TACTILE:		
astringent	metallic	
cool/cooling	puckery	
warm	pungent	

During the mid-1960's, industrial researchers in England documented some 800 odor and flavor words in the English language, from which they selected a subset of 60 odor terms, 4 taste terms, and 6 tactile terms to be used as standards in odor/flavor evaluation (Harper 1977: 393-396; Table 5.4). In what came to be known as the Norwich Project, a group of fourteen diverse chemical odorants was selected to represent the most salient of the standardized odor terms: camphor, minty, woody, sweet, floral (three types), musk (two types), amber, fruity, and citrus. In a series of experimental trials, however, only four of the fourteen were consistently labeled with the expected odor terms by a group of professional food-tasters (Land, Harper and Griffiths 1970). The experiment demonstrated the highly subjective and variable nature of odor perception,

and the difficulty of arriving at intersubjectively (much less cross-culturally) valid standards of evaluation. As Harper (1977: 397) notes:

> Many odours seem to become more complex with experience and to become unique. Characterizing them in terms of a set of general qualities fails to give a complete picture and many odours are best described in terms of themselves.

Brett (1994: 128) notes that previous scientific odor classifications made broad, categorical statements about universally valid odor types, yet made frequent reference to culturally or geographically specific odorants, for example, "goat-like," "garlicky," and "camphor-like." Hedonic evaluation (pleasant vs. unpleasant) also figures prominently in scientific and industrial classification of odors. Brett describes Tzeltal Maya odor classification as being markedly different:

> Predominant odor words do not refer to <u>any</u> <u>thing</u>, but rather appear to be conceptual constructs which comprehend or include a variety of perceptually related odors. They are abstract concepts which contain within them any number of possible odors, but the labels identifying each category are not <u>likened</u> to anything (ibid.: 131).

A comparison with Matsigenka and Yora/Yaminahua odor vocabulary reveals a number of categories that match Brett's description, that is, odor terms that refer to abstract odor concepts without reference to any specific odorous substance. For example, the Yora/Yaminahua term *sasa* describes garlicky odors without having to mention a specific odorous substance. However Matsigenka equivalents *santarienka*, '<u>Cedrela</u>/peccary odor,' and *samperaenka*, '<u>Mansoa</u> odor,' communicate the same kind of garlicky odor by pointing to specific, garlic-smelling (by Western standards) plants and animals. The highly agglutinative nature of the Matsigenka language makes such terms extremely common, permitting a virtually unlimited number of specific odor formulations. Several other Matsigenka odor terms make reference to specific substances: 'heart odor' (*anigarienka*) describes blood or raw meat as well as certain rank plants; 'herb, leaf odor' (*inchashienka*) and 'tree odor' (*inchatoenka*) are used to indicate nondescript vegetative odors; *asuroenka*, 'bee-attracting odor' describes ripe fruits and flowers whose fragrance is perceived at a distance. The closest

Yora/Yaminahua equivalents to these terms are abstract concepts that refer to such odors without making reference to any specific object: wiya for blood or raw meat, axo for mild vegetative odors and ane or tokas for ripe or floral odors perceived from a distance. The Yora/Yaminahua term chiko describes the unpleasant odor of urine as an abstract concept without having to mentioning urine (iso). The Matsigenka would describe the same odor as tsinienka, 'urine odor.' Thus odor vocabulary in the Yora/Yaminahua language is generally abstract like in Tzeltal, and consists of simple, linguistically irreducible terms. Matsigenka odor vocabulary, on the other hand, is often comparative (e.g., "herb-like," "peccary-like") and is formed by agglutination of noun stems.

Second perhaps only to vision, olfaction is a crucial sense in Matsigenka and Yora/Yaminahua botany. Informants often smell the leaves or trunk slash before examining other vegetative features. The Matisgenka and Yora/Yaminahua seem to identify trees effortlessly with nothing more than a quick glance at the trunk, a machete slash and a sniff. Mostly following the lead of their indigenous and mestizo guides, some botanists working in Amazonia have come to appreciate odor as a useful character for plant identification. Gentry (1993: 4) provides a "special word of encouragement on the sense of smell" in his field guide to the woody plants of the Northwest Amazon, noting the importance of learning to discern "the sometimes rather faint odors that may be critical for recognizing tropical plants vegetatively." Unlike the Tzeltal Maya, odor is paramount in the way both the Matsigenka and the Yora/Yaminahua understand illness and plant therapy. W. Wilbert (1986, 1996) likewise discusses the importance of odor in Warao medical concepts, perhaps reflecting a pattern throughout much of lowland South America.

Table 5.5 - Selected Odor Vocabulary in Matsigenka and Yora/Yaminahua

	Matsigenka		Yora/Yaminahua	
Gloss	Name	Notes	Name	Notes
Fragrant	kasanka	"that which evaporates" i.e., volatile; usually pleasant; aromatic, fragrant, usually said of stem, leaves (not flowers, fruit); also any strong odor	ini	odorous; always pleasant; aromatic, fragrant, usually said of stem, leaves (not flowers, fruit)
Rank, musk	enkaga	odorous; pleasant to mildly unpleasant, especially animal scents; rank aromatic vegetative odors; also any strong odor	itsa	mildly unpleasant, especially animal scents; rank aromatic vegetative odors; garlic-like odors
Foul	shiti	usually unpleasant e.g. feces, rotten food; garlic-like odors; also any strong odor	pisi	usually unpleasant e.g. feces, rotten food; also any strong odor
Nauseating, unpleasant	N/A		chiko	not as unpleasant as pisi: urine, ferns
Garlicky	samperaenka, santarienka	" Mansoa odor," "Cedrela/peccary odor"; odors a European would describe as garlicky or onion-like	sasa	odors a European would describe as garlicky or onion-like
Blood, meat odor	anigarienka	"heart odor"; odor of raw or slightly rotten meat, blood, fish	wiya	odor of raw or slightly rotten meat, blood, fish
Intoxicating odor	kepigarienka	odor of known poisonous or hallucinogenic plants; also any overwhelming odor	N/A	
Herb, leaf odor	inchashienka	"herb, plant-leaf odor"	cf. axo	
Mild vegetative odor	N/A		axo	maize, legumes, semen
Ripe, floral, fragrant at a distance	asuroenka	bee attracting odor; fruits, flowers, strongly aromatic plants	cf. ane, tokas	
Ripe, floral	cf. asuroenka		ane	fruits, flowers, pleasantly aromatic plants (Piper)
Fragrant at a distance	cf. asuroenka		tokas	flowers, fruits, noted at a distance
Burnt, toasted odor	tagarienka, shinkorienka	e.g., recently burned garden soil, toasted manioc, smoked meat	nowe	e.g., toasted corn, termite nest, scorched animal fur
Unique odor	ashi oenkagake	"its own odor"	awe ini	"its own fragrance"

Odors tend to be more difficult to describe and communicate verbally than flavors, instead they have to be experienced directly to be understood. During botanical collections, my attempts to capture the essence of novel odors generated complex and sometimes bizarre descriptive phrases:

> For me, the smell is sort of sickly sweet, like maraschino cherries or jellied fruits (as in fruitcake, panetonne...candied melon)... I hate maraschino cherries!!! Why do so many things smell like maraschino cherries?! There is also a nauseating Lactarius or Russula [temperate mushrooms] that smells the same.
> --Gesneriaceae used by the Matsigenka to bathe babies.
>
> Intriguing, musty smell, definitely not pleasant, but the more you smell, the more you become intrigued. Somehow familiar, yet hard to finger: mildewy, turnipy.
> --Rubiaceae used by the Yora/Yaminahua as a love potion.
>
> Strong, pleasant, cinnamon-spicy hot smell.
> --Rubiaceae used by the Matsigenka as a cold remedy.
>
> Powerful fragrance, overpowering almond odor.
> --Bignoniaceae used by the Yora/Yaminahua as a perfume.
>
> Aromatic-turpentiny, musky, musty-perfumy smell. Soapy, definitely not almondy. Soapy, fragrant. Hard to describe.
> --Euphorbiaceae used by the Yora/Yaminahua as a perfume.
>
> Like furniture polish. Musty, unique smell.
> --Aristolochiaceae used as a fertility medicine by Yora/Yaminahua women.
>
> Very rank, skunky smell.
> --Rutaceae used by the Matsigenka as a medicine for hunting dogs.

Such examples underscore the difficulty inherent in describing odors, and the almost unavoidable reliance on familiar substances and emotionally-charged experiences to communicate these sensations. I made similar observations of indigenous informants' descriptions of odor categories. Before describing the odor of a novel plant or a spice in the taste/odor experiment, informants would often sniff and then concentrate for a few moments, seeking associations with something familiar: "it burns like chili peppers," "it is rank like barbasco fish poison," "it smells like Piper." Sometimes, especially among

the Matsigenka, informants would give up trying to classify the odor and conclude, 'it has its own unique odor' (M: ashi oenkage: Y: aweini).

In both languages, and especially in Matsigenka, odor terms show a certain degree of ambiguity. Depending upon context, a single odor term may refer to a pleasant fragrance or a foul stench. The same occurs in English. For example, the meaning of the phrase "What is that smell?" is ambiguous, depending on intonation, facial expression and other nonlexical cues. Such ambiguity occurs because many odor terms embrace simultaneously various dimensions of olfactory perception: presence/absence of any distinguishable odor, intensity (independent of other qualities), hedonic value (pleasant/unpleasant), similarity to familiar odors as well as specific chemosensory qualities (aromatic, pungent, rank, foul). Ultimately, contextual cues influence the meaning of all pharmacognostic assessments, especially odor vocabulary.

It is important to recognize that odor vocabularies do not consist of mutually exclusive categories, nor do they exhaustively classify the spectrum of odors in the environment. Rather, odor terms overlap one another in meaning and are discontinuous in their coverage of an idealized odor spectrum. Furthermore, odor terms are often associated either directly (linguistically) or indirectly (by association) with specific plants, animals or substances in the local environment.

At first, I had difficulty teasing apart context-dependent meanings in odor vocabulary, especially among Matsigenka informants. Some odor terms appeared to defy definition because their meanings varied from informant to informant and with the same informant in different contexts. The "best example" experiment, however, helped clear the air in this matter. While a given plant might be described by different informants with different odor terms, there was greater consistency in naming the "best example" of a given odor term both among informants of a given ethnic group and between ethnic groups (Appendix 2.3). In Matsigenka, the terms kasanka (glossed as 'fragrant') and shiti

(glossed as 'foul') can both be used to describe any strong odor, independent of its hedonic (pleasant/unpleasant) value. Feces might be described by some informants as pairo okasankatake, 'it is very fragrant, i.e., it smells strongly,' just as perfume plants might be described by some as pairo oshititake 'it reeks, smells strongly' (the Yora/Yaminahua would never describe feces as ini, 'fragrant,' though pisi, 'foul, strong-smelling' is sometimes used to describe pleasant odors). When giving examples of odors that are "best examples" of kasanka, however, Matsigenka informants always start by naming pleasant-smelling things, and when giving examples of odors that typify shiti, they always started by naming foul-smelling things (Appendix 2.3). Though the extended meanings overlap, the focal or prototypical meanings are more restricted. Such methods have been used in the study of ethnobiological categories and color classification (Berlin and Kay 1969; Berlin 1992). Based on the results of the "best example" experiment, I was able to establish a rough equivalence between many of the commonly used odor terms in the two languages. Several odor terms, however, have no close equivalent in the other language or in English.

The Matsigenka odor term kepigarienka, 'intoxicating odor,' illustrates the subjectivity and experiential basis of some odor vocabulary. Kepigarienka is used to describe the odor of known toxic or hallucinogenic plants. Ascribing this odor term to intoxicating plants requires knowledge of the plants' use category that precedes the physiological act of sensing and ascribing the odor label. Most Solanaceae share a characteristic, rank odor like that of tomato plants. The odor of ritually used narcotic and hallucinogenic Solanaceae (Brugmansia, Brunfelsia, Juanulloa) are described as kepigarienka. Other narcotics and toxic plants from different botanical families have diverse odors quite unlike Solanaceae, and yet are also described as kepigarienka, 'intoxicating odor.' Non-narcotic Solanaceae species, for example, the tomato-like Solanum sessiliflorum (cocona) and the garden weed Physalis (known in English as

‘ground cherry’), have rank, tomato-plant odors quite similar to those of solanaceous narcotics. I suggested to one Matsigenka companion that the odor was kepigarienka, ‘intoxicating odor,’ and he corrected me immediately: kepigarienka applies only to hallucinogens and poisons. The odor of garden weeds could only be described as tovaserienka, ‘weed odor,’ implying uselessness.

Both the Matsigenka and the Yora/Yaminahua formerly considered garlicky odors (M: samperaenka, santarienka; Y: sasa) to be unpleasant. Many Matsigenka and Yora/Yaminahua do not like the flavor/smell of garlic and onion in Peruvian cuisine, and claim it can cause illness in those not accustomed to it. Matsigenka shaman-healers are prohibited from eating garlic, as its unpleasant odor is said to frighten away the benevolent spirits (Saangariite) who serve as the shaman’s guides in the spirit world. Despite such attitudes, Matsigenka and Yora/Yaminahua who frequent Peruvian towns have come to appreciate the taste of garlic or onion in their food. By means of a gradual and prolonged exposure to novel cuisine, they “get used to” (M: irametempa) flavors/odors previously consider unpleasant, and come to consider them desirable and delicious. Both groups describe a similar process in getting accustomed to the use of commercially available salt in their food. In their early days of contact, they considered salty food to be ‘sour’ (M: kacho) or ‘bitter’ (Y: moka), but with time they have grown used to it.

The Yora/Yaminahua use dozens of species of ‘fragrant’ (ini) plants which are worn in bracelets around the upper arms and calves as form of body ornamentation. Perfume plants account for approximately 10% of all uses registered (see Figure 6.3). Fragrances ranging from almond to floral to musk and rank are thought to attract members of the opposite sex. Imitating the fragrance of the benevolent spirits, the Xoma, perfume plants also promote health and add to the joy of communal celebrations. Yora/Yaminahua informants are open and forthcoming about describing the sexual

significance of perfume plants. One afternoon during a lull in the "best example" experiment, a Yora woman smiled and began to sing this verse about the fragrant, balsam-like tree Amburana:

ako oa inini	Amburana is fragrant like a flower
awe raki xoroko	From where does its odor embrace me?
ea mãi imeti	Why does it envelope me?
ako oa inini,	Amburana is fragrant like a flower
tsika mawa inini	fragrant like the Vanilla pod

She explained that the song makes veiled reference to an extramarital lover, chai wene, literally 'distant man,' who is far away, perhaps gone to the forest on a hunting expedition or war party. The verse sums up the sensuality and sexual connotations of fragrant plants: the scent of Amburana reminds her of her lover's sweet perfume, makes her long for his fragrant embraces and arouses her with their secret passion.

The Matsigenka also recognize a number of 'fragrant' (kasanka) perfume plants, though they represent less than 1% of total registers (Figure 6.3). Unlike the Yora/Yaminahua, the Matsigenka are secretive about this knowledge. They usually speak of these plants only when no one else is near, for fear of being accused of practicing love magic. The Matsigenka claim that love magic is not a part of their traditional pharmacopoeia, but rather was introduced by foreign ethnic groups who historically acted as intermediaries for European economic interests. The same rival ethnic groups are blamed for the rising incidence of sorcery and other social and bodily ills. Publicly, many Matsigenka denounce the practice of love magic, claiming it can lead to heart palpitations and 'heart pain,' bad dreams and even insanity. Love potions depend on the strength of their 'intoxicating odor' (kepigarienka) to overwhelm the intended victim. The Matsigenka use a series of botanical antidotes to protect themselves and their spouses from the social and spiritual disturbances of such unwelcome passions. Some of these remedies appear to contain psychoactive compounds (Shepard 1998b). Despite negative

attitudes towards strongly fragrant and 'intoxicating' (*kepigari*) love filtres, the Matsigenka value more mildly fragrant plants used to protect newborn children.

Despite the culturally variable nature of odor vocabulary and attitudes towards odors, certain categories and organizational features stand out cross-culturally. Comparing Matsigenka and Yora/Yaminahua odor terms (Table 5.5) with various Western researchers' systems of odor classification (Tables 5.2-5.4) we notice many differences but also some similarities. Hedonic distinctions between pleasant (fragrant, aromatic) and unpleasant (foul, nauseating) odors are common to Western and Amerindian odor vocabulary. Linnaeus and other Western authors considered the pleasant odors (*Suaveolentes*) to be "to be kindly and desirable to our nerves and even to life itself," while the unpleasant odors (*Foetidi*) represent "that which is repellent to life" (Harper, Bate-Smith and Land 1968, cited in Brett 1994: 130). Similar attitudes are found in both Matsigenka and Yora/Yaminahua concepts of illness and medicinal plant efficacy, as discussed in the following chapter. Certain odor types and odorous substances appear to be salient in many cultures: flowers, ripe fruits, musk, burnt odors, rotten meat, feces. Although the Linnaean category *Alliaceos* (garlicky) would appear to be restricted to Western vocabulary, we find salient odor terms for garlicky plants Mansoa and Cedrela in both Matsigenka and Yora/Yaminahua. Sulfur-containing compounds such as found in garlic are widespread in nature, and are noticed and labeled by many cultural groups. Animal scents and musk odors are significant in many Western odor classifications (e.g., "hircine," "caprylic," "musk") as well as in Matsigenka and Yora/Yaminahua vocabulary (M: *enkaga*; Y: *itsa*). In discussing different Western systems of odor classification, Harper (1977: 396) states:

> A very similar pattern is obtained if all existing systems of odour classification are tabulated together -- No single quality runs through all the systems. No single system includes all the qualities. Differences may represent indiosyncracies of the individual who proposed the particular system... many of the proposed English flavour classifications are similar, but no single term is found in all, though many overlap.

Further cross-cultural research into odor classification could contribute to understanding universal and culturally variable aspects of olfaction.

Irritation

The trigeminal nerve system detects chemical and physical irritation throughout the face, especially in the eyes, nose and mouth. Specific receptors detect temperature (thermoreceptors), texture and pressure (mechanoreceptors), and pain (nocioreceptors) (Silver and Finger 1991). These sensations are registered and transmitted through a largely independent set of receptors from taste and odor, though ultimately they are incorporated as components of holistic flavors and smells. Unlike chemically specific taste and odor receptors that become habituated through prolonged exposure to a stimulus, trigeminal nerve receptors occur as free nerve endings, providing a quick, strong and prolonged response to offensive substances. Responses to trigeminal nerve stimulation are "among the strongest in the body" (Silver and Finger 1991: 104). The include reflex reactions such as sneezing, gagging, salivation, tear production, sweating and flushing of the face as well as instinctive withdrawal from the stimulus. Such reactions occur before the brain assigns a label to the stimulus: boiling water, formaldehyde or strong chili peppers are spat out reflexively before one is consciously aware of the stimulus. As adaptations, such responses ensure that noxious substances are quickly and automatically rejected and flushed out of the nose, eyes and mouth.

However, pain and pleasure can be linked through cultural as well as physiological mechanisms. Pungent condiments such as chili peppers and wasabe may produce an euphoric rush of endorphins, craved by habitual users (Rozin 1990: 258). Both ethnic groups value a number of noxious plants as purgatives, emetics and hallucinogens, and the Matsigenka in particular take interest in various toxic plant medicines. Bitter and other harsh medicines produce an unpleasant initial reaction followed by an improvement in health condition. The Matsigenka draw on personal

sensory experience of “painful” and other unpleasant substances to understand the efficacy of many medicinal plants. Some illnesses are conceived of as humanoid demons, vengeful animal spirits, biting insects or burrowing worms. Such anthropomorphized and zoomorphized illnesses instinctively withdraw from unpleasant stimuli just as humans do. Plants with strong chemosensory properties (pungent, caustic, bitter, astringent) are said to ‘cause pain’ (okatsitakeri) to illness agents, thereby killing them or forcing them to retreat. Through such cultural processes, many human societies have come to value seemingly noxious substances as condiments, food preservatives and medicines. The distinction between condiment, preservative and medicine is not always clear (Etkin and Ross 1982). Many condiments, for example, black pepper, may have served as preservatives as well as flavor enhancers in the days prior to refrigeration.

Table 5.6 - Irritation Vocabulary in Matsigenka and Yora/Yaminahua

	Matsigenka		Yora/Yaminahua	
Gloss	Name	Notes	Name	Notes
Painful, pungent (Y: also intoxicating)	katsi	painful i.e., pungent, also any unpleasant taste, especially bitter; strongly aromatic odors, caustic substances; also tingling sensation followed by anesthesia	pae	painful, strong i.e., pungent, also intoxicating; strongly aromatic odors, caustic substances; also poisons, hallucinogens
Stings, burns	otegaka	to burn by chemical means or by the sun; similar to katsi but more restricted	waka	to burn by chemical means or by the sun; similar to pae but more restricted
Irritating, urticating, itching	kaeni	chemical or physical irritants	xoai	chemical or physical irritants
Tingling, anesthetic	cf. katsi		asawanã	tingling followed by anesthesia
Toxic, intoxicating, emetic	kepigari	for hallucinogens, narcotics, poisons, emetics	see pae	

Matsigenka *katsi* and Yora/Yaminahua *pae* are common expressions in both languages, referring to substances characterized by pungency and other strong chemosensory, physiological, or spiritual properties. The basic meaning of *katsi* in Matsigenka is "painful"; the verb root *-katsi-* means "to hurt, to cause pain." The basic meaning of *pae* in Yora/Yaminahua is "strong, painful," referring to strong pain, strong illness, and strong chemosensory or spiritual properties. The Yora/Yaminahua term *isi*, 'painful,' is close in meaning to *pae* but refers to simple pain or illness and is not used to describe chemosensory properties. As discussed in Chapter 4, many illness terms in both languages incorporate the noun 'pain' (M: *katsi*; Y: *pae*, *isi*), since pain and illness are closely associated. As pharmacognostic terms, *katsi* and *pae* include 'painful' chemosensory stimuli. The English word 'pungent,' derived from Latin *puncere*, 'to prick, stab,' is semantically close, but 'painful' is a more literal translation of the indigenous terms. Both Matsigenka and Yora/Yaminahua informants affirm that *katsi/pae* substances induce reflex actions such as sneezing, flushing of the face, sweating, tears in the eyes, a surprised or pained facial expression, and an instinctive withdrawal from the stimulus. One Yora/Yaminahua informant stated that "*pae* frightens, surprises" (*pae mesetiro*). This suite of chemosensory and physiological reactions is consistent with the phenomena of trigeminal nerve stimulation. The fact that both the Matsigenka and Yora/Yaminahua use vocabulary associated with 'pain' to describe pungent substances is also consistent with the physiological importance of pain receptors (nocioreceptors) in the trigeminal system. The terms *katsi* and *pae* can be used to describe tastes, odors and chemical irritation as well as to pain and illness. The Yora/Yaminahua term *pae* has a more extended range of meaning, referring also to poisonous, intoxicating, and hallucinogenic substances as well as strong spiritual properties.

Both languages have terms that refer to the stinging or burning produced by pungent substances (and the sun) on skin, eyes or mucous membranes (M: otegaka; Y: waka). Similar to katsi/pae, these terms are used in a more limited sense to refer to the actual sensations associated with pungency, rather than the substances that produce it. Both languages have terms referring to irritating or urticating substances (M: kaeni; Y: xoai), derived in both cases from the verb 'to itch.' The same terms are used to name skin conditions that produce irritation, inflammation, burning and itching (see Table 4.8). The Yora/Yaminahua term asawanã is used to describe the specific sensation of tingling or stinging on the tongue followed by numbness, much like that produced by chewing whole cloves. The Matsigenka include this sensation under the category katsi, 'painful.'

Sensory Categories in Matsigenka and Yora/Yaminahua Pharmacognosy

As I use the term here, "pharmacognostic property" refers to any characteristic of plants or other substances that serve as a cue to their therapeutic uses in a given ethnomedical context. These include, but are not limited to, chemosensory evaluations such as taste and odor. It is important, though not always easy, to distinguish between primary pharmacognostic properties, those properties directly related to therapeutic efficacy, and other identifying features that may distinguish a given medicinal species without bearing a direct relation to efficacy. For example, if two closely related bitter species have different leaf shapes, and only one species is used medicinally, leaf shape may be a secondary character while bitterness is the primary pharmacognostic property. In some cases, however, leaf shape might also be perceived as a pharmacognostic property through mnemonic association. For example, in choosing among bitter Menispermaceae lianas for treating leishmaniasis, the Matsigenka select species with somewhat lanceolate leaves, avoiding species with round leaves. They state that the round leaf has the same shape as the leishmaniasis lesion, and would cause the lesion to grow rather than curing it.

The broad range of properties I encountered in Matsigenka and Yora/Yaminahua pharmacognosy presented a challenge to the regime of data collection and to the development of the classificatory scheme elaborated in this chapter. At the outset of the project, my focus was on chemosensation, that is taste/odor classification, following Brett (1994) and also reflecting a culturally biased assumption that medicines would be identified and evaluated primarily by chemical cues. I initially divided plant properties in the database among three categories: taste, odor and "other," with the assumption that "other" would be a relatively small group. This initial classification proved unwieldy because "other" came to include a large number of diverse and dissimilar properties: visual characteristics (color, shape), tactile features (slippery, abrasive) and overall toxic effects (emetic, hallucinogenic). For these reasons, I expanded the investigation from a more restrictive focus on chemosensation to include pharmacognostic properties in a broader sense. While recognizing the incomplete separation between taste, odor, irritation and other sensations, I found it analytically useful to classify pharmacognostic properties according to the main sensory modalities involved in their perception. Taste, odor and irritation have been described by physiologists as representing distinct modes of chemosensory perception, and the indigenous vocabulary largely supports this finding. For these reasons, I have adopted the categories "Taste," "Odor" and "Irritation" in the subsequent analysis. In addition to chemosensory properties, visual and tactile cues are also significant in the pharmacognostic vocabulary of the two groups. These two properties are combined into a single category, "Visual-Tactile," because several common terms such as 'spiny,' 'bristly' and 'sticky latex' refer to visual and tactile features simultaneously.

Left-over terms include descriptions of toxicity such as "emetic" and "toxic," referring to the gross physiological effects of plants upon ingestion or administration, usually based not on direct sensory evaluation at the time of plant collection but rather on

memories of past experience or secondhand knowledge. These terms are included with the category of "Irritation" due to the broad meaning of the term pae ('strong, painful, pungent, intoxicating') in the Yora/Yaminahua vocabulary. Hearing is the only modality of sensation that is not particularly significant in either group's assessment of medicinal plants. Nonetheless, hearing is perhaps the most important sensory modality for shamanism, since healing power comes mostly from songs. Also, both groups listen to the orange cup fungus (probably Pizeza) to predict rainstorms. When crushed and held close to the ear, the fungus sometimes produces a crackling or popping sound said to be an omen of coming rains.[9]

Table 5.7 - Selected Visual-Tactile Vocabulary in Matsigenka and Yora/Yaminahua

	Matsigenka		Yora/Yaminahua	
Gloss	Name	Notes	Name	Notes
Red, blood-colored	kirajaama, jiraatsi	together with potsitaama (below), the only visual-tactile property commonly assigned to medicines; for illnesses associated with blood	õshi, imi keskara	commonly ascribed to medicinal plants; for illnesses associated with blood
Dark liquid	potsitaama	similar to kirajaama; also used to describe plants that form a dark, protective film over wounds	ene chexe	similar to above, also for plants forming blakish liquid when mixed w/ water
Spiny	aityo otsei	not common, when occurs, often in combination with some other chemosensory property (e.g. bitter taste): for heart pain	moxaya, mitsisya	very common; for illnesses associated with wasp spirits
Bristly, pilose, urticating	kepiri	not commonly ascribed to medicines, more often, a property to avoid for fear of causing rashes to infants	xopoya	commonly ascribed to medicines; for treating rashes believed to be caused by millipedes (xako), worms (nõwi)
Latex	aityo okashi	important for plant identification, but not commonly ascribed to medicines	wepoya	commonly ascribed to medicines; for treating rashes believed to be caused by millipede (xako), worms (nõwi)

Cool	katsingaama	infrequent, mostly plants with watery latex, used for treating cough or eye infection; not associated with humoral model of illness	matsi	not commonly ascribed to medicines

The chosen classificatory scheme reflects both common sense and scientific research on the subject, and also draws upon field observations: informants would sometimes point to certain body parts (tongue, nose, eyes, skin) when describing the locus of sensation for certain pharmacognostic terms. The chosen classificatory scheme also proves to be useful in the cross-cultural comparison of pharmacognosy. As illustrated in the following figures and discussion, the Matsigenka and Yora/Yaminahua show marked differences in the relative importance of taste, odor, and other categories of sensation in their evaluation of medicinal plants.

Collections Database

A total of some two thousand plant vouchers were collected in the various study communities, including medicinal as well as edible and other useful or named plants. In the present study, I am concerned only with the medicinal plants encountered or collected. As discussed in Chapters 3 and 4, the cultural categories of 'medicine' (M: ampi; Y: rao) and 'herb' (M: inchashi; Y: nisa) in both languages are included within complex cultural conceptions of well-being. Medicines (sensu latu) may address social and spiritual problems as well as bodily ailments. For each medicine collected for botanical identification, I noted the use category, mode of preparation/administration, and sensory properties.

The fundamental unit in the data analysis of this and the following chapter is the plant/use pair. In the figures, the following conventions will be used to refer to the size of the data set. "Plant Collections" refers to botanical voucher specimens of medicinal

plants collected in the field and stored in herbaria for botanical identification. Multiple collections of the same plant species are counted separately. A total of 430 medicinal plant voucher specimens were collected with Matsigenka informants of all study communities. A total of 461 medicinal plant voucher specimens were collected with Yora/Yaminahua informants. After I had collected a given species frequently (more than about seven times) with informants of either ethnic group, I stopped collecting voucher specimens unless they were particularly useful for herbarium work (i.e., having fruits or flowers). Nonetheless, I noted the local names, botanical identification, and full ethnobotanical information. "Plant Encounters" refers to all medicinal plants observed and noted in the collections notebooks, including those collected as voucher specimens and those noted but not collected. The total number of medicinal plant encounters was 477 with Matsigenka informants and 513 with Yora/Yaminahua. Some plants have multiple medicinal uses, especially among the Matsigenka. For purposes of data analysis, multiple medicinal uses of a single plant collection were registered and counted as separate plant/use pairs or "Registers" (see Figures 5.3-5.8). A total of 740 plant/use pairs were registered among the Matsigenka, and 538 plant/use pairs were registered among the Yora/Yaminahua.

The fact that the Matsigenka ascribe multiple medicinal uses to many plants and the Yora/Yaminahua do not appears to be a result of differences in the two groups' models of illness and plant efficacy. For the Matsigenka, many plants are selected according to strong chemosensory properties (bitter taste, pungency, strong odor, etc.) that expel illness. A single chemosensory property such as bitterness is considered efficacious in treating a number of illnesses, especially skin conditions and gastrointestinal conditions. Plants that sting the eyes are efficacious in controlling headaches, eliminating bad dreams and improving hunting skill. In the Yora/Yaminahua homeopathic model of illness ("like treats like") relationship between medicinal plant and

illness is more specific: the plant both causes and cures a given illness. The efficacious property is usually indicated by the visual qualities of the plant, qualities that suggest only a single kind of illness or a limited class of illnesses. Multiple medicinal uses of a single plant species among the Yora/Yaminahua are thus more rare, though they do occur. For example, xako rao, 'millipede medicine' (Asclepiadaceae and Apocynaceae) treat itching in the throat as well as skin infections, both believed to be cause by the xako millipede.

Sensory Properties

Figure 5.3 compares the sensory categories attributed by Matsigenka and Yora/Yaminahua informants to medicinal plants registered. This and subsequent figures illustrate graphically the similarities and differences in the way the two cultural groups employ various sensory modes and properties to assess medicines. Properties displayed on the left side of the graph are those mentioned more by the Matsigenka than the Yora/Yaminahua, and those on the right are vice-versa. Those in the middle are properties mentioned consistently by both groups. One could look at these histograms as a sort "graphic equalizer" contrasting the sensory perceptions of medicines by the two groups. As illustrated, the Matsigenka place a strong emphasis on taste (22% of encounters) and irritation (25%) in assessing the efficacy of medicinal plants, whereas the Yora/Yaminahua rarely note these aspects (less than 5% each). Both groups emphasize odor in assessing medicinal plants (34% for the Matsigenka, 41% for the Yora/Yaminahua). The Yora/Yaminahua pay more attention to visual and tactile properties (32%) than do the Matsigenka (13%). Less than 5% of Matsigenka medicines were ascribed "inherent medicinal property" with no stated sensory quality, compared with 18% for the Yora/Yaminahua.

Figure 5.3: Sensory Properties of Medicinal Plants

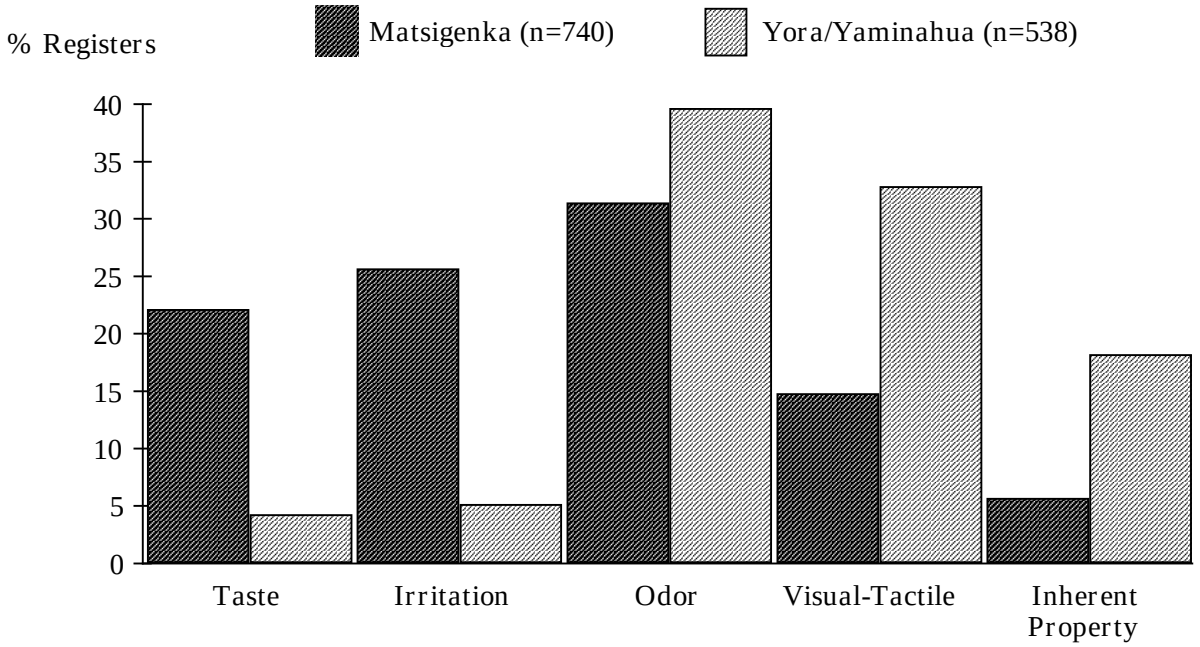


Figure 5.4: Mode of Administration

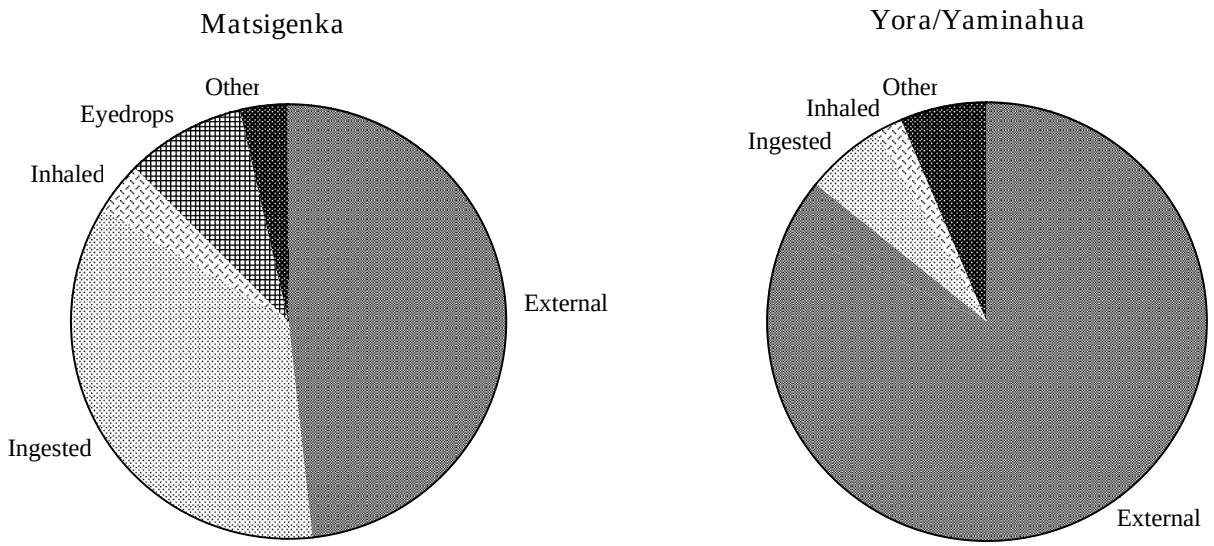


Figure 5.5: Taste Assessment of Medicinal Plants

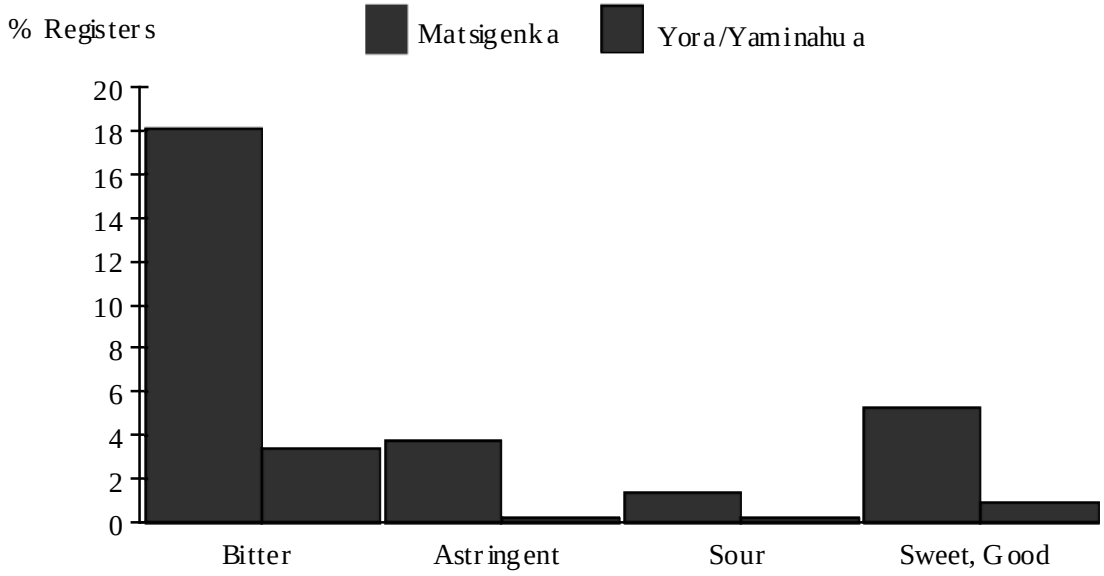


Figure 5.6: Irritation Assessment of Medicinal Plants

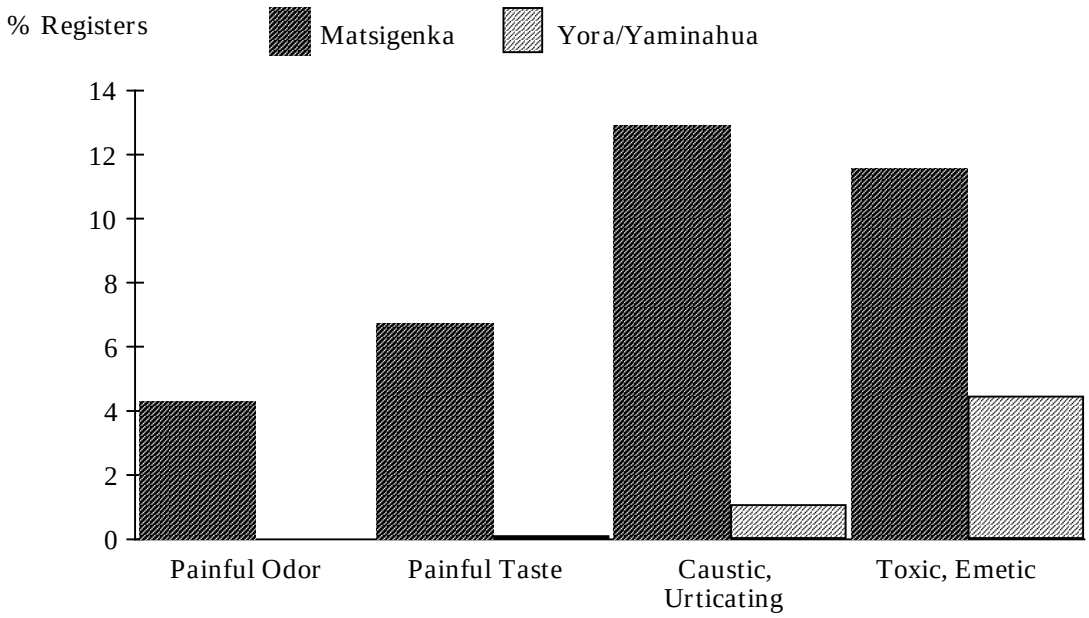


Figure 5.7: Odor Assessment of Medicinal Plants

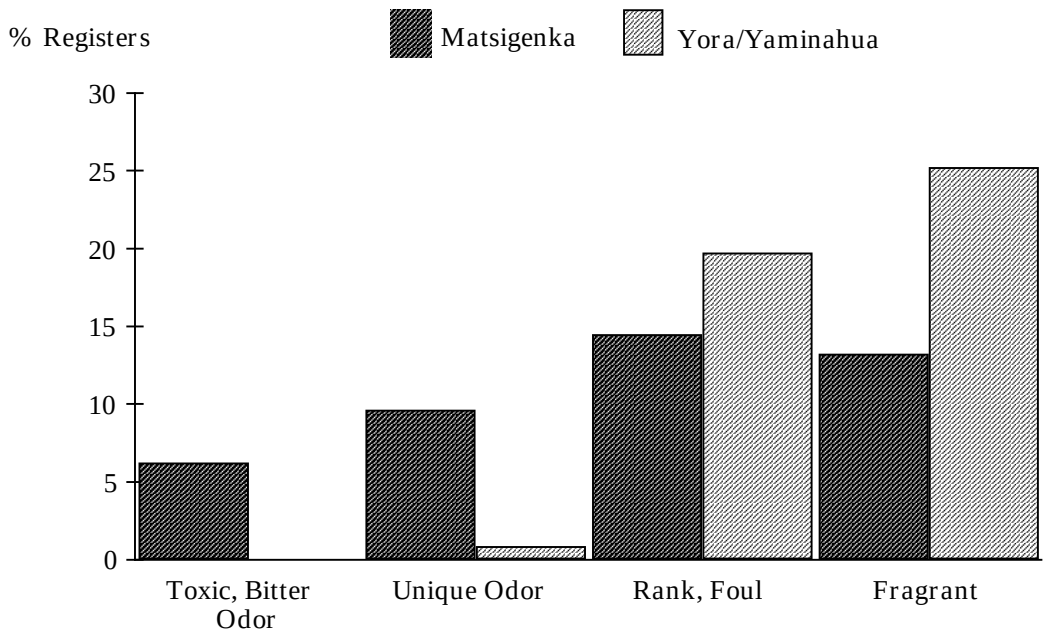
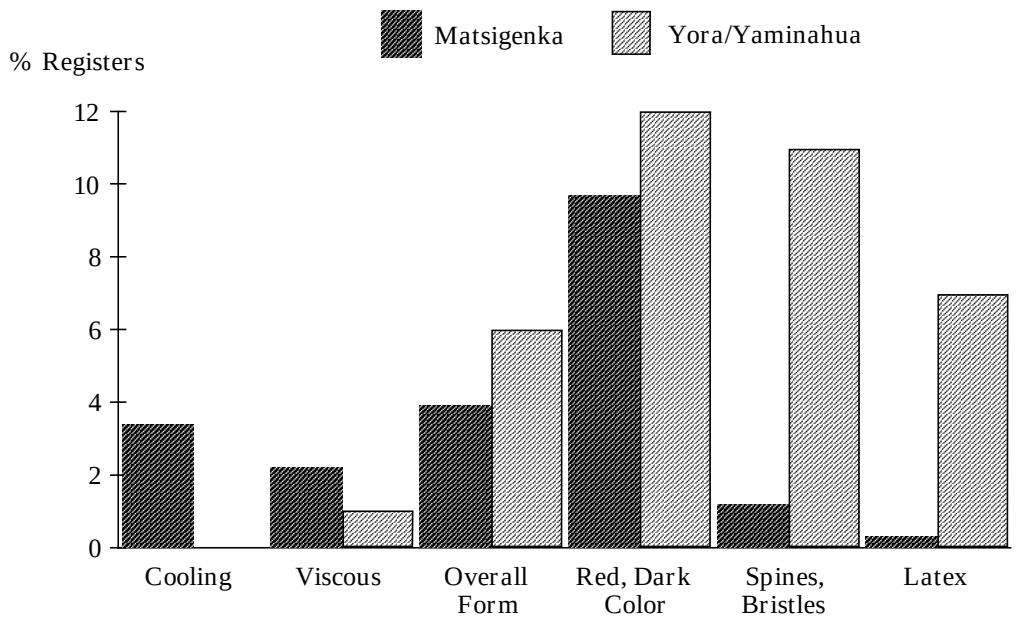


Figure 5.8: Visual-Tactile Assessment of Medicinal Plants



Mode of Administration

The contrasting emphasis on different sensory modes in the two groups is consistent with differences in the mode of administering medicines (Figure 5.4). Tastes were attributed to less than 5% of Yora/Yaminahua medicines, and only 6% of Yora/Yaminahua medicines are ingested orally. Taste and chemical irritation (including pungent taste/odor) account for a much greater proportion of Matsigenka medicines, and not surprisingly 35% of Matsigenka medicines are ingested. Most Yora/Yaminahua medicines (82% of encounters) are applied as compresses, baths, perfumes and other external applications. Such external applications are also important among the Matsigenka, accounting for just under half of plants encountered. Plants applied to the eyes (somewhat intermediate between external and internal administration) account for another 9% of Matsigenka plants. Both groups use a smaller number of plants as inhalants, also intermediate between ingestion and external application.

Taste

Bitter taste (including 'astringency') accounts for 18% of all Matsigenka medicines encountered (Figure 5.5), making it the single most frequently encountered pharmacognostic property for this group. Extremely bitter plants are considered too toxic to ingest, but are typically applied externally to treat skin lesions such as leishmaniasis. Moderately bitter plants are often taken orally as warm infusions to treat gastrointestinal conditions or as emetics to expel illness-causing substances or spirits. Bitter plants are considered too toxic for young children to ingest in the treatment of gastrointestinal conditions, so sour or sweet plants are given to them instead.

Because the Yora/Yaminahua do not commonly ingest medicinal infusions, they are unaware of and indifferent to the taste of most medicinal plants. For example, both the Matsigenka and the Yora/Yaminahua use the strychnine-containing plant *Strychnos*

tarapotensis medicinally. The plant is quite bitter, and the Matsigenka use it to treat diarrhea and intestinal worms. The Yora/Yaminahua use the plant as a warm bath given to babies to ensure they grow up strong and healthy. Though it is occurs commonly and is known by many Yora/Yaminahua informants, none were aware of its taste. When I tried to demonstrate the bitter flavor, one Yora/Yaminahua informant remarked, somewhat nonplused, "It is used to bathe babies. Why taste it?"

Irritation/Toxicity

Under the category of irritation (including toxicity; Figure 5.6), a similar allopathic tendency is found in Matsigenka medicine. The Matsigenka use 'painful' (pungent) tasting plants to treat toothache, and use plants with 'painful' odors to treat respiratory conditions. The Matsigenka also value plants that irritate the skin and eyes in order to treat skin conditions, eye infections and to improve the aim and stamina of hunters (Shepard 1997, 1998). Emetics, toxic and hallucinogenic plants are thought to expel illness-causing spirits from the body and purify the soul (Shepard 1998). The Yora/Yaminahua use a considerably smaller number of pungent, caustic, emetic, and hallucinogenic plants. One species of emetic is taken by Yora/Yaminahua women in order to purify the body and thereby 'fatten up.' Several hallucinogenic plants are used by shamans in healing ceremonies. These few species account for all encounters of 'bitter' as a pharmacognostic property (Figure 5.5) for the Yora/Yaminahua. Though a few bitter and emetic plants are recognized by the Yora/Yaminahua, it is clear that the Matsigenka place a greater overall emphasis on such plants.

Odor

Odor is important to both the Matsigenka and the Yora/Yaminahua in identifying and evaluating all plants. When examining a plant, medicinal or otherwise, informants from both groups typically examine the leaves or trunk first, and then smell the trunk

slash or crushed leaves. Only if visual and olfactory examination are inconclusive will a Matsigenka informant carefully taste a small portion of the plant to continue the identification process. In addition to its importance in botanical identification, odor is also important in both groups' understanding of the efficacy of medicines (Figure 5.7). Consistent with their appreciation of toxic plants as medicines, the Matsigenka describe several medicinal plants as having 'intoxicating' or 'bitter' odors. Both groups value a number of medicinal plants for their rank, aromatic or fragrant odors. Matsigenka hunting dogs are treated in the nostrils with a mixture including rank, musk-smelling plants (notably Icacinaceae, Proteaceae and Rutaceae) in order to improve their sense of smell and courage when hunting. Fragrant and aromatic plants, especially the sedge *Cyperus* and numerous Myrtaceae, are valued by the Matsigenka for bathing infants. In accordance with allopathic Matsigenka theory, the powerful aroma of these plants is thought to overwhelm and repel the foul smell of demons, animal spirits and illness vapors that attack young children.

Both groups use a number of fragrant plants as love charms to attract members of the opposite sex. The Matsigenka, however, are secretive about such knowledge, and publicly denounce love charms due to the health problems and social disturbances they cause. The Yora/Yaminahua, on the other hand, are open about the use of love charms as a normal part of body adornment and social interaction. The Yora/Yaminahua use more than thirty species of plants as body perfumes and adornments, displayed prominently in bracelets worn around the upper arm. The pleasant odor of these plants is thought to attract members of the opposite sex, dispel unpleasant body odors and enhance social interactions by imitating the *Xoba*, fragrant and benevolent spirits of the sky. Both the Matsigenka and the Yora/Yaminahua believe in the power of fragrant plants as love potions to attract members of the opposite sex.

Odor is especially important in Yora/Yaminahua understandings of illness, efficacy and well-being. Several kinds of gastrointestinal illnesses are believed to be caused by unpleasant odors, for example, that of urine, feces and scorched animal fur. The understory fern *Adiantum* is said to have a slightly foul smell, like the 'stench of urine' (*iso chiko*) The plant is used as a warm compress to treat a form of stomachache caused by inhaling the stench of urine. This is an example of the homeopathic rationality typical of Yora/Yaminahua constructions of efficacy.

Visual and Tactile Properties and the "Doctrine of Signatures"

Visual and tactile properties can indicate therapeutic power in both Matsigenka and Yora/Yaminahua medicine (Figure 5.8). Both groups value a number of plants with red latex or juice in the treatment of illnesses associated with blood: bloody diarrhea, menstrual or birth hemorrhages and wounds or cuts. Many of the plants assigned a visual/tactile property by the Matsigenka are also assigned a taste property. For example, the leguminous liana *Machaerium cuspidatum* has 'bloodlike latex' but is also 'slightly bitter/astringent,' and is used to treat bloody diarrhea. In contrast, many Yora/Yaminahua medicines have a visual or tactile cue as their only pharmacognostic property. Several Gesneriaceae species with pink, eye-shaped leaves are used to treat eye infections ("pink eye") because of their suggestive shape and color. A number of latex-containing plants are believed to both cause and cure diarrhea: the watery latex is associated with watery diarrhea. Such a symbolic association does not necessarily rule out the empirical efficacy of the plants. Only a small subset of possible latex-containing plant families are represented among Yora/Yaminahua diarrhea remedies, particularly the Apocynaceae, Asclepiadaceae, Caricaceae and Moraceae, families known for pharmacologically active medicinal plants such as rosy periwinkle, milkweed, papaya and Ficus. Several important latex-containing families, for example, Clusiaceae, Sapotaceae and Euphorbiaceae, are not used as diarrhea medicines by the Yora/Yaminahua. Thus the presence of latex is a

necessary but not sufficient condition for use in treating diarrhea. In orally transmitted traditions, especially those subject to severe external pressures, such mnemonic devices may be important in the transmission and maintenance of medicinal plant knowledge. Plants that are both efficacious and easy to remember are more likely to be maintained in the pharmacopoeia.

Some twenty species characterized by spines or prickles are used by the Yora/Yaminahua to treat inflammatory skin conditions, swollen lymph glands, headache, toothache, 'heart pain,' and other illnesses characterized by fever, pain and inflammation. Such symptoms are associated with those of wasp stings, and are blamed on malevolent wasp spirits. Spiny plants are associated symbolically with wasps, and are therefore considered efficacious for these illnesses.

The attribution of therapeutic power to plants according to the "doctrine of signatures" is generally dismissed by Western science, considered an example of irrational or magical thinking. Such plant uses are often ignored by pharmacologists who study the bioactive properties of plants. For example, in a recent ethnobotanical survey of medicinal plants in Bolivia, plants with a stated or even inferred "doctrine of signatures" type of use (e.g. all red plants) were given a low ranking by the authors for their potential in pharmacological screening (Barford and Kvist 1996). The assumption behind this rejection is that a symbolic association between a plant's form and its use constitutes unscientific reasoning and thus invalidates any empirical efficacy. Yet as Etkin (1986) suggests, red color may be an accurate indicator for specific kinds of bioactive compounds. Furthermore, mnemonic associations are significant in the retention of orally transmitted knowledge, and may also shape the process of medicinal plant discovery. Thus experimentation with plants is guided by multiple principles, and is not merely a random sampling of plants by "trial and error."

Inherent property

A significant number of plants registered with Yora/Yaminahua informants (18%) were ascribed no sensory property (Figure 5.3). Informants stated that these plants were medicines by virtue of an inherent medicinal property that was not manifest in any stated sensory quality. During my early collecting expeditions with Yora/Yaminahua informants, some responded to my insistent questions about taste/smell properties of medicines with the exasperated observation, "No taste! No smell! It's just a medicine!" In many cases, recognizing the plant visually and knowing its name (heart pain plant, cough plant, millipede plant) is an automatic indication of its medicinal use. The name itself reflects the plant's inherent medicinal property, without need to mechanically assess additional sensory properties such as taste or odor. Many of the plants registered in the category "Inherent Property" indeed have visual/tactile properties such as spines, red color, etc. that were not mentioned by the informant in question, but were mentioned by other informants in separate encounters of the same plant species. The visual or inherent association between a plant and its medicinal use are so obvious to the Yora/Yaminahua that they often feel no need to justify or articulate that association by invoking particular sensory qualities. 'Stomach medicine' (*xakimeranoa*) treats stomachache because that is its inherent property, no further explanation is required.

Chemosensory Vocabulary

Up to this point, I have approached sensory vocabulary in rather general terms. Here, I analyze in greater detail the sensory terms in Matsigenka and Yora/Yaminahua that are relevant to the evaluation of medicinal plants. The discussion is organized according to the stated categories of sensation: taste, irritation, odor and visual/tactile properties. Vocabulary items within each category are presented roughly in order of overall frequency in the collections database, with more frequently encountered terms treated first. Each entry begins with a simplified English gloss (one word, where

possible) of the native vocabulary. Glosses are used throughout the text in single quotation marks, with the understanding that they are adopted for the sake of convenience. The use of simplified glosses suggests neither equivalence with English nor exact equivalence between paired terms from the two indigenous languages. Following the simplified English gloss are listed the indigenous vocabulary items in the two languages that most closely correspond to one another. Some vocabulary items have no equivalent in the other language, and are treated separately. However most terms show enough similarity between the two languages to be considered approximate glosses of one another, if not exact equivalents. Matsigenka vocabulary is marked by the initial "M" and Yora/Yaminahua vocabulary by "Y." Alongside each native vocabulary item is a more thorough list of possible glosses or definitions in English where necessary. Then follows a detailed discussion of the range of sensations described by each term, highlighting both similarities and differences between the Matsigenka and Yora/Yaminahua vocabulary. I summarize data from the taste/odor experiment (Appendices 2.1 and 2.2) for each term, showing how the two groups used their native vocabulary to evaluate novel herbs and spices. Drawing on the "best example" experiment (Appendix 2.3), I identify locally occurring medicinal and other plants that exemplify each sensory term for the two indigenous groups. Drawing on the botanical collections database, I provide evidence of the relationship between specific sensory qualities (Figures 5.3-5.8), therapeutic uses and the perceived efficacy of medicinal plants.

TASTE VOCABULARY

Bitter

M: *kepishi* -- 'bitter, bitter-astringent'

Y: *moka* -- 'bitter, bitter-astringent, excessively salty'

As used by the Matsigenka, *kepishi* is similar to 'bitter' in English. In Yora/Yaminahua, *moka* refers focally to bitterness much as in English, but is also used to

describe the unpleasant taste of excessive salt (the Matsigenka use kacho, 'sour,' to describe excessive salt). Informants from both groups typically described the taste of bitterness by giving examples of bitter-tasting plants. Matsigenka informants also mention the gallbladder of mammal species as being a good example of bitter taste. Bitterness is perceived by both groups as being an unpleasant taste. The Yora/Yaminahua, for example, frequently use the compound expression moka chaka, 'bitter-bad.' This attitude is underscored by both groups with a look of pain on the face when describing or tasting bitter substances. In both groups, bitterness is considered to be akin to 'painful' (katsi/pae). Despite unpleasant connotations, the Matsigenka value many bitter plants for medicinal use. The Yora/Yaminahua, in contrast, show little affinity for bitter taste in their medicines.

In the taste/odor experiment (Appendix 2.1), instant coffee powder was consistently described as kepishi/moka by most Matsigenka and Yora/Yaminahua speakers. In addition, a majority of Matsigenka informants described catnip as kepishi. No Yora/Yaminahua speakers gave a taste description for catnip, an example of a general trend among Yora/Yaminahua speakers to be less enthusiastic than the Matsigenka about evaluating the taste of plants. Two Yora/Yaminahua speakers describe salt as moka ('bitter') or moka wata ('bitter+sweet'), illustrating their use of moka to refer to excessive saltiness.

In the "best example" experiment (Appendix 2.3), all seven Matsigenka informants mentioned two or more medicinal plants as being good examples of the property kepishi. Five informants mentioned one or more plants used in the treatment of skin conditions, and three informants mentioned one or more plants used in the treatment of gastrointestinal conditions. Four of seven Matsigenka informants independently mentioned Curarea (the botanical source of curare), an extremely bitter liana of the Menispermaceae used as a topical treatment for the skin lesions of leishmaniasis. One

common Matsigenka name for this plant is *kepishirori* 'the bitter one,' an indication that it is a prototypical example of bitter taste for the Matsigenka.

Two informants independently mentioned as a good example of *kepishi* a Paullinia species taken internally to treat gastrointestinal conditions and 'heart pain'. This plant is known as *yairipini*, 'bumble bee plant,' due to the belief that 'heart pain' is caused by a malignant spirit, the 'chief of the bumble bees,' *itinkami yairi*. 'Bumble bee plant' contains a bitter chemical principle that, taken internally, is thought to poison and expels the bumble bee spirit from the body. In high doses, this Paullinia species acts as an emetic.

Both Matsigenka and Yora/Yaminahua informants mentioned Cedrela and Guarea, lumber trees in the mahogany family, as good examples of 'bitter.' Guarea is boiled and taken internally by both groups as an emetic and tonic. Cedrela, far too bitter to ingest, is steeped in water and applied externally for fungal skin infections.

In the ethnobotanical collections, 135 of 740 (~18%) medicinal plants registered were attributed bitter taste (Figure 5.5), making it the single most frequently attributed pharmacognostic property for the Matsigenka. Bitterness and other toxic properties are fundamental to the Matsigenka's allopathic theories of efficacy. The verbal form of *kepishi* is used to explain the medicinal efficacy of bitter plants. Applied externally, bitter plants 'embitter the worms' (*okepishitakeri tsomiri*) believed to cause skin diseases. Taken internally, bitter plants 'embitter the intestines' (*okepishitake iramporetsa*) and kill the microscopic or macroscopic worms that cause gastrointestinal conditions. Bitter plants can 'embitter the body' (*okepishitake ivatsa*) and render it inhospitable to the malevolent spirits that cause illness, or can provoke vomiting and purging to cleanse the body and soul of harmful spiritual or physical impurities. Like 'painful' (*katsi*) plants, bitter plants are said to 'sting' (*otegakeri*), 'hurt' (*okatsitakeri*), kill and expel illness from the body.

Bitter plants used internally are typically boiled and drunk as warm infusions, once daily for a maximum of three consecutive days. Bitterness goes hand in hand with toxicity, and proper dosage as well as mode of administration are crucial for achieving the desired medicinal outcome without causing debilitating or fatal toxicity. As one informant explained during the "best example" experiment:

> You cannot drink 'truly bitter' plants. They turn your insides bitter and kill you. You can only use them for foot fungus [literally tsomiri, 'worms'].

Though responding accurately, he was also expressing criticism at my formulation of the question. In the exercise, I asked informants to give examples of 'truly bitter' (kepishisanorira) plants and their medicinal uses. This informant insisted that 'truly bitter' plants were too toxic to use in any way except externally. If I wanted to get the names of additional 'bitter' medicines, I would have to lower the standard of bitterness in the question.

The Yora/Yaminahua showed a markedly different pattern with regard to bitterness in both the "best example" experiment and ethnobotanical collections (Appendix 2.3). Of the seven informants interviewed five stated that bitterness was not a common property among their traditional medicinal plants. One informant explained:

> I only know one bitter plant, 'vomit inducer' [Guarea]. You drink it, you throw up, then you gain weight. It is not a true plant medicine, no one uses it as a warm compress. All true plant medicines are paiki, warm compresses. No one drinks them. No one tastes them. Why taste them? You apply them as compresses.

Two informants mentioned non-medicinal lumber trees first on the list of examples of bitter taste. Two mentioned the hallucinogenic liana Banisteriopsis. Two informants mentioned the tree Guarea, known by the names anati, 'vomit inducer' and mokawi, 'bitter tree.' Guarea is used both by the Matsigenka and the Yora/Yaminahua as an emetic that is thought to fortify the body after a momentary bout of nausea. Among the Yora/Yaminahua, it is used mostly by women in order to 'throw up and then fatten

up' (ãnatiro xoatiro). Yet as clarified by the informant quoted above, this plant is not considered to be nisa, 'plant medicine' or rao, 'illness/medicine' in the strict sense. True plant medicines are used as warm compresses, paiki, because they harbor spirits that both cause and cure illness.

In the collections database, only 19 of 538 plants registered for the Yora/Yaminahua (~4%) were described as moka, 'bitter' (Figure 5.5). Bitterness (including astringency) is essentially the only taste property ascribed by the Yora/Yaminahua to plant medicines, and represents a minor aspect of their pharmacognosy overall. Even among those plants that were ascribed bitterness, several, including Banisteriopsis, are recent acquisitions for the Yora group. The emetic Guarea, the only consistently mentioned example of a bitter plant in traditional Yora/Yaminahua ethnobotany, is not considered to be a medicine in the strict sense. This attitude towards bitter plants stands in sharp contrast to that of the Matsigenka, for whom bitterness is the single most frequently registered pharmacognostic property.

A striking illustration of this difference is the case of the shrub Strychnos, the botanical source of strychnine, used elsewhere in South America as an ingredient in curare arrow poison (Cipoletti 1988). The inner cortex of the plant is extremely bitter, even in small amounts. The Matsigenka use the plant to treat diarrhea in adults or older children, but it is considered too toxic for treating young children. It is prepared by rasping and boiling the cortex and drinking the warm infusion. Most Matsigenka of the Manu have ingested or administered the plant at some point during their lives, and comment on its bitterness when encountering it in the forest without having to taste it. The Yora/Yaminahua also recognize the plant, and use the leaves to bathe the heads and bodies of infants to insure that they grow strong and fast. Though I encountered the plant on several occasions with at least five different Yora/Yaminahua informants, none of them was aware that the plant had a bitter cortex. Instead, they commented on the mild

fragrance of the crushed leaves. None had ever bothered to taste it, and did not appear very interested when I demonstrated its bitterness on a few occasions. One man responded, in slight exasperation, "I don't know if it's bitter. No one tastes it!": *Tapiama moka, tsoa metiroma!*

Astringent

M: *tine* -- '*astringent, slightly bitter; to draw together, gather*'

Y: *tsimo* -- '*astringent, slightly bitter*'

The terms are nearly identical in meaning in the two languages, referring focally to an unpleasant sensation of dryness or puckering on the lips, mouth or surface of the tongue, often in conjunction with a somewhat bitter taste. Matisgenka and Yora/Yaminahua speakers would almost certainly describe oak tannins and unripe persimmons as *tine/tsimo*. Astringency is not a taste *per se*, but rather a physiological reaction of the tongue or other skin surfaces caused by chemical or physical means. Informants in both groups described *tine/tsimo* as being like the feeling of ashes or fine sand in the mouth. One Matsigenka informant compared *tine* to the sensation of placing a tomentose or bristly leaf[10] on the tongue. On several occasions, informants tapped their tongue with a finger when describing the dry sensation of chemical astringency. Similar observations were made by the Tzeltal Maya concerning the term *sup*, also translated 'bitter-astringent' (Brett 1994).

Though the terms are also used to describe physical or chemical astringency on the skin, they are most frequently encountered in descriptions of taste. Both Matsigenka and Yora/Yaminahua speakers consider astringency and bitterness to be very closely associated, in fact almost interchangeable. Informants from both groups described astringency as being 'the same as bitterness,' only less powerful and less distinctive, for example, 'a little bitter' or 'not truly bitter.' The terms *tine/tsimo* in both language are also considered to be similar to 'sour,' (*kacho/wokash*). Unripe or tannin-rich fruits dry,

pucker and irritate the mouth and throat with their sourness or astringency, rendering them inedible to humans.

The words for astringency in both languages appear to show a degree of sound symbolism. The Yora/Yaminahua pronounce tsimo with a grimacing facial expression and phonetic emphasis, low tone and an explosive-mbo! sound in the last syllable, reminiscent of the tone used in saying, "Blah!" in English. Moka, 'bitter' in Yora/Yaminahua is also pronounced in a way that, to an English speaker, might sound like someone spitting out an unpleasant mouthful of food.

Several Matsigenka speakers described astringent plants in this way:

> otinetake noneneku, okantaka ti-ne-ne-ne-ne-ne-ne!
> "It is astringent on my tongue, it goes ti-ne-ne-ne-ne-ne-ne!"

The Matsigenka language is rich in such onomatopoeic or pseudo-onomatopoetic expressions that translate sounds, actions or sensations into words whose auditory characteristics are reminiscent of the event being signified. The literal meaning of tine is 'to draw together, gather, thicken,' for example, when saliva thickens in the mouth due to thirst or fatigue (the English verb 'astringe' is derived from Latin verbs meaning 'draw close, contract, bind'). The verb and the associated ringing sound, ti-ne-ne-ne-ne-ne-ne! seem to imitate the dry, puckering sensation of chemically astringent compounds drawing together the surface of the tongue. Furthermore, the expression appears to incorporate the body part classifier -nene, 'tongue.'

In the taste/odor experiment (Appendix 2.1), three of eight Matsigenka informants and two of nine Yora/Yaminahua speakers attributed 'astringent' taste (tine/tsimo) to Echinaceae powder, apparently due to the dry, powdery texture and as well as the slightly bitter taste. Cocoa powder was described as 'astringent' by two Matsigenka informants but 'bitter' by five. Other spices described as tine by Matsigenka informants include bay

leaf and powdered nutmeg . One Yora/Yaminahua speaker also described nutmeg as tasting *tsimo*.

In the "best example" experiment (Appendix 2.3), all seven Matsigenka informants mentioned one or more medicinal plants as being good examples of 'astringency' (*tine*). Emphasizing the close connection between bitterness and astringency, five of seven informants noted that *tine*, 'astringent,' and *kepishi*, 'bitter' were the same or similar concepts, but that 'astringent' plants were not as strong or 'not truly as bitter' (*tesakona onkepishite*) as 'truly bitter' (*kepishisanorira*) plants. As good examples of *tine*, four of seven informants (57%) mentioned plants taken internally in the treatment of gastrointestinal conditions or 'heart pain,' and two of seven (29%) mentioned plants used topically in the treatment of cutaneous infections. This represents nearly the reverse of the responses noted in eliciting medicinal plants with 'bitter' taste, in which five of seven informants mentioned topical medicines for skin conditions and three of seven mentioned medicines ingested for gastrointestinal conditions. Thus we acquire an insight into the relationship between toxicity and mode of administration for the Matsigenka: plants that are 'truly bitter' or 'most bitter' are considered too toxic to ingest, and are applied to the skin, while plants that are moderately bitter or merely 'astringent' are more frequently ingested, typically for gastrointestinal conditions.

As an example of a medicinal plant that epitomized 'astringent' taste, three of seven Matsigenka informants named Myristicaceae (nutmeg family) tree species . The trees have an aromatic, nutmeg odor and a tannin-rich sap that was described by one Matsigenka informant as 'nicely astringent' (*kameti otinetake*), that is, there is very little bitter component to the taste, but rather a sensation of pure astringency and dryness throughout the mouth. The sap is commonly known and used by women to treat *kotsetsi*, a disease category including thrush (Candida), mouth ulcers and fever blisters in infants. The raw sap is daubed on the baby's tongue, gums and lips. Matsigenka informants say

that the sap 'astringes,' that is draws together (otinetakeri), the white discharge of the sores into discrete lumps that are then removed by swabbing with a ball of native cotton.

Two of seven Matsigenka informants mentioned as a good example of astringency the Paullinia species 'bumble bee plant,' also mentioned under 'bitter' and used to treat gastrointestinal conditions and 'heart pain.' One informant mentioned the liana Machaerium (Fabaceae) known in Matsigenka as jiraatsipini, 'blood plant' or shiarontsipini, 'bloody diarrhea plant.' The name reflects the blood-colored latex of the plant, and represents an example of mnemonic cues in Matsigenka pharmacognosy. The same plant was elicited more frequently as an example of the property kirajaama, 'red/blood-colored liquid.' When chewed, the leaves release a blood-red, bitter-astringent juice that is swallowed to treat diarrhea, especially bloody diarrhea. Though the bloodlike color is interpreted as an indication for bloody diarrhea (homeopathic rationale), the chemical cue of bitterness/astringency (allopathic rationale) is also significant. The juice is not 'truly bitter,' but nonetheless slightly bitter or 'astringent' (tine), and is thus able to 'embitter' (okepishitakeri) the intestines and 'draw together' (otinetakeri) and expel the worms that are believed to gnaw at the intestines and cause bloody diarrhea.

In the ethnobotanical collections, 28 of 740 (~4%) of all medicinal plants registered with Matsigenka informants were attributed 'astringent' taste as their principal pharmacognostic property. Most of these were registers of the noted Myristicaceae species used for treating thrush and fever blisters in children. A larger number of plants were considered to be both 'bitter' and 'astringent.' Because they are so closely related in both languages, and because bitterness and astringency occurred together so frequently in Matsigenka descriptions of plants, the two properties were combined in the comparative analysis of pharmacognostic properties (Figure 5.5).

In the "best example" experiment (Appendix 2.3), three of seven Yora/Yaminahua speakers mentioned a psychoactive Paullinia species as the best example of an 'astringent' (tsimo) plant. The Yora/Yaminahua name for this species, tsimo, means literally, 'astringent,' as it epitomizes this taste property for them. The plant is also pae in the sense of 'intoxicating.'

Two of seven Yora/Yaminahua informants stated that "no medicinal plants are astringent" (nisa tsimoyama). As in the case of the bitter emetic plant Guarea, the hallucinogenic Paullinia is not considered to be a 'medicinal plant' (nisa) in the strict sense, as it is not used as a warm compress to withdraw illness. In the botanical collections with Yora/Yaminahua, only two of 538 registers were described as being tsimo, 'astringent'. Like bitterness, astringency is a minor aspect of Yora/Yaminahua pharmacognosy overall (Figure 5.5), although the 'astringent' hallucinogenic beverage tsimo was a central part of the shamanistic healing tradition.

Sweet-Salty-Tart

M: pocha -- 'sweet, pleasantly salty, pleasantly tart'

Y: wata -- 'sweet, pleasantly salty, pleasantly tart'

The terms pocha in Matsigenka and wata in Yora/Yaminahua are nearly identical in their range of meanings, but defy a simple English gloss. The closest English equivalent is 'sweet,' but pocha and wata are also used to refer to things an English speaker would consider to be salty or tart. Sweet and salty tastes are considered to be delicious and desirable by both the Matsigenka and the Yora/Yaminahua, and are classified together under the terms pocha/wata. Nonetheless, both groups perceive sweetness and saltiness as distinct tastes. In the taste/odor experiment (Appendix 2.1), informants from both groups described refined sugar as being 'pocha/wata like sugar cane' and salt as being 'pocha/wata like salt.' Both groups use a different expression to

describe excessive saltiness: kacho ('sour') in Matsigenka and moka ('bitter') in Yora/Yaminahua.

The terms pocha and wata often occur with the words for 'delicious' (M: poshini) or 'good' (M: kameti; Y: shara), underscoring the hedonic nature of the vocabulary. Things that are pocha or wata are by definition also 'delicious' and 'good,' though the reverse is not necessarily true. Fatty foods, meat and starches are 'delicious' without necessarily being pocha/wata. Such foods become pocha/wata by adding salt. Fruits that would be considered tart or sour by European standards (limes, cashew fruit, wild fruits like Pseudolmedia and other Moraceae, Clavija) are described as pocha and wata, because they are sweet enough to eat when ripe. Unripe or inedible fruits are described as 'sour' (M: kacho; Y: wokash), and hence not edible, in both languages. The distinction between 'sweet' and 'sour' is not absolute, however. The strongly tart wild herb Oxalis, used by the Matsigenka as a medicine and an edible plant, has two interchangeable names: pochashiri, 'sweet leaf plant,' and kachoshiri, 'sour leaf plant.' The former name emphasizes the palatability, edibility and positive value of the plant, while the latter emphasizes the actual acidic quality of its taste. Because of this overlap, I grouped 'sweet' and 'sour' tastes together in Figure 5.5.

In the taste/odor experiment (Appendix 2.1), eight Matsigenka and nine Yora/Yaminahua informants ascribed 'sweet' (sweet/salty/tart) taste consistently to sugar, salt and vanilla extract. Three Matsigenka informants described salt as kacho, 'sour' or kacho+pocha 'sour/sweet'. Likewise, two Yora/Yaminahua speakers described salt as moka, 'bitter' or moka-wata, 'bitter+sweet.' All Matsigenka informants described cinnamon stick as pocha, while no Yora/Yaminahua speaking informants ascribed it a taste property, reflecting the tendency for Yora/Yaminahua speaking informants to be less interested in taste evaluation, especially for substances with strong odors.

In the "best example" experiment (Appendix 2.3), six of seven Matsigenka informants mentioned the plant name pochashiri ('sweet leaf') as being a good example of pocha. This name refers to several unrelated plants with identical uses. Oxalis is an understory herb with a distinctly tart flavor resulting from the presence of oxalic acid as in its European relative, bitter clover. Lunania and Endlicheria are small trees in different botanical families whose leaves have similar, almost saccharine-sweet flavors. Informants distinguish Oxalis from the other 'sweet leaf' plants by describing it as the 'sweet leaf plant' (pochashiri) that has 'sour leaves' (kachoshiri), an example of the overlap between 'sweet' and 'sour' (or tart) for the Matsigenka. Women chew the fresh leaves of Oxalis, Endlicheria or Lunania together with boiled manioc and pass the resulting mash mouth-to-mouth (aviakeri) to infants in order to treat appetite loss or mild gastrointestinal upsets. Leaves of the same species are stripped off in passing and chewed by men during hunting forays or garden work in order to quench thirst and stave off hunger. At first it appears contradictory that the same plant can both stimulate and suppress appetite. Taking into account the Matsigenka classification of these plants as 'sweet' (sweet/salty/tart), it appears that they contain sugars, salts, minerals, acids or other nutrients that stimulate a malnourished baby's appetite while also temporarily satisfying the hunger of a weary adult. Other plants mentioned as good examples of pocha include sugar cane and tart, edible fruits of the fig family, Moraceae.

In the ethnobotanical collections, 50 of 740 (~7%) of all medicinal plants registered with Matsigenka informants were attributed 'sweet' taste as their principal pharmacognostic property (Figure 5.5). Most of these were encounters of the sweet or tart pochashiri ('sweet-leaf') species noted above. Sweet and tart plants, rather than bitter ones, are given to infants to treat gastrointestinal problems because bitter plants are considered too strong, unpleasant to taste and potentially too toxic for younger infants to ingest. The sweet plants are said to 'sweeten' (opochatakeri) infants' intestines so that

they recover their appetite. Weary adults who chew sweet leaves in the forest state that they feel temporary relief of thirst, hunger and fatigue, as when chewing sugar cane.

In the "best example" experiment (Appendix 2.3), five of seven Yora/Yaminahua informants stated that "no medicines are wata." Instead, most informants mentioned several species of wild fruits as good examples of 'sweet' (sweet/salty/tart) taste. Three of seven coincided in mentioning various edible fruits of the Moraceae. Two mentioned medicinal plants that happened to have sweet fruits, though other parts of the plant were used to prepare the medicine. In the botanical collections with Yora/Yaminahua, only three of 538 registers were described as being 'sweet'. Like other taste terms, wata is a negligible aspect of Yora/Yaminahua pharmacognosy (Figure 5.5).

Sour

M: kacho -- 'sour, acid, unripe, fermented'

Y: wokash -- 'sour, acid, unripe, fermented

As in English, 'sour' in both Matsigenka and Yora/Yaminahua refers to acidic, mostly unpleasant flavors including unripe fruits as well as fermented food or beverages and stomach acid or vomit. Sourness in both languages often implies inedibility, though tart, edible fruits are considered both pocha/wata ('sweet') and kacho/wokash ('sour'). The Matsigenka describe excessive amounts of salt in food or water as 'sour' (kacho). The Matsigenka describe salty or brackish water, for example, at mineral licks, as kachoaama, 'sour-liquid.' Kacho also describes heavily fermented manioc beer, which has a somewhat unpleasant, vinegar-like taste, but which is consumed nonetheless for its high alcohol content. Sour, fermented, and hence inedible, food is kacho/wokash, as is the acidic taste in the throat and unpleasant sensation in the stomach accompanying indigestion and other gastrointestinal illnesses. The Matsigenka describe acid indigestion

with the expression kachonegitagantsi, ‘sourn in the heart,’ a symptom that sometimes accompanies ‘heart pain’ (katsinegitagantsi).

The only item in the taste/odor experiment (Appendix 2.1) noted as ‘sour’ among the eight Matsigenka informants was salt, described both as kacho, ‘sour’ and kacho+pocha ‘sour+sweet’ . One Yora/Yaminahua speaker described salt as wokash, ‘sour,’ while two described it as moka, ‘bitter’ or moka-wata, ‘bitter+sweet.’

In the “best example” experiment (Appendix 2.3), three of seven Matsigenka informants mentioned domesticated citrus fruits (lemons, grapefruits, oranges) as being good examples of kacho. These fruits, introduced since European contact, are eaten and also used to treat cough and colds. Oxalis, discussed earlier as a ‘sweet leaf’ plant, was also mentioned by three of seven informants as being a good example of kacho. Two informants mentioned edible Moraceae fruits as being good examples of kacho, because of their tart taste, while qualifying that the fruits were not ‘truly sour,’ but rather somewhat ‘sweet/savory’ (pocha). Two informants also mentioned strongly fermented manioc beer as being a good example of kacho.

In the collections database, 11 of 740 plants registered (~2%) with Matsigenka informants were ascribed the property kacho (Figure 5.5). All were herbs or shrubs with succulent leaves, including the tart Oxalis (described as pocha, ‘sweet,’ in most registers) used to treat gastrointestinal conditions in infants; the snakebite remedy Chrysochlamys with sour leaves and edible fruits; a Monstera used for skin abscesses; and several registers of Costus, an herb in the ginger family (Zingiberaceae) whose tart stem is sucked or boiled to treat sore throat and respiratory infections. The acidic property of kacho plants is said to ‘sour up’ (okachotakeri), ‘burn or roast’ (otashitakeri) and ‘hurt’ (okatsitakeri) the invisible worms or poisons that cause sore throat, skin abscesses, the pain of snakebite and mild gastrointestinal conditions in infants. Though similar to

bitterness and pungency in its efficacy, sourness is considered less strong, and for this reason is especially appropriate for infants.

A majority of Yora/Yaminahua informants (four of seven) stated that few or no medicinal plants were 'sour,' wokash. Instead, sourness was considered to be a property of tart, unripe or inedible wild fruits. Four of seven independently mentioned fruits of the family Clusiaceae, the same family as the tart Chrysochlamys collected as a snakebite remedy among the Matsigenka. Some species in the family are considered tart but edible, while others are considered too sour to eat. Like the Matsigenka, Yora/Yaminahua speakers mentioned tart, edible fruits of the Moraceae as being good examples of both wokash, 'sour' and wata, 'sweet'. In the collections database, none of the plants encountered were described as wokash. (Figure 5.5).

IRRITATION VOCABULARY

Painful, pungent

M: katsi - 'painful, pungent'

Y: pae - 'strong, painful, pungent, intoxicating'

'Painful' substances for both the Matsigenka and Yora/Yaminahua include things that an English speaker would describe as piquant or "spicy hot." Virtually all informants in both groups mention chili peppers as typifying the property 'painful.' However any substance with strong or unpleasant chemosensory properties may be considered 'painful.' Extremely bitter, astringent or acidic substances may on occasion be described as katsi/pae in either language. Informants in both groups consider the categories of pungency, bitterness, astringency, acidity and causticity to be similar in some fundamental way, united by their shared painfulness and unpleasantness.

In both languages the terms katsi and pae cross-cut chemosensory categories and organ systems. The burning sensation of tobacco snuff in the nostrils is described as katsi by Matsigenka informants. The painfulness of tobacco is equated with its intoxicating potency. As in the case of cultural groups or individuals who appreciate and enjoy spicy-hot cuisine, there is a masochistic element to the Matsigenka's appreciation and use of tobacco. Tobacco is judged by how katsi it is: the more painful, the more intoxicating and hence better. The intensity of tobacco's pain and intoxicating strength is also a measure of the spiritual strength of its owner. The more painful the tobacco, the more powerful the shaman who prepared it.

Strong, peppery, aromatic or acrid odors (for example, burnt chilies, black pepper, menthol and gasoline) are classified in both languages as katsi or pae. Such substances are described by both groups as "penetrating deep in the nostrils" and "filling up the head" with their odor, and are capable of overwhelming or "intoxicating" a person who inhales carelessly. Similar descriptions are given by the Tzeltal Maya studied by Brett (1994: 132) in characterizing the odor term yij-yij ik'. The single terms katsi and pae in Matsigenka and Yora/Yaminahua thus encompass what in Tzeltal Maya chemosensory vocabulary consist of two separate concepts: yaj for spicy-hot tastes and yij-yij ik,' for pungent or strongly aromatic smells.

Though the terms from both languages overlap to a great extent, there are differences in the range of meanings. In Matsigenka, katsi includes the tingling sensation on the tongue that accompanies the anesthetic effects of several herbal toothache remedies. Chewing whole cloves, a toothache remedy in European herbal medicine, produces a comparable sensation. In Yora/Yaminahua, this sensation is described by a more specific expression, asawanã, 'tingling, anesthetic.'

As a pharmacognostic term, the Matsigenka use katsi in three related but distinct ways, which are often marked linguistically. In its broadest pharmacognostic sense, katsi

indicates substances that produce a 'painful,' stinging sensation when they come into direct contact with mucous membranes (tongue, mouth, lips, nasal sinuses and eyes) and skin. Substances that are katsi to the tongue are always katsi when they come in direct contact with the nasal mucosa or the eyes. The reverse is not necessarily true. Trees in the Lauraceae have a penetrating, aromatic odor (e.g., laurel, cinnamon, cloves, camphor) that is described as katsienka, 'painful odor,' though most Lauraceae are not 'painful' to taste in the way chili peppers are. A large category of Matsigenka remedies are applied as 'painful' drops to sting the eyes. Though they are considered katsi to the eyes, they are not usually katsi to taste. This kind of painfulness is distinguished from that of chili peppers by using the terms katsiaama, 'painful liquid,' or katsi okiaku, 'painful in the eyes. These linguistically marked variants refer to distinct use categories of plants. Drawing on these distinctions, I separate katsi into three separate pharmacognostic categories for purposes of data analysis: 1) katsi, 'painful,' focally pungent taste; 2) katsienka, 'painful odor'; 3) katsiaama, 'painful liquid,' for caustic topical applications (Figure 5.6).

Katsi refers focally to pungent tastes. In the taste/odor experiment (Appendix 2.1), all eight Matsigenka informants described black pepper, cloves, ginger and wasabe paste as tasting katsi or kañotaka tsitikana, 'like chili peppers.' A majority of informants also described garang masala, curry and garlic as katsi. In the "best example" experiment (Appendix 2.3), all seven Matsigenka informants mentioned one or more medicinal plants as being good examples of katsi, referring mostly to pungent taste in their use of the term. Four of seven independently mentioned spicy-hot Piper species used to treat toothache. Four of seven mentioned cultivated and wild chili peppers (Capsicum) as being good examples of katsi. In the ethnobotanical collections, 50 of 740 plants registered (~7%) were described as having pungent taste (Figure 5.6), making it the second most important taste term (the first being bitterness/astringency) in Matsigenka pharmacognosy. Most

katsi plants are applied externally in the treatment of toothache or skin conditions. The Matsigenka conceive of toothache, fungal skin infections, and cutaneous lesions as tiny worms or insects burrowing into the flesh, so small as to be invisible to the eye. *Katsi* plants can 'hurt' (*okatsitakeri*) these creatures, killing them or expelling them from the body.

Katsienka, incorporating the noun root *-enka*, 'air, vapor, odor,' means literally 'painful odor.' This term refers to strongly aromatic or pungent odors, for example, those of burnt chili peppers, tobacco snuff and trees in the Lauraceae (laurel family). Recently introduced aromatic substances such as menthol and gasoline are also described as *katsienka*. In the taste/odor experiment (Appendix 2.2), the spices most frequently described as *katsienka* by Matsigenka informants are wasabe, ginger, nutmeg, tiger balm, black pepper and curry. In the "best example" experiment (Appendix 2.3), five of seven Matsigenka informants mentioned Petiveria, an herb whose stem has a penetrating odor reminiscent of both garlic and skunk musk (the local Peruvian word for this plant, *mucura*, literally "opossum," derives from the musk-like odor). The Matsigenka word for the plant is *isere vumpuo*, 'tobacco of the screaming piha.' The screaming piha (Lipaugus vociferans) is a drab forest bird with a "startlingly loud penetrating cry" (Meyer de Schauensee and Phelps 1978: 230), and is believed by the Matsigenka to be a guardian spirit of shamans. The 'painful' odor of Petiveria is explained by analogy with the painful tobacco snuff of human shamans. When inhaled sharply, the odor of Petiveria produces intense stinging in the nose and trigeminal nerve stimulation throughout the face, much like what occurs when eating horseradish or wasabe. This and other *katsienka* plants are inhaled or ingested as infusions to fight off nasal congestion, colds and mild respiratory infections. As in the case of 'painful' toothache remedies, 'painful' odors hurt and expel the illness. *Katsienka* plants account for 32 of 740 plants registered (~4%) (Figure 5.6).

Katsiaama, incorporating the noun root *-aa-* for liquids, means literally, 'painful liquid.' A snake's venom is also referred to as *igatsiaare*, 'its painful liquid.' *Katsiaama* is used to describe the stinging produced in the eyes or on the skin by mildly to strongly caustic latex, saps or juices. A more specific term, *katsi okiaku*, refers specifically to plants that are 'painful in the eyes,' without being 'painful' (i.e., pungent) when tasted. In the "best example" experiment (Appendix 2.3), five of seven Matsigenka informants mentioned one or more Psychotria species as good examples of the property *katsiaama*. Four of seven mentioned *turuvanto*, a folk genus of succulent, yellow-flowered plants cross-cutting the families of Acanthaceae and Gentianaceae. Two of seven mentioned Astronium, a small tree in the poison ivy family, Anacardiaceae. All of these plants belong to a diverse category of medicines known collectively as *kaokirontsi*, literally 'eye bathing plants.' A few drops of sap or juice derived from crushed leaves or stem are administered directly into the eyes, producing intense stinging and incapacitation for several minutes. These plants are used to cure headaches, dispel nightmares, repress undesired emotional states such as grief and anger and improve men's vision and skill for hunting. In addition to these uses, Astronium sap is administered to treat eye infections. In the ethnobotanical collections, the property *katsiaama* was attributed to 96 of 740 plants registered (~13%; Figure 5.6).

The Matsigenka perceive the efficacy of *katsi* eye-stinging remedies in terms of both immediate and long-term effects, both physical and spiritual in nature. The short-lived pain is thought to cleanse the eyes of physical impurities and frightening apparitions such as the demons, ghosts or animal spirits that cause nightmares, headaches and other illnesses. The eyes for the Matsigenka are the portholes of the body and soul. Drops administered to the eyes 'infuse' (*okitsitingakeri*) a person's body and soul with the 'soul' of the plant. The word *suretsi*, 'soul,' refers to the life force of all animate beings, manifest in growth, activity and interactions with other animate beings. This definition

includes the core or heartwood of living trees and the pharmacological activity of plants. The soul of eye-stinging medicines is described as a palpable force moving through the body, starting with pain in the eyes, then spreading as a subtle tingling sensation in the head through the neck via the muscles and veins to fill the entire body. In the case of remedies used by hunters to improve their aim, the plant's soul infuses the arms and hands and is thereby absorbed into the bow and arrow. With time, the plant's effect throughout the body dissipates, and a fresh dose is required.

In Yora/Yaminahua, pae is more ambiguous than Matsigenka katsi, because it has a broader range of meanings, and because most of the shades of meaning are not marked linguistically. Nonetheless, Yora/Yaminahua speakers recognize and distinguish different meanings of pae, which correspond with different use categories of plants. During the "best example" experiment, one Yora/Yaminahua man explained the multiple meanings of pae in this way:

> Demons are pae because they frighten you and make you sick. Chili peppers' pae is different, it just burns the tongue. Paullinia [a psychoactive plant] has a different pae, like the pae of Banisteriopsis and booze. It makes you drunk.

I relied on such comments to distinguish four distinct uses of pae in Yora/Yaminahua pharmacognosy: 1) meaning 'pungent,' focally for taste; 2) signifying 'strong' in the sense of being "owned" by a powerful and dangerous spirit; 3) referring to strongly intoxicating, poisonous and psychoactive substances; and 4) as a modifier in compound expressions to indicate any 'strong' chemosensory property. As in Matsigenka, the various shades of meaning overlap to some extent. Psychoactive plants like tobacco and Banisteriopsis are pae in the sense of having painful tastes, of causing strong intoxication and because they have strong spirit owners. Snake and stingray venom are pae both because they are poisonous and because they are painful.

Pae like Matsigenka katsi, is used as a chemosensory term to describe pungent tastes such as that of chili peppers. The expression nochi keskara, 'like chili peppers,' is

a synonym for pae in this sense. In the taste/odor experiment (Appendix 2.2), the spices most frequently described as pae and/or nochi keskara ('like chili peppers') by the nine Yora/Yaminahua speakers are curry, black pepper, ginger, wasabe, cloves and garang masala. In the "best example" experiment (Appendix 2.3), four of seven Yora/Yaminahua speakers noted chili peppers (Capsicum) as a good example of pae, clearly referring to pungency as a taste. These responses are similar to Matsigenka responses for katsi. Taste is not commonly noted by Yora/Yaminahua speakers in describing the pharmacognostic properties of medicinal plants. In the collections database, only 1 of 538 medicinal plants registered with Yora/Yaminahua informants was described as having pungent taste (Figure 5.6). The majority of plants mentioned as examples of pae do not have pungent tastes, however, but exemplify other facets of the meaning of this complex term.

Pae is used in a broader sense to describe plants that host strong, painful and thus dangerous spirit owners. In the "best example" experiment (Appendix 2.3), most Yora/Yaminahua informant responses reflect this meaning of pae. Seven informants mentioned a total of twenty examples of pae plants, and eleven of these refer to plants that are not necessary painful or pungent to taste or smell, but rather pae in the sense of harboring powerful spirits. The presence of illness-causing spirits is most frequently revealed in visual rather than chemosensory cues. Three of seven informants mentioned members of the folk genus wina nisa, 'wasp plant,' or winana rao, 'medicine/illness of the wasp,' each species of which is named for a different kind of wasp. This group of plants includes Machaerium liana species and related Fabaceae mostly characterized by blood-colored sap and/or spines or prickles on young shoots. Such visual cues indicate that these species are "owned" and inhabited by the spirits or 'demons' (yõshi) of various wasp species. The plants are thus pae, 'strong, painful,' because they harbor aggressive beings that cause illness. By the same token, they can be used as warm compresses to

treat the illnesses caused by their respective wasp spirits. Only the plant species owned by the specific kind of wasp responsible for the illness is effective in treating it. The proper wasp/plant combination is discovered by trial and error: if one wasp medicine fails, another is tried.

Three of seven informants mentioned the category *õitisi rao*, 'heart pain medicine,' as a good example of *pae*. Included in this category are species from diverse botanical families, especially Flacourtiaceae, Phytolaccaceae and Rubiaceae, characterized by prominent spines. None has particularly 'strong' or 'painful' taste or odor. These plants are *pae* because the 'demons' (*yõshi*) that own them cause 'heart pain,' as revealed by the presence of sharp spines. To cure 'heart pain,' it is necessary to prepare a warm compress of the same species of plant responsible for causing the illness. During ethnobotanical collections, Yora/Yaminahua informants most frequently classified such medicines according to their visual and tactile properties, rather than their taste or odor qualities. In contrast to the Matsigenka's allopathic model, Yora/Yaminahua responses reflect a homeopathic understanding of the concept of *pae*, and of efficacy in general: medicinal plants are inhabited by spirit owners that both cause and cure illness.

Pae can also be used to mean 'strongly intoxicating,' referring to toxic, poisonous or psychoactive substances. *Pae* also refers to dizziness, nausea, alimentary intoxication, and altered states of consciousness. In this sense, *pae* is synonymous with Matsigenka *kepigari*, 'intoxicating.' This meaning is reflected in the "best example" experiment by three of seven Yora/Yaminahua informants who mentioned the hallucinogenic liana Banisteriopsis as a good example of *pae*. Tobacco and other ritually-used psychoactive plants as well as alcohol are also *pae*, 'strong, intoxicating.' Most plants that are *pae* in this sense are also 'bitter' and/or 'astringent,' virtually the only mentions of bitter plants in the Yora/Yaminahua pharmacopoeia. *Pae* also applies to lethal and toxic substances

such as barbasco fish poison (Lonchocarpus), snake venom and insect and stingray stings. In the collections database, mentions of pae used in the sense of 'intoxicating' were counted under the category of "Toxicity." The category "Toxic+Emetic" accounts for 24 of 538 registers (~4%) (Figure 5.6).

Finally, pae is used in compound expressions to indicate an especially strong or unpleasant sensation, for example, 'strongly bitter' (moka pae), 'strongly sour' (wokash pae), 'strong pain' (isi pae). Strongly aromatic or penetrating odors are described with the compound terms ini pae, 'aromatic+painful,' or itsa pae, 'rank+painful,' similar to Matsigenka katsienka, 'painful odor.' In the taste/odor experiment (Appendix 2.2), the only spice described as ini pae by two or more Yora/Yaminahua informants was tiger balm. Compound terms incorporating pae are discussed under their respective taste and odor categories.

Stinging, burning (by chemical means)

M: otegaka -- 'to sting, burn (by chemical means)'

Y: wa'a[11] -- 'stinging, burning, itching (chemical means)'

Matsigenka otegaka and Yora/Yaminahua wa'a are very close in meaning to katsi and pae. Informants in both groups state that "otegaka is the same as katsi," or "wa'a is the same as pae." It is clear from usage, however, that otegaka and wa'a refer in a more limited sense to the physical sensation of stinging or burning on mucous membranes or skin produced by pungent or caustic compounds.

The verb otegaka, the conjugated form of the stem -tega 'to sting, burn,' is used by Matsigenka informants to describe the painful physical effects on the nose, mouth, skin and eyes of substances like chili peppers, wild herbs in the pepper family (Piperaceae) and aromatic trees, as well as such introduced condiments as black pepper, garlic, wasabe paste and menthol. The verb -tega is often used together with body part affixes, and can also be used to describe sunburn, sunstroke, or windburn. (The verb -

taga, differing by one vowel, refers to burning by combustion.) By affixing the classifier -aa- for liquids and the eye (Shepard 1997), the verb oteaatake means 'to sting the eyes,' referring to caustic substances that accidentally enter the eye as well to as 'painful' (katsiaama) eyedrops applied intentionally for medicinal purposes. The classifier -girimashi-, 'nose,' is affixed to refer to the deep penetration of pungent odors into the sinuses: otegirimashitakena, 'it stings my nose.' With the affix -ant, indicating directed actions, the verb otegantake means, 'it stings, burns (directed at a specified body part)'. As in the case of katsi, the verb otegaka and linguistic variants are used by Matsigenka speakers to illustrate and explain the efficacy of unpleasant chemosensory properties in fighting illness. Pungent, bitter, astringent, acidic, caustic and other 'painful' substances 'sting' or 'burn' (otegakeri) the illness, causing it to retreat.

In the taste/odor experiment, the "best example" experiment and in ethnobotanical collections, responses of Matsigenka informants involving the term otegaka overlap with those of katsi ('pungent, painful taste'), katsienka ('pungent odor') and katsiaama ('painful liquid [topical application]'). Relative to these terms, otegaka is used less frequently, generally to specify the body part affected by a given substance's pungency, for example, otegantake nonene, 'it stings my tongue.' In the taste/odor experiment (Appendices 2.1, 2.2), the spices whose tastes were most frequently described as otegaka by eight Matsigenka informants are nutmeg, garlic, lavender, black pepper, cloves, wasabe, garang masala and Echinaceae. Two informants used otegaka to describe the odor of tiger balm, and one used it to describe the odor of ginger. In the "best example" experiment (Appendix 2.3), three of seven Matsigenka informants mentioned Petiveria as a good example of the property otegaka, and one mentioned chili peppers (Capsicum), plants that were also mentioned for the properties katsi and katsienka. For these reasons, otegaka is treated as a synonym of katsi ('pungent, painful') and derivative terms in the collections database.

The Yora/Yaminahua term wa'a is almost identical to Matsigenka otegaka, referring to the stinging or burning sensation in the mouth and nose produced for example by chili peppers. One Yora/Yaminahua informant stated that wa'a is somewhat like being burned by fire or by the sun. Another described wa'a as being similar to the sensation of a sore throat. Pungent or strongly aromatic odors cause a stinging pain deep inside the nose, also described as wa'a. As a pharmacognostic term, wa'a is not common. In the taste/odor experiment (Appendix 2.1), it was used by one person to describe the taste of garlic and by one person to describe the taste of garang masala. Also, one informant described the odor of black pepper with the compound expression itsa wakashta, 'rank+stinging (a little).' In the "best example" experiment (Appendix 2.3), three of seven informants mentioned edible chili peppers (Capsicum) as a good example of wa'a, but no medicinal plant was consistently mentioned. In the collections database, wa'a was not mentioned as a pharmacognostic property for any of the 538 plants registered.

Intoxicating, emetic

M: kepigari -- 'intoxicating, hallucinogenic, toxic, poisonous'

Y: pae -- 'strong, painful, intoxicating'

Y: anati -- 'emetic, inducing vomiting'

The Matsigenka word kepigari is derived from the verb root -piga, meaning literally 'to return, turn around' and by extension 'to feel like one is spinning; to feel giddy, nauseous, faint; to be intoxicated, drunk, poisoned; to hallucinate, go crazy.' The verb root is found in the Matsigenka word for shaman, seripigari, meaning 'tobacco intoxicated one' (Baer 1992) as well as 'the one who returns (regurgitates) tobacco' (Shepard 1998b). Kepigari means, 'that which causes intoxication,' and is used to describe poisonous, toxic, narcotic or psychoactive substances and their associated physiological states. Examples of substances considered kepigari, 'intoxicating,' include:

alcohol, tobacco and other psychoactive plants; purgatives, emetics and poisonous plants; venomous snakes, frogs, insects and toxic mushrooms; any substance with an overpowering odor (kepigarienka, 'intoxicating odor'); and menstrual blood, known as ogepigariaate, 'her poison that flows' (see Rosengren 1987). Most substances that are kepigari are also kepishiri, 'bitter,' or have an 'intoxicating odor,' kepigarienka. Kepigari is also an illness category, referring to bouts of dizziness, fainting, nausea and vomiting as well as insanity.

The Yora/Yaminahua word pae is similar to Matsigenka kepigari in the sense of 'intoxicating, poisonous,' though the broad range of meaning of pae includes all substances with 'strong, painful' chemosensory or spiritual properties. The Yora/Yaminahua term anati means 'to induce vomiting,' and is used to describe emetic plants. The Yora/Yaminahua name for the sweet-smelling tree Guarea is anati, 'emetic' or mokawi, 'bitter tree,' one of the rare examples of a 'bitter' (moka) medicine for the Yora/Yaminahua cultural group. Guarea is used as a health tonic, especially by women. After throwing up, the person is said to 'grow fatter' (xoatiro).

In the "best example" experiment (Appendix 2.3), five of seven Matsigenka informants mentioned cultivated Brugmansia (Solanaceae) as an example of kepigari. The Matsigenka use Brugmansia as a warm plaster for broken bones, stomach aches, arthritic pains, swelling and other conditions, and give a small amount orally to women during a difficult childbirth. Large doses are given to induce visions for shamans, hunters, or people suffering from incurable illnesses. This preparation is considered to be the most intoxicating (kepigari) and strongest of all Matsigenka medicines.

Two of seven Matsigenka informants mentioned Brunfelsia, also of the Solanaceae, as an example of kepigari. The plant is known as chirisanango, 'cold medicine,' in Quechua and Peruvian Spanish due to the unusual form of intoxication it produces: shivering, numbness and prickling sensations in the extremities. The

Matsigenka describe the tingling sensation with quasi-onomatopoeia: tseki-tseki-tseki-tsek!, the sound/sensation of needles pricking the skin. This sensation is the physiological manifestation of the infusion of the plant's soul (osure) into the hunter's body, especially the hands. In addition to these sensory hallucinations, the plant produces dizziness, nausea, disorientation, and in larger doses, convulsions, dreams, or visions. In the days following the consumption of the plant, the hunter experiences improved eyesight, steadiness of the hands, concentration, and stamina.

In the collections database, 78 of 740 plants registered (~11%) with Matsigenka informants were ascribed the property kepigari, 'intoxicating,' counted in the category "Toxic+Emetic" in Figure 5.6. These include emetic and psychoactive plants used by men to improve their own and their dogs' hunting skills, as well as narcotics, hallucinogens and their admixtures. The relationship between plant toxicity and curative power is basic to Matsigenka understandings of illness and healing: medicines are poisons, used to purge the body and purify the soul (Shepard 1991). Many illnesses are believed to be caused by harmful spirits that enter the body and 'steal the soul' (yagasuretakeri). Toxic plants expel such intruders from the body, while psychoactive plants allow the sick person or the healer to enter the spirit world and address the underlying cause of the illness. During the consumption of hallucinogenic plants, transcendental effects in consciousness go hand-in-hand with unpleasant effects in the body such as nausea, vomiting, sweating, shaking, and dizziness. Regurgitation and vomiting are fundamental in Matsigenka ethnomedical practices, and go hand in hand with the notion of kepigari. The Matsigenka tobacco shaman ingests and then regurgitates tobacco paste, passing his supernatural powers on to his apprentice mouth-to-mouth in a mystical kiss. The Matsigenka name for the sacred liana Banisteriopsis is kamarampi, 'vomiting medicine,' emphasizing the inextricable association between psychoactivity and emesis. The violent bouts of vomiting that may be induced by

Banisteriopsis, tobacco snuff, or strong manioc beer are considered beneficial to health. Though toxicity is a valued property in many Matsigenka medicines, kepigari can also refer to lethal poisons like Tephrosia (used for fishing) as well. Sorcerers are believed to administer toxic plants in secret rituals to inflict illness on their victims.

In the "best example" experiment, most plants mentioned by Yora/Yaminahua speakers as examples of pae reflected the meanings of 'painful' (pungent) taste and 'strong' spiritual properties (Appendix 2.3). Three of seven informants mentioned Banisteriopsis (also mentioned by one Matsigenka informant for kepigari) as an example of pae in the sense of 'intoxicating.'

In the collections database, 22 of 538 plants registered (~4%) with Yora/Yaminahua informants were ascribed the property pae in the sense of 'intoxicating.' These included three species of wild and cultivated fish poisons. Two additional registers were ascribed the property anati, 'emetic' (Figure 5.6). Half of the registers of pae consisted of the hallucinogenic Banisteriopsis liana and its admixtures, unknown to the Yora group prior to their 1984 contact with acculturated Yaminahua migrants from the Purús River. Though tobacco and the hallucinogenic Paullinia liana were used in shamanistic healing ceremonies by the Yora/Yaminahua prior to 1984, psychoactive, emetic and other toxic plants are far less pervasive than in Matsigenka medicine. In contrast to the Matsigenka, who ingest a toxic Brunfelsia infusion to become better hunters, the Yora/Yaminahua consider its intoxication to be 'too strong' (wasa pae) for ingestion. Instead, they rub its 'fragrant' (ini) leaves and flowers on their own or their dog's nose, face and body to improve hunting skill.

A similar difference in perception between the two groups is found in the case of Daphnopsis, a shrub of the Thymelaeaceae with a strongly aromatic odor and pungent-tasting bark and seeds. The Matsigenka ingest one or two toasted seeds, causing severe vomiting and diarrhea. It is considered one of the most powerful and kepigari of all

hunting plants, and hence one of the most effective. Its aromatic vegetative odor is described as kepigarienka, 'intoxicating.' Raw or in higher doses, the 'painful' (katsi) seeds are said to be lethal. The Matsigenka call the plant jojajane orinchashite 'Bufo toad's herb,' named after the highly toxic Bufo toad (jojajane) whose skin secretions can be mixed with tobacco and ingested to gain hunting skill or shamanic strength. The Yora/Yaminahua use the same species, however their sensory evaluation and use is markedly different. They value the plant for its 'fragrant' (ini) odor and fibrous bark. They are not aware of its pungent taste or emetic seeds. Instead, strips of bark are cut and tied around the upper arm as bracelets for displaying perfume plants (postameti). Such examples epitomize the contrast between Matsigenka and Yora/Yaminahua pharmacognosy: the Matsigenka seek out plants with unpleasant taste (bitter, pungent) and physiological toxicity, while the Yora/Yaminahua appear to prefer pleasant fragrances and milder external applications.

Irritating, urticating, itching

M: kaeni

Y: xõai

The verb okaenitake means, "it itches." The same verb can be used in the transitive form, nokaenitake, "I itch, scratch." Kaenisetagantsi, the noun derived from this transitive verb form, is an ethnomedical category for inflammatory and allergic skin conditions (see Table 4.8). Itching (kaeni/xõai)and pain (katsi/pae) are close in Matsigenka and Yora/Yaminahua classification of sensation, and may be used interchangeably by some informants. However most informants distinguish the two by saying kaeni/xõai is less severe, characterized by allergic (rather than infectious) inflammation and an urge to scratch. If such an allergic condition becomes aggravated by excessive scratching or infection, it can turn into true pain, katsi/pae.

None of the spices in the taste/odor experiment were described as kaeni or xõai by Matsigenka or Yora/Yaminahua informants. In the "best example" experiment (Appendix 2.3), all seven Matsigenka informants mentioned one or more medicinal plants as exemplifying the property kaeni. Five mentioned one or more species of Araceae, common epiphytic plants including Philodendron, many of which have have caustic sap. Caustic Araceae are applied raw to treat snakebite, broken bones, sprains, and inflammation. Araceae with mildly caustic sap are applied as drops to the eyes to treat cataracts or eye infections. The caustic property 'irritates' (okaenitakero) the cataract or infection and eliminates it from the eye. Some Araceae are boiled to reduce their causticity for use in ingested preparations to treat intestinal parasites. The caustic property of the plant is nonetheless able to 'irritate, itch' (okaenitakeri) intestinal worms, causing them pain and expelling them from the body.

Dieffenbachia, also of the Araceae, is characterized by a rank, garlic-like odor (shiti) and a strongly a caustic sap. The Matsigenka believe sorcerers use it to cause burning, inflammatory illnesses in their victims. When it is boiled, however, the irritant property is destroyed. By drinking the boiled infusion, it is believed that the caustic properties inflicted by the sorcer are counteracted, and the sorcery is returned to its sender. A similar principle is found in the case of matsontsorishi, 'jaguar leaf,' also an Araceae species. The stems, extremely caustic when raw, are boiled for extended periods of time to eliminate causticity, and the liquid is used to bathe babies to make them strong, "like a jaguar," and impervious to illness. One man told me of a tragic accident he witnessed as a young boy when an infant was bathed in a batch of this preparation that had not been completely cooked. The ensuing caustic reaction was so intense that the baby eventually died of complications.

Four of five Matsigenka informants mentioned Hura crepitans as an example of kaeni. The latex of Hura is extremely corrosive, comparable with battery acid, and can

cause blindness. One drop applied to a decayed tooth kills the root and allows the tooth to be removed; careless administration can cause a whole row of teeth to fall out. Hura latex is also used to treat snakebite, and to destroy the body of venomous snakes that have been killed. By leaving the snake's carcass under a slashed Hura trunk, such that the latex drips onto it, the animal's flesh is eaten away. The treatment is said to destroy the snake-demon's arrow (the physical snake) so that the demonic archer is unable to recover his weapon and strike again. On the second shot, it is said, he never misses. The treatment also responds to empirical aspects of snake behavior: snakes are capable of striking and delivering venom through reflex muscle action many hours after death. Treating the snake carcass with corrosive Hura latex ensures that such mishaps do not occur.

A number of plants contain urticating hairs or trichomes that produce irritation, itching and inflammation of the skin through both chemical and physical means. Notable is the nettle family, Urticaceae, owing its very botanical name to the urticating properties recognized in folk botanical systems worldwide. The Matsigenka use the nettle (Urera) both as a punishment for naughty children and as a topical treatment for arthritic pain. The urticating leaves are slapped onto the sore joint (or the unfortunate child's bare skin), inducing intense itching and localized inflammation, followed by pain relief (amiriganai; see Visual/Tactile properties). Plants that are extremeley kaeni and/or have urticating hairs (kepiri) are generally avoided by Matsigenka parents with newborn children, lest the child become ill with rashes.

For the Yora/Yaminahua, itching that cause itching are often associated with the millipede (xako) and the worm (nõwi; see Chapter 4). Plants with pilose stems (xopoya) or latex (wepoya) resemble xako and are believed efficacious in treating inflammatory skin conditions. In the "best example" experiment (Appendix 2.3), four of seven Yora/Yaminahua mentioned 'millipede plant' (including pilose Acanthaceae,

Apocynaceae, Asclepiadaceae, and Gesneriaceae) as an example of the property xõai. One mentioned Urera (also mentioned by the Matsigenka) to treat inflammation, in what appears to be a case of recent acquisition of plant knowledge from acculturated populations.

Anesthetic

M: amirigake -- 'calms pain'

M: ampatake, jampatake -- 'tingling, numbness'

Y: asawãna -- 'causes tingling, numbness; anesthetic'

The Yora/Yaminahua term asawana is somewhat more specific, referring to the tingling and numbing sensation on the tongue and mouth (like clove oil) produced by certain plants. The herb Acmella, for example, produces a distinctive, clove-like numbing sensation on the tongue and mouth. The Matsigenka describe this sensation as 'painful/pungent' (katsi), and use it to treat toothache. Chili peppers, too, are said to produce pain followed by a period of numbness. Numerous Matsigenka pain medicines are said to 'calm pain' (amiriganai). The Matsigenka term ampatake refers to numbness and tingling caused by poor circulation in the limbs (e.g., when one's leg falls asleep). Chronic numbness and tingling is described as jampaseri, and is believed to be an illness caused by sorcerers (see Table 4.11).

In the "best example" experiment (Appendix 2.3), two of seven Yora/Yaminahua informants mentioned Piper species used for treating toothache as examples of the property asawãna. Two mentioned Araceae used in the treatment of insect stings, and one each mentioned chili peppers and Acmella (cf. Matsigenka responses for katsi, Appendix 2.3)

ODOR VOCABULARY

Translation between Matsigenka, Yora/Yaminahua and English odor vocabulary is considerably more difficult than for other properties. The English glosses are adopted for the sake of simplicity in the text and tables, while recognizing the ambiguities discussed here in detail. There are a number of odor concepts that are similar in the two languages, and I have presented these cases together. Several odor terms, however, have no close equivalent in the other language.

The three most common odor terms concerning wild plants in the two languages are discussed first. The English glosses I have adopted for these three categories are 'fragrant' (M: kasanka; Y: ini), 'rank' (M: enkaga; Y: itsa) and 'foul' (M: shiti; Y: pisi). The trio of terms divide the vast spectrum of odors into three general, though not exhaustive, categories based on hedonistic appraisal: aromatic odors that are generally pleasant and fragrant; aromatic odors that are mildly unpleasant and rank without being foul (especially animal musk); and extremely strong, usually unpleasant odors. In addition to the three general terms, there are a number of less-frequently used terms referring to more specific kinds of odors. In both languages, however, there is overlap among the three categories as well as with other odor terms.

Fragrant

M: kasanka -- 'volatile, fragrant, aromatic, odorous'

Y: ini -- 'fragrant, aromatic, odorous; aroma, odor (general term)'

The focal meanings of the terms kasanka and ini are similar, though there are slight differences in usage. The Matsigenka term kasanka appears to be related to the verb -saanka, 'to disappear, to be invisible.' If this interpretation is correct, the term kasanka means literally, 'that which disappears (i.e., vaporizes) of its own accord,' making it cognate with English 'volatile.' The related verb -masanka means 'to lose odor, flavor; to become stale' (i.e., over a period of time). The word for animal scent glands, isankatare, incorporates the same root. Focally, kasanka refers to the odors of

volatile oils and other aromatic compounds produced by plants, especially in leaves, stem or trunk slash. The fragrances of flowers and fruits are usually described with other terms. Kasanka is most frequently applied to pleasant, perfumelike odors, for example, the spicy to citrus fragrance of many Myrtaceae (Eucalyptus family), an almond odor found in Bignoniaceae and other plant families, the incense fragrance of Peruvian balsam (Myroxylon balsamum) and the spicy odors of Lauraceae (laurel family). In a broader sense, kasanka can refer to any strong odor, pleasant or unpleasant, that can be perceived at a short distance from its source. Intonation, facial expression and context serve as clues to the precise meaning of a given utterance. The phrase pairo okasangatake means literally 'very + it is fragrant.' Said with a smile, the phrase could mean 'it is very (i.e., pleasantly) fragrant'; said with a grimace, the same phrase could mean 'it is very (i.e., excessively, unpleasantly) odorous' (e.g., feces). Strongly kasanka plants may be described as having an 'intoxicating odor,' kepigarienga.

The focal meaning of ini is the same as that of kasanka in Matsigenka, referring to the pleasant, fragrant odors of aromatic compounds in plants. As in Matsigenka, floral and fruity odors are described with separate terms. The prototypical ini plants for Yora/Yaminahua speakers are the diverse species used as body perfumes (postameti) placed in bracelets around the biceps. These include almond-smelling Bignoniaceae, Peruvian balsam (Myroxylon balsamum) and its fragrant relative Amburana, Vanilla orchid pods, a wild turmeric relative (Renealmia), soapy-smelling palm fibers, aromatic Asteraceae and many other fragrant plants. Whereas kasanka in Matsigenka is used only as a verb root or adjective, ini in Yora/Yaminahua functions also as a noun, meaning 'fragrance, aroma' as well as 'odor' in its broadest sense. In this sense, ini is close to the Matsigenka noun root -enka, 'odor, vapor, smoke, air' (see enkaga, below). Taking these details into consideration, the most appropriate English gloss for ini might be the noun-adjective pair, 'aroma; aromatic.' Used as a noun, ini can refer to any strong odor,

pleasant or unpleasant. The compound term *ini pae*, 'fragrant+strong/painful,' can be used to describe penetrating, pungent odors much like Matsigenka *katsienka*.

In the taste/odor experiment (Appendix 2.2), Matsigenka informants ascribed the odor term *kasanka* most consistently to the following items: Skin-So-Soft mineral oil, almond extract, bay leaf, cinnamon stick, vanilla extract, lavender, cloves, spearmint and garang masala . Responses of *ini* for Yora/Yaminahua speakers were similar: Skin-So-Soft, cinnamon stick, garang masala, almond extract, bay leaf, cardamom, cloves, dill weed, lavender, sandalwood, spearmint, curry and nutmeg. These results and those of the "best example" experiment reinforced my conclusions about the overlap between the focal meaning of the terms in the two languages.

In the "best example" experiment (Appendix 2.3), three of seven Matsigenka informants mentioned the cultivated herb Justicia pectoralis as a good example of *kasanka*. When crushed, the leaves become noticeably oily and give off a distinct almond odor. Several varieties are cultivated, forming a key part of women's arsenal of fragrant plants used in the warm, daily baths given to newborn infants. The same fragrant Justicia varieties are applied as 'painful' eyedrops or as warm baths to the face and head of people suffering from nightmares, fever and/or headache. Three of seven informants also mentioned various Myrtaceae species having spicy, citrus odors. These, too, are used by women to 'bathe babies' (*okaatakeri ananeki*). Two of seven informants mentioned tree species of the Lauraceae, a family with characteristic, aromatic odors including those of such familiar spices as laurel, cinnamon, cloves and camphor. Lauraceae are not used medicinally by the Matsigenka, though their fruits attract birds while their lumber has commercial value in more accessible regions. One Matsigenka informant mentioned a Bignoniaceae liana species with an almond odor, used as a love potion. The Yora/Yaminahua use the same species as a body perfume.

In the collections database, 97 of 740 plants registered (~13%) with Matsigenka informants were ascribed the property *kasanka*, making it the most frequently encountered single odor term in Matsigenka pharmacognosy. Most of these registers were of fragrant plants used by women to bathe babies, while a smaller number correspond to the secretive practice of perfumes and love potions. The use of fragrant herbal baths for newborn babies is one of the most ubiquitous features of Matsigenka ethnomedicine. Women in traditional Matsigenka settlements bathe newborn babies daily in a warm mixture of aromatic plants. The concoction contains cultivated sedge roots (Cyperus) and almond-smelling Justicia as its principal ingredients, to which are added a variety of fragrant admixtures, mostly Myrtaceae. Succulent plants are also added to make the herbal mixture viscous (*tsire*), thereby adhering better to the baby's skin. The plants are steeped together in water in a clay pot known as, 'her bathing pot,' *ogajare*, and warmed and reused daily. The same batch is reused for several days until the odor begins to fade, at which time fresh ingredients are added. The idea behind the warm baths is to surround the fragile, newborn baby's body and soul with a protective aura of strong fragrance. Foul-smelling demons, toxic plants and the spirits of game animals 'snatch the soul' (*yagasuretakeri*) of fragile infants, thereby causing a variety of illnesses including gastrointestinal upset, rashes, lethargy, irritability, 'heart pain' and nightmares. Babies thus afflicted 'wake up in the middle of the night crying' (*isengatake*). Bathing a child in fragrant plants 'infuses the baby's body' (*okitsitingakeri ivatsa*) and causes the baby to 'be fragrant' (*ikasankatake*), 'to reek' (*ienkagake*) or 'to stink' (*ishititake*). Harmful spirits cannot come close because they smell the child's odor from a distance, become frightened and run away.

Specific plants added to the basic mixture act as antidotes to specific kinds of animals or other harmful substances. Mnemonic associations link the plant and its medicinal use. At least five fragrant Myrtaceae species of the genus Calyptranthes are

named for different species of carnivorous fish believed to ‘take revenge’ on young children. The leaf size and shape of each species corresponds to the relative sizes and shapes of the indicated fish species. Calyptranthes maxima, boasting the largest leaves of the genus, is named komagirishi, ‘leaf of paco/tambaqui (Piaractus brachypomum),’ likewise the largest fish of its family in the region. The paco is omnivorous and has fatty, almost porklike meat. The fish is said to eat the garlicky seeds of the tree Gallesia when they fall in the river, thereby ‘infusing’ (okitsitingakeri) its flesh and soul with the strong, rank odor. If parents of a newborn infant eat this fish, its foul-smelling spirit ‘takes revenge’ on the child. Using the proper fragrant plant, the foul-smelling spirit is kept at bay, and the harmful effects of eating the fish can be prevented. Other fragrant and/or succulent plants including Acanthaceae, Gesneriaceae, Piperaceae, and Nyctaginaceae are used to protect infants from the odorous or noxious spirits of specific ‘vengeful’ animals and plants, including armadillos, anteaters, adult males of most monkey species, many small bird species and toxic or urticating plants.

Whereas baby-bathing plants are considered to have pleasant, harmless fragrances, perfume plants are thought to have more powerful and potentially dangerous odors. The Matsigenka are secretive about their knowledge of fragrant perfumes and love potions, because their use is seen as socially disruptive. Perfume plants, known as posanga throughout Amazonian Peru, come from a wide range of botanical families including Bignoniaceae, Araceae, Rosaceae and ferns. Many have strong, almond odors that are described as both ‘fragrant,’ kasanka, and ‘intoxicating,’ kepigari. When rubbed on the body or administered in secret rituals to a coy or unwilling lover, the fragrance causes the victim to become ‘intoxicated’ by passion for the owner of the perfume. Some of the same fragrant plants can also be used by hunters to disguise their body odor from game animals; this use, however, requires a strict regime of sexual abstinence. Many Matsigenka men and women recognize perfume plants in the forest and know how to use

them as love potions. All state that this knowledge was learned from foreign ethnic groups, especially the Piro. Though privately proud of this knowledge and the sexual conquests it permits them, informants are keen on hiding their knowledge from other members of their own community. When showing me a love potion (posanga) plant in the forest, informants would typically take me out of earshot of any accompanying people and lower their voice to a conspiratorial whisper as they described its powerful attractive or aphrodisiac properties. I was asked to conceal these plants from others who might be present at the afternoon plant pressing session. In addition to the marital infidelities and social disruption love potions cause, their 'intoxicating smell,' kepigarienga, can also inflict symptoms of physical intoxication on the victim, including heart palpitations, dizziness, weakness and even insanity. Matsigenka of the Urubamba River have frequent interactions with foreign ethnic groups, such as the Piro and Ashaninka, and complain about how they have used love potions to disrupt marriages and shatter social stability. In these communities I collected a number of love potion antidotes, mostly fragrant Myrtaceae similar to those used to bathe babies. Like baby-bathing medicines, the plants are administered as a warm bath. Their mild, pleasant fragrance is believed to wash off and dispel the 'intoxicating fragrance' of love potions.

Yaminahua speakers' responses for ini in the "best example" experiment were similar to those of the Matsigenka for kasanka (Appendix 2.3) emphasizing plants with pleasant, aromatic odors. All seven Yora/Yaminahua informants mentioned the use category postameti, 'bracelet plant,' as an example of ini. The Yora/Yaminahua traditionally used more than thirty species of plants as body perfumes and adornments, displayed prominently in bracelets worn around the upper arm by men and women alike. Yora/Yaminahua speakers mentioned more plant species for ini than for any other category in the exercise, reflecting the importance of perfumes in their traditional lifestyle. Four of seven Yora/Yaminahua speakers independently mentioned the tree ako,

Amburana, as an example of the property ini. Shavings from the inner cortex have a strong and unique odor somewhat like that of vanilla. Other perfume plants mentioned frequently by informants as examples of ini include almond-smelling Bignoniaceae liana species (the same mentioned by the Matsigenka as posanga love potions), Vanilla orchid pods, soapy-smelling Carludovica (a Cyclanthaceae) and almond-smelling Justicia pectoralis, also used by the Matsigenka to bathe babies. One Yora/Yaminahua informant mentioned a fragrant Myrtaceae species used to bathe babies and make them 'grow up fast,' similar to the Matsigenka practice.

Both the Matsigenka and the Yora/Yaminahua use fragrant plants to bathe babies and as perfumes, yet a clear difference is observable in the relative emphasis placed on the two use categories. The same difference is reflected in botanical collections: perfume plants make up 10% of registers with Yora/Yaminahua informants and less than 1% of registers with Matsigenka informants; fragrant baby-bathing plants account for more than 20% of all registers with Matsigenka informants, and less than 6% of registers with Yora/Yaminahua informants (Figure 6.3). Whereas the Matsigenka are secretive and private about their knowledge and administration of perfume plants, the Yora/Yaminahua display perfumes openly in their bracelets, and do not hesitate to discuss the sexual connotations of these plants in public.

In the collections database, 132 of 538 plants registered (~23%) were described as ini, making it the single most important property in Yora/Yaminahua pharmacognosy (Figure 5.7). The majority of these were registers of bracelet plants, postameti. The pleasant odor of these plants is thought to attract members of the opposite sex, dispel unpleasant body odors and enhance social interactions by imitating the Xoma, fragrant, joyous, and benevolent spirits of the forest.

Rank

M: enkaga, jenkaga -- 'reeking, smoking; rank, aromatic, musk odor'

Y: itsa -- 'rank, aromatic, musk odor'

The terms enkaga and itsa are close in meaning, though there is a slight difference in usage. The Matsigenka term enkaga (often pronounced with an 'h' sound at the beginning, jenkaga) is derived from the noun root -enka, which refers to anything in a gaseous or vaporous state, including air, smoke,[12] steam, mist and odors as well as breath and speech. The verb root -enkaga means literally, 'to reek, to be odorous, to give off smoke or vapor.' When used as an adjective, the term takes on a more restricted meaning, referring focally to rank or strongly aromatic odors that are somewhat unpleasant without being foul. Enkaga is especially appropriate for describing animal scents and musk. A number of plants have rank odors that are reminiscent of animal scents. There is considerable ambiguity in the use of enkaga, which may overlap with 'fragrant,' kasanka, and 'foul,' shiti. Like Matsigenka enkaga, Yora/Yaminahua itsa refers mostly to rank and strongly aromatic odors, especially animal scents, that are unpleasant without being foul.

In the taste/odor experiment (Appendix 2.2), Matsigenka informants applied the odor term enkaga to the following spices: curry, catnip, Tiger Balm, black pepper, cardamom, cloves and Echinaceae root. Yora/Yaminahua speakers described garlic, black pepper, cardamom, catnip, cocoa powder, dill weed, Echinaceae powder and ginger as itsa. The results are similar, the one exception being garlic. Whereas nearly all Yora/Yaminahua speakers agreed that garlic was itsa, most Matsigenka speakers described it as shiti, literally 'foul.'

In the "best example" experiment (Appendix 2.3), six of seven Matsigenka informants mentioned a folk genus containing several Siparuna species as an example of

the odor enkaga, ‘rank’. The high degree of informant consensus is not surprising, because the name for this folk genus, enkagari, means literally, ‘the rank one,’ epitomizing the odor term enkaga. All species in the genus Siparuna (Monimiaceae) have a powerful, nauseating aromatic odor somewhat like skunk musk or formic acid. The species included under the folk genus enkagari are the strongest-smelling of these, used in the treatment of snakebite. The leaves are applied externally and taken internally as a cold infusion. By drinking a large quantity of the infusion, the snakebite victim is induced to vomit repeatedly, until blood appears. The powerful odor of the plant is thought to overpower the snake's venom and expel the contaminated blood from the body. The odor of Siparuna is considered to be ‘intoxicating’ and dangerous when inhaled. One informant reported that Siparuna leaves can be burned in wild cane patches to put nesting Oropendula birds to sleep. Another informant said that in former times, smoldering Siparuna could be introduced into the house of sleeping enemies so that they would remain in a deep stupor while attacked.

Two of seven Matsigenka informants mentioned the scent glands of peccaries as a good example of enkaga. Mansoa, a liana in the Bignoniaceae with a distinctly onionlike odor, and Angostura, a shrub in the Rutaceae (Citrus) family with a skunklike odor, were also mentioned by one Matsigenka informant each. These and other plants with rank, musk odors perceived as being similar to those of game animals are used to improve the tracking skills of hunting dogs. One informant mentioned spicy-aromatic Lauraceae as an example of enkaga, demonstrating overlap with the odor category kasanka, ‘fragrant.’

In the collections database, 75 of 740 plants registered with Matsigenka informants (~10%) were ascribed the property enkaga, grouped with other unpleasant odors under the category “Rank-Foul” in Figure 5.7. The majority of these were plants used to treat hunting dogs. Musk-smelling plants are soaked in water with other ingredients including psychoactive plants, animal fur or scent glands, chili peppers, wasp

nests and ant stingers. The cold infusion is forced into the dog's nostrils while the owner sings an inspirational, improvised song:

gara pipigapitsa!	Don't turn back!
chatting maika pogana!	Get it right!
pipatimatanakeri shintori	Chase the peccary
gara pishigopitana!	and don't turn back!
pipatimakeri kemari	Chase the tapir
maika pogana!	and get it right!
gara patsikeri matsigenka	Don't bite people
onti patsikakeri shintori	just bite peccaries.
katinga maika pogana!	Get it right!
gara pipigapitsa!	Don't turn back!...

The narcotic elements in the mixture as well as the physiological shock of the nasal administration leave the dog in a stupor lasting several minutes to as long as a several days, depending on the plants used. When the dog recovers, its sense of smell as well as its endurance are thought to be heightened for several months. The odor of musk-smelling plants and scent glands is thought to infuse (okitsitingakeri) and imprint the dog's nose with the scent of game animals.

In the "best example" experiment (Appendix 2.3), Yora/Yaminahua informants mentioned as examples of itsa, 'rank,' some of the same plants mentioned by Matsigenka informants for enkaga, emphasizing the similarity between the terms in the two languages. Peccary scent glands, onion-like Mansoa, rank Rutaceae and aromatic Lauraceae were mentioned once each by Yora/Yaminahua informants as examples of itsa. The Yora/Yaminahua name for Mansoa, wowaitsa, contains the noun stem itsa, indicating that the onion-smelling plant epitomizes this odor quality. One Yora/Yaminahua informant mentioned a Siparuna species (also mentioned by Matisgenka informants for enkaga) as an example of itsa. The plant is known as nisõ rao, 'convulsion illness/medicine,' because its powerful odor is believed to cause epileptic fits. Likewise, people suffering from epileptic fits can apply a warm compress of the leaves to their head. Like other 'illness/medicines' (rao) Siparuna is both cause and cure.

Two of seven Yora/Yaminahua speakers mentioned the folk genus xako rao, 'millipede medicine,' as an example of itsa. This folk genus includes hairy and/or latex-containing herbs and vines of the Apocynaceae (dog bane family), Asclepiadaceae (milkweed family) and Gesneriacaea (African violet family), all of which have faintly rank vegetative odors. Xako is a venomous millipede looked upon with fear and disgust by the Yora/Yaminahua. It is believed to contaminate food and water and thereby cause respiratory and skin infections. Plants that are reminiscent of the millipede's flexible body and hairy texture are thought to cure these conditions, as discussed in greater detail under the properties xopoya, 'has hairs, bristles,' and wepoya, 'has latex.'

Two of seven Yora/Yaminahua speakers mentioned the black-footed fern Adiantum as an example of itsa. The Yora/Yaminahua name of the plant is isõ chikõ rao, 'urine stench medicine,' because its slightly rank vegetative odor is compared with that of urine (this plant is discussed further under the odor category chikõ, 'slightly foul, urine stench').

In the collections database, 66 of 538 plants registered (~12%) were ascribed the property itsa, grouped with other unpleasant odors under the category "Rank-Foul" in Figure 5.7.

Foul

M: shiti -- 'foul, rotten, stinking, reeking, strongly odorous'

Y: pisi -- 'foul, rotten, stinking, reeking, strongly odorous'

The terms are similar in meaning, referring focally to foul odors such as those of feces, urine, rotten food, dead animals or other decaying organic material. The phonetic similarity in Matsigenka between shiti, 'foul,' and the verb -shita, 'to defecate' is perhaps not coincidental. In both languages, the terms refer to the actual process of organic decay as well as to the odor it produces, much like the English words 'rot/rotten' and 'putrefy/putrid.' In a broader sense, shiti and pisi can refer to any strong or unpleasant

odor that causes an instinctive withdrawal from the stimulus and usually a sensation of disgust. Dirty clothing, strong body odor, animal scents and rank to strongly aromatic vegetative odors can also be described as shiti/pisi. As with other odor terms, context influences the meaning of a given utterance. A powerfully 'fragrant' (kasanka/ini) or 'rank' (enkaga/itsa) odor may on occasion be described as shiti/pisi, that is, 'stinking, reeking, strongly odorous,' without necessarily being 'foul' in the strict sense.

In the taste/odor experiment (Appendix 2.2), several of the eight Matsigenka informants used shiti to describe spices with the strongest and least pleasant (in their judgement) odors: garlic and wasabe paste. None of the nine Yora/Yaminahua-speakers described any spice as pisi. In the "best example" experiment (Appendix 2.3), five of seven Matsigenka informants mentioned Gallesia, a large tree with a distinctly garlic-like odor, as an example of shiti. The Matsigenka name for the tree, shitiro, means literally 'foul, stinking one,' reflecting the Matsigenka's disdain for the garlicky or onionlike odors (likened to the scent of peccaries) found in certain wild plants. The garlicky seeds of Gallesia are believed to infuse the flesh of the omnivorous fish komagiri, Piaractus brachypomum, with their rank odor, rendering the animals spirit harmful to infants. Warm baths of aromatic Myrtaceae protect infants by making their bodies 'reek' (ienkagake) or 'stink' (ishititake) with fragrance, repelling foul-smelling spirits.

Two of seven Matsigenka informants mentioned peccary scent as being an example of shiti, again reflecting the extended meaning 'reeking, stinking' without necessarily implying 'foul, rotten.' One Matsigenka informant mentioned feces as being an example of shiti, demonstrating the meaning 'foul' in its strict sense.

In the collections database, only 5 of 740 medicinal plants registered were ascribed the property shiti. These include canine hunting medicines with peccarylike odors, also described as 'rank' (enkaga) or 'peccary odor' (shintorienka), and plants believed to be used by sorcerers to cause illness, for example, caustic and garlicky

Dieffenbachia. Encounters of the property *shiti* ('foul') were counted together with *enkaga* ('rank') and other unpleasant odors within the category "Rank-Foul" in Figure 5.7.

Four of seven Yora/Yaminahua speakers mentioned the folk genus *samama rao*, 'fast medicine,' as an example of *pisi*. The group includes fragrant Myrtaceae and other aromatic leaves administered as warm baths to promote health and 'fast growth' in infants. Similar to and yet an inversion of Matsigenka understandings of efficacy, the strong fragrance is thought to mimic the strong, 'foul' (*pisi*) odors of demons and animal spirits as well as of feces, urine and burnt animal fur. They do not consider such fragrant plants to be literally 'foul,' but rather *pisi* in the sense of 'reeking, strongly odorous.' One informant described them as *ini-pisi*, 'fragrant-stinking.'

Two of seven Yora/Yaminahua speakers mentioned ghosts (*waka*) and demons (*yõshi*) as being examples of *pisi*, reflecting the focal meaning of 'foul, rotten.' One informant mentioned feces and one mentioned peccary scent, responses also observed among the Matsigenka. Two informants mentioned the plant name *iwi pisi*, 'foul tree,' a folk genus of unpleasantly odorous trees including Gallesia, extremely rank Fabaceae and others.

In the collections database, only 4 of 538 medicinal plants registered were ascribed the property *pisi*. All were registers of fragrant Myrtaceae used to bathe babies, described with equal frequency as 'fragrant.' Occurrences of the property *pisi* ('foul') were counted together with *itsa* ('rank') and other unpleasant odors under the category "Rank-Foul" in Figure 5.7.

Raw meat, blood odor

M: *anigarienka, janigarienka* -- '*heart odor; odor of raw meat, blood*'

Y: *wiya* -- '*odor of raw fish, blood, meat, organs*'

Both words refer specifically to the unpleasant odor of raw or slightly rotten meat, fish, organs and blood. Both terms are applied on occasion to plants with rank vegetative odors. The Matsigenka word anigarienka (or janigarienka) means literally, 'heart odor,' derived from affixing the noun root -enka, 'odor' to nigakentsi, 'heart.' The term is used infrequently and inconsistently by some Matsigenka informants to describe odors that others might describe as enkaga, 'rank,' shiti, 'foul,' or kepigarienka, 'intoxicating odor.' The following anecdote illustrates the unpleasant associations evoked by this odor term:

> Passing through Cuzco with Mateo and Alejandra [Matsigenka field assistants], a Japanese friend invited us to a delicacy of raw beef in ginger sauce. Mateo, willing to experiment, tried the beef and liked it. Alejandra [Mateo's wife], looked on horrified. She said, "When we get home, remind me to prepare you manioc beer so you can vomit up that raw meat odor (anigarienka)!" For the next six months, this was the running joke anytime we went to a household where manioc beer was being served. Alejandra would remind the hostess, "Don't forget to give Mateo an extra bowl of manioc beer. He still has to vomit up that raw meat he ate in Cuzco!"

Unlike Matsigenka anigarienka, the Yora/Yaminahua word wiya is not a comparative term (e.g. 'heart odor') but rather an abstract term that describes the odor of raw meat, raw fish, organs and blood without referring to any specific noun.

In the taste/odor experiment (Appendix 2.2), anigarienka was used by only one Matsigenka informant to describe the odor of vanilla extract. Two Yora/Yaminahua speakers described the odor of ginger as wiya. In the "best example" experiment (Appendix 2.3), four of seven Matsigenka informants mentioned blood or meat as examples of the odor anigarienka. One mentioned the mushroom Dyctophera, a tropical relative of the temperate stink horn, Phallus impudicus. Dyctophera has a blatantly phallic stem surrounded by a lace-like white veil. The spores give off an offensive odor exactly like that of rotten meat, attracting carrion flies involved in the spore dispersal of the mushroom. The plant is known as 'demon's placenta' (iranotare kamagarine) or 'demon's penis' (ishivu kamagarine) and is considered extremely dangerous. Likewise, two of seven Yora/Yaminahua speakers mentioned the stink horn Dyctophera as an example of wiya. The Yora/Yaminahua name for the mushroom is yõshi maxko,

‘demon’s mane.’ Three of seven Yora/Yaminahua speakers mentioned blood or fish as being examples of wiya, and two of seven mentioned ghosts (waka) or demons (yõshi).

In the collections database the terms anigarienka and wiya were registered infrequently, and were included within the category “Rank-Foul” in Figure 5.7. With the Matsigenka, seven of 740 plants registered (~1%) were ascribed the property anigarienka. Most were hunting medicines for dogs having rank odors perceived as being like raw meat or peccary scent. These included Solanaceae, having a rank, tomato-plant odor, Rutaceae, with a rather skunk-like odor, and Proteaceae, described by Gentry (1993: 702) as having an odor “which is exactly that of poor quality or slightly spoiled canned beef.” With Yora/Yaminahua speakers, 11 of 538 medicinal plants registered (~2%) were ascribed the property wiya, mostly Solanaceae and the characteristically rank Fabaceae. No use category corresponded consistently with this property.

Unique odor

M: oenkagake ....-enka -- ‘its odor is ... odor’

Y: .... xetetsa -- ‘.... odor’

When Yora/Yaminahua speakers encounter an odor that is unusual, nondescript or difficult to describe, they often use compound expressions based on abstract odor and/or taste terms, for example, initsa, ‘fragrant+rank,’ mokaitsa, ‘bitter+rank’ or wiya axoshta ‘blood odor+mild vegetative odor (a little).’ The Matsigenka rely more frequently on comparative odor terms formed by affixing the noun stem -enka, ‘odor.’

The nondescript odor of crushed leaves is described by Matsigenka speakers as inchashienka, ‘herb/leaf odor,’ and that of garden weeds is described as tovaserienka, ‘weed odor.’ The unique, aromatic odor of Cyperus root is described as ivenkikienka, ‘Cyperus odor,’ and is believed to ward off ghosts and foul-smelling spirits that cause bad dreams and illness, especially in infants. Other frequently encountered sui generis odor terms include ivarantsishienka, ‘Piper odor’; inchovikienka, ‘Lauraceae odor’;

tsirompienka, ‘fern odor’; and posangaenka, ‘posanga (love potion) odor.’ The Matsigenka compare some rank vegetative odors (Monimiaceae, Polygalaceae, Proteaceae, Rutaceae, ferns) to the scent of specific animals (shintorienka, ‘peccary odor’; kemarienka, ‘tapir odor’; samanienka, ‘agouti odor’) and administer these plants to the nostrils of hunting dogs. The acrid odor of one Peperomia species is described as sakaroenka, ‘Campanotus ant odor,’ because the plant is tended by Campanotus ant colonies. It, too, is used to treat hunting dogs. The turmeric odor of Renealmia is described as mushienga, ‘Paraponera ant odor,’ and the root is used to treat the painful stings of this ant. The fragrant odors of some baby-bathing plants are likened to the odors of the animals thought to cause harm to infants: for example, some aromatic Peperomia species are described as katsarienka, ‘Oropendula odor,’ and etinienka, ‘armadillo odor,’ animals believed to ‘take revenge’ (ipugatakeri) on infants.

Comparative odor terms were encountered frequently in the taste/odor experiment (Appendix 2.2) for both groups. Matsigenka speakers described bay leaf, cinnamon stick and cloves (all members of the Lauraceae) as inchovikienka, ‘Lauraceae odor.’ Both Matsigenka and Yora/Yaminahua speakers described cardamom as having ‘Renealmia odor’ (M: porenkienka; Y: arawa xetetsa), correctly associating the odors of two Zingiberaceae species from different continents. Yora/Yaminahua speakers described fragrant spices such as almond extract, bay leaf, garang masala, lavender and Tiger balm as ako ini, ‘Amburana fragrance.’ Yora/Yaminahua speakers described catnip as having ‘tobacco odor’ (nawe xetetsa), while Matsigenka described it as having ‘herb odor’ or ‘weed odor’ (inchashienka, tovaserienka). Matsigenka speakers described dill weed as having ‘tobacco odor’ (serienka) as well as ‘Calathea herb odor’ (tsipanshienka). Yora/Yaminahua speakers described cocoa powder as smelling like ‘termite nest’ (womakea) or ‘wasp nest’ (wona mapo), and coffee as smelling like ‘toasted maize’ (xekitoa). Both Matsigenka and Yora/Yaminahua speakers described garlic as having an

odor like that of the onion-like Mansoa liana (M: sampera; Y: wowaitsa). Such examples demonstrate how odor vocabulary is firmly rooted in concrete sensory experiences of specific cultural and natural environments. In the collections database, comparative terms were assigned to the odor category generally associated with the object of the comparison: for example, 'peccary smell' (M: shintorienka; Y: isawo xetetsa) would be included under "Rank-Foul" because peccaries are generally considered to stink; Yora/Yaminahua ako ini, 'Amburana fragrance' and Matsigenka posangaenka, 'posanga love potion odor,' would be included under 'Fragrant' (Figure 5.7).

Intoxicating odor

M: kepigarienka -- 'intoxicating, overwhelming odor; odor of poisons, intoxicants (e.g. Solanaceae)'

(Y: pae; ini pae; itsa pae -- 'strong, painful, intoxicating; fragrant+strong'; 'rank+strong,')

The Matsigenka odor term kepigarienka incorporates the term kepigari, 'intoxicating' (see "Irritation"). Kepigarienka may be used to describe strongly fragrant, aromatic, rank or foul odors that overwhelm the senses. Love potions (posanga) are said to overpower their victims with intoxicating fragrance, and are believed to cause physical symptoms of intoxication such as dizziness, fainting, headaches, heart palpitations and even temporary insanity. There is no equivalent to kepigarienka in Yora/Yaminahua, though Yora/Yaminahua speakers might describe such odors either as pae, 'strong, painful, intoxicating,' or by incorporating pae into compound odor expressions such as ini pae, 'fragrant+strong' or itsa pae, 'rank+strong.' Matsigenka informants use kepigarienka in a second, more literal sense to describe the vegetative odors of narcotics and hallucinogens, including Solanaceae species (Brugmansia, Brunfelsia, Datura, Nicotiana, Juanulloa) and Banisteriopsis. Kepigarienka also describes the odor of poisonous plants, for example, Tephrosia fish poison and toxic mushrooms, as well as

ritually or medicinally used emetics. The contaminating effect of menstrual blood is also attributed to its 'intoxicating odor,' kepigarienka.

I was constantly warned by members of both ethnic groups to avoid sniffing so many plant odors, lest I become 'intoxicated' (M: kepigari; Y: pae) or ill. In my enthusiasm to describe novel odors, however, I often overindulged my senses despite my companions' warnings. I was overcome with giddiness, nausea and headaches on several occasions after inhaling too deeply the powerful aromas of forest plants such as Siparuna and rank Fabaceae. One evening, I suffered nightmares after smelling and handling Ormosia, an extremely rank Fabaceae, and my indigenous companions were not surprised.

Kepigarienka, 'intoxicating odor,' was mentioned in the taste/odor experiment (Appendix 2.2) to describe the odors of lavender, nutmeg and cocoa powder by one Matsigenka informant each. Yora/Yaminahua speakers consistently used pae, 'strong, painful, intoxicating' alone or in compound expressions to describe the odor of Tiger Balm. In the "best example" experiment (Appendix 2.3), Matsigenka informants mentioned Brugmansia, tobacco (Nicotiana), other solanaceous narcotics and hallucinogenic Banisteriopsis as examples of kepigarienka. In the collections database, Matsigenka informants ascribed the property kepigarienka to 38 of 740 plants registered (~5%). These include narcotics, hallucinogens and their admixtures, emetic plants used to improve men's hunting skills, narcotic or musk-smelling plants administered to hunting dogs and rank or poisonous plants believed to be used by sorcerers in secret rituals to inflict illness on their victims. Responses of kepigarienka were included under the category "Pungent, Toxic, Bitter Odor" in Figure 5.7. The compound Yora/Yaminahua odor terms ini pae, 'fragrant+strong' and itsa pae, 'rank+strong' were attributed to only five of 538 plants registered (~1%). These registers were included under the respective odor categories "Fragrant" and "Rank-Foul" in Figure 5.7.

Bitter odor

M: kepishienka -- 'bitter odor'

Y: mokaitsa -- 'bitter+rank'

The compound Matsigenka and Yora/Yaminahua odor terms kepishienka, 'bitter odor,' and mokaitsa, 'bitter+rank,' demonstrate synesthesia between taste and odor sensation. Like kepigarienka, the terms require prior knowledge of a plant's full suite of properties, and were used on occasion to describe the odors of hallucinogens, poisons and other bitter plants. Neither term was encountered frequently in the taste/odor experiment or the collections database, and responses were included under the category "Pungent, Toxic, Bitter Odor" in Figure 5.7.

Mild to slightly rank vegetative odor (like maize, legumes)

Y: axò

Axò is an odor term in Yora/Yaminahua that has no exact Matsigenka or English equivalent. Most Yora/Yaminahua speakers describe axò as being the odor of freshly grated, raw maize used for making tamales (misi). One Yora/Yaminahua man stated that axò is like the odor of semen. In describing wild plants, axò is applied to those whose freshly cut stems or trunks have a nondescript to somewhat rank vegetative odor.[13] Many Fabaceae have a characteristic, vaguely unpleasant odor like that of raw peas, frequently described as axò by Yora/Yaminahua speakers. Matsigenka speakers might describe this odor as enkaga, 'rank,' or else use comparative terms such as inchatoenka, 'tree odor,' kepigarienka, 'intoxicating odor' or kogienka, '*Tephrosia* odor' (*Tephrosia*, a fish poison is a member of the Fabaceae).

In the taste/odor experiment (Appendix 2.2), three Yora/Yaminahua speakers described wasabe paste as smelling axò. In the "best example" experiment (Appendix 2.3), four of seven Yora/Yaminahua speakers mentioned maize (*Zea maydis*) as an example of axò, and two of seven mentioned other Poaceae species (*Guadua* bamboo,

Paspalum grass). Two of seven mentioned Fabaceae species, and two of seven mentioned the plant name xaki rao, 'stomach medicine,' a use category including Hippocrataceae, Apocynaceae and Verbenaceae species. Like other rao ('medicine/illness'), these plants are applied as warm plasters to cure the illnesses their spirits are believed to cause, in this case stomach-ache or menstrual cramps. In the collections database, 23 of 538 medicinal plants registered (~4%) were described as axò, mostly the mentioned 'stomach medicines' (xaki rao) and Fabaceae 'wasp medicines' (wina rao), believed to cause/cure headache, body pain and inflammatory skin conditions. Encounters of axò were counted under the category "Rank-Foul."

Nauseating, stench of urine

Y: chíko-- 'nauseating, acrid, unpleasant; urine stench'

This odor term has no equivalent in Matsigenka. It is an abstract term referring to acrid, usually offensive odors that can be perceived at distance from their source, for example, accumulated urine or scorched fur. Though similar to pisi, 'foul' (e.g., feces) chíko[14] is considered less unpleasant. It is used on occasion to describe plants with rank or aromatic vegetative odors. The Yora/Yaminahua consider the stench of human feces and urine to be disgusting and dangerous to one's health. The stench of urine and feces, as well as that of scorched animal fur, is believed to enter the body through the nose and mouth, descending to the stomach where it causes stomach-ache and diarrhea.

Chíko was not encountered in the taste/odor experiment. In the "best example" experiment (Appendix 2.3), five of seven Yora/Yaminahua speakers mentioned Adiantum as examples of chíko. This small fern is common in the understory and is one of the most widely known and frequently encountered plant medicines among the Yora/Yaminahua. Its name íso chíko rao,[15] literally 'urine stench medicine,' reflects the slightly acrid vegetative odor, likened to that of urine (íso). The plant is used to treat mild gastrointestinal disorders attributed to inhaling offensive odors, especially urine but also

feces or scorched animal fur. Two of seven informants mentioned spicy-aromatic Piper species, used in the same way, as examples of chíko. Applied as a warm compress to the abdomen, these plants exemplify the importance of fragrance as well as the homeopathic principle in Yora/Yaminahua herbal medicine: plants that smell like urine are used to treat illnesses caused by smelling urine and other offensive odors. In the collections database, the Adiantum fern íso chíko rao occurs 6 times out of 538 registers (~1%), described as both íso chíko, 'urine stench,' and itsa, 'rank.' Encounters of the odor term chíko were included under the category "Rank-Foul" in (Figure 5.7).

Garlicky

M: samperaenka -- 'Mansoa odor'

M: santarienka -- 'Cedrela odor'

M: chariro -- 'Petiveria'

Y: sasa -- 'garlicky, rank'

Y: wowaitsa -- 'Mansoa (rank odor)'

Garlic and onions were introduced recently among both the Matsigenka and the Yora/Yaminahua, and are appreciated as condiments in food only by the most acculturated members of the ethnic groups. However a number of naturally occurring wild plants have odors remarkably like garlic or onion, probably indicating the presence of sulfur compounds. As in English, such odors are described in Matsigenka with comparative odor terms incorporating the names of specific plants, much like the terms 'garlicky' and 'onion-like.' Mansoa is a liana of the Bignoniaceae with a rank vegetative odor similar to onion or garlic. The Matsigenka describe Mansoa and similar odors as samperaenka, 'Mansoa odor,' or simply sampera, 'Mansoa.' The tree Cedrela, an important lumber species of the mahogany family, has a rank, garlicky odor when fresh (with aging, the odor fades and becomes more like that of cedar, from which is derived its botanical name). The Matsigenka name is santari in the Manu dialect and santaviri in

the Urubamba dialect. Santaviri is also the name for the white-lipped peccary, an animal with a strong, rank scent somewhat like garlic. Garlicky odors may be described as santarienka 'Cedrela odor' or simply santari, 'Cedrela.' The herb Petiveria, with a pungent (katsienka, see "Pungency Vocabulary") and very garlicky odor, is known both as isere vumpuo, 'tobacco of the screaming piha' and chariro. The latter name can also be used as an odor term to describe garlicky odors. In the cases of sampera (Mansoa), santari (Cedrela) and chariro (Petiveria), the plant name and the odor term are virtually synonymous. The Matsigenka consider these plants and all garlicky odors to be shiti, 'foul (i.e., rank, unpleasant).'

The Yora/Yaminahua word sasa refers to garlicky and onionlike odors exactly like those described by the comparative Matsigenka terms, but sasa is an abstract odor concept that does not rely on comparison to a specific plant or animal. Incorporating the odor term itsa, 'rank,' the Yora/Yaminahua name for onion-like Mansoa is wowaitsa, which can be used as a comparative odor term as well.

In the taste/odor experiment (Appendix 2.2), Matsigenka speakers described garlic as samperaenka, 'Mansoa odor' and santarienka, 'Cedrela odor' as well as shiti, 'foul.' Yora/Yaminahua speakers likewise described garlic with the comparative odor term wowaitsa 'Mansoa (rank).' A few Matsigenka speakers described sandalwood as santarienka, 'Cedrela odor.' The term sasa was used by only one Yora/Yaminahua informant in the compound expression sasa pae, 'garlicky+strong,' to describe the pungent odor of Tiger Balm.

In the "best example" experiment (Appendix 2.3), six of seven Matsigenka informants not surprisingly gave the plant name sampera, Mansoa, as an example of the odor term samperaenka. Some considered Mansoa to have no medicinal use, while others claimed that inhaling the odor or drinking tea made from stem scrapings can help fight colds and respiratory infections. The strong odor was said by one informant to

‘astringe the nose’ (otinegirimashitake) and the throat, ‘drawing together’ (otinetake) the mucous and phlegm so it can be expelled. Also mentioned as an example of the odor term enkaga, ‘rank,’ some use Mansoa to administer to hunting dogs due to the ‘peccary-like odor’ (shintorienka). Two of seven Matsigenka informants mentioned garlic and onion as examples of samperaenka, ‘Mansoa odor,’ though they disagreed over whether garlic was edible and delicious, or rather ‘foul’ (shiti) and unpleasant. Two of seven Yora/Yaminahua informants mentioned the plant name sawa, Dieffenbachia, as an example of the odor sasa. Many species of this terrestrial Araceae genus have a rank odor similar to garlic. Three of seven Yora/Yaminahua speakers mentioned other Araceae species with rank or garlicky odors. None had medicinal uses. In the collections database, this group of odor terms was encountered infrequently for both ethnic groups, and was included under the category “Rank-Foul” in Figure 5.7.

Toasted, smoked, burnt odor

M: shinkorienka-- ‘smoked odor’

M: tagarienka -- ‘burnt odor’

Y: nowe -- ‘toasted, smoked, burnt odor; mildly, pleasantly aromatic’

Though not common in pharmacognosy, these terms were encountered consistently in the taste/odor experiment in both groups’ descriptions of cocoa and instant coffee powder, and in Yora/Yaminahua speakers’ descriptions of curry, Echinaceae root and other spices. The Matsigenka odor terms shinkorienka and tagarienka incorporate the verb roots ‘to smoke, roast’ (-shinko) and ‘to burn’ (-taga). Both are considered to be pleasant sensations, associated with the taste/odor of toasted or smoked foods as well as the rich aroma of a newly burned swidden. The Yora/Yaminahua term nowe is an abstract term, describing the pleasant odor of smoked, toasted or burnt things without reference to specific substances or verb actions. Nowe can also be used alone or in compound expressions to describe plants with mild, pleasant or slightly aromatic odors

that are not literally toasted or smoky, but nonetheless invoke these sensations. Comparative odor terms such as 'termite nest odor' (womakea xetetsa), 'wasp nest odor' (wona mapo xetetsa) and 'toasted maize odor' (xekitoa xetetsa) were also used by Yora/Yaminahua speakers in the taste/odor experiment (Appendix 2.2) in describing the toasted odor of cocoa and instant coffee powder.

Neither shinkorienka nor tagarienka was registered in the collections database for Matsigenka informants. Only 5 of 538 plants (~1%) registered with Yora/Yaminahua speaking informants were described with the term nowe or the compound expression ini nowe, 'fragrant+nowe.' These included a faintly aromatic Annonaceae, a sweet-smelling Meliaceae, a mildly fragrant Myrtaceae and the incense tree Protium, counted under the category 'Fragrant' in Figure 5.7.

Ripe, floral, fragrant at a distance

M: asuroenka -- 'ripe, floral, fragrant at a distance'

Y: ane -- 'ripe, floral, fresh, aromatic'

Y: tokas, ta'as -- 'aromatic, fragrant at a distance'

These terms are similar to kasanka/ini, 'fragrant,' but are usually used to describe the fragrances of flowers and fruits rather than of leaves and stems. The Matsigenka term asuroenka contains the noun suro, 'stingless bees,' referring to the kind of odor that is attractive to bees. Unlike kasanka, 'fragrant' (i.e., volatile oils), which usually requires intentionally crushing or cutting plant parts, asuroenka is an odor that is perceived unintentionally in the air at a considerable distance from its source, typically fragrant flowers or ripe fruits. The Yora/Yaminahua terms ane and tokas (Yora dialect) or ta'as (Yaminahua proper) both overlap partially with Matsigenka asuroenka. Whereas the Matsigenka term is quasi-comparative, meaning literally, 'odor like that which attracts bees,' the Yora/Yaminahua terms are abstracted odors not referring to any specific noun. Ane describes the fragrance of ripe fruits and flowers as well as the aromatic odor of the

genus Piper, appropriately named ane rao, 'ane medicine.' Tokas refers to any pleasant fragrance that can be perceived at a distance from its source.

In the taste/odor experiment, none of the 8 Matsigenka informants used asuroenka to describe a spice odor. Ane was used by a majority of Yora/Yaminahua speakers to describe the odor of vanilla extract . Tokas was used only once in the compound expression ini tokas, 'fragrant+tokas,' to describe dill weed. In the "best example" experiment (Appendix 2.3), both Matsigenka and Yora/Yaminahua speakers mentioned miscellaneous flowers and ripe fruits as examples of asuroenka, ane and tokas. Three of seven Matsigenka mentioned as examples of asuroenka a group of almond-smelling Bignoniaceae liana species used as fragrant additives to tobacco and coca leaf preparations. Some of the same species can be used as inhalants to fight nasal congestion. Four of seven Yora/Yaminahua speakers mentioned peppery-aromatic Piper (ane rao) as an example of ane. Chewing the stem freshens the breath and turns the teeth black, a practice considered both aesthetically pleasing and hygienic in traditional Yora/Yaminahua culture. As an example of tokas, three Yora/Yaminahua speakers mentioned fragrant Myrtaceae used as perfumes.

In the collections database, no medicinal plants were described as asuroenka or tokas. The property ane was ascribed to eight of 538 medicinal plants (~2%) registered with Yora/Yaminahua informants, all registers of Piperaceae used for dental hygiene and decoration. These were counted (together with ini) under the category of 'fragrant' in Figure 5.7.

VISUAL/TACTILE VOCABULARY

Red, blood-colored

M: kirajaama -- 'red liquid (sap, juice, infusion)'

M: iraatsi, jiraatsi -- 'blood'

Y: oshi -- 'red'

Y: imi keskara -- 'bloodlike'

Despite important differences in their understandings of efficacy, the Matsigenka and the Yora/Yaminahua agree on this point: plants with red coloration are likely to be useful as medicines for treating illnesses associated with blood. Red is perhaps the most salient color for both the Matsigenka and the Yora/Yaminahua in descriptions of plant leaves, flowers and latex as well in the naming of species or varieties. When searching for medicinal plants, informants of both groups take special note of red or purple coloration on stems, leaf undersides, sap and juice of crushed leaves. Even if red color is not apparent in the vegetation, plants that cause a warm infusion to turn reddish or dark (see potsitaama/ene chexe, 'dark liquid') are also described as 'bloodlike' by both groups. The Matsigenka color term kiraa- (or kiraja-) is apparently related to the word for blood, iraatsi, and includes a range of colors from reddish-brown to bright red to pink and purple (Johnson, Johnson and Baksh 1986). When describing plants with red or purple parts or juices, the Matsigenka may use color terms kirajaama, 'red liquid' or kiraashiari 'having red leaf,' or make the comparison kañotaka iraatsi, 'like blood' or simply use the noun, iraatsi, 'blood,' alone and unmodified. Yora/Yaminahua speakers use the expressions imi keskara, 'bloodlike' or õshi, 'red,' to describe plants with red leaves, stem, sap or juice.

Visual and tactile assessments were not noted in the taste/odor experiment. In the "best example" experiment (Appendix 2.3), four of seven Matsigenka informants mentioned the liana genus Machaerium of the Fabaceae as an example of kirajaama, 'red liquid'. At least two folk species are distinguished by the Matsigenka according to leaf characteristics, and are known collectively as shiarontsipini, 'bloody diarrhea plant,' or jiraatsishi, 'blood leaf.' One species has a thick, red sap almost exactly the color and consistency of blood, and both have somewhat bitter-astringent leaves that turn the saliva

thick and blood-colored when chewed. The leaves are chewed or a warm infusion of leaves or scraped stem is drunk to treat diarrhea, especially bloody diarrhea. A warm infusion or compress applied to the abdomen is used by women to help recover blood lost during menstruation or childbirth. The astringency of the leaves is said to help draw together or 'astringe' (otinetakeri) the worms or offensive spirits believed to cause bloody diarrhea. However only one informant mentioned Machaerium as an example of the property tine, 'astringent,' in the exercise. Instead, the most salient pharmacognostic property is the bloodlike color, a clear example of the mnemonic function of visual and tactile cues in both Matsigenka and Yora/Yaminahua pharmacognosy.

Two of seven Matsigenka informants mentioned the tree Picramnia as an example of kirajaama. Its leaves become deep purple when moistened with saliva, and the juice is used principally as a dye to decorate net bags. However the extremely bitter, purple liquid may also be used to treat infected cuts, pustules and other skin infections. The bitter liquid is said to 'embitter' (okepishitakeri) and 'hurt' (okatsitakeri) the invisible cause of the infection, while the purple color 'toasts' (otashitake) the skin, providing a protective stain or crust. In the collections database, 60 of 740 plants registered (~9%) with Matsigenka informants were attributed the property 'red' or 'blood-colored' (Figure 5.8). Most belong to one of four use categories: gastrointestinal conditions (especially bloody diarrhea), menstrual or post-partum bleeding, skin conditions, improvement of hunting skill. In many cases, the visual cue of red color is complemented by some other chemosensory property that justifies the medicinal use. The red juice of Machaerium used to treat bloody diarrhea and menstrual bleeding is described by some as 'astringent.' A number of skin remedies with red or purple juice are also 'bitter.' Some hunting medicines have juice that is both 'blood-colored' and 'painful' when dripped into the eyes to improve a man's aim with the bow and arrow.

In the "best example" exercise, all seven Yora/Yaminahua speaking informants mentioned the plant name imi rao, 'blood medicine,' as an example of the property imi keskara. The name imi rao is a use category of plant species from diverse families, including Fabaceae, Gesneriaceae, Acanthaceae, Melastomataceae, Commelinaceae and others, all characterized by red or purple sap, juice, leaves or stems. All are used as warm compresses on the abdomen to treat menstrual cramps and menstrual or post-partum bleeding in women. Two of seven mentioned plants of the genus Machaerium, also mentioned for pae, 'strong, painful,' as examples of 'bloodlike' color. At least four Machaerium species are used medicinally by the Yora/Yaminahua, and most of the folk names applied to them refer to various wasp species. The spirit of each wasp species 'owns' plant species that both cause and cure painful or inflammatory illnesses, as discussed in detail under the property pae. In addition to their blood-red sap or juice, Machaerium species are characterized by recurved spines or prickles on young shoots, further indications of their ownership by vindictive wasp spirits. Yora/Yaminahua speakers also mentioned Picramnia, used as a dye, as an example of 'bloodlike' color. In the collections database, 56 of 538 (~10%) of medicines registered were ascribed the property 'blood-colored,' mostly the indicated 'blood medicines' and Machaerium 'wasp medicines' (Figure 5.8).

Dark liquid

M: potsitaama

Y: ene chexe

Matsigenka potsitari and Yora/Yaminahua chexe are color terms referring to dark or earthy colors, from dark red or purple to brown and black. Both color terms can also mean 'dirty, unclean.' In botany and pharmacognosy, potsitaama and ene chexe ('dark liquid') overlap partially in meaning with 'blood-colored,' referring to plants whose crushed stems, leaf juice or infusions produce a reddish brown to dark brown or blackish

liquid. Both groups consider ‘dark liquid’ and ‘blood-colored’ to be the same or similar properties. The category potsitaama was not included in the Matsigenka “best example” experiment. Four of seven Yora/Yaminahua informants mentioned Clidemia as an example of the property ene chexe, ‘dark liquid,’ which is also the Yora/Yaminahua name for the plant (Appendix 2.3). Clidemia releases a purplish liquid when soaked in water and is used to bathe infants to ensure fast growth. Two of seven mentioned the use category imi rao, ‘blood plant,’ used for menstrual bleeding. In the collections database 12 of 740 plants registered with Matsigenka informants were ascribed the property potsitaama. Nearly all were plants used to treat skin conditions. Their dark juice ‘hurts’ (okatsitake) or ‘burns’ (otegaka) cutaneous illnesses and ‘toasts’ (otashitake) the skin, forming a dark stain or crust like that of toasted foods. Yora/Yaminahua informants ascribed the property ene chexe to 12 of 538 plants registered (~12%), mostly belonging to the diverse category of ‘blood medicines’ or the mentioned ‘dark liquid’ Clidemia for bathing infants. Results of ‘dark liquid’ were counted together with ‘blood-colored’ in Figure 5.8.

Spiny

M: aityo otsei -- ‘has spines’

Y: moxaya -- ‘has spines’

Y: mitsisya -- ‘has prickles, recurved spines’

The Matsigenka noun root -tsei refers to the spines, prickles, stipules or stingers of plants, insects, stingrays, porcupines and other organisms as well as to the spiny bones of fish. The Yora/Yaminahua term moxa refers to longer, straight plant and animal spines, while mitsis refers to short or recurved spines and prickles. In both groups, the presence of spines may serve as an indicator of medicinal use for sharp or needlelike pain, especially ‘heart pain.’ The property ‘spiny’ was not included in the “best example” experiment for the Matsigenka. All seven Yora/Yaminahua speakers mentioned the plant

name *õitisi rao*, 'heart medicine,' as an example of the property *moxaya*. Next to herbal perfumes, 'heart pain medicine' is the most speciose and commonly registered use category in Yora/Yaminahua ethnobotany, including some twenty plant species from diverse families such as Bignoniaceae, Fabaceae, Flacourtiaceae, Phytolaccaceae Piperaceae and Rubiaceae, all characterized by conspicuous spines or prickles. These plants are considered to be *pae*, 'strong, painful,' because the spirits that inhabit them attack like wasps, causing (as well as curing) needle-like pain in the heart, chest or upper abdomen. In the collections database, spiny 'heart pain medicines' account for 46 of 538 (~9%) of plants registered with the Yora/Yaminahua (Figure 5.8). Spiny plants account for three of 740 registers with Matsigenka informants. These include Flacourtiaceae and Rubiaceae, with spines or stipules, used to treat sharp pains in the chest or heart. The infusions are ingested and have a bitter taste in addition to their spiny signature.

Bristly

M: *kepiri* -- '*bristly, fine or urticating hairs, tomentose*'

Y: *xopoya* -- '*bristly, coarse hairs, pilose, tomentose*,

Both are terms used to describe the textures of plant leaves or stems, and are significant in ethnomedicine. The Matsigenka term *kepiri* refers to fine hairs, tomentose surfaces or bristles that tickle or irritate the skin. The urticating hairs of palm species such as *kepito* (literally, 'urticating tree,' Wettinia) and bamboo are believed to 'take revenge' (*opugatakeri*) and 'urticate' (*okepitakeri*) newborn infants, causing skin rashes. Men must avoid *kepiri* plants, including arrow points manufactured from Guadua bamboo (*kapiro*), until the child emerges from this fragile stage. The Yora/Yaminahua term *xopoya* is similar, but more often refers to coarse bristles or long, soft hairs (pilosity) on plant stems and leaves. *Kepiri* was not included in the "best example" experiment for Matsigenka informants, because it is a property of only noxious, not medicinal plants.

Five of seven Yora/Yaminahua informants mentioned the plant name xako rao, 'millipede medicine,' as an example of the property xopoya. The use categories xako rao, 'millipede medicine,' and nõwi rao, 'earthworm medicine,' include vine and herb species of the Apocynaceae, Asclepiadaceae, Acanthaceae and Gesneriaceae characterized by flimsy, hairy stems reminiscent of their lowly namesakes. Some species (Apocynaceae, Asclepiadaceae) have copious white latex. Both the millipede, xako, and the earthworm, nõwi, are considered to be disgusting creatures. They are believed to contaminate food, water, mud and other surfaces as they slither in the forest or in household areas. Ingesting foods touched by the xako is said to cause a mild cough or sore throat known in pre-contact times as xako xea, 'millipede swallowed.' Touching or stepping in water, mud or other surfaces contaminated by xako or nõwi is believed to cause rashes and fungal skin infections. Applying warm compresses of the proper 'millipede' or 'worm' medicine calms these illnesses. In the collections database, 11 of 538 plants (~2%) registered with Yora/Yaminahua speakers were ascribed the property, xopoya, 'bristly.' These results were included under the category "Spines+Bristles" in Figure 5.8.

Latex

M: aityo okashi; oani -- 'has latex; sap'

Y: wepoya -- 'has latex'

In Matsigenka, okashi refers to copious, white, or resinous latex, and oani, literally, 'its liquid,' refers to watery latex, sap or juice. In Yora/Yaminahua, wepo refers to white latex or resin. Presence or absence of latex, especially in a trunk slash, is one of the first characters noted by both the Matsigenka and Yora/Yaminahua when identifying plants. Presence of latex, however, is not a primary pharmacognostic property for the Matsigenka. That is, it may be used as a feature to help identify or name a given species, medicinal or not, but it is not a often factor in the evaluation of medicinal efficacy. A few species are valued for sticky latex that forms a protective crust on wounds.

In contrast, presence of latex is a primary pharmacognostic feature for the Yora/Yaminahua. In the "best example" experiment (Appendix 2.3), four of seven Yora/Yaminahua informants mentioned xako rao, 'millipede medicine,' as an example of the property wepoya. These include Apocynaceae and Asclepiadaceae (milkweed family) whose copious white latex is associated with the body fluids of the illness-causing xako ('millipede') and nõwi ('earthworm'). Three of seven mentioned the use category 'stomach medicine,' xaki rao, whose members include latex- or sap-containing species of the Apocynaceae, Asclepiadaceae, Caricaceae and Hippocrataceae. The watery latex is likened to watery diarrhea, and the plants are believed to 'take revenge' (kopitiro) on people by causing stomach-ache and gastrointestinal upset. By applying a warm compress of the offending plant to the abdomen, the illness is drawn out of the body. In the collections database, 37 of 538 plants registered with Yora/Yaminahua speakers (~7%) were ascribed presence of latex as a pharmacognostic property, compared with only two of 740 registers (<1%) with Matsigenka speakers (Figure 5.8).

Overall form

M: kañotaka ... -- 'similar to ...' (e.g., kañotaka irai samani, 'like agouti teeth')

Y: ... keskara -- 'similar to ...' (e.g., paka pei keskara, 'like bamboo leaf')

Y: ...-na -- 'of ...' (e.g., winana, 'of the wasp')

Mnemonic association is a significant aspect of both Matsigenka and Yora/Yaminahua medicine. Specific visual or tactile features (spines, bristles, latex) have been discussed as indicators of medicinal use through mnemonic association. Likewise, the shape, texture or arrangement of leaves and other plant parts may be perceived as being 'similar to' (M: kañotaka; Y: keskara) familiar objects and thereby suggest medicinal uses. A number of Yora/Yaminahua plant medicines are described as being 'owned' by animal spirits, especially wasps (wina) and millipedes or worms (xako, roro, nõwi). Some informants point out specific features, for example, presence of spines,

bristles or pilose stems, white latex or 'bloodlike' color as pharmacognostic properties for 'wasp medicines' (mostly Machaerium) and 'millipede/worm medicines' (Apocynaceae, Asclepiadaceae, Acanthaceae and Gesneriaceae). Other informants state merely that such plants are 'owned by the wasp' (winana) or 'owned by the millipede' (xakona) as their only pharmacognostic property. The 'ownership' of a plant by an animal spirit is clearly related to visual and tactile features, and such examples were included in the category "Overall Form" in Figure 5.8.

In the collections database, 29 of 740 plants registered (~4%) with Matsigenka informants were ascribed medicinal value based on overall form or shape (Figure 5.8). Most were examples of plants whose form was reminiscent of animals or animal body parts. A number of medicines for hunting dogs are said to resemble the intended game animal species. The fruits of the herb Triolena, known as samanipini, 'agouti herb,' are encased in a row of triangular calyces, said to be 'like the teeth of agouti' (kañotaka irai samani). The plant has a mild vegetative odor described as samanienka, 'agouti odor,' and is administered to the nostrils of dogs to improve their tracking skills for agouti. The rhomboid leaves of Roupala are said to be 'like peccary ears' (kañotaka ikempita shintori), while its rank, "corned beef" odor is described by the Matsigenka as shintorienka, 'peccary odor.' Known as shintoripini, 'peccary plant,' it is also administered to hunting dogs. Some baby-bathing plants are also selected through visual cues. Various Peperomia species are named for different mammal or bird species believed to inflict illness on infants. The floral spikes are likened to the shape of the animal's tail and their spicy-aromatic odor is likened to the animal's scent.

These and other Matsigenka plant medicines are valued for their visual form as well as their taste or odor qualities. The fern Adiantum, the same genus as Yora/Yaminahua 'urine stench medicine,' has a dangling rachis tip likened to the segmented tail of poisonous snakes. Known as irishipini maranki, 'tail plant of the

snake' in Matsigenka, the plant is rubbed on the legs after dreaming about a snake. Its acrid vegetative odor is described as enkaga, 'rank,' and is believed to frighten snakes away. The herb Costus, known as tampiapini, 'wind plant' in Matsigenka, has a helical stem likened to the funnel-shape of whirlwinds, and is used to treat the spinning sensation of dizziness. The same plant can be used to treat cough because of its tart (pocha) or sour (kacho) taste. A fragrant Myrtaceae with glossy, convex leaves is heated and rubbed on a woman's pubis, removing hair and leaving it round, smooth, fragrant, and attractive. A few Matsigenka medicines appear to have symbolically suggestive visual features as their only efficacious property. An orchid species with a fan of leaves emerging like ribs from the sternum is known as tanatsipini, 'sternum plant,' and is used to treat chest pains. A Bromeliad with a cascade of long, fine leaves is used by women to wash their hair so it grows long and healthy.

Overall visual form accounts for 34 of 538 collections (~6%) with Yora/Yaminahua speakers (Figure 5.8). In contrast to the Matsigenka, most Yora/Yaminahua medicines having a visual form as the efficacious property are ascribed no other property. A wild chili pepper (Capsicum) species known as ko rao, 'fire medicine,' has red fruits likened to blisters. Its leaves are applied as a lukewarm plaster to treat burns. The inner bark of the robust tree xono, Ceiba, is rasped and used to bathe the body in order to grow fat and strong. While bathing, the person sings to the tree, Mi yora ea miniwe!, "Give me a body like yours!" The liana Byttneria has a large, round fruit likened to the shape of a ball of cotton thread (yõme woxka keskara), and is used as a warm plaster to treat cysts or tumors of similar shape. The trifoliate leaf of the vine Phaseolus is likened to the toes of the capybara. The plant is used to treat sores and rashes in children, in the belief that the vengeful spirit of the capybara causes these rashes. Peperomia species like those used by the Matsigenka to bathe babies are used by the Yora/Yaminahua to treat nosebleed. The flower spike is said to 'look like the squirrel

monkey's tail' (wasa ina keskara), and the animal's spirit is thought to inflict sudden nosebleed. The leaf of the Bambusoid grass Olyra is said to 'look like Guadua bamboo leaf' (paka pei keskara), and is used as a warm plaster to treat wounds caused by bamboo arrow tips.

Sticky

M: tsire -- 'sticky, adhesive; slightly spoiled (food)'

Y: te -- 'sticky, adhesive'

These terms are used to describe the adhesive properties of latex, sap, and resin, as well as of clay and thick mud. Matsigenka tsire also refers to the sticky film that forms on food that has just begun to spoil, usually accompanied by a slightly rotten or fermented odor. The terms were not included in the "best example" experiment. In the collections database, 12 of 740 plants registered (~1%) with Matsigenka informants were ascribed the property tsire, included under the category "Viscous" in (Figure 5.8). Most were plants from latex-containing families such as Apocynaceae, Clusiaceae and Moraceae applied to skin infections, forming a protective crust. Also included were epiphytic cactus and tree fern species whose sticky sap is rubbed on sore joints, producing a warming friction that is thought to relieve pain. The latex of Symphonia (Clusiaceae) is prepared as a resin used for fletching arrows and other adhesive purposes as well as to treat the umbilical cord of newborns. The plant and its resin are not to be touched by a man while his wife is pregnant, lest the adhesive property cause the placenta (iranotare) or fetus to 'stick' (otsiretaka) and fail to descend, resulting in death. Once the child is safely born and the placenta has descended, the cut umbilical cord is daubed with Symphonia resin, 'toasting' (otashitake) and sealing it with a protective crust. Furthermore, the faces of mother and child are painted with streaks of the resin, symbolizing the emergence of the woman from the dangerous period of childbirth and foreshadowing the eventual return of the father to normal subsistence activities such as

fletching arrows with Symphonia resin and hunting. The Yora/Yaminahua term te is sometimes used to describe the sticky white latex of Apocynaceae and Asclepiadaceae 'millipede medicines,' whose principal pharmacognostic property is the visible presence of latex (wepo), rather than its adhesive qualities (Figure 5.8).

Viscous

M: karentsa -- 'viscous, thick, sticky, slippery'

Y: wicha -- 'viscous, thick, sticky, slippery'

Both are terms used to describe succulent plants whose stems or leaves cause a liquid infusion to become viscous and slippery or slightly sticky (without adhering strongly) between the fingers. The usage overlaps somewhat with 'sticky' (tsire/te), which usually refer to more strongly adhesive substances. Slick mud or wet rocks can also be described as karentsa, 'slippery,' in Matsigenka. The terms were not included in the "best example" experiment. The properties karentsa, 'viscous,' or tsire, 'sticky,' were ascribed by Matsigenka informants in 5 of 740 registers (<1%) to the succulent stems and leaves of frequently collected Acanthathaceae species used by women to bathe infants. Most Acanthaceae collections were ascribed 'fragrant' odor (Figure 5.7), which is their principal pharmacognostic property. In addition to their protective fragrance, however, some baby-bathing medicines contribute viscosity to the infusion, making it adhere better to the baby's skin. Encounters of karentsa, 'viscous,' and tsire, 'sticky,' were counted together under the category "Viscous" in Figure 5.8.

The Yora/Yaminahua term wicha, 'viscous,' was found in the collections database for 6 of 538 registers (~1%; Figure 5.8). Three were of a Malvaceae vine used by both the Matsigenka and the Yora/Yaminahua to treat stingray stings. The broad cardioid leaf is compared to the shape of the stingray, while the cool, phlegm-like sap, likened to the pus produced by an infected stingray sting, is thought to relieve pain. One Acanthaceae species used by the Matsigenka to bathe babies is known in Yora/Yaminahua as roro rao,

named for a kind of venomous millipede (roro) similar to xako. The succulent plant has a viscous sap that one Yora/Yaminahua informant compared to mucous-laden diarrhea. The leaves are applied as a warm compress to the abdomen of children suffering from this kind of diarrhea, believed to be caused by contamination from the roro millipede.

Cool

M: katsinkaari -- 'cool liquid'

Y: matsi -- 'cool'

In Matsigenka, katsinkaari is similar to poshiniaani ('delicious liquid'). Katsingaari ('cool liquid') emphasizes the temperature of the liquid, while poshiniaani ('delicious liquid') emphasizes its flavor. Both terms are used to describe water that is drunk as refreshment or is applied to inflammatory conditions such as eye infections or cough. Lianas like Uncaria (Rubiaceae) and Davilla (Dilleniaceae) and the bamboo Guadua store a surprising amount of drinkable water in their stems, maintained naturally clean and cool by the living plant. Such plants are harvested to quench thirst during long treks through the forest. Uncaria is used by the Matsigenka as a remedy for colds and cough, apparently a recent acquisition of medical knowledge from acculturated populations. The clean, cool water is said to cool the burning sensation of the cough in the throat, while the bitter-astringent taste helps kill the illness and remove phlegm. The Matsigenka apply clean drops of water from freshly cut Davilla in the treatment of eye infections, thereby cleaning the eye and cooling the pain. Drops of dew, known as 'urine of the stars' (itsine impokiro), are also valued for their cleanliness and cool temperature in treating eye infections. The Yora/Yaminahua term matsi is similar, most often used to described drinking water but not mentioned frequently during botanical collections.

Though both groups have terms for cool, refreshing liquids and medicines, neither appears to employ a humoral system for classifying "hot" vs. "cold" medicines and illnesses, such as found in many parts of Latin America (Bastien 1985; Foster 1988).

Humoral concepts, however, have been introduced in more acculturated lowland communities by contact with Quechua-speaking migrants (Bennett 1991: 241).

Chapter 6: Medical Botany

Up to this point in the discussion, I have been mostly concerned with the cultural construction of illness and medicinal plant therapy in the two societies. Consistent with an interpretive/symbolic perspective, it has been demonstrated that the two different cultural-linguistic groups have quite divergent theories about the origins and therapies of many illnesses. In this chapter, I examine the data concerning the medicinal plants themselves, addressing head-on the question posed in the opening sentence of the dissertation.

Botanical Collections

The species-effort graphs in Figures 6.1 and 6.2 demonstrate the relationship between the number of plants encountered and collected and the total number of distinct species represented in these collections. A total of 300 medicinal species were encountered with the Matsigenka, and 237 with the Yora/Yaminahua, representing 435 distinct species in all. Because some plant species are commonly known and used by my many people, a large number of species were encountered on several occasions. Approximately one hundred distinct plant species were encountered twice or more during the research period for each ethnic group, representing the most commonly known medicines. Some leveling is noted towards the right of both species/effort curves, indicating that the medicinal plant collections may be a representative, though not exhaustive sample of the total medicinal flora known to both groups. There is still a significant upward slope at the right end of both graphs, however, indicating that further research would likely yield additional medicinal species.

Use Categories of Botanical Medicines

Figure 6.3 summarizes the use categories of medicinal plants registered. In the center of the graph there is an area of significant overlap in treatments for common health issues: fertility control ("Fertil"), skin conditions ("Skin"), venomous bites ("Bite"), general health tonics ("Tonic"), gastrointestinal conditions ("GI"), pains and fevers ("Pain"), obstetrical problems ("Obst"), and dental conditions ("Dental"). On the left side of the graph are categories of plant use registered more frequently with the Matsigenka, including plants believed to be used by sorcerers ("Sorcerer"), plants to control the content of dreams ("Dream"), hunting medicines for men ("Hunt"), plants used by women in child care ("Child"), and psychoactive plants used for shamanistic purposes ("Psych"). To the right side of the graph are categories of use more frequently registered among Yora/Yaminahua informants, including respiratory conditions ("Resp"), eye conditions ("Eye"), 'heart pain' ("Heart") and fragrant body perfumes ("Perfum"). This exercise helps outline areas of similarity and difference between the two cultural groups in the priority they place on various categories of plant use. What stands out most clearly in this figure is the great number of registers of plants used by the Matsigenka for hunting (men's specialty) and child care (women's specialty), areas of ethnobotanical specialization that emphasize the contrasting gender specialization in Matsigenka society. The Yora/Yaminahua have similar categories of plant use and gender division, but the ethnobotanical register do not demonstrate such a pronounced trend. The Yora/Yaminahua, on the other, show high priority in the use of perfume plants for bodily adornment, an area of plant use shared by men and women.

Ecological Convergence

Despite major cultural differences in their understandings of efficacy and mode of administering medicinal plants, significant convergence was found in the ecological and taxonomic characteristics of medicinal plants used in both societies. Herbs, shrubs and lianas of the forest understory (as opposed to trees) predominate in both pharmacopoeia

(Figure 6.4). Sixteen botanical families account for close to 70% of medicines for both groups (Figure 6.5), while the remaining 150 botanical families present in the region account for only 30% of medicines encountered.

Ranking plant families according to the number of medicinal species they contain is highly problematic, since plant families have widely ranging total number of species. Some important medicinal families, such as the Asteraceae, are also very large families, containing tens of thousands of species worldwide. Such families would naturally overshadow smaller families. On the other hand, calculating the percent of medicinal species per family would overemphasize small families. For example, the family Gingkoaceae contains a single species, Gingko balboa, which is used medicinally in Asia. Thus, it would be considered to have 100% of its species used medicinally.

Moerman (1991) uses regression analysis to evaluate patterns of medicinal use for different plant families. In simple regression analysis, data is plotted onto a scatter diagram and the equation is calculated for a line which best fits those data points. The closer the actual data fits onto this line, the higher the r-value of the regression, and the more linear is the relationship between the dependent and independent variables. Following Moerman, I use a linear regressions to control for the number of species present in each family. The number of medicinal species per family, as determined from my botanical collections, is regressed as the dependent variable on the total number of species known for each family in the Manu River, as reported by Foster (1995). If medicinal species are distributed randomly among plant families, one need only multiply the number of species in the family by a coefficient and add to it a constant (the Y intercept of the line of best fit) in order to calculate the number of medicinal plants per family.

Residuals measure the distance between the value predicted by the linear equation and the actual data point. A large residual for a given data point indicates that it does not

fit well into the linear model. For medicinal plants, a large (positive) residual indicates a plant family with much greater frequency of medicinal use than would be predicted by chance based on its size. A low (negative) residual indicates a family with much lower frequency of medicinal use than predicted. Plant families that fall close to the line of best fit contain numbers of medicinal species that might be expected by chance based on the size of the family. The analysis presented here is imperfect for a number of reasons. First, the medicinal plants collected represent a sample, not an exhaustive census, of the total medicinal flora known to both native groups. Second, the flora of lowland Peru is still poorly known. Foster's (1995) "pocket list" of plant species identified in Manu is admittedly incomplete. Furthermore, the specific regions inhabited by the study communities have not been surveyed botanically. Nonetheless, Foster's manuscript is as good a species list available for any region of Amazonian Peru.

Figures 6.6 and 6.7 are graphic representations of the regression. The horizontal axis represents total number of species per family in the Manu flora, and the vertical axis represents number of species per family used medicinally by a given group. Families with large positive ("high use") or negative ("low use") residual values are identified with standard botanical abbreviations. Families found among the top ten (largest positive residuals) in the regression for both cultural groups are indicated in bold type. Families found among the bottom five (largest negative residuals) for both groups are indicated in italics. Families that occur high in the regression for one group and low in the regression for the other group are indicated by (+).

Regression analysis reveals significant similarities among the plant families most used as medicines by the Matsigenka and Yora/Yaminahua. Rubiaceae, the botanical family of coffee and quinine, stands out as the top family in the regression (largest positive residual) for both groups. Foster identifies 200 species of Rubiaceae for the Manu, making it among the largest families for the region. Yet the medicinal use of the

Rubiaceae by Matsigenka and Yora/Yaminahua communities is disproportionate, even considering the family's size. I identified 46 Rubiaceae species used medicinally by the Matsigenka, and 26 used medicinally by the Yora/Yaminahua. The Acanthaceae, Araceae, Gesneriaceae and Nyctaginaceae are found among the top ten medicinally used families in the regression for both groups. Piperaceae (black pepper family) species are also used extensively as medicines by both groups. Several large botanical families show a disproportionately low frequency of medicinal use. The Pteridophyta (ferns), with 358 species for Manu, contains nine species used medicinally by the Matsigenka and eight species used medicinally by the Yora/Yaminahua, making it the family with the largest negative residual in the regression for both groups. Melastomataceae, Moraceae, Orchidaceae (orchids) and Poaceae (grasses) are also large families with a disproportionately low incidence of medicinal use by both groups.

The Pearson coefficient of correlation is a measure of the similarity between two sets of residuals from regression analysis, a coefficient ranging from near zero (complete dissimilarity between the two sets of residuals) to one (identical residual values). The Pearson coefficient for the Matsigenka and Yora/Yaminahua medicinal plant regressions is .66, which is statistically significant to the level of $p < .0500$. In other words, it is highly improbable that chance alone explains the similarity between the two sets of data. Nonetheless, the coefficient of correlation between the medicinal flora of Korea, Chiapas, Kashmir, Native North America, and Britain is .63 (D. Moerman, personal communication), only nominally lower than that found between the Matsigenka and Yora/Yaminahua. The medicinal flora of Kashmir and Chiapas, on separate continents, show a higher coefficient of correlation (.75) than that of the neighboring Amazonian groups examined in this study. The high biological diversity of Amazonian forests, their relatively recent history of human occupation, and the historical processes resulting in cultural isolation (post-rubber boom ethnic fragmentation) may contribute to the

heterogeneity of neotropical medicinal flora, when compared with those of northern and temperate regions (ibid.).

Though the Matsigenka and Yora/Yaminahua use many of the same plant families as medicines, they often seek out different sensory properties, select different species within each family, and use them for different purposes. Of a total of 431 plant species with medicinal uses collected for the two groups, only 81 (19%) are used in common by both groups. Table 6.1 synthesizes data on the seventeen most frequently encountered plant families, comparing regression rankings, number of species used per family, attributed sensory properties and medicinal uses for the two groups.

The analysis reveals important differences in the use of certain plant families by the two groups. The Fabaceae (bean family) ranks near the top of the regression for the Yora/Yaminahua, and yet occurs near the bottom for the Matsigenka. The Fabaceae are the principal source of 'wasp medicines' (*wina rao*), an important category of therapy for the Yora/Yaminahua. The common presence of spines as well as reddish latex in the family, both important aspects of Yora/Yaminahua pharmacognosy, likely contribute to the salience of Fabaceae as medicines for this group.

The Asteraceae are used extensively as medicines worldwide, and consistently rank among the most used medicinal families in many regions (Moerman 1991; Brett 1994; Gottlieb, Borin and Bosisio 1996). In this study, however, the Asteraceae were not among the top families for either group. Of 129 Asteraceae species occurring in Manu, the Yora/Yaminahua use only five species medicinally, placing it among the lowest ranking families in the regression. The Matsigenka use eleven Asteraceae species medicinally, often citing bitterness or pungent taste as the efficacious property. Nonetheless, the Asteraceae are not ranked high among Matsigenka medicinal families, with residual values that place it only slightly above the regression line. Most Asteraceae are weedy plants that thrive in areas of secondary growth. Neither the Matsigenka nor the

Yora/Yaminahua made large, permanent clearings until quite recent times. Most medicines for both groups are gathered in the forest, rather than areas of secondary growth. These factors appear to account for the relative underutilization of the Asteraceae by the two groups, when compared with other cultures worldwide. The fact that the Matsigenka use twice the number of Asteraceae species as the Yora/Yaminahua may reflect the somewhat longer historical process of sedentarization in Matsigenka communities. As more areas are converted into permanent clearings dominated by secondary growth, and primary forest becomes more distant, it might be expected that people would begin to take advantage of plants closer at hand. Furthermore, the high apparency of weedy plants growing in areas of secondary growth may contribute to the development of defensive chemical substances like those found in many Asteraceae. Such coevolutionary aspects of human-environment-health relationships are discussed in more general terms in the concluding chapter.

How could the taxonomic and ecological convergence demonstrated in Figures 6.4-6.7 be explained? It is possible that diffusion of plant knowledge occurred in the distant past, though given the geographical and linguistic isolation of the two groups, this theory seems unlikely to account for a large part of the pharmacopoeia. Another possibility is that the leaves of understory plants, including shrubs, herbs and lianas, are simply easier to reach than large trees. Yet many of the medicines used by both groups are taken in the form of scrapings from the inner bark, not as leaves. Scraping the bark of large trees is as easy as for smaller plants. Furthermore, Matsigenka and Yora/Yaminahua men and boys climb with great agility and speed into large trees to gather ripening fruits. Why not gather medicinal leaves in this way, as well? The regression analysis suggests that the consistent use of certain taxonomic and ecological groups of plants as medicines is not the result of mere convenience or chance, but reflects something about the physiological activity of compounds contained in those plants.

Many of the families highlighted in Table 6.1 are used medicinally throughout the world. Why are some plant families used frequently as medicines but diverse human cultures, and others are not? Theories of plant chemical defense predict that the foliage of herbaceous plants is highly "apparent" to herbivores, and therefore these plants are more likely invest in metabolically costly but effective deterrent compounds such as alkaloids (Feeny 1970; Moerman 1991; Gottlieb, Borin and Bosisio 1996). Toxins that are effective in deterring one kind of herbivore likely have pharmacological activity on a wide range of organisms and metabolic pathways, and when used in the proper doses can serve as medicines. On the other hand, woody plants, notably trees, are more likely to invest in structural defenses against pests, for example, strong or tannin-rich bark. This possibility clearly contributes in part to the observed ecological and taxonomic similarities between the medicinal flora used by the Matsigenka and the Yora/Yaminahua. Plants such as the Rubiaceae, Araceae, Piperaceae, Solanaceae and others appear to have evolved toxic chemical defenses to protect them from animal predation.

However the heavy reliance of both groups on odor and visual cues suggests that medicinal plant selection is more complex than merely identifying plants with toxic secondary compounds. Plants have also evolved mechanisms to attract animals, especially insects and other pollinators or seed disperses. Such attractant chemicals likewise affect a wide range of physiological responses in animals, and many are used by humans for their stimulating, aphrodisiac or soothing properties (Jellinek 1994). Fragrances have been employed in religious, ritual and medical settings by human cultures throughout history (Howes 1987; Steele 1992). The recent emergence of aroma therapy in alternative medicine in the West attests to the therapeutic power and symbolic value of odors (Dodd and Skinner 1992). In addition to their chemical constituents, many medicinal plants are valued for visual, tactile and other non chemical properties. Such

properties are incorporated into the symbolic rationality of many medical systems (see also Zimmerman 1987), and may also serve a mnemonic function. In orally transmitted systems of plant knowledge, plants that are easy to remember are more likely to stand the test of time.

Figure 6.1: Species-Effort Curve: Matsigenka

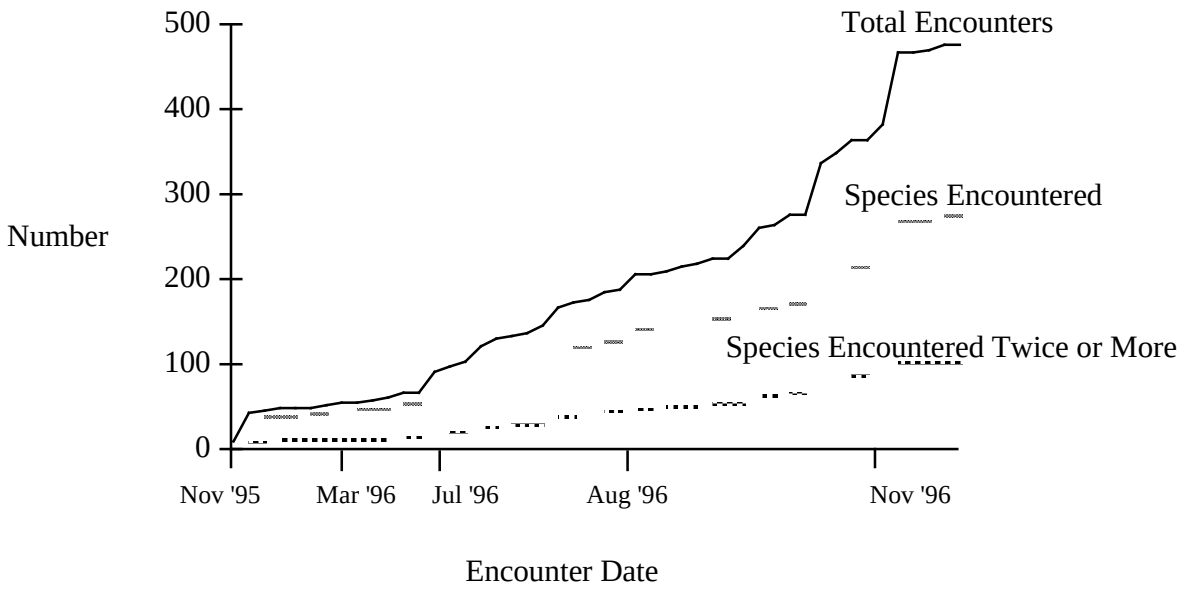


Figure 6.2: Species-Effort Curve: Yora/Yaminahua

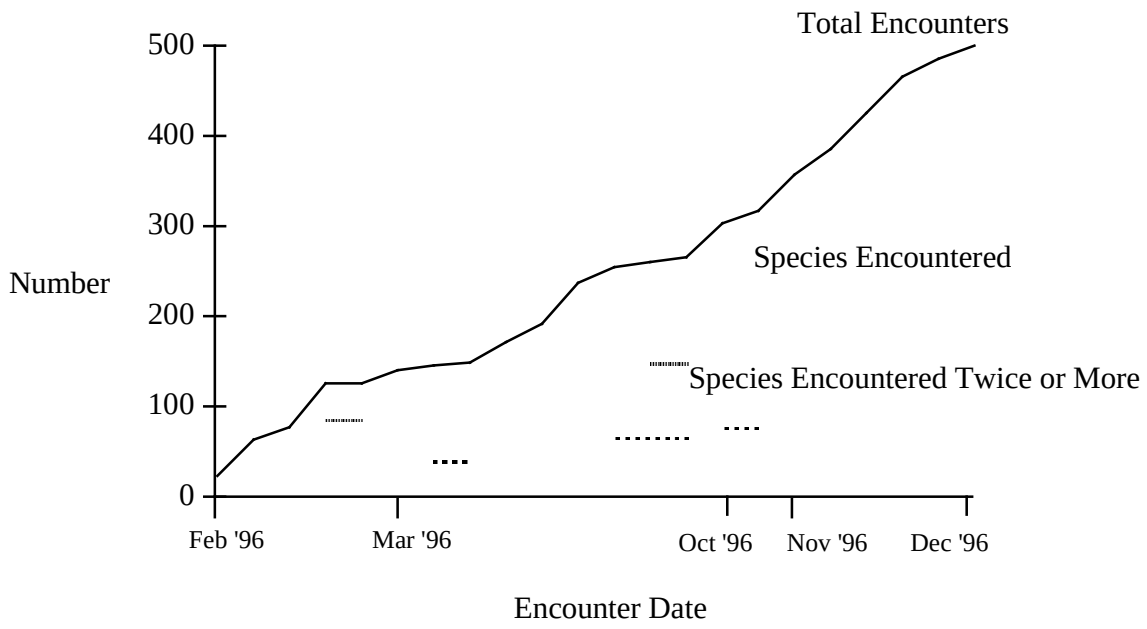


Figure 6.3: Use Categories of Plants Registered

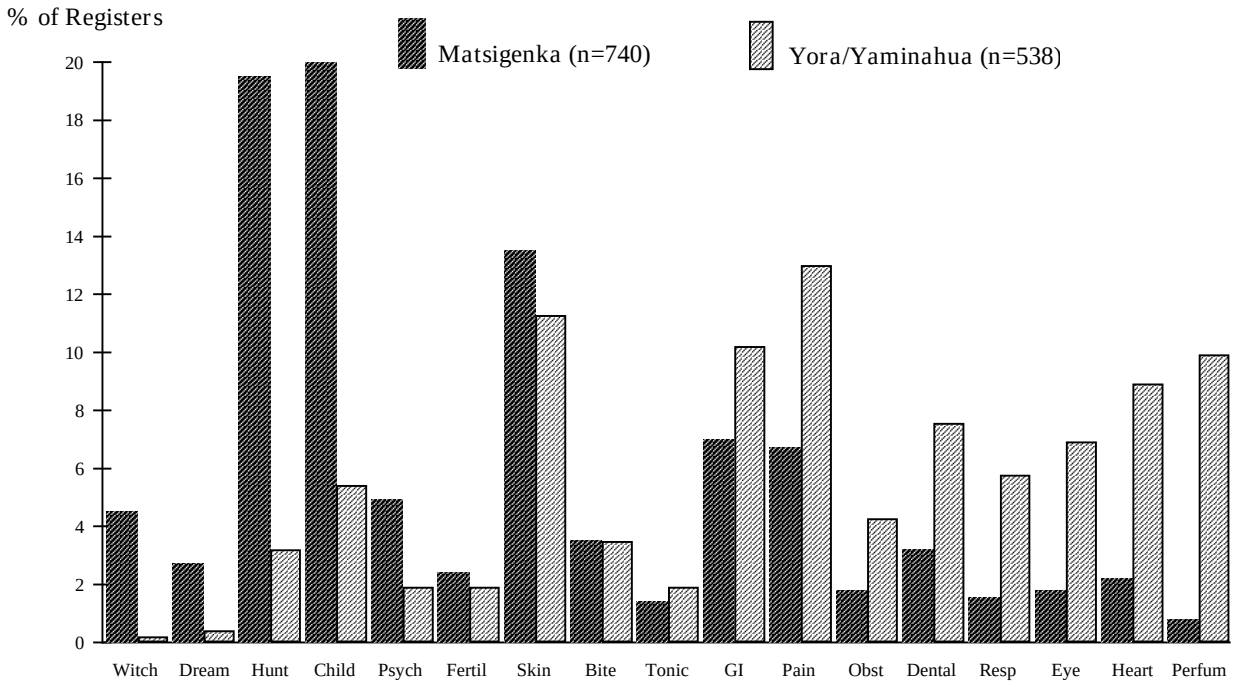


Figure 6.4: Growth Habit of Medicinal Plants

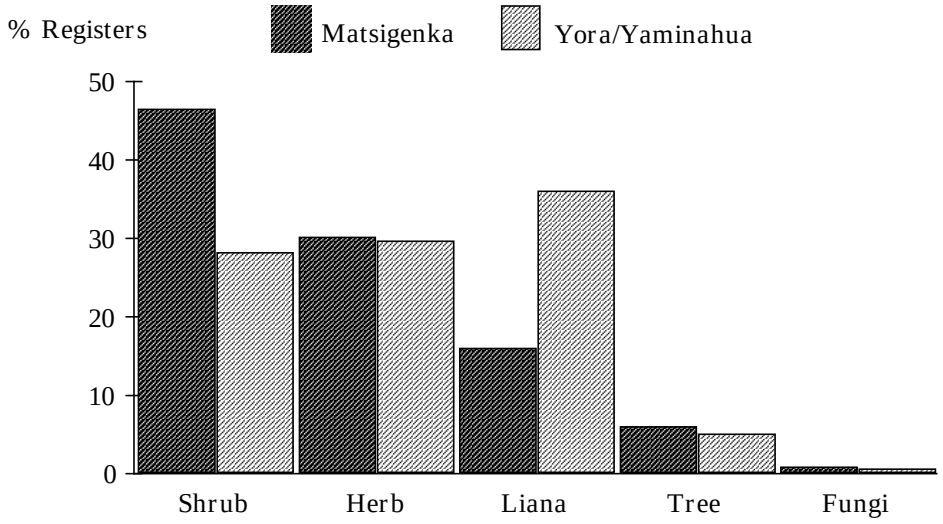


Figure 6.5: Principal Medicinal Plant Families

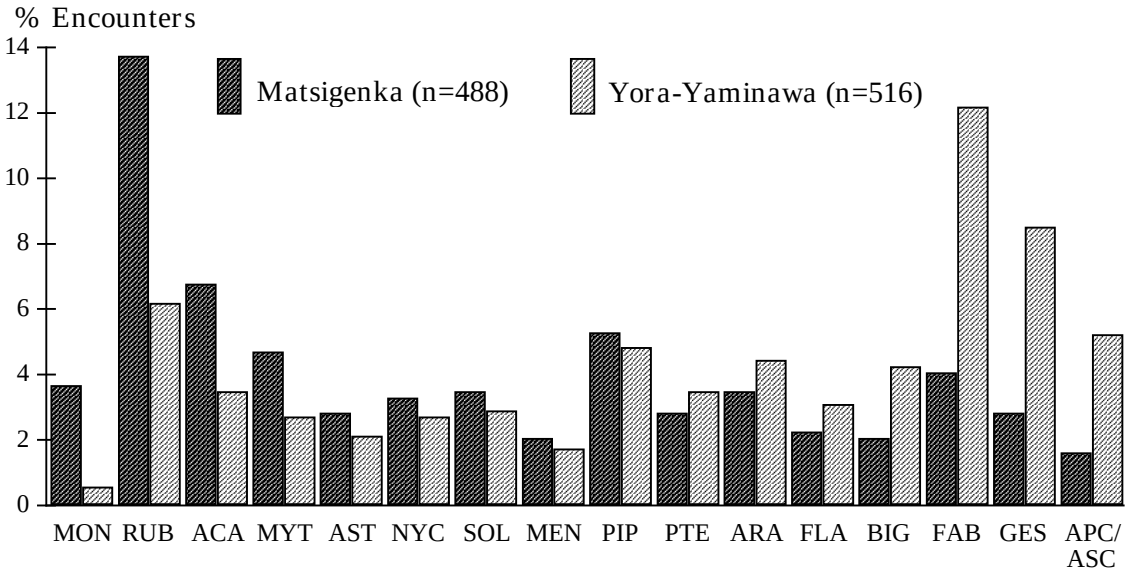


Figure 6.6: Regression Analysis of Plant Families:
Matsigenka Collections

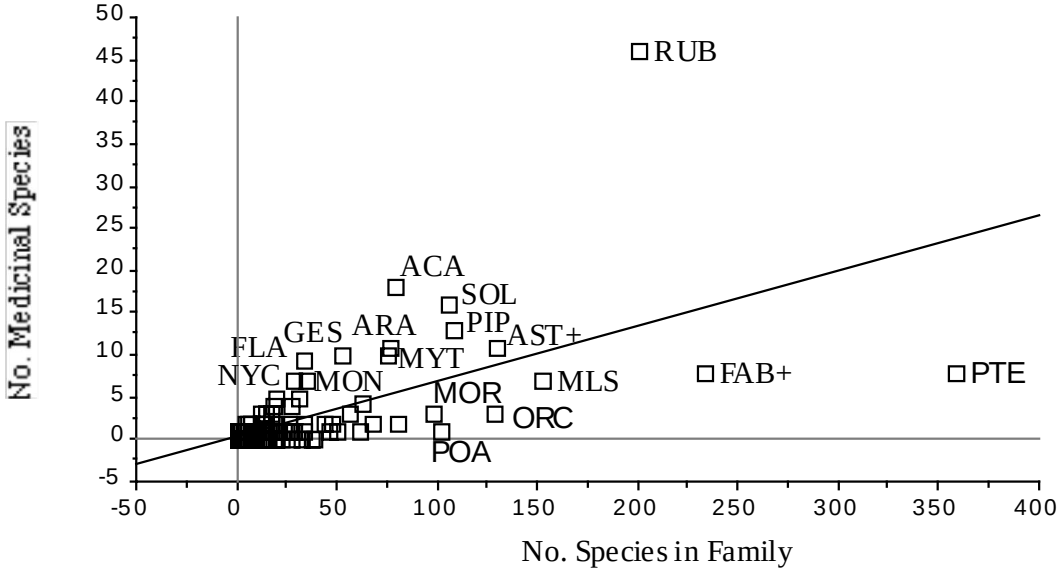
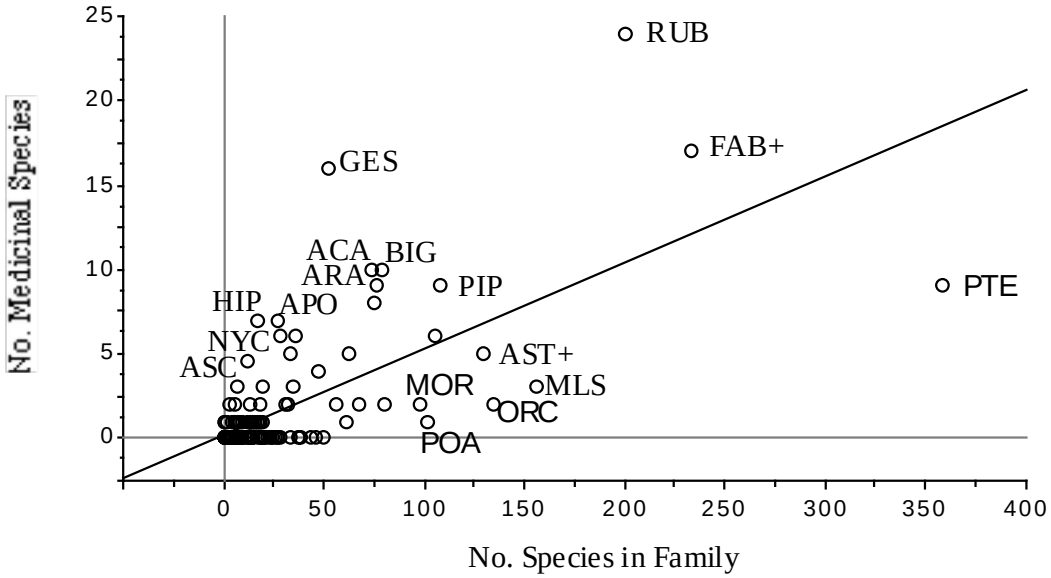


Figure 6.7: Regression Analysis of Plant Families:
Yora/Yaminahua Collections



Bold type: families among top ten in regression for both groups
Italics: families among bottom five for both
+: families ranked high for one group and low for the other

Table 6.1: Summary of Principal Medicinal Families. Principal medicinal families, number of encounters (#), and rank in regression analysis. Pharmacognostic properties, uses registered twice or more for each family are listed.

	Matsigenka				Yora			
Family†	#	Rank	Property	Use	#	Rank	Property	Use
ACA***	33	Top 5	fragrant - 16 'bad' - 6 color, form - 7 viscosity - 3	child care - 9 sorcery - 8 hunting - 7 dreams - 3	18	Top 5	red color - 7 inherent - 5 fragrant - 4	eye - 4 heart pain - 2
APC*	7	Top 20	painful - 7	skin - 4 dental - 2	15	Top 10	latex - 14	GI - 5 skin - 4 snakebite, stingray - 3 resp. - 2
ARA**	17	Top 10	irritant - 13 rank - 3	snakebite, insect - 3 ear, eye, dental - 3 GI - 2 gynecol. - 2 hunting - 2	23	Top 10	inherent - 8 rank - 6 spines, color - 4 irritant - 3	skin - 9 dental, body pain - 5 GI - 4 insect sting - 2
ASC+	1	#50	fragrant - 1	hunting - 1	12	Top 10	latex - 9 bristles - 4	resp. - 6 skin - 4
AST+	14	Top 20	bitter - 7 painful - 4	skin - 6 dental - 3 ear, eye - 2 GI - 2	11	Last 20	fragrant - 5 dark color - 2 toxic - 2	perfume - 5 urinary - 3 fish poison - 2
BIG*	10	Top 20	fragrant - 4 'sweet' - 2 bitter, painful - 2	perfume - 3 hunting - 3 narcotic - 2 GI - 2	22	Top 5	fragrant - 15 spines - 2	perfume - 14 heart pain - 2
FAB+	20	Last 5	red color - 9 bitter, astringent - 7 rank - 4	GI - 10 skin - 5 resp. - 2	63	Top 10	spines - 9 'wasp plant' - 8 red color - 7 rank - 2	dental - 17 skin - 12 heart pain - 9 resp. - 6 gynecol. - 5
FLA*	11	Top 5	fragrant, rank - 3 'sweet' - 2 spines, red color - 2	insect repellent - 3 child care - 2 dental - 2	16	Top 20	spines - 7 inherent - 5 misc. odor - 2	heart pain - 9 body pain - 7
GES***	14	Top 5	fragrant, rank - 6 red color - 4 painful - 2	child care - 8 resp. - 5	44	Top 5	inherent - 17 red color - 13 bristles - 8 rank - 5	eye - 26 resp. - 8

† Abbreviations for botanical families: see bottom of next page.
*** Family among top five in regression ranking for both groups;
** among top ten for both;

* among top twenty for both.
+ Family “split,” high ranking for one group, low ranking for other.

Table 6.1 (cont’d)

Family	#	Rank	Matsigenka Property	Use	#	Rank	Yora Property	Use
MEN*	10	Top 20	bitter - 9	skin - 7	9	Top 20	fragrant, rank - 6 bitter - 2	skin - 4 dental, heart, body pain - 3
MON	18	Top 10	rank - 15 intoxicating - 2	snakebite - 3 pain/fever - 5 sorcery - 3 hunting - 3, child care - 2	4	#22	rank - 3	seizure - 2 headache - 1 GI - 1
MYT*	23	Top 10	fragrant - 18	child care - 14 heart pain - 2 love filtre antidote - 2	14	Top 20	fragrant - 12	child care - 6 resp. - 3
NYC**	16	Top 10	red color - 8 fragrant, rank - 4	child care - 9 contraceptive - 4 skin - 3	14	Top 10	inherent - 10 odor - 2 red color - 2	skin - 8 resp. - 2
PIP*	26	Top 10	fragrant, rank - 15 painful - 7 color, form - 6	child care - 8 dental - 5 skin - 4 hunting - 3	25	Top 20	color - 11 fragrant - 9	dental - 13 weather ctrl. - 3 hunting - 2
PTE	14	Last	fragrant, rank - 7 ‘like snake tail’ - 4 sticky - 2	skin - 4 dreams - 4 snakebite - 3 pain/fever - 2	18	Last	fragrant - 7 rank, urine odor - 5	GI - 9 perfume - 5 hunting - 2
RUB***	67	First	‘stings eyes’ - 24 bitter, astringent - 8 painful - 7 intoxicating - 7 fragrant, rank - 6	hunting - 20 skin - 9 child care - 8 dreams - 6 headache - 6 GI - 6 heart pain - 4 narcotic - 4	32	First	spines - 7 inherent - 4 intoxicating - 5 red color - 2 fragrant - 4	heart pain - 12 narcotic - 6 hunting - 4
SOL	17	Top 5	rank - 7 intoxicating - 5 color - 3	hunting - 8 child care - 3 body pain - 2 dreams - 2	15	#32	fragrant - 6 rank - 3 intoxicating - 3	skin - 8 hunting - 7
17 of 164 Families (10%)			318 of 488 Encounters (65%)				354 of 516 Encounters (69%)	

† Abbreviations for botanical families: ACA-Acanthaceae; APC-Apocynaceae; ARA-Araceae; ASC-Asclepiadaceae; AST-Asteraceae; BIG-Bignonaceae; FAB-Fabaceae; FLA-Flacourtiaceae; GES-Gesneriaceae; MEN-Menispermaceae; MON-Monimiaceae; MYT-Myrtaceae;

NYC-Nyctaginaceae; PIP-Piperaceae; PTE-Pteridophyta (ferns); RUB-Rubiaceae; SOL-Solanaceae.

Conclusion

This work began with a deceptively simple question: Do people of different cultural backgrounds living in similar ecological settings discover the same plant medicines? In short, the answer appears to be, "Yes." Two distinct cultural groups were found to use ecologically and taxonomically similar plant medicines, apparently through independent processes of discovery. Yet this answer does not imply a deterministic view of the influence of environment over culture. Matsigenka and Yora/Yaminahua uses and understandings of medicines are guided and elaborated through culturally particular theories of illness and efficacy.

Complementing its rich biodiversity, the rain forests of the Peruvian Amazon are home to tremendous cultural diversity even within limited geographic areas. For centuries, empires, trade networks, national and international politics and other global forces have shaped the cultural history of native people and altered Amazonian ecosystems. Though Amazonian cultural groups have suffered numerous negative impacts of European colonization, especially over the past century, traditional theories prove dynamic and resilient in the process of adaptation to new epidemiological and social factors. Ethnoscientific methods prove especially powerful in studying the relationship between culture, the environment and health. A cross-disciplinary and comparative approach to "cultural constructions of efficacy" (Kleinman 1980; Etkin 1988) offers an alternative synthesis to the unresolved polemics raging between the schools of biomedical and critical medical anthropology (Wiley 1992; Singer 1993). Medicines, whether natural or synthetic, indigenous or globally distributed, are at the same time empirically active agents and potent symbols of healing power.

Appendix 2: Results of Taste/Odor and "Best Example" Experiments

Contrasting Systems of Plant Therapy

The word rao in Yora/Yaminahua signifies both "medicine" and "illness" as well as "poison," corresponding to a homeopathic theory of efficacy. Matsigenka medicine, on the other hand, obeys an allopathic theory: bitter, pungent and other toxic compounds are ingested or applied in order to overpower and expel illness from the body. Whereas the Matsigenka believe that many illnesses 'fall from the sky' or enter the body in the form of tiny worms, the Yora/Yaminahua contend that illnesses come from plants, namely medicinal plants. For this reason the Yora/Yaminahua are reluctant to taste most wild plants. Instead, the vast majority of medicines are applied as warm compresses to the affected area. Wilting of the plants' leaves in the warm water, darkening of the liquid and steam coming off the sick person's body are signs that the illness has returned to the forest whence it came.

In many ways, Yora/Yaminahua medical concepts represent an inversion of Matsigenka concepts. For the Matsigenka, illness arrives as a vapor; for the Yora/Yaminahua, illness departs as a vapor. For the Matsigenka, medicine heals from the inside out, working in opposition to the illness. For the Yora/Yaminahua, medicine works from the outside in, drawing illness from the body on the principle of "like attracts like." For the Matsigenka, medicines are poisons acting against the intrusion of illness, whereas for the Yora/Yaminahua, medicine and illness are united in a single poison. These fundamental differences between Matsigenka and Yora/Yaminahua theories of efficacy appear to contribute to the differences in the way the two groups understand and use Western medicines.

Most of this work has been dedicated to describing the similarities and differences between Matsigenka and Yora/Yaminahua medicine and culture. Explaining these similarities and differences is an altogether different matter. For a hard-core materialist, it might be tempting to attribute the similarities (e.g., similar patterns of use of plant

families) to universal, material constraints (e.g., pharmacological properties), and to dismiss the differences as mere cultural entropy. From a culturalist or world systems perspective, on the other hand, similarities might owe to the diffusion of cultural traits, and differences might be attributed to different trajectories of historical contact with the global economy. I find it more useful to look at a variety of factors, ecological, social, cultural, historical, that might contribute to the observed patterns.

It seems highly unlikely that the observed similarities in the use of plant families is due to cultural contact between the two groups in the recent or distant past. The two groups were at war for most of this century, and had little opportunity or desire to learn the medicinal habits of the other. Some degree of transfer of plant knowledge, illness concepts, and other cultural traits likely occurred between Arawakan and Panoan peoples prior to the 20th century. While many of the same plant families and genera are used by both groups, the number of identical botanical species used in common by the two groups is quite small. Furthermore, very few of the plant species used in common by the two groups are used to treat the same illness complaints. The fact that models of efficacy are so different between the two groups also suggests an independent process of discovery. The medicinal flora of widely separate temperate regions may be more similar to one another than are the medicinal flora of the neighboring Matsigenka and Yora/Yaminahua, a fact that attests to the tremendous cultural and biological diversity of the Amazonian rain forests.

Both the Matsigenka and Yora of Manu migrated relatively recently into their current, adjacent territories. The Matsigenka, however, appear to have migrated more gradually and less far from their core territory than the Yora. The Matsigenka have inhabited the Madre de Dios-Urubamba watershed since as long as records have been kept; Yora oral histories indicate that they came to this region from the Purus River basin less than a hundred years ago. Botanical surveys of the Upper Purus have not been

conducted, so it is difficult to say how different the Manu and Purus River flora are. The Yora are possibly still in the process of learning the medicinal flora of the new territory. This fact might explain their reluctance to ingest medicines, their preferred use of external applications, and their heavy reliance on visual cues rather than taste. This line of reasoning might suggest an evolutionary trajectory in systems of plant therapy, whereby plants are first selected and used for external applications, offering the least exposure to possibly toxicity, and are only later tested for use by ingestion. Comments by some Yora/Yaminahua informants suggest how this transformation might occur. When describing the use of warm plasters to treat heart pain, stomachache, and other ills, a few Yora/Yaminahua informants stated, "you apply a warm plaster, then you drink a very small amount" (paaitiro, ichapamashta ayatiro).

Exposure to novel illnesses and the botanical knowledge of foreign ethnic groups may also contribute to the differences observed between medical practices of the two groups. Some of the medicinal plants used by the Manu River Matsigenka today to treat diarrhea, intestinal parasites, cough, and eye infections were taught to them by acculturated Matsigenka from the Urubamba who assisted Protestant missionaries during the 1960's contacts. The allopathic tendencies in Matsigenka medicine may reflect, in part, a longer history of experience with parasites and other pathogens associated with intergroup contact and a more sedentary lifestyle.

Significant differences were also observed in the ethos and social structure of the two groups, differences which influence medical practices to some extent. Contemporary Matsigenka communities are relatively stable, though mass migrations occur every 15 to 20 years. Although population densities are low, extended family groups nonetheless engage in a silent competition with other families for valued resources such as land, game, and trade goods. Stoic attitudes, secrecy (for example, in shamanistic practice), and a high degree of family autonomy may be consistent with what has been called the

"family level" or "competitive mode" of social organization (Steward 1955; Johnson and Earle 1987). The Yora, on the other hand, spent much of the past century living in highly nomadic groups, loosely controlled by headmen who organized communal hunts, festivals, and raiding parties. The pathos, openness, and mutual dependence of the Yora may be consistent with a more cooperative mode of organization. Yet as Biersack (1999: 11) argues:

> ...any attempt to explain behavior in terms of 'material circumstances' or 'objective needs' overlooks the fact that so-called objective circumstances and material needs are sociohistorical products. Rooted in the collective imagination and the projections it spawns, desire as much as need motivates human-nature relations, producing Dionysian, Apollonian, or spartan economies, as the case may be.

At some basic level, however, the Matsigenka and the Yora are different peoples. While ecology, social structure, and history have affected the two groups differently, some of the observed differences may not be easily or consistently explained according to "objective circumstances and material needs". Further research with other Arawakan and Panoan peoples could be used to test the relevance of ecological, historical, socioeconomic, and cultural variables in shaping medical practices among these indigenous populations.

From Plant Selection to Plant Discovery

The process of medicinal plant selection among the Matsigenka and Yora/Yaminahua takes place within a highly structured theoretical framework. Theories about illness, sensory evaluation of medicinal plants and constructions of plant efficacy fit together like pieces of a puzzle to reveal an underlying logical structure: a system as opposed to a haphazard assemblage of empirical remedies. By inference, medicinal plant discovery also likely takes place within a theoretical framework. This assertion represents a challenge to the concept of "trial and error" learning, generally credited with the gradual accumulation of medicinal plant knowledge in so-called "primitive" societies. As Brett (1994: 164) characterizes this attitude:

> The assumption would seem to be that in the absence of "science"... there can be no adequate generation of knowledge except by the random exploratory process of "trial and error."

Trial and error is also invoked to explain the hypothesized use of plant medicines among some animals (Janzen 1978; Wrangham and Nishida 1983; Huffman and Seifu 1989). While accidental discovery of toxic and therapeutic compounds has no doubt contributed to human medicine[16], I hesitate to generalize trial and error as the prime explanation for medicinal plant discovery in human societies. There is a qualitative difference in the way humans, as opposed to other animals, acquire knowledge about medicinal plants and other environmental phenomena. One of the unique properties of human communication is the elaboration of language, including the nearly complete distinction between the "signifier" (the spoken word) and the "signified" (the concept conveyed by the word). It is this separation that allows objects or concepts that have no other relationship to be united by rhyme, alliteration, metaphor or other symbolic associations. Metaphorical thinking is the basis of any system of knowledge, whether we consider it to be "scientific" or "magical" (Tambiah 1978). Plant remedies of both the Matsigenka and the Yora/Yaminahua are selected according to sensory properties that correspond with each group's metaphors for understanding illness.

Like other studies in the interpretive tradition of medical anthropology, this work has revealed a consistent logic relating therapies to native illness concepts. By comparing ecological and taxonomic characters of medicinal plants, however, it becomes possible to move beyond a limited symbolic/interpretive perspective and appreciate aspects of medical botany that transcend the particularities of specific cultural groups.

Coevolutionary Processes in Medical Systems

A key aspect of coevolutionary theory is the presence of feedback mechanisms among organisms (Gilbert and Raven 1975; Pimentel, Levin and Olson 1978). Secondary compounds in plants play an important role in driving coevolutionary processes in nature,

for example, by attracting animal pollinators and seed dispersers or by deterring herbivores (Janzen 1978). In response to chemical deterrence mechanisms, some animals (especially insects) counteract in the chemical arms race by evolving metabolic processes to detoxify the chemical defenses of a single host plant. As generalist consumers, humans have relatively poor biological adaptations for detoxifying plant chemical defenses. Instead, humans rely on cultural adaptations such as cooking, mechanical processing, domestication and selective breeding to minimize their exposure to toxins present in food plants (Johns 1990: 19). The chemical senses in humans were perhaps first used to detect and avoid toxic plants. At some point, however, people began using their chemical senses to seek out toxic plants for use as medicines (see Brett 1994: 105). Yet the discovery of medicines takes place within a symbolic as well as an environmental context, and is not reducible to the mere search for poisonous plants.

Medical systems, including those found among small-scale societies, are complex, dynamic bodies of theory and practice that fulfill multiple functions in a society. At one level, medicine is an adaptation that allows human societies to overcome ecological and epidemiological constraints on population growth. Both the Matsigenka and the Yora/Yaminahua are swidden agriculturists, a lifestyle that is not entirely sedentary but nonetheless requires extended periods of residence in a single area for preparing and harvesting gardens. Such activities generate multiple effects in the environment that in turn influence human lifestyles. Parasites and other pathogens proliferate among human hosts, while hunting and other forms of human extractive activities deplete important resources in the vicinity of the settlement.

Many of the plant medicines used by the Matsigenka and the Yora/Yaminahua appear to address the health problems, broadly conceived, that beset humans living in this ecological and economic context. Both groups use a variety of plant remedies to treat gastrointestinal conditions, many of which appear to result from fecal contamination of

food and water. Both groups appear to have plant medicines that are effective against fungal skin infections, a common problem in the moist, tropical environment. Both groups use herbal remedies to treat leishmaniasis, an endemic, insect-borne disease associated with human disturbance. Both groups have plant medicines for treating broken bones, wounds, snakebite and other hazards associated with a strenuous, forest-dependent lifestyle. Hunting medicines, some of which may have stimulating or tonic properties, are highly valued by the two groups, reflecting both the importance of game animals in the diet and the pressure exerted on game resources by human hunting activities.

It would be reasonable to assume that many of the plants used by the Matsigenka and Yora/Yaminahua contain pharmacologically active compounds or other empirical properties that affect the human mind/body in ways that are consistent with cultural understandings of efficacy. Here, humans may be taking advantage of chemical or physical constituents that coevolved in plant-animal interactions. Through complex cultural processes, humans come to recognize these constituents, remove them from the intended "arms race" (i.e., between a plant and an herbivore or a pollinator), and apply them in humanity's own arms race with pathogens, dangerous animals, and prey species. Assuming that such therapies are effective, the hypothetical state of dynamic equilibrium would shift more in favor of the growing human population, causing a cascade of further events and additional exchanges between humans and the environment, leading to yet a new dynamic state, *ad infinitum*. Humans, and in fact all organisms, come to play the role of the Red Queen in Lewis Carroll's magical world: the faster the Queen runs, the faster the surroundings move to keep up with her.

Such coevolutionary complexes are not restricted to the empirical dimensions of human medicine. The Matsigenka and Yora/Yaminahua belief that animal spirits wreak vengeance on human families represents a projection of ecological concepts into the cosmological realm. Medical systems address not only the biological manifestations of

illness, but also the cognitive, emotional, social, and moral implications of ill health. It is not enough to treat the outward symptoms of an illness: humans seem to crave explanations for how and why illness affects them. In part, this tendency reflects an apparent intellectual need of the human mind to bring order where there is chaos. In part, however, the intellectual elaboration of illness models allows humans to formulate and test hypotheses about how illness works, and how it might be treated.

Human social groups, ecological contexts, and adaptive strategies are not closed systems. Interactions among human populations have a drastic influence over health status. Amazonian societies appear to have traded with one another and with Andean populations since ancient times. Pathogens, medical materials and medical ideas were undoubtedly exchanged among these populations. The arrival of Europeans brought entirely new pathogens and systems of economic exploitation to the American continents. Many Amazonian peoples survived as societies into the 20th century only by isolating themselves from the brutal economies and epidemic illnesses brought by Europeans, especially during the rubber boom. However such extended periods of cultural and epidemiological isolation led to other severe health consequences: fragmentation of larger, intermarrying social units (see also Lyon 1984); migration out of territories with a familiar resource base; inability to obtain trade items such as metal implements and medicines; intergroup warfare; and finally, high rates of mortality when contact with outside populations is re-established.

Today, indigenous populations such as the Matsigenka and Yora/Yaminahua depend heavily on Western medicines for their survival. Medicinal plants passed down for generations or learned from neighboring groups are effective for treating some common health conditions, but the onslaught of epidemic diseases such as measles, colds and flu, malaria, dysentery, and many others have overwhelmed indigenous populations and their medical systems, sometimes to the point of extinction. The persistence of

traditional-style plant therapy and ritual healing among some groups could be seen as a testament to the resilience of indigenous culture. On the other hand, these practices also persist because indigenous populations have only limited access to Western health care and the economic and educational opportunities required to partake of it. Medical cosmologies reflect changing social, political, and economic contexts. Both the Matsigenka and the Yora/Yaminahua attribute sorcery to foreigners and acculturated indigenous peoples. Sorcery beliefs appear to function as a way of understanding the coincidence between ill health, unhappiness, and social strife in communities transformed by global economic forces.

Nature, Culture and Sensation

Sensory evaluation of plants appears to be an important means by which humans discover efficacious medicines. Sensation is a complex biocultural process through which humans acquire information about their environment. Psychophysical studies have helped clarify the physiological pathways and cognitive processes through which humans perceive and organize sensory information, though the so-called "higher senses" of vision and hearing have received more attention and are far better understood than the chemical senses of taste and smell (Erickson 1977; Bartoshuk 1978; Doty 1991; Pritchard 1991). Cross-cultural studies of taste and olfaction are limited in number and scope. The available evidence suggests that the inherent sensory properties of chemical substances interact with genetic and dietary factors, individual experience and the social milieu to produce a variety of chemosensory experiences, shaping personal and collective preferences and aversions (Doty 1985: 673, 681). However more interdisciplinary research is needed to better understand these complex interactions. Cross-cultural studies of taste and odor perception in dietary and medicinal practices are particularly fruitful areas for future research (see Rozin 1990; Johns 1990; Brett 1994).

Appendix 2: Results of Taste/Odor and "Best Example" Experiments

The nascent subfield of sensory anthropology has explored cross-cultural variation in sensory experience. Though many ethnographies (for example Turner 1967) have explored aspects of sensory perception across cultures, Stoller's (1989) *The Taste of Ethnographic Things* was among the first to propose sensory anthropology as a new subfield. Despite the suggestive title, however, Stoller dedicates relatively little attention to taste and smell perception among the Songhay, focusing more on vision and hearing. Howes (1991: 167) approaches the study of cultures through the concept of the "sense ratio," the relative emphasis placed by a specific cultural group on different sensory modes. In this study I have shown how the Matsigenka and the Yora/Yaminahua use the senses differently in evaluating plant medicines, the Matsigenka focusing more on taste and the Yora/Yaminahua more on visual/tactile dimensions. But I feel that Howes goes too far in generalizing such claims to the level of entire cultural traditions. It would be a distortion of the facts to say that the Matsigenka are a more "gustatory people" than the Yora/Yaminahua, or to assert, as Howes (ibid.: 185) and other sensory anthropologists do, that print- and media-based Western culture places a greater emphasis on vision than non-Western cultures. All cultures value and use all of the senses. When sense ratios vary from culture to culture, they do so within specified contexts.

Sensory anthropology as proposed by Howes and colleagues suffers from an almost exclusive focus on cultural differences, neglecting cross-cultural similarities. An offhand dismissal of psychophysical and other scientific research likewise belies an unfortunate disciplinary bias. For example, Howes asserts that "perception is not simply a physical process... as students of psychophysics have taught us to believe" (ibid.: 188), yet he does not support this assertion by citing a specific statement by any "student of psychophysics." In fact, modern sensory scientists have proposed complex mechanisms of interaction between cultural and physical processes in sensation (for example, Doty 1985; Rozin 1990; Wysocki, Pierce and Gilbert 1991). Sensory scientists often cite

recent anthropological studies of sensation, including Howes’ work. Most major conferences and edited volumes on taste and olfaction in recent decades include one or more contributions concerning cross-cultural variation (e.g., Doty 1985; Steele 1992; Jellinek 1994; Lenti-Boero 1994). Howes (ibid.: 172) also directs straw-man arguments at Berlin and Kay’s (1969) cross-cultural study of color terms, which he curtly dismisses as having “plainly failed to transcend our culture's sensory biases.” Classen (1997: 402) criticizes sensory scientists for supposedly deeming the senses “pre-cultural” or “purely biological in nature.” However the reverse case, an approach to the senses as somehow “pre-biological” or “purely cultural in nature” is equally untenable. Rather than assuming that physiological research on the senses are anathema to cultural approaches, I suggest that sensory anthropologists read the extensive scientific literature on sensation. Dupire (1987), for example, provides an insightful comparison between scientific taste/odor classifications and those of the Ndut of Senegal, highlighting similarities and differences while addressing the senses in their full ethnographic richness. In the preceding chapters, I have attempted to show how scientific and indigenous understandings of the senses illuminate one another, without privileging one perspective over the other. For example, the distinctions made by physiologists between the three primary pathways of chemosensation (taste, odor, irritation) proved useful in classifying and “making sense of” the indigenous taste/odor vocabularies. The spectrum of sensory vocabulary Matsigenka and Yora/Yaminahua reveals similarities and differences when compared with Western scientific classification schemes. Translation is a problem between any two languages, but the evidence presented here suggests that cross-linguistic comparison of sensory vocabulary is feasible as well as analytically productive (see Wierzbicka 1986 on the cross-cultural translation of emotional vocabulary), and can lead to novel formulations of nature-culture interactions.

Appendix 2: Results of Taste/Odor and "Best Example" Experiments

In a recent special edition of the *American Anthropologist*. Biersack (1999) has characterized the "new ecologies" emerging in contemporary anthropology: symbolic ecology, historical ecology, and political ecology. Synthesizing cultural ecology, symbolic anthropology, and political economy, such approaches attend to "the textual and the semiotic, on the one hand, history, politics, economy, and biology, on the other" (ibid.: 11). Here, I propose a fourth "new ecology": sensory ecology. Rather than falling into the pitfalls of older dichotomies, sensory ecology would be equally interested in cross-cultural variation and similarities, and should incorporate physiological understandings and cultural constructions of sensory perception within a broad, biocultural model addressing human-environment interactions. Taste, olfaction, and other senses play an important but poorly studied role in subsistence, diet, medicine, religion, cognition, memory, social and gender relations, sexuality, and many other areas of human activity. Sensory ecology could provide new perspectives in a broad range of anthropological topics.

In this study, I have examined the role of the senses in two indigenous medical systems. Taste and odor as well as visual, tactile and auditory perception in waking life, dreams, and altered states of consciousness all play a role in how the Matsigenka and the Yora describe illness, evaluate plant medicines, and respond to therapies. Although their medical systems operate according to different logical principles, the Matsigenka and Yora/Yaminahua seem to have arrived at certain similar conclusions about the kinds of plants that are most effective in treating illness as constructed in their systems of thought. The sensory evaluation of medicinal plants provides healers with information about chemical and physical properties that are deemed efficacious within specific ethnomedical contexts. The senses convey the human experience of illness, and influence how people respond to empirical therapies and rituals, whether indigenous or biomedical. While firmly rooted in physiological mechanisms, sensation is also shaped by individual

experience, cultural preconditioning, and environmental variables. The senses mediate directly between the individual, social, environmental, and spiritual realms. An interdisciplinary approach to sensation could lie at the heart of a new anthropology of the body and a coevolutionary theory of human health.

Notes

[1] I had contracted a suspected case of typhoid fever while staying with the family in question. I sought treatment in Cuzco, and sent medicines with precautionary instructions to the health care worker in the event of additional cases of the disease.

[2] The Yora/Yaminahua cognates for dau muka and dau bata would be rao moka, 'bitter medicine,' and rao wata, 'sweet medicine,' though such a distinction is not made. The phonetic similarity, however, is an example of the close linguistic and cultural affinities among the Purus group of Panoan languages.

[3] Long periods of cooking raise the concentration of beta-carbolines that show mild psychoactivity in oral administration (J. Callaway personal communication; cf. Callaway et al. 1994).

[4] Kogapage means literally 'for no reason, of its own accord' similar to Spanish por gusto.

[5]. When I have seen Matsigenka children interact with the children of other ethnic groups, I am struck by the almost uncanny silence and "good behavior" of the Matsigenka in comparison to the more typical crying, whining, shouting, and boisterous play of the other children.

[6] The Pongo de Mainique, a steep canyon dividing the Upper from the Lower Urubamba River, is an important landmark in Matsigenka mythology. It bears the Matsigenka name Tonkiniku, 'the place of bones,' because it is thought to be inhabited by the dead.

[7] Identifications of "leishmaniasis insects" to the level of Order were provided by Douglas W. Yu, Harvard University, based on field observation of the organisms as pointed out by Matsigenka informants.

[8] The species epithet in Latin, radicans, also refers to the tail-like shape of this Asplenium species' rachis tip.

[9] In practice, the weather-predicting fungus appears to work. Perhaps changes in atmospheric pressure or humidity affect the porous internal structure of the fungus and influence the production of these sounds.

[10] The Matsigenka term for 'bitter' kepishi, appears to consist of the term kepi, 'tomentose, bristly, hairy,' and the affix for 'leaf,' -shi. Thus the etymology of kepishi may lie in the literal translation, 'bristly leaf,' drawing on the close relationship between chemical or physical astringency and bitterness. An alternative interpretation is that kepishi is a contraction of kepigarishi, 'intoxicating, poisonous leaf.'

[11] Wa'a should be properly transcribed as waka, according to the orthography I use. However when pronounced with the hard k sound, waka usually refers to a kind of dead spirit. The chemosensory term is usually pronounced with a glottal stop, wa'a. This shift in pronunciation is probably the result of different tones in the two words.

[12] The English word 'smell' reflects a similar etymology, derived from Low German terms meaning 'smolder' and 'smoke.'

[13] The word for the tree Capirona is áxó, and the trunk has a mild vegetative odor described as axò. This led me to believe the two words were the same. Yora/Yaminahua informants corrected me, however, stating that the words are not related, and are pronounced in different tones. The tree name appears to have a rising tone in one or both syllables (áxó) while the odor term appears to have a falling tone in the last syllable (áxò). However the difference is quite subtle, and I hesitate to assign definitive tonal markings (see "Notes on Orthography" in Chapter 2).

[14] Chiko with apparently rising tone on the first syllable (chíko) means 'urine stench' while with falling tones (chìkò) it means younger brother of female ego.

[15] Rising tone on the first syllable (íso or ísò) yields the meaning 'urine,' while falling tones (ìsò) yields 'spider monkey.' Mispronouncing the tones of íso chíko rao could result in the nonsensical 'female spider monkey's younger brother medicine' rather than the intended 'urine stench medicine'!

[16] Accidents have led to recent biomedical advances such as the discovery of penicillin, LSD and chemical models for Parkinson's disease. However overall, such accidental discoveries are rare. It would be safe to assume they would be equally rare in prehistoric and indigenous human populations.

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Appendix 1: Informants for Structured Interview Activities

Informant (Group)	Sex	Age	Community	Activity† 1	2	3	4
1 (Matsigenka)	M	~40	Shipetiaari			X	X
2 (Matsigenka)	M	~60	Yomybato		X	X	X
3 (Matsigenka)	F	~30	Shipetiaari			X	X
4 (Matsigenka)	F	~35	Yomybato	X			X
5 (Matsigenka)	M	~35	Yomybato				X
6 (Matsigenka)	F	~25	Yomybato	X	X	X	X
7 (Matsigenka)	M	~40	Yomybato			X	X
8 (Matsigenka)	M	~40	Yomybato		X	X	X
9 (Matsigenka)	M	~60	Yomybato	X			X
10 (Matsigenka)	M	~60	Shivankoreni	X		X	X
11 (Matsigenka)	M	~35	Yomybato	X			X
12 (Matsigenka)	F	~40	Yomybato	X			X
13 (Matsigenka)	M	~35	Segakiato	X			X
14 (Matsigenka)	M	~50	Nuevo Mundo	X			
15 (Matsigenka)	M	~30	Yomybato	X	X		X
16 (Matsigenka)	M	~35	Yomybato				X
17 (Matsigenka)	M	~30	Yomybato		X		X
18 (Matsigenka)	F	~20	Yomybato		X		
19 (Matsigenka)	F	~35	Shipetiaari			X	
20 (Matsigenka)	F	~55	Yomybato				X
21 (Matsigenka)	F	~55	Yomybato				X
22 (Matsigenka)	F	~50	Yomybato		X		X
23 (Matsigenka)	M	~60	Nueva Luz				X
24 (Matsigenka)	M	~40	Nueva Luz				X
25 (Asháninka)	M	~40	Nuevo Mundo	X*			X*
26 (Piro)	M	~60	Sepahua				X*
27 (Yora)	M	~40	Serjali			X	X
28 (Yora)	M	~25	Serjali				X
29 (Yora)	M	~35	Serjali	X			X
30 (Yora)	F	~35	Serjali	X			
31 (Yora)	M	~60	Serjali	X	X		X
32 (Yora)	M	~25	Serjali		X		
33 (Yora)	F	~40	Serjali	X	X	X	X
34 (Yora)	M	~25	Serjali		X	X	X
35 (Yora)	F	~25	Serjali	X	X		
36 (Yaminahua)	M	~40	Sepahua		X	X	X
37 (Yaminahua)	M	~50	Sepahua	X	X		X
38 (Yaminahua)	M	~60	Sepahua	X		X	X
39 (Yora)	F	~35	Serjali	X			X
40 (Yora)	M	~55	Serjali				X
41 (Yora)	F	~55	Serjali				X
42 (Yora)	M	~55	Serjali				X
43 (Chitonahua)	F	~25	Raya				X
44 (Chitonahua)	M	~20	Raya				X

† Activities: 1) taste/odor experiment; 2) best example experiment; 3) illness elicitation/classification; 4) ethnobotanical collections.

* Data from Asháninka, Piro informants not included in data analysis.

Appendix 2.1: Taste/Odor Experiment Results. Taste description of spices by eight Matsigenka and nine Yora/Yaminahua. Numbers indicate times a quality was mentioned by two or more informants of each group; * comparative taste terms; -- no taste mentioned.

Spice	Matsigenka	English Gloss	Yaminahua	English Gloss
Almond Extract	-- (8)	--	-- (8)	(no taste noted)
Bay Leaf	-- (4) kepishi, tine (2)	-- bitter, astringent (2)	-- (7)	--
Black Pepper	katsi (6) katsi+otegaka (2)	painful painful+stings	-- (4) *nochi (3) pae (2)	-- *chile pepper taste painful
Cardamom	-- (4) katsi (2)	-- painful	-- (8)	--
Catnip	kepishi (6) katsi (2)	bitter painful	-- (7)	--
Cinnamon	pocha (8)	sweet/savory	-- (6) wata (3)	-- sweet/savory
Cloves	katsi (6), otegaka (2)	painful, stings	pae (4) -- (4) asawana (3)	painful -- anaesthetizing
Cocoa Powder	poshi (5) tine (2)	delicious astringent	-- (6)	--
Coffee Powder	kepishi (6) katsi (2)	bitter painful	moka (5) nowe, toa (2) -- (2)	bitter toasted --
Curry Powder	katsi (6) pocha+katsi (2)	painful sweet/savory+painful stings	pae (4) *nochi (2) -- (2)	painful *chile pepper taste --
Dill Weed	poshi, kameti (5) pocha (2)	delicious, good sweet/savory	-- (8)	--

Echinaceae Root (Powdered)	tine (3) -- (3) otegaka (2)	astringent -- stings	-- (7)	--

Appendix 2.1 (cont'd)

Spice	Matsigenka	English Gloss	Yaminahua	English Gloss
Garang Masala	katsi (5), otegaka (2) poshi (2)	painful, stings delicious	-- (3) pae (1), wa'a (1) wata (2) shara (2)	-- painful, stings sweet/savory good
Garlic (Fresh)	katsi (5), otegaka (3)	painful, stings	-- (7) pae (1), wa'a (1)	-- painful, stings
Ginger (Powdered)	katsi (8)	painful	pae (2) *nochi (2)	painful *chile pepper taste
Lavender	otegaka (3), katsi (2) kepishi (2)	stings, painful bitter	-- (8)	--
Mineral Oil (Skin-So-Soft)	-- (6) pocha (2)	-- sweet/savory	-- (8)	--
Nutmeg	otegaka (4), katsi (2) tine (2)	stings, painful astringent	-- (7)	--
Salt	pocha (5) pocha+kacho (2) kacho (1)	sweet/savory sweet/savory+sour sour	wata (7) moka+wata (1) moka (1)	sweet/savory bitter+sweet/savory bitter
Sandalwood	-- (8)	--	-- (9)	--
Spearmint	-- (3) kepishi (2) pocha (2)	-- bitter sweet/savory	-- (7)	--
Sugar	pocha (8)	sweet/savory	wata (5) wata+shara (3)	sweet/savory sweet/savory+good
Tiger Balm	-- (4) katsi (4)	-- painful	-- (9)	--

Vanilla Extract	pocha (4) poshi (2) katsi (2)	sweet/savory delicious painful	wata (5) -- (3)	sweet/savory --
Wasabe Paste	katsi (6) katsi+otegaka (2)	painful painful+stings	pae (4) moka (2)	painful bitter

Appendix 2.2: Taste/Odor Experiment: Odor description of spices by eight Matsigenka and nine Yora/Yaminahua. Numbers indicate times a given quality was mentioned by two or more informants per group; * comparative terms; -- no odor mentioned.

Spice	Matsigenka	Gloss	Yaminahua	Gloss
Almond Extract	kasanka (7)	fragrant	ini (6) *ako ini, nai rao (2)	fragrant *Amburana, Bignonaceae
Bay Leaf	kasanka (7) *metaki-, inchovikienka (2)	fragrant *Lauraceae spp. odor	ini (6) ane (2) *ako ini, nai rao(2)	fragrant sweet-smelling *Amburana, Bignonaceae
Black Pepper	jenkaga (2) katsienka (2) -- (2)	rank painful odor (no odor noted)	itsa (4) ane (2)	rank sweet-smelling
Cardamom	kasanka (3) jenkaga (2) *porenkienka (2)	fragrant rank *Renealmia odor	ini (6) itsa (2) *arawa xetetsa (2)	fragrant rank *Renealmia odor
Catnip	kasanka (3) jenkaga (3) *inchashi-, tovaserienka (2)	fragrant rank *herb, weed odor	ini (4) initsa (2) axo (2) *nawe xetetsa (2)	fragrant fragrant+rank slightly rank (like maize) *tobacco odor
Cinnamon	kasanka (7) *metaki-, inchovikienka (4)	fragrant *Lauraceae spp. odor	ini (7)	fragrant
Cloves	kasanka (4) jenkaga (2) *metaki-, inchovikienka (2)	fragrant rank *Lauraceae spp. odor	ini (6) ane (2)	fragrant sweet-smelling

Appendix 2: Results of Taste/Odor and "Best Example" Experiments

Cocoa Powder	poshinienka (3) *chocolatienka (2)	delicious odor *chocolate odor	nowe (4) ane (3) itsa (2) *womakea, wona (2)	toasted sweet-smelling rank *termite nest, bee hive odor
Coffee Powder	shinkorienka, tagarienka (4) *oenkagake cafe (3)	toasted, burnt odor *coffee odor	nowe (7) *xekitoa xetetsa (2)	toasted *toasted maize odor
Curry	jenkaga (5) katsienka (2)	rank painful odor	ini (5) nowe (4) *waspe xetetsa (2)	fragrant toasted *Justicia odor

Appendix 2.2 (cont'd)

Spice	Matsigenka	Gloss	Yaminahua	Gloss
Dill Weed	kasanka (3) *inchashi-, tsipanashienka (3) *serienka (2)	fragrant *herb, *Calathea* odor *tobacco odor	ini (6) initsa (2)	fragrant fragrant+rank
Echinaceae Root (Powdered)	kasanka (3) jenkaga (3) -- (2)	fragrant rank --	ini (3) nowe (3) itsa (2) *maketiio (2)	fragrant toasted rank **Abuta* smell
Garang Masala	kasanka (4) poshinienka (2) *pimentaenka (3)	fragrant delicious odor *black pepper odor	ini (7) ane (2) *ako, woni ini (2)	fragrant sweet-smelling **Amburana, Myroxylon*
Garlic (Fresh)	shiti (3) *sampera (2), santarienka (1) *ajosenka (2)	foul **Cedrela, Mansoa* odor *garlic odor	itsa (7) *wowaitsa (2)	rank **Mansoa* odor
Ginger (Dried)	katsienka (3), otegaka (1) *tsitikana-, ivarantsienka (2)	painful odor, stings *chili pepper, *Piper* odor	ini (4) itsa (2) wiia (2)	fragrant rank raw-smelling
Lavender	kasanka (3) kasanka+kepigarienka (3)	fragrant fragrant+intoxicating	ini (7) *ami rao, ako(2)	fragrant **Sloanea, Amburana*
Mineral Oil (Skin-So-Soft)	kasanka (8)	fragrant	ini (9)	fragrant
Nutmeg	kasanka (3) katsienka (2) kasanka+katsienka (2)	fragrant painful fragrant+painful odor	ini (5) nowe (2) ane (2)	fragrant toasted sweet-smelling
Salt	-- (7)	--	-- (5) ini (2)	-- fragrant
Sandalwood	kasanka (2) *santarienka (2)	fragrant **Cedrela* odor	ini (6)	fragrant

Appendix 2.2 (cont'd)

Spice	Matsigenka	Gloss	Yaminahua	Gloss
Spearmint	kasanka (4) *kokaenka (2)	fragrant *coca leaf odor	ini (6) nowe (2) ane (2)	fragrant toasted sweet-smelling
Sugar	-- (7)	--	-- (5) ini (2) ane (2)	-- fragrant sweet-smelling
Tiger Balm	jenkaga (3) kasanka (2) otegaka (2), katsienka (1)	rank fragrant painful odor, stings	ini (4) ini+pae (2) pae (2) *ako ini (2)	fragrant fragrant+painful painful *Amburana* fragrance
Vanilla Extract	kasanka (6)	fragrant	ane (6) ini (2)	sweet-smelling fragrant
Wasabe Paste	katsienka (3), otegaka (2) shiti (2) *chariro (2)	painful odor, stings foul **Petiveria* odor	axo (3) itsa (2) ini (2) ane (2)	slightly rank (like maize) fragrant sweet-smelling

Appendix 2.3: "Best Example" Experiment: Responses of seven Matsigenka and seven Yora/Yaminahua. Numbers indicate times specified plants were mentioned as "good examples" of listed properties by two or more informants of either group. "NA" - no equivalent term in the language; [ ] - terms not included in the experiment for this group.

Property	Matsigenka	Examples	Use	Yaminawa	Examples	Use
TASTE: 'Bitter'	kepishi	Curarea (4) Paullinia (2) Guarea (1) Cedrela (1)	skin heart pain, GI emetic skin	moka	Guarea (2) Banisteriopsis (1) Cedrela (1)	emetic psychoactive (timber)
'Astringent'	tine	Myristicaceae (3) Paullinia (2) Banisteriopsis (1) Uncaria (1) Fabaceae (1)	candida heart pain, GI psychoactive respiratory	tsimo	Paullinia (3) Banisteriopsis (2) Brunfelsia (2) Uncaria (1) Fabaceaea (1)	psychoactive psychoactive (no use) respiratory
'Sour'	kacho	Citrus (3) Oxalis (3) Moraceae (2) manioc beer (2)	edible, respiratory GI, thirst edible edible	wokash	Garcinia (4) Moraceae (2)	(inedible) edible
'Sweet/savory'	pocha	'sweet leaf'* (6) Saccharum (2) Moraceae (1) * Oxalis (3); Endlicheria, Lunania (4)	GI, thirst edible edible	wata	Moraceae (3)	edible
IRRITATION: 'Painful, pungent'	katsi cf. 'anaesthetic' (Phys. Effect)	Capsicum (4) Piper (4) Petiveria (3) Tabernaemontana (2)	edible dental respiratory dental	pae also 'strong, intoxicating' (Phys. Effect)	Capsicum (4) Banisteriopsis (3) 'wasp plant' (3) 'heart pain plant' (3)	edible psychoactive pain, inflammation heart pain

'Stings, burns'	otegaka	Petiveria (3) Capsicum (1)	respiratory edible	wa'a	Capsicum (3)	edible
'Painful odor'	katsienka	Petiveria (5) Mansoa (2)	respiratory respiratory	(NA)		

Appendix 2.3 (cont'd)

IRRITATION cont'd 'Painful liquid'	katsiaama	Psychotria (5) 'succulent flower' (4) Astronium (2)	hunting, dreams hunting, dreams dreams, eye inf.	(NA)		
'Irritating, urticating'	kaeni	Araceae (5) Hura (4) Urera (1)	snakebite, bones dental inflammation	xoai	'millipede plant' (4) Urera (1)	skin, respiratory inflammation
'Tingling, anaesthetic'	cf. katsi: 'painful, pungent'	'katsi' responses: Capsicum (4) Piper (4) Petiveria (3) Tabernaemontana (2) Acmella (1)	 edible dental respiratory dental dental	asawana	Piper (2) Araceae (2) Capsicum (1) Acmella (1)	dental insect sting edible dental
'Intoxicating'	kepigari cf. 'kepigarienka' (Odor)	Brugmansia (5) Brunfelsia (2) Banisteriopsis (1)	psychoactive psychoactive psychoactive	pae also 'painful, pungent, strong'	'pae' responses: Capsicum (4) 'wasp plant' (3) Banisteriopsis (3) 'heart pain plant' (3)	 edible pain, inflammation psychoactive heart pain
'Emetic'	[kamarankari]			[anatiro]		
ODOR: 'Fragrant'	kasanka	Justicia (3) Myrtaceae (3) Lauraceae (2) Bignoniaceae (1)	child care child care (no use) perfume	ini	'perfume plants' (7) Amburana (4) Bignoniaceae (3) Vanilla (2) Carludovica (2) Justicia (1) Myrtaceae (1)	perfume perfume perfume perfume perfume perfume child care

Appendix 2.3 (cont'd)

ODOR (cont'd): 'Rank, musk odor'	enkaga	Siparuna (6) peccary gland (2) Mansoa (1) Lauraceae (1) Rutaceae (1)	snakebite hunting hunting (no use) hunting	itsa	Adiantum (2) 'millipede plant' (2) Siparuna (1) peccary gland (1) Mansoa (1) Lauraceae (1) Rutaceae (1)	GI respiratory, skin siezures (no use) (no use) (no use) (no use)
'Foul, strong odor'	shiti	Gallesia (5) peccary gland (2) feces (1)	(no use), respiratory hunting --	pisi	Myrtaceae (4) Gallesia (2) ghosts, demons (2) peccary gland (1) feces (1)	child care (no use) -- (no use) --
'Blood, meat odor'	janigarienka	blood, meat (4) Dyctophera (1)	-- (no use)	wiya	blood, fish (3) Dyctophera (2) ghosts, demons (2)	-- (no use) --
'Garlicky'	samperaenka [santarienka]	Mansoa (6) garlic, onion (2) Cedrela (1)	(no use), resp. edible/inedible (timber)	sasa	Dieffenbachia (2) other Araceae (3) Cedrela (2) Mansoa (1)	(no use) (no use) (timber) (no use)
'Intoxicating odor'	kepigarienka cf. 'kepigari' (Irritation)	Brugmansia (3) Nicotiana (2) other Solanaceae (1) Banisteriopsis (2)	psychoactive psychoactive psychoactive psychoactive	(NA)		
'Herb, leaf odor'	inchashienka	'all plants' (5) Myrtaceae (2)	(misc. uses) child care	(NA)		
'Ripe, floral, fragrant at a distance'	asuroenka	Bignoniaceae (3) misc. flowers (2) misc. fruits (2)	admixture, resp. (no use) edible	cf. ane, tokas		

Appendix 2.3 (cont'd)

'Ripe, floral, aromatic'	cf. asuroenka			ane	misc. fruits* (5) Piper (4) * Spondias, Pouteria	edible dental
'Fragrant at a distance'	cf. asuroenka			tokas [ta'as]	Myrtaceae (3) misc. flowers (3) misc. fruits (1)	perfume (no use), perfume edible
'Mild vegetative odor (like maize, legumes)'	(NA)			axo	maize (4) other Poaceae (2) 'stomach plant' (2) Fabaceae (2)	edible (no use) GI perfume, GI
'Nauseating, unpleasant (like urine)'	(NA)			chiko	Adiantum† (5) Piper (2) † 'urine stench plant'	GI GI
VISUAL/TACTILE: 'Red, blood-colored'	kirajaama	Machaerium (4) Picramnia (2)	GI dye, skin	imi keskara	'blood plant' (7) Machaerium (2) Picramnia (2)	menstruation, GI pain, inflammation dye
'Dark liquid'	[potsitaama]			ene chexe	Clidemia (4) 'blood plant' (2)	child care menstruation, GI
'Spiny'	[aityo otsei]			moxaya [mitsisya]	'heart pain plant' (7)	heart pain
'Bristly, pilose urticating'	[kepiri]			xopoya	'millipede plant' (5)	skin
'Latex'	[aityo okashi]			wepoya	'millipede plant' (4) 'stomach plant' (3) 'heart plant' (2)	respiratory, skin GI heart pain
'Cool'	katsingaama	cold water (5) Uncaria (4) Davilla (3)	(thirst) respiratory, fever eye infection	[matsi]		

Appendix 2: Results of Taste/Odor and “Best Example” Experiments