

QOLLAHUAYA-ANDEAN BODY CONCEPTS: A  
TOPOGRAPHICAL-HYDRAULIC MODEL OF PHYSIOLOGY\*

Ritual, pathological, and ethnopharmacological data indicate that Qollahuaya Andeans have a topographical-hydraulic model for understanding the physiology of their bodies. Qollahuayas look to their ayllu, a mountain with three ecological levels, and its waterways for understanding their physiology. Analogously, Qollahuayas understand the body as a vertically layered axis with a system of ducts through which air, blood, fat, and water flow to and from the sonco (heart). Blood and fat, principles of life and energy, come together at the heart and flow to the members of the body in a hydraulic cycle of centripetal and centrifugal motion. The sonco is also a distillation center that combines respiratory, digestive, and reproductive functions. Within this distillation process, secondary fluids (bile, feces, gas, milk, phlegm, semen, sweat, and urine) are produced that need to be eliminated. If these fluids accumulate, they become noxious and must be purged from the body with carminatives, emetics, enemas, fastings, dietary restrictions, and baths. Basically, the body is a hydraulic system with distillation, circulation, and elimination processes, which operate by the centripetal and centrifugal forces of liquids.

An understanding of how Qollahuaya Andeans think about their bodies is a necessary precondition to the incorporation of modern medicine in the Andes: cultural barriers between practitioners of modern and traditional medicine present obstacles to improving health in the Andes. According to a recent study (Evaluacion 1978:227), clinics and health workers in rural Bolivia increased 80% between 1974 and 1978, yet there was a minimal increase in clients, and health workers complained of their ineffectiveness with Andean peasants. I presented seminars to health workers during the summers of 1982, 1983, and 1984 to help them understand how Andeans perceive causes, symptoms, and treatments of sicknesses. Many Bolivian doctors and nurses were, and still are, unaware of how Andeans think about their bodies.

In response, I analyzed Qollahuaya ritualistic, pathological, and ethnopharmacological data to posit a model of Qollahuaya ethno-

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physiology. I have done fieldwork among the Qollahuaya since 1971 and collected data on ritual, pathology, and ethnopharmacology (Bastien, 1973, 1978, 1982a, 1983). Approximately 15,000 Qollahuayas live in the Province Bautista Saavedra of midwestern Bolivia at altitudes of 2,500 to 5,000 m, where they farm and herd. Qollahuayas cure with medicinal plants, perform rituals, and are famous in Andean countries, where they are called "Lords of the Medicine Bag" ("Qolla Kapachayuh") (See Girault, 1966, 1969, 1984; Oblitas, 1963, 1968, 1969; Otero, 1951; Stark, 1972). Historically, they practiced brain surgery, cured with plants, and employed a wide variety of medical paraphernalia, such as enema syringes and snuff trays, as early as 700 A.D. (Wassén, 1972). During the Inca empire, they carried the emperor's chair (Poma de Ayala, 1936:331) and healed members of his family (Oblitas, 1968). Qollahuaya herbalists traveled until 1950, when they settled in urban centers of Argentina, Bolivia, and Peru, where they continue to cure in herbal clinics (Bastien, 1982a). Consequently, Qollahuayas are traditional and widespread curers, and their ethnophysiology is useful in understanding Andean body concepts in general. This is not to imply that Qollahuaya ethnophysiology is universal to the Andes but that this model probably shares structural similarities to models of ethnophysiology in other regions of the Andes, a comparison that needs to be studied by ethnographers.

One assumption about Andean ethnophysiology is that it derives from Greek humoral theory. This is implicitly assumed in the writings of George Foster (1978) and Horacio Febrega (1973), who have generalized from the widespread use of hot and cold categories that Greek humoral pathology is the basis of Latin American folk medicine. Although Greek humoral pathology apparently influenced Andean ethnophysiology, it is misleading to assume that they are the same. I intend to explicate a model of Qollahuaya ethnophysiology from fieldwork data rather than assume a prototype in Greek humoral thought. Whether Qollahuaya ethnophysiology is pre-Columbian in origin, derivative of Greek humoral theory, or a combination of both is a question for future ethnohistorical research.

#### Topographical Metaphor: Ayllu and Body

The first premise of this model is that Qollahuayas understand the body as a vertical axis with three levels through which blood and fat flow from the center to the peripheral in centripetal and centrifugal motion. The methodological assumption is that Qollahuayas look to their mountain-ayllu and hydraulic systems for understanding their physiology. There is a wholeness characteristic to their ayllu that is projected on their body concepts. Qollahuayas understand ayllu as a vertical triangular land mass divided into high, center, and low ecological zones, in which communities live; its solidarity is formed by kinship ties, common earth shrines, and exchange of resources.<sup>1</sup> There are nine Qollahuaya ayllus: my ethnographic data is selected from Ayllu Kaata (See Bastien, 1978), a mountain with the three major communities Ninokorin, Kaata, and Apacheta. The people of Ninokorin

are Quechua speakers who farm corn, wheat, barley, peas, and beans on the lower slopes (3,200-3,500 m). The people of Kaata also cultivate oca (*Oxalis crassicaulis* Zucc.) and potatoes on rotated fields of the central slopes (3,500-4,250 m). The people of Apacheta speak Aymara and herd alpacas, llamas, and sheep on the highlands (4,300-5,000 m) of the ayllu. Traditionally, the people from the three levels exchange produce and provide each other with the necessary carbohydrates, minerals, and proteins for their balanced subsistence. The members of these communities maintain social ties with each other by marriage exchange and ritual kinship. These social ties reinforce, as well as originate from, ceremonial ties between the people of the specialized communities.

The people of Ninokorin, Kaata, and Apacheta historically referred to the integrity of Ayllu Kaata as similar to that of a human body. This evidence is contained in legal documents from 1592 to 1928 held in Kaata. When the governor of Charazani usurped Ninokorin for his hacienda, Kaatans resisted and began a two-hundred-year battle to restore Ninokorin to Ayllu Kaata. The Kaatan manuscripts also include sworn testaments by aged Indians, who attested to the solidarity of Ninokorin with communities Kaata and Apacheta. Near the end of the 18th century, Pocomallcu, 80 years old, testified before a representative of the Crown. "Ninokorin belongs to Kaata", he swore, "because it is the leg of its body" (Kaatan manuscripts, 1797:109).

Witnesses from other ayllus said that the Indians of Ayllu Kaata were authorized to cultivate all of the body, which they had cultivated from time immemorial (Kaatan manuscripts, 1796:66). In 1799, the Crown decreed that Ninokorin belonged to Ayllu Kaata; since the mountain constituted one geographical and anatomical unit, its land and communities belonged together (See Bastien, 1979).

Presently, the people of the three communities use topographical place names that correspond to different levels and parts of the mountain/body metaphor. The upper level (4,300-5,000 m) has an uma (head), nawi (eyes), and wayra (mouth); the central level (3,500-4,300 m) has a sixa (stomach) and sonco (heart); and the lower level (3,200-3,500 m) has chaqis (legs) and sillus (toenails) which are indentations on the river. A principal informant, Marcelino Yanahuaya, explained the mountain/body metaphor this way, "I am the same as the mountain. Pachamama. Pachamama has fluids which flow through her, and I have fluids which flow through me. Pachamama takes care of my body, and I must give food and drink to Pachamama."

The following is a summary of how the people of the three communities use the metaphor of the human body to understand their ayllu: Apacheta corresponds to the head, Kaata to the trunk, and Ninokorin to the legs (See Figure 1). Just as the parts of the human body are organically united, so are the three levels of Ayllu Kaata. Rivers, underground streams, and tunnels link the three levels together; Kaatans perceive this system as being similar to the human body with its conduits linking the head, trunk, and appendages. Kaatans understand



The metaphor is essentially a comparison of analogous qualities between Andeans and their environment.<sup>2</sup> They understand their own bodies in terms of the mountain, and they consider the mountain in terms of their anatomy. Sickness, for example, is a disintegration of the human body similar to the landslide on the mountain, and health is restored by feeding the complete mountain. During healing rituals, diviners create a metaphorical image of the body when they feed the earth shrines of the mountain (See Bastien, 1978:64-77, 129-139). Diviners serve coca, blood, and fat in 13 scallop shells to different earth shrines, which are associated with topographical features of the three ecological levels and with anatomical parts of the human body. The shrines of Qowila and Kalla Kalla correspond to the arms and legs of the body; Pachaqota and Zaqtalaya, to the eyes; Kala, to a teat; Wayra Wisqhani, to the mouth; and Mojata, Yanach'oj, and Phesqa Pata, to circulatory and distillation processes associated with the sonco (heart). The chief ritualist of Ayllu Kaata, Sarito Quispe, said that the earth shrines of Kaata refer to the inner organs of the body where blood and fat are processed. "The blood and fat must be circulated to the other parts of the mountain. This gives life to Pachamama." The underlying assumption is that if he symbolically feeds the earth shrines of the three levels of the mountain, then ayllu will be complete, and this will bring about the completeness of the body.

The organic wholeness projected on Mount Kaata originates from Kaatan's understanding of their physical bodies. The body (uqhuntin) consists of all the parts and only those parts that form one inner self. Kaatans do not conceptualize interior faculties for emotions and thoughts as being distinct from corporal organs. Rather, they refer to their bodies as within or inside (uqhu). The body includes the inner self, and experiences are not dualistically perceived as those of the psychic and those of the body. A basic assumption of Qollahuaya body concepts is that the body is holistic and not dualistic, the suffix, tin, of uqhuntin expresses that the whole is greater than the sum of the parts, or a gestalt. Wholeness (health) of the body is a process in which centripetal and centrifugal forces pull together and disperse fluids that provide emotions, thought, nutrients, and lubricants for the members of the body. Moreover, this process extends beyond dualistic confines of inner and outer, in that fluids of the body are governed by similar dynamics within the environment. Fluids flow back and forth between the body and the mountain, which has a central axis and levels through which air and water flow inward and outward.

#### Centripetal and Centrifugal Fluids

The dynamics of centripetal and centrifugal motions are symbolically expressed in ritual by the gathering and disposal of ritual items, the movement of the flute players, and the different uses of blood and fat. Characteristic to Qollahuaya rituals is the bringing together of ritual items from the three levels and peripheries to the center, the mixing of these products, and the dispersal to the earth shrines of the mountain. The coming together symbolically of ritual foods and distant

earth shrines to the center in a ritual meal is a metaphor for the parts of the body, separate, yet united by the flow of nutrients and fluids to and from the sonco. The sonco is where air, blood, food, and water come together in rapid movement and separate into other fluids (primarily fat, bile, milk, and semen) and by-products (feces, urine, and sweat). Although the sonco is translated as "heart", Qollahuayas refer to it as a compression-distillation center, which performs circulatory, respiratory, and digestive processes. (The sonco is also associated with thought and emotions, which are qualities of the fluids.) Certain Qollahuayas, such as Juan Wilka and Damaso Yanahuaya, understand the processes of sonco in terms of tinku, which refers to the coming together of two streams, creating a turbulence that separates nutrients in the water and fills it with air and foam. From this analogy, it is understood that the coming together of liquids produces centripetal forces that not only separate components of fluids but also disperse them through the system.

Analogously, centripetal and centrifugal forces of circulation are expressed by the dance of the flute players at the major agricultural ritual, Khallay Chajmay (See Bastien, 1978:75-77). The flute players begin with a spiral, inward-directed counterclockwise movement from east to west and end in an out-ward directed clockwise movement from west to east. Sarito Quispe says that the dancers are like a spring that winds tightly inward and then releases itself outward. Symbolically, this is a metaphor of centripetal movement with a centralized focus in one direction, and of centrifugal movement with dispersal to the peripheries in the other direction. It is representative of body fluids that distill in the center and disperse to the parts.

Air, blood, and fat are primary body fluids for Qollahuayas. Air is an invisible fluid substance that provides breath to living things. People, plants, and animals share in this fluid, which is understood as a unitive principle between them. Ritualists breathe on a ritual offering to bond themselves with the recipient. Breath is associated with wind (wayra), the cause of mal de aire, which includes muscle and nerve disorders from paralysis, such as Bell's palsy, to muscle cramps. This is treated ritually by blowing smoke on the paralyzed muscle. Air concentrates in the sonco, disperses to the muscles, and provides movement. Conversely, wind blowing on the muscles causes contractions and brings paralysis.

Blood and fat empower the body: blood (yawar) is the life principle and fat (wira) is the energy principle. Ritualists use blood and fat differently, reflecting their conceptions of these fluids. During Khallay Chajmay, they cut open a llama, remove its pulsating heart, and sprinkle blood in a rotating movement toward the peripheries of the ayllu. This symbolizes the blood flowing from the sonco in a spiraling outward movement of centrifugal force. In contrast, ritualists break llama fat into pieces and distribute them to the earth shrines. They believe that fat is a semifluid, broken down and distributed to the peripherals of the body, where it is either stored or broken down for energy. Fat is carried by the blood to the parts of the body; for example, they diagnose a person with dark-colored blood as having

fatty blood. Within the sonco, fat is separated from food by the force of the blood coming together in an inward spiral of centripetal movement. This force, then, reverses itself in outward movement and disperses the fat and blood to the parts of the body. Although blood circulates from the sonco to the peripheries by hydraulic dynamics, it is limited in supply and is not regenerative.<sup>3</sup> Qollahuayas believe that by the age of seven a person has acquired his or her amount of blood for life; if during his lifetime he loses some blood, there is no way of recovering it, except by a transfusion, which is comparable to receiving gold (personal conversation with Dr. Abraham Mariaca).<sup>4</sup> Andeans also attribute illnesses, such as debility and depression, to the loss of blood in the past. This is one reason why it is difficult to take blood samples from Qollahuayas, as well as from other Andeans.

Qollahuaya herbalists vary in the way they classify blood. One elderly herbalist, Juan Wilka, classifies bloods as strong, weak, frightened, and exhausted. For example, he diagnosed the pulse of one patient, Elsa Yanahuaya, as weak because a landslide had thinned her blood with water. He suggested that she receive new blood by transfusion. Many herbalists refer to the qualities of blood according to four symbols: hot and cold, wet and dry. These qualities refer to when the blood is too fast (hot), too slow (cold), too thick (wet), and too thin (dry). Herbalists diagnose these qualities by a sophisticated system of reading the pulse. Sometimes they combine qualities: hot and wet blood is associated with energetic people and refers to fast-moving blood with much fat. Because the rates of concentration and dispersal are high, the central organs and the members are exchanging fluids at a rate that is not calibrated to similar dynamics in the surrounding environment. Sometimes these people upset those around them with expressions of anger and power. Hot and dry blood is symptomatic of tachycardia or thinly oxygenated blood and refers to rapidly dispersing blood with little air and fat. Cold and wet blood is symptomatic of arthritis and refers to sluggish blood that does not disperse to the muscles. Cold and dry blood is symptomatic of respiratory ailments and refers to blood with a low concentration of air and a slow rate of dispersal to the parts of the body. Corresponding to the diagnosis, herbalists prescribe an herb to regulate hydraulic forces of the blood.

Qollahuayas also attribute sickness to loss of fat. Physiologically, fat is esteemed in the Andes, where it is cold at night with few sources of heat besides the human body. The importance of fat is symbolically expressed in language and ritual. Viragocha means "Lake of Fat" and is the term for gentleman. It also refers to a creator/deity who arose from Lake Titicaca and created earth, sun, and people. (Parades, 1963:37-38). Modern Qollahuayas spread llama fat over a person to anoint him or her with political and ritual authority. A healthy Qollahuaya has fat; someone sick lacks fat. A common ailment is mal de higado (liver ailment), which Andeans recognize as a problem of fat metabolism. As they see it, fat remains in the sonco because there is insufficient bile to break it down so that undistilled fat clogs the ducts and cannot be dispersed to the muscles. Qollahuayas, as well as other Andeans, attribute a serious sickness, liquichado, to

the sudden and mysterious removal of fat by a kharisiri. A kharisiri (cutter) is usually a doctor, lawyer, or priest who travels at night to remove fat from peasants (See Oblitas, 1963:30).

I observed one instance of liquichado in Cacachaqa, an Aymara community between Oruro and Potosí, on July 17, 1982. Although this clinical case was outside Qollahuaya territory, Qollahuaya herbalists reported similar treatments. Marcelino, 25 years old, had been sick for a year. He had a high fever, was weak, and walked with crutches. The nurse's assistant had diagnosed the disease as tuberculosis of the kidneys, and he had treated Marcelino with antibiotics. On the other hand, the village diviner claimed that Marcelino was a victim of the kharisiri. Marcelino agreed and said that someone removed his fat with an aparato (apparatus) while he was traveling, partially intoxicated from chicha (corn beer), in the bed of a truck through a mestizo community. Because he was in an intoxicated slumber, he could not recall how this was done. The diviner treated Marcelino with foods high in fat: soup from the marrow of burro bones and fat from the pancreas of sheep. At first, Marcelino recovered but suffered a relapse several months later when he became intoxicated with chicha. The diviner prescribed more fat for his diet and performed a turqa ritual, in which he went into a trance to talk with Mother Earth, the Dead (Supaya), and Condor. The diviner scolded and punished these deities for taking Marcelino's fat, and for trying to take his life. In exchange, the diviner agreed to send them llama fat (llampu) and other ritual items. At dawn, the diviner distributed the llama fat to the principal earth shrines around the community.

In analysis, the etiology and treatment of liquichado is homologous to the hydraulic cycle. A kharisiri enters the back of the body (opposite to the navel), where it extracts fat in a noncyclical or exploitive manner. The afflicted person continually loses fluids, especially fat, unless diviners (1) restore the person's fat and (2) stop the noncyclical dispersal of fat. Diviners do this by feeding the person fatty foods and by correcting the cycle with below-earth (Supaya), earth (Pachamama), and sky (Condor). Diviners treat the physiological system with concentrates of fat, thereby utilizing centripetal motion, but they also restore the person's position with regard to the cosmological system, by communicating with the three levels of the universe (utilizing centripetal motion), and the environmental system, by distributing llama fat to the peripheral earth shrines (utilizing centrifugal motion).

Inherent in Qollahuaya pathology is the belief that vital fluids can be dispersed from the body to the environment. Liquichado is loss of fat. Chullpa (osteomyelitis) is caused by digging near the site of an ancestor grave. In certain instances, diarrhea in children is often believed to be caused by the mother urinating in a cave at night. Venereal disease is attributed either to urinating in the wind or in a fire. Tapeworms, hookworms, and roundworms are attributed to eating earth and walking barefoot. Susto (fright) is the dispersal of

ajayu (fluid-emotions) from the body to the land or water: its symptoms are diarrhea, low fever, depression, melancholy, lack of appetite, and nervous ticks. Rubel (1964) explains it as loss of soul or spirit, either alma or animo, but for Andeans these terms suggest Western ideas of immortality. Qollahuayas believe that fright causes fluids, associated with emotions, to surge from the body and to enter either a stream or the earth. Animo is a fluid that gives consistency to the body (Oblitas, 1963:32) and psychologically links it together. In Quechua, animo is called juch'uy ajayu (small ajayu), and alma, jatun ajayu (large ajayu). When people lose their juch'uy ajayu, they begin to dry up (blood gets thin, skin becomes pale, and the body becomes emaciated). When people lose their jatun ajayu, they die because their bodies have dried up (Oblitas, 1963:32-33). In other words, Qollahuayas consider animo and alma fluids that flow through the body, similar to electrical energy; they are invisible but connect all parts simultaneously with a charged substance. Qollahuayas distinguish animo from alma, in that animo is used to describe the beginning or temporary departure of this fluid, and alma, the permanent dispersal of the fluid. Animo and alma are not conceived as entities but as fluids circulating by centripetal and centrifugal motions within the body; susto is the temporary dispersal of these fluids, which may result in death unless a diviner recovers the animo in a stream and returns it to the sick person (See Bastien, 1978:152-154). Health is restored by the infusion of liquids within the dry body. Living bodies are centers where fluids circulate by dynamics of concentration and dispersal. They are in cyclical exchange between the wet and dry. Dead bodies have had all their fluids dispersed from them. This partially explains Andeans' fixation with mummification of their dead (See Allen, 1982, for the relationship of wet and dry cycles to the living and dead).

#### Medicinal Plants and Ethnophysiology

Qollahuaya ethnopharmacology further substantiates a topographical-hydraulic model of physiology. One characteristic of this model is an exchange of ingredients between the earth and body. Although Qollahuaya herbalists employ plants, many of which have active ingredients with therapeutic effects, they believe that the earth provides the cure in certain plants that are the gifts of Pachamama (Mother Earth) to humans. Ingredients are transferred from the earth through the plants to themselves. The most common method of administering herbs is by steeping parts of the plant in a cup of boiled water, called maté. The assumption is that the plant concentrates and distills substances from the earth and then distributes these energies through the leaves (another expression of the centripetal and centrifugal forces concentrating and circulating fluids from the center to the peripheral). These substances are released from the leaves by steeping in a maté, which is drunk, distilled, and dispersed in the sick person's body. Qollahuayas also believe that the Qollahuaya region (Qolla means herbs, and huaya means place) has the most efficacious plants not only because of its rich minerals, climate, and topography, but also because their ayllus and mountains are at the center.

Clinically, herbalists are primarily concerned with the circulation, distillation, and elimination of fluids. I studied the use of medicinal plants by three noted Qollahuaya herbalists, Florentino Alvarez, Nestor Llavers, and Mario Salcedo, from 1979 until 1984 (See Bastien, 1982a, 1982b, 1983a, 1983b). First, herbalists diagnose the person's sickness by feeling the pulse and analyzing the urine. They take the urine sample early in the morning, observe it in the sunlight, and identify certain diseases by its clarity, color, and density. Qualities within blood and urine are important indicators of circulation and elimination processes. From the pulse and temperature of the body they diagnose whether the blood is hot, cold, wet, or dry. Corresponding to the diagnosis, they prescribe an herb to regulate concentration, dispersal, and elimination processes. Herbalists categorize herbs as hot, warm, cordial, and fresh. Hot and warm refer to the degree to which a plant causes fluids to come together and to flow faster to the peripheries, described therapeutically as emmenagogues, emetics, cardiotonics, cardiopulmonaries, expectorants, galactopoiesis, linaments, purgatives, and sudorifics. Cordial and fresh herbs slow down distillation and dispersal processes of fluids, primarily biliary regulants or refrigerants, carminatives, disinflamants, hemostatics, stomachics, and tranquilizers. Classification of plants into hot and cold, then, follows a hydraulic ethnophysiology. Table 1 contains an analysis of therapeutic uses of 89 plants (See Bastien, 1983, for the names, taxonomic identification, classification, and therapeutic uses of each plant). Many therapeutic uses provided in Table I fit into hydraulic categories.

Herbalists's therapeutic applications of vegetable drugs follow empirical observation and theoretical assumptions based on hydraulic conceptions of the body. By observation, practice, and learning, Qollahuayas attribute therapeutic uses to herbs according to the effects that the herbs have on the body, depending on whether they make a person sweat (sudorific), reduce fever (febrifuge), remove mucous (expectorant), calm pain (analgesic), regulate bile (biliary regulant), cause menstruation (emmenagogue), increase lactation (galactopoiesis), repel worms (vermifuge), relax muscles (linament, tranquilizer), dispel poisons (emetics and purgatives), and more. This is an empirical knowledge based on active ingredients in certain plants having therapeutic effects: for example, quinine (Cinchona calisaya Wedd.) is an effective febrifuge for malaria, cocaine (erythroxyllum coca Lam) and bocanine (Bocconia integrifolia H. & B.) are analgesics, and digitalis (Digitalis purpurea L.) is an important medicine for treating congestive heart failure (edema). Qollahuaya herbalists claim that pharmaceutical companies, such as Inti and Vita in La Paz, have taken more than 50 vegetable drugs discovered by the Qollahuayas for use in pharmaceutical products.

This empirical science corresponds to their conceptions of the body. Qollahuayas employ plants for certain therapeutic effects according to how they understand human physiology. Figure 1 indicates the following; (1) 42% of the therapeutic uses are concerned with liquids (blood, bile, milk, phlegm, urine, and water) or fluids (air, food, and fecal matter); (2) 28% are concerned with regulating and purifying the conduits and processing organs; and (3) 30% deal with pain and injuries

Table 1  
Therapeutic properties and physiology.

		No. of herbs	%			No. of herbs	%
<b>HUMORS</b>							
<i>Blood</i>							
1. emmenagogue		6	3.8	1. stomachic		5	3.2
2. hemostatic		4	2.5	2. vermifuge		4	2.5
3. purify		3	1.9	3. carminative		2	1.3
4. coagulant		2	1.3	4. emetic		2	1.3
5. control sugar		1	.6	5. purgative		2	1.3
6. draw blood		1	.6				
7. strengthen		1	.6	Total		15	9.6
8. cardiotoxic		1	.6	<i>Reproductive</i>			
9. cardiopulmonary		2	1.3	1. emmenagogue		6	3.8
Total		21	13.4	2. hemostatic		2	1.3
<i>Biliary</i>							
1. emetic		5	3.2	3. stimulant		2	1.3
2. regulant		4	2.5	4. tranquilizer		1	.6
3. refrigerant		2	1.3	5. contraceptive		1	.6
4. febrifuge		1	.6	6. abortifacient		1	.6
5. purgative		1	.6	7. aphrodisiac		1	.6
6. antiseptic		1	.6	Total		14	8.9
Total		14	8.9	<b>FRAME</b>			
<i>Urinary</i>							
1. antiseptic		5	3.2	<i>Muscles &amp; Bones</i>			
2. diuretic		5	3.2	1. liniment		12	7.6
3. disinflammatory		2	1.3	2. glutinous		6	3.8
Total		12	7.6	3. thermic		1	.6
<i>Milk</i>							
1. galactopoiesis		3	1.9	4. vermifuge		1	.6
<i>Phlegm</i>							
1. expectorant		10	6.4	5. stimulant		2	1.3
<i>Sweat</i>							
1. sudorific		6	3.8	Total		22	14.0
<b>PROCESSING ORGANS</b>							
<i>Respiratory</i>							
1. expectorant		10	6.4	<i>Senses &amp; Neural</i>			
2. sudorific		2	1.3	1. analgesic		9	5.7
3. pectoral		1	.6	2. tranquilizer		5	3.2
Total		13	8.3	3. antiseptic		5	3.2
<i>Digestive</i>							
<i>Grand Total</i> <sup>1</sup>							
						156	100%

<sup>1</sup>Total (156) is greater than number of plants (89) because some plants have more than one therapeutic use.

of the skin, muscles, and bones. This explains the herbalists' style of administering medicinal plants in maté, compresses, cooking, plasters, enemas, suppositories, massages, and baths (See medicinal uses in Bastien, 1983b and SEMTA, 1984:85-150). This further supports the hypothesis that these Andeans understand the human body as a hydraulic system characterized by a muscular-skeletal framework and conduits through which air, blood, feces, milk, phlegm, semen, sweat and urine flow.

Qollahuaya herbalists classify plants by how they affect the flow of primary and secondary fluids, eliminate noxious by-products, and cleanse passageways. This ethnophysiology consists in the circulation of primary fluids (air, blood, and water) and semifluids (fat and food) with distillation processes (breathing, digestion, and reproductiveness), which produce secondary fluids (phlegm, bile, gas, milk, semen, sweat, and urine) and secondary semifluids (feces), that need to be regularly eliminated. If these processed fluids accumulate, they become noxious and must be purged from the body with carminatives, emetics, enemas, fastings, dietary restrictions, and baths. Basically, herbalists perceive the body as a hydraulic system with centripetal and centrifugal forces that control the distillation, circulation, and elimination of fluids.

#### Topographical-Hydraulic Models in Andean History

The Qollahuaya topographical-hydraulic model has certain prototypes in Andean history. The application of anatomical paradigms to land and society is found among early Peruvians, who planned the space in their ancient cities according to the metaphors of birds and animals (Richard Schaedel, personal communication, 1978). They made outlines of large animals on the surface of the Mazca valley between 200 and 600 A.D., (W. Isbell, 1978:140-153; Mason, 1968:88). During the 14th and 15th centuries, the Incas designed Cuzco according to the metaphor of a puma (Rowe, 1967:60). The Huarochiri legends, preconquest oral traditions of the Central Andes, depicted the crest of the mountain as the head, the central slopes as the chest and shoulders, and the place where two rivers diverge below the central slopes as the crotch and legs. Throughout the conquest, metaphors persisted, and today the people of Jesus de Machaca, a community near Tiahuanaco, Bolivia, still refer to their land as divided and integrated according to the parts of a cougar (Albo, 1972:788-790).

#### Inca Cosmology

Hydraulic dynamics of centripetal and centrifugal forces share certain features with Earls and Silverblatt's (1978) model of Inca cosmology. First there was a flood, Uno Pachacuti, which symbolized the centrifugal dispersal of water. After the waters receded, earth was uncovered, lagoons, rivers, and lakes were formed. Mamácocha (Mother Water) emerged to rule the aquatic elements, and Viracochoa

(Lake of Fat) performed his creator acts and disappeared in the ocean. Early conquest legends symbolize Lake Titicaca as a vertical axis of water that connects the highest waters of Lake Poopo in the east with the lowest waters of the Atlantic Ocean in the west by the rivers of Desaguadero and Pilcomayo. From this, Earls and Silverblatt conceptualize the geometrical structure of Inca cosmology. Lake Titicaca is a vertical axis, like a funnel, through which water flows in a concentrated upward movement to the surface, where it disperses in evaporation. This forms clouds and rain, which descend to the earth. The water then soaks into the ground and enters the underground rivers that flow to Lake Titicaca. The dynamics of this hydrographic circulation are that the centrifugal movement of the water (evaporation, flooding, rain) begins outside-above and the centripetal movement begins within-below.

In comparison, Qollahuayas apply a similar cosmology to their body. One distinction in the Qollahuaya model is that the movement of the fluids is reversed: fluids are received through the nose and mouth, then travel downward to the sonco, a center where beneficial fluids are dispersed to the peripherals, and noxious fluids to the bottom. The Lake Titicaca model posits that water soaks in the ground and enters underground rivers that flow to the center, Lake Titicaca. These waters are compressed (mixed with fat [ viraqocha ]) and compelled upward for dispersal to the land. This difference provides another dimension toward understanding Andean cosmology: lakes and mountains share similar interrelated hydraulic dynamics. Together, they create centripetal and centrifugal forces: rivers and lakes concentrate fluids from the peripheral toward the center (rivers, downward, and lakes, upward), and the surrounding land disperses fluids from the center to the peripheral, and conversely. Lakes flow upward and are regulated by centripetal forces which bring together moisture from surrounding areas. Lakes would be parallel to distillation processes within the body. Rivers flow downward and are regulated by centrifugal forces, which circulate fluids to and from the lakes. Rivers symbolize vessels of the body. The mountain brings lakes and rivers together into a geophysical structure that combines this upward and downward flow of fluids by absorption, compression, internalized movement of water upward (springs), and distillation (different types of water). The mountain is consequently a metaphor for Qollahuaya physiology because its geophysical mass makes it a unit, which is a unified hydraulic structure based on the inter-dynamic flow of fluids between land, lakes, and rivers. Consequently, the mountain serves as a holistic metaphor for Qollahuaya ethnophysiology, not only because it has a vertical axis but also because it is a structural unit transformed into a whole by the process of centripetal and centrifugal hydraulics.

#### Aymaras of Poopo

I do not contend that all Andeans share similar body concepts to the Qollahuayas, but one conclusion from this research is a methodological process for uncovering how Andeans perceive their physiology. This

methodology is to examine their perceptions of land and water. For example, the Aymaras of Poopo, Bolivia (64 km south of Oruro), divide the body into four parts, similar to their division of fields and communities into quarters. A vertical axis divides the body into a right and left side (kupisa janchi and ch'eqasa janchi), and a horizontal axis at the waistline divides the body into upper and lower halves (alajjasa janchi and aynachasa janchi). They distinguish four parts: alajja kupisa janchi (upper right side), alajja ch'eqasa janchi (upper left side), aynacha kupisa janchi (lower right side), and aynacha ch'eqasa janchi (lower left side). Pain and disease are often contained in one of these parts. They say, for example, "Kupisa pege usutu; kupisa janchi usutaraquiniwaa" (the left side of my head is sick, and the left side of my body will also become sick).

One difference between Qollahuaya ethnophysiology and that of the Aymaras in Poopo is the division of the body into four parts. The importance of four-part division in Andean culture has been documented by scholars. Earls and Silverblatt (1978:300) write that the basis of Andean spatial order is the division into quarters based on the movement of the sun in relation to the earth or, as Urton (1981) writes, the movement of the Milky Way. R.T. Zuidema (1964) writes that the Incas divided Cuzco into four parts. The Inca empire was popularly called "Tawantinsuyo" or "Four places inasmuch as they constituted a whole". Geographical differences, however, explain why the Aymaras divided the body into four parts, whereas the Qollahuayas divided it into three. These Aymaras farm on one level of the Altiplano, whereas the Qollahuayas have three ecological levels on their mountain. Moreover, the Aymaras of Poopo are miners who are aware of the noxious fluids that flow from the earth, so they posit the beneficial and noxious fluids of the body. Qollahuayas have saline springs, which they compare to emission of sweat and urine from the body. The point is that a hydro-graphic model for ethnophysiology derives not only from historical patterns but also from a processual-reflective relationship of Andeans with their land and water, which differs regionally and from community to community.

#### Quechua Lexemes

Quechua speakers' conception of the body is also influenced by their conception of geographical topology. Louisa Stark (1969:59) has shown that the body is not only described in terms of land; roundness and hollowness are also distinguished. Quechua lexemes for the head follow this pattern: each lexeme has a semantic component that denotes concavity (t'uqu [hole], with nawi [eye], ninri [ear], sinqa [nose]; and uxu [cavity], with simi [mouth]) and one that denotes convexity (kapacu, with nawi and ninri; rapra [exterior], with sinqa; and wirp'a [rounded], with simi). Semantic patterning of convex chest has the constituents nunu (breast) and q'asqu wayq'u (chest ravine); siki wak'a (buttocks) have as constituents siki pata (buttocks ledge) and siki wak'a (buttocks furrow); and wasu (back) has as constituents wasu muqu (shoulder blades or back hill) and wasu wayq'u (shoulder break) (See Table 2).

This patterning of roundness and hollowness is related to the overlap between body parts and geographical domains in Quechua. The simple lexemes have meanings covering more than body aspects. The first eight of the simple lexemes are egressive transfers; that is, the semantic dimension of the body part is extended away from its original domain to include a geographical domain. The body-part meaning is primary, and the extended geographical meaning is secondary. The exception is muqu, in which the primary meaning is hill and the secondary meaning is knee. The overlap of geographical and body-part domains also extends to compound lexemes, which often consist of a body part plus a topographical term. The compound lexemes represent ingressive transfers; that is, the geographical meaning of a lexeme is extended to the domain of body parts. One of Stark's conclusions (1969:9) is that Quechua speakers' conception of the body as composed of convex and concave contrasts is influenced by their conception of topology in which contrasts between convex and concave entities exist on a far grander scale than on the body. Combining Stark's conclusion with mine and those of Earls and Silverblatt, it appears that Andeans distinguish convexity and concavity as important features for their body and land because roundness and hollowness are important to hydraulic physiology and irrigation systems. The geography and ecology of the ayllu are important to Andeans for their subsistence and physiology. This shows how homologies between geography and physiology are based on common hydraulic dynamics.

#### Comparison with Greek Humoral Theory

Greek humoral pathology derives from the cosmology of Ionian philosophers of the 6th century B.C., who taught that the world was made up of four primary elements: fire, earth, water, and aer (air, vapor, mist) (See Edelstein, 1967 and Sarton, 1954). Corresponding to these elements, the body is made up of four fluids, which circulate freely throughout the relatively stable and solid tissues of the body. Three fluids correspond to bodily processes: blood flows from wounds, phlegm drips from the nose, and yellow bile is vomited. The fourth fluid, black bile, was added for symmetry. According to Foster (1978:5):

Each fluid, or humor, was believed marked by a complexion stemming from one each of two opposing pairs of qualities of the four elements, viz.: blood -- hot and moist; phlegm -- cold and moist; yellow bile (or "cholera") -- hot and dry; black bile (or "melancholy") -- cold and dry. Health, said Alcmaeon, was a condition of eucrasia, of equilibrium or balance, of the proper mixing of the humors, while illness resulted from dyscrasia, and upset in this equilibrium sometimes, but not necessarily, caused by an excess of heat or cold.

This doctrine of humors was adopted by Hippocrates, born about 460 B.C., and incorporated into a collection of medical treatises, Hippocratic Corpus. The four humors were dissimilar in their qualities of heat, cold, dryness, and moisture, and the physician treated disease

Table 2

Simple lexemes	Body part meaning	Geographical meaning
<i>kunka</i>	neck	small chasm in mountain
<i>ñawi</i>	eye	spring
<i>rixra</i>	shoulder	shoulder of mountain
<i>sinqa</i>	nose	mountain ridge
<i>uma</i>	head	mountain peak
<i>wasa</i>	back	other side of mountain
<i>sixa</i>	stomach	small hill
<i>siki</i>	buttocks	foot of a hill
<i>muqu</i>	knee	hill

  

Compound lexemes	Body part meaning	Literal meaning
<i>čaki muqu</i>	ankle	foot hill
<i>čaki puxyu</i>	arch of foot	foot well
<i>čaki pampa</i>	sole of foot	foot field
<i>q'asqu puxyu</i>	furrow between the chest and diaphragm	chest well
<i>q'asqu wayq'u</i>	area between breasts	chest ravine
<i>q'asqu ñuñu</i>	breast	chest hill
<i>siki pata</i>	buttocks	buttock ledge
<i>siki wak'a</i>	buttocks	buttocks furrow
<i>wasa wayq'u</i>	area between shoulder blades	back ravine
<i>wasa muqu</i>	shoulder blade	back hill
<i>ñawih t'uqu</i>	eye socket	eye hole
<i>simi pata</i>	area between nose and mouth	mouth ledge
<i>simi wirp'a</i>	lips	rounded mouth
<i>simi uxu</i>	mouth opening	mouth cavity
<i>ninri t'uqu</i>	ear opening	ear hole
<i>ninri kapachu</i>	outer ear	ear cape
<i>sinqa t'uqu</i>	interior of nostril	nose hole
<i>sinqa rapra</i>	outer nose	nose

by the principle of opposition (Chadwick and Mann, 1950:5, 205-207). Foods and herbs were characterized by paired qualities of hot and cold, and moistness or dryness (Foster, 1978:7). The physicians of Greek humoral pathology emphasized balance (Fabrega, 1973:236-237): health was signified by a warm, moist body maintaining equilibrium among the blood, phlegm, yellow bile, and black bile. Sickness resulted from humoral imbalance caused by an excess of one of the four humors. There was a strong culturally sanctioned emphasis on the restoration of balance. Food, drinks, herbs, and medicinal substances were classified into hot or cold categories and were used to maintain health or return the body to a previous healthful state. Emotions reflected the degree of balance in social relation.

In comparison, Andean and Greek humoral systems are based on analogies from nature. Greek humoral pathology began, not in medicine per se, but in philosophical speculation and scientific experimentation concerning the nature of the universe. The universe was composed of four elements -- fire, water, earth, and aer -- corresponding to four body fluids; to emotions, personality types, seasons, and sickness. The body was analogous to the universe, seasons, and personality types within society. Moreover, there was interaction between the systems; diseases related to seasons and were cured by change of seasons. Hippocrates wrote in On the Number Seven that a disease will end well if the season is not on its side but fights along with medicine; for generally speaking, man's nature cannot overcome the nature of the universe (Edelstein, 1967:72). I have shown in this paper that Qollahuaya hydraulic physiology is rooted in analogies between these Andeans and their land. As did the Greeks, the Andeans perceive similarities and relationships between physiology, geology, and climate. Basic to both systems are ideas of nature, analogously expressed through the components of the system, such as parallels between elements of the universe and bodily humors for the Greeks and metaphorical relationships between a mountain and body parts for the Qollahuayas. Moreover, terms of the universe are not only reflective of each other but also interdynamically related so that Greeks need the season on their side to get well and Qollahuayas have to feed the earth shrines of the mountain to make their bodies complete and healthy.

In contrast, Andeans differ from Greeks in the understanding of nature. Basically, the Greeks understood nature as a system in balance, or to be kept in balance, and Andeans view nature as a system in cycle. One concentrates more on symmetry, a steady state, and the other emphasizes the cycle of fluids, implying a certain and necessary assymetry of hot/cold, and wet/dry, which causes a pendulumlike movement. Implicit to Qollahuaya theory are hydraulic dynamics in which liquids are concentrated or distilled by centripetal forces and dispersed to the periphery by centrifugal forces. For early Greeks, health was the balance (equilibrium) of four humors -- hot and cold, wet and dry -- to maintain a steady state. Extremes were to be avoided. Sickness resulted from dyscrasis or imbalance of humors, other body fluids, food, or human activity. Disease was synonymous with a disturbance of balance (disproportion of the parts). The relationship between the various parts was continually subject to change because of the constant intake of fresh nourishment, because of constantly new activities, and because of automatic seasonal increases and decreases in the body fluids or in their circulation under the influence of hot and cold. For this reason, everyone tried at all times to correct the imbalance as it arose (Edelstein, 1967:69-70). Hot/cold, wet/dry were important because they influenced the balance of humors.

For Qollahuaya Andeans, on the other hand, health is the cycle of fluids and semifluids (water, air, blood, and food) all of which, except blood, are distilled into secondary fluids (mucus, bile, sweat, urine, gas, milk, and semen) and semifluids (feces and fat), which, except for fat, need to be eliminated regularly, and become toxic if

they accumulate. Disease is synonymous with stopping the cycle of circulating blood, distilling fluids, and eliminating waste products (which are also recycled). Hot/cold, wet/dry are important factors because they influence the fluidity of this cyclical hydraulic system.

Similarities and basic structural difference between Qollahuaya and Greek humoral theory suggest several hypotheses for future research; (1) Qollahuaya humoral theory is indigenous in origin, (2) it is an assimilative product of contact between two traditions, or (3) it is a postcontact invention. There is need for more research into ethno-historical data to determine which hypothesis is valid. Research is needed in other parts of the Andes to ascertain to what extent Qollahuaya hydraulic physiology is characteristic of Andean humoral theory in general. Finally, to what degree do the formal patterns of humoralism resemble or differ from each other in different civilizations (Andean, Chinese, Hindu, and Mediterranean).<sup>5</sup>

### Summary and Conclusion

A topographical-hydraulic model is proposed for explaining Qollahuaya ethnophysiology. The body is a vertical axis with three levels: head, trunk, and members through which fluids flow from the center to the parts and back by centripetal and centrifugal motion. Fluids come together at the sonco, a distillation center that includes digestive, respiratory, reproductive, and circulatory processes, in an inward spiral. The fluids are broken down, distilled into other fluids, and dispersed throughout the body in an outward spiral. Distillation is the compressed movement of fluids to the center: this separates fluids, such as fat, from the food. Dispersal is the circulating of the fluids to the parts of the body for storage, release of energy, and elimination.

This model explains Qollahuaya etiology that attributes diseases to the following causes: (1) fluids dispersing from the body to the land (susto, diarrhea, V.D.), (2) loss of blood and fat (liquichado), (3) too much wind (mal de aire), (4) improper circulation of fluids and blockage of ducts, (5) accumulation of noxious fluids, (6) upsetting distillation processes by improper mixing of fluids, and (7) skewed relationships with the land. Consequently, herbalists are primarily concerned with the circulation, distillation, dispersal, and elimination of fluids.

This model also coordinates the ritual activities of Qollahuaya diviners with the ethnopharmacological practices of the herbalists. It explains how both are related to the ayllu and its topographical-hydraulic features. The model is deduced from a methodology that assumes that there are homologous structures or structural similarities between systems in nature and culture. Within Andean society, the use of metaphors and anatomical paradigms for understanding land and society is well documented. This research goes a step further to show how the land and its hydraulic features serve as a model for understanding how the body works. It also posits a structural basis for why Qollahuayas

prepare mesas (ritual tables) to feed the earth shrines of the ayllu when they are sick. They believe that telluric systems reflect corporeal systems and that systems in nature are related to systems in culture.

Although the Qollahuaya model shares some similarities with Greek humoral theory, there are structural differences. Greeks had an equilibrium understanding of their physiology, which was maintained by avoiding contrasts and balancing mutually opposed fluids and qualities. Greeks were concerned with balancing the pendulum; Qollahuayas are concerned with keeping it swinging. Qollahuayas have a processual understanding of their physiology that combines complementary and opposite forces of centripetal and centrifugal motion. Moreover, this process extends beyond dualistic confines of inner and outer in that fluids of the body are governed by similar dynamics within the environment.

Finally, certain structural elements of this model can be used to improve health in the Andes. During the summer of 1983, I used concepts of the hydrographic model to teach Andeans about the use of oral rehydration therapy for diarrhea control. In essence, I modified an old Andean legend in which two mountains, Sajama and Sahaya, fell in love with Kariquina, a lovely maiden mountain, who because of their rivalry rejected both of them. In anger, Sajama knocked the crest off Sabaya with a boulder slung from his sling. In retaliation, Sabaya sent gophers to tunnel out Sajama. The gophers dug many holes in Sajama and daily the water began to drain from this mountain. Sajama got thinner, began drying up, and when he was almost dead, the condor (symbol of the healer) saved him by flying to Mount Illimani for a liter of pure water, to Mururata for two tablespoons of sugar, to Wayna Potosi for a quarter teaspoon of salt, to Condiriri for a quarter teaspoon of bicarbonate of soda, and to Illillampu for a lemon. The condor mixed these ingredients together, returned to Sajama, and gave him tablespoons of this mixture to drink every 15 minutes. After repeating this treatment for one week, Sajama was cured.

This story illustrates the use of the mountain and its hydrographic nature as a metaphor to teach Andeans that diarrhea is a dangerous disease because it can cause dehydration and that the use of oral rehydration is an appropriate response to the disease. On a symbolic level, the story deals with resistance to oral rehydration therapy because Andean Indians consider diarrhea a wet disease that should be cured by abstaining from liquids. The condor and earth-shrine mountains make oral rehydration therapy an understandable and proper treatment for diarrhea. This illustrates how the topographical-hydraulic model can be used in the metaphorical setting of a myth to improve rural health conditions. It also shows the relevance of cultural anthropology for applied health work in the Andes.

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### NOTES

1. Among the Qollahuayas, ayllu can also refer to territorial ties (llahta ayllu), permanent claim to land and lineage (jatun ayllu), work ties (mitmaj ayllu), and community in general.
2. Although the terms of analogy come together, like mirrors reflecting one another, they do not become one another. The analogies are never one to one: the body metaphor never corresponds completely to the communities, earth shrines, ecology, and physiography. The analogies involve imagination, ability to understand meaning of Andean languages, embellishment by oral traditions, and most of all, the external application of the metaphor in ritual. The mountain and its people change with the seasons, sickness, natural catastrophes, migrations, and conquest. When the terms change, diviners gather the people together to match the body metaphor with the land and communities (See Platt, 1976, for other examples of the metaphorical process).
3. This provides a question in regard to menstruation. I am not aware of how they deal with this question, which involves further research. Another belief among Qollahuayas is that women become pregnant when they have intercourse during menstruation. This reflects their observation of animals and the belief that semen mixing with blood is important for conception.
4. Certain Aymara communities in the Oruro region believe that blood can be increased by drinking the blood of vicunas. However, these animals are near extinction, so the possibility of increasing one's blood is rare. In other words, the rare cure implies that it is very difficult to increase one's blood, except by transfusion, which is also expensive.
5. Charles Leslie (personal communication, letter, 1982) hypothesizes that the formal patterns of humoralism resemble each other in different civilizations (Chinese, Hindu, and Mediterranean) in that there is a common belief in a circulation of essences (air and liquids), with distillation processes (fire, cooking, and digestion) that give off residues of poisons (feces, urine, sweat), which need to be regularly eliminated but may accumulate so that periodic purification (hot baths, fasting, purges) are needed.

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