THE NAZCA LINES, WATER AND MOUNTAINS:  
AN ETHNOARCHAEOLOGICAL STUDY

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The limit of man's knowledge in any subject possesses a high interest, which is perhaps increased by its close neighborhood to the realms of imagination.

Charles Darwin

ABSTRACT

The lines and figures constructed on the desert surface (geoglyphs) near Nazca are analyzed in terms of water/mountain/fertility concepts found widely throughout the Andes.

Ethnographic and historical data are presented to demonstrate that mountain worship was important at Nazca from ancient to recent times. Comparative data relating to geoglyphs in other areas is also used in the development of a theory to explain the lines and figures as part of religious practices designed primarily to insure the provision of water for the people and their crops.

Introduction

Few archaeological sites in the world have attracted as much attention as the large figures and lines drawn in the desert's surface near Nazca. These geoglyphs have puzzled laymen and archaeologists alike. Some of the figures are only visible in their entirety from the air and along with the maze of lines—many extending for several kilometers—have led to a multitude of theories, several of which have entered into the realm of the bizarre. None of the theories, however, has succeeded in providing a convincing explanation as to the meaning of this enigmatic complex.

This article will not present a physical description of the geoglyphs nor will it examine theories which have been presented previously, beyond making brief comments about the one most widely accepted in scientific circles (cf. Reinhard 1986; Morrison 1978). The focus of this paper is instead on the presentation of a theory based on historical and ethnographic data relating to water/mountain/fertility concepts found throughout the Andes. Archaeological data from Nazca will be re-examined utilizing this material.

The questions as to who made the geoglyphs, and when, have been in broad terms answered by archaeologists. Based on a study of pottery found at the geoglyphs and a few C14 dates of wood samples, it is believed that people living in the region of Nazca constructed them
sometime between 300 B.C. and about 800 A.D. (cf. Isbell 1980: 190; Morrison 1978: 61) with some lines apparently being constructed up until the Inca conquest of ca. 1475 A.D. (Clarkson n.d.). Based principally on the work of Maria Reiche (1968), the lines have generally been interpreted as being used as aids in making astronomical observations (cf. Isbell 1980: 195-6; Waissbord 1980). Several arguments have been presented to disprove this theory, however.

One criticism is that it is difficult to explain with this theory the different lengths and widths of lines, many being either longer or shorter than necessary (Petersen 1980: 23). In addition, a large percentage of the lines do not point in the areas where the sun, moon and planets are located, i.e. where most significant astronomical activity takes place (Aveni 1982: 13-14). Without knowing the approximate date that particular lines were constructed, it is difficult to find correlations with stars or constellations of stars since they shift their positions through time (Morrison 1978: 56). Computer studies have failed to find any statistically significant correlations for any period during the past few millennia, except for possibly a small number of the lines (Hawkings 1973; Aveni 1986). The plant and animal figures are especially problematical to explain utilizing this theory. Furthermore, a complex astronomical observation system utilizing ground lines does not accord well with our knowledge of ancient peoples in South America. The Incas provide the best case for which we have information (albeit much later in time), and few of the lines of their ceque (conceptualized line) system at Cuzco had astronomical significance (cf. Zuidema 1982). The general opinion now among specialists is that only a few of the lines at Nazca might have played a role in making astronomical observations (cf. Petersen 1980: 28; Morrison 1978: 64; Aveni 1986).

Recently a theory has been presented that the geoglyphs were part of a water cult (Petersen 1980: 28-30). This conclusion was reached based on the importance of water at Nazca and that water cults were widespread in the Andes (cf. Soldi 1980). However, little solid evidence was provided as to how the different figures and lines were actually related to this cult.

Several scholars have demonstrated the difficult ecological situation that existed, and still exists, at Nazca (e.g. Rossel 1977: 48, 173; Petersen 1980: 30). Indeed, the astronomical theory arose precisely because it was felt that the people needed such information to foretell the times to begin planting (cf. Kosok 1965: 58). The water situation was critical because the Nazca River does not have water for some months of the year and may remain completely dry for several years (Mejia 1940: 559; Rossel 1977: 173). The rivers were dependent upon rainfall in the mountains to the east (see Figure 2). If there was insufficient rainfall, not only the rivers would remain dry throughout the year, but the underground water currents would dry up as well (Rossel 1977: 173). In order to make maximum use of these currents and obtain water even when the rivers were dry, a unique and extensive system of underground filtration canals was built. The canals were generally located along the side of the river beds (Rossel 1977: 168). By means of irrigation and astute use of water sources, the Nazca people were able to practice intensive agriculture and develop a high standard of craftsmanship in ceramics and textiles in a
poor desert area. Their position was always a precarious one, however, being dependent on the annual rains in the mountains. The role of mountain worship in the religious-economic beliefs of Andean peoples was (and still is) extremely important and must have been so in ancient Nazca as well.

Mountains, Water and Fertility

The reason for combining the words mountain/water/fertility in this way is because they were, and still are, closely linked in traditional Andean beliefs. This can best be demonstrated by briefly describing concepts relating to mountain worship. Mountains were worshipped for several reasons, many of which still pertain to the present day. People often perceived themselves as descendents of mountain gods (Robles 1978: 228; Paredes 1976: 44). There was a widespread belief that the souls of the dead went to reside in sacred mountains (cf. Valderrama and Escalante 1980; Arguedas 1956: 227; Nuñez del Prado 1970: 111), and this may explain why mummies were used as intermediaries to the mountain gods (Tello and Miranda 1923; 326; cf. Arguedas 1956: 206). Mountain deities were seen as the protectors of man (Roel 1966: 28; Casaverde 1970: 141), but hey would punish man as well (Favre 1966: 130; Fuenzalida 1980: 162; B. Isbell 1978: 59). They particularly had to be worshipped at the time that construction works, such as irrigation canals and roads, were built near them (Favre 1966: 131). Ritual specialists dealt with these gods when important offerings were made and when curing illnesses (Arguedas 1956: 199, 226-7). During Inca times, priests who served key mountain shrines were considered among the privileged of the Inca who personally supported them (Guaman Poma 1956: 201).

Mountains were among the most important and numerous of the sacred places worshipped in the Inca empire and this practice clearly predates the Incas (see Guaman Poma 1956; Albornoz in Duviols 1984). Whole colonies were sent by the Incas to support important mountain shrines (Duviols 1984: 198). The most powerful ones were usually the highest mountains in the area, but virtually all the mountains and hills were believed to have their own deities residing there (cf. Martinez 1976; Urton 1981: 48; Barthel 1959). Even today the especially powerful mountain gods are believed equal to a supreme deity (Marziali 1971: 250) or to act as his most important intermediaries (Arguedas 1956: 195; Casaverde 1970: 143; cf. Kessel 1980: 281). They also served as lords of all wildlife (Flores 1975: 17; Millones 1975: 52) and especially as guardians of livestock (Casaverde 1970: 141; Gow 1974: 67). But of all the reasons they were worshipped, the most prominent one was with regard to their control of economic production, especially the fertility of crops and animals.

Throughout the Andes mountain deities are perceived as the controllers of meteorological phenomena (rain, hail, frost, clouds, lightning, etc.) (Mishkin 1946: 464; Tschopik 1946: 559) (cf. Figure 3). As controllers of water, they were closely associated with lakes and, what was perceived as the ultimate source of water, the ocean (Cobo 1964: 161; Earls and Silverblatt 1978: 304). For this reason sea water and sea shells played an important role in worship to mountains for rain throughout the Andes (Martinez 1976: 301-2; cf.
By controlling meteorological phenomena, not only the fertility of crops, but also the fertility of livestock was dependent upon the mountain deities (Roel 1966: 26; Urbano 1976: 141). With these reasons for mountain worship in mind, it is easy to understand why the mountain gods were so important in ancient times and continue to be so in many areas of the Andes today (cf. Mariscotti 1978a: 201; Martínez 1976; Kessel 1980: 276-7; Favre 1966).

Although the mountains near Nazca are not the high snow peaks of the central Andes, the basic beliefs as to deities controlling meteorological phenomena appear to have been very similar. Some of these beliefs were held by people living in Nazca in recent times and figure in their legends as well. Arguedas (1956: 199) described a seance in Nazca where a ritual specialist invoked various mountain deities of the surrounding area while curing an illness. The most important of these was Co. Blanco, a mountain to the east of Nazca (see Figures 2 and 4). Rossel (1977: 39 ftn. 1) stated that there are two mountains called Co. Blanco, one of these being the mountain that overlooks Nazca to the east and another being one of the highest mountains in the cordillera further east which gives origin to the main rivers around Nazca. According to Rossel both of these mountains also have the name Illa-kata, although currently the mountains are terminologically distinguished. He describes a legend about them which we will briefly examine here, as it has a bearing on a number of points to be dealt with later.

Illa-kata was lord of the heights (see Figure 2). Tunga, lord of the coast, became his friend and brought him gifts of gold, precious stones, cotton cloaks and ceramics. He deceived the wife of Illa-kata into believing he was sent by the god of the ocean, who fertilized the lands and produced animals. He convinced her she could leave behind the unpleasantness of the thunder, cold nights and dense clouds. While Illa-kata slept, they ran off towards the sea. Illa-kata awoke to find her gone and called her with a roar of thunder. She heard, realized she would be overtaken, and begged Tunga to let her stay and die where she was. Tunga, however, covered her with maize flour from his valleys in order to disguise her. After the heat of the sun in the morning caused Illa-kata to stop in his quest, Tunga planned to return to her. Later Illa-kata came but did not recognize his wife and so returned to his mountains where in anger he caused great earthquakes to destroy the lower hills. His wife remained buried under the rocks and, according to Rossel, since that time this mountain has also been called Illa-kata (Cerro Blanco). Tunga was also turned into a mountain just as he was about to reach the sea.

Other legends associate Co. Blanco with water. In one of these Co. Blanco is said to have erupted and spewed water from its summit, i.e. became a "volcano of water" (Urton 1982: 10). Another legend tells of the people enduring a long drought. They went to Co. Blanco, which was their principal place of worship and the place where they spoke to the gods. Viracocha descended from the sky and heard the weeping of the people. Tears came from his eyes, ran down Co. Blanco and penetrated the earth, thereby being the origin of the underground aqueducts (Urton 1982: 11).
While at Nazca we were told a story that within recent times a man happened to find a cave leading into Co. Blanco. He reached a vast chamber with a waterfall and lake. Several outlets led to the subterranean canals. The belief that Co. Blanco is the source of subterranean water neatly supplements the fact of surface water having Illa-kata for its source. It is commonly believed in the Andes that lower mountains and lakes are the wives of higher mountains which fertilize them.

Without going into any great detail, there are a few elements of these myths which should be pointed out: 1. They clearly demonstrate that the people of Nazca shared beliefs about the importance of mountain deities in providing water and controlling meteorological phenomena. 2. There is a belief in the ocean as a fertility source, both for the land and for animals. 3. Mountains near and distant, high and low in elevation, were important in the beliefs of the Nazca people. 4. The mountain Tunga was associated with the coast and fertility of fields and lower Co. Blanco - a "white" mountain of sand - with subterranean water, the high mountains and the lord of meteorological phenomena. Both Tunga and Co. Blanco are located near Nazca (see Figures 2 and 4).

The only references we have seen are specifically to the huacas (sacred places or objects) of the Nazca people at the time of the Spanish conquest were those by Albornoz and Acosta writing in the late 1500s and Severino's account of 1623. Albornoz only mentioned one huaca for the Nazca people - a mountain called Sañoc Ancauilca (Duviols 1984: 213).

Acosta (1962: 224) was told that the principal huaca of the ancient Nazcans was a mountain of sand that stood out amidst the stone mountains near Nazca. This could only have been Co. Blanco. Since Acosta was speaking of ancient Nazcans when he was there in the late 1500's, we can assume this mountain was worshipped at least a few centuries earlier - probably the oldest direct evidence of religious beliefs at Nazca that exists.

In an unpublished document of 1623 in the Archbishop's Archives of Lima (Idolatry Section, File IV), the priest Vicente Severino wrote down the testimonies of people at Nazca concerning traditional religious practices. One man stated that there was no shrine in the village because the people went to worship on a mountain of sand called Moich, on the mountain Uracancana and at the springs. Their idols were made of stone and were burned by the Catholic priests. Crosses were placed at all the sites where these idols had been worshipped. The only mountain of sand near Nazca is Cerro Blanco. Given the information presented above, it would seem to be no coincidence that mountains and springs were listed together and that they were the most important places of worship of the Nazca people.

We were also told that Cerro Blanco was believed to have been the wife of a snowcapped mountain to the east named Carhuarazo. Its summit is visible on clear days from mountains such as Illa-kata. Cerro Blanco is said to have come down from the highlands to visit the coast, but she failed to return soon enough to her husband. The sun came out and burned her into stone and sand, and she has remained near Nazca to
the present day. In this myth we see a linkage of a barren hill near geoglyphs in the desert with a major snow peak of the highlands, and such mountains are still believed to be the principal deities controlling weather and fertility.

There is only one snow mountain which fits the description we were given and that is Carhuarazo (Qarwaras) which is about 140 kms east by northeast from Nazca. This is the mountain noted in 1586 as being the most widely worshipped deity in the province of Soras (Jiménez de la Espada 1965: 222). Today Soras is in the eastern part of the province of Lucanas (Department of Ayacucho) which borders Nazca. If, as appears likely, the current day myth is based upon an ancient one, we have a case of the principal deity of the Nazca people being associated with, and subordinate to, one of the most important deities in the region of Ayacucho in prehispanic times. Carhuarazo is one of the highest and most sacred of the mountains situated in the hearth of what was once the heart of the Huari Empire which had close ties with Nazca in the latter half of the first millennium A.D. It is still the most powerful traditional deity worshipped in Puquio not far to the east of Nazca and, along with other mountain deities, is annually invoked to send rain (Arguedas 1956).

Due to the constantly shifting sand, one would not expect to find ruins on Co. Blanco. However, we did see recent offerings of, among other things, cotton plants and river stones. River stones were, and still are, often used to invoke an increase in the water supply, and the cotton plants were likely placed along with the stones as offerings to gain water for the drought-stricken cotton fields of the Nazca Valley. Co. Blanco also provides excellent views towards other sacred mountains such as Tunga.

On the summit of Illa-kata we observed remains of structures which clearly served a ceremonial purpose (see Figures 5 and 6). Indeed, several ritual stone mounds (apachetas) appeared to be of recent origin, while typically Inca stonework was also present. The archaeological evidence thus supports the legend as to Illa-kata's ritual importance.

There are lines of sight from Illa-kata's summit to snow peaks, such as Coropuna, believed to be powerful deities in southern Peru (cf. Reinhard 1986). We observed several prehispanic ritual structures on and near the summit of Tunga (see Figures 2 and 7). Seashells, common offerings for water, were scattered amidst some of the ruins.

Apachetas have also been found on the summits of mountains to the east of Nazca, including on Co. Fraile which rises above the main concentration of lines and figures on the Pampa de San José. We found a recently made structure and offerings on its summit. Gerald Hawkins (1973: 107) found the remains of several vessels - clearly used in rituals - on the summit of a large hill bordering the east side of the Pampa de San José.

According to Albornoz, mountain worship also existed at other places along the coast. A document of 1620 A.D. describes worship of mountains and water sources at Pisco, to the north of Nazca (Rostworowski 1977: 265-6). One of the "mountains" was a hill near
Pisco and the other a high mountain in the Andes to the east (María Rostworowski, personal communication). The chronicler Albornoz wrote that especially important to the Incas were the high mountains and volcanoes that "looked to the ocean," i.e., which had no other mountains blocking the view in that direction (Duviols 1984: 198). It is clear that worship of water sources and mountains was widespread along the coast in Inca times and prior to the Incas as well. The association of high mountains with coastal hills and deities of the lowlands has been pointed out in the early Spanish writings of such authors as Avila (1975) and the Agustinos (1918).

Little ethnographic research appears to have been published with regard to current-day rituals for water at Nazca. Fortunately, Urton (1982: 11) provides some information in this regard. During periods of drought, a man is sent at night to the coast with a water jug. After collecting foamy water from a place where the waves are crashing onto the rocks, he returns to an unspecified hill above Nazca and sprinkles the water on the summit. It is believed that it will rain in the mountains within two weeks of this offering.

The use of sea water in rituals to obtain rain is common throughout the Andes (Martínez 1976: 301; Soldí 1980: 25). Thus it frequently figures in offerings made to the mountain gods (cf. Reinhard and Sanhueza 1982; Reinhard 1985b). Interestingly, the name Viracocha has been translated as meaning "foam of the sea" (Cieza 1977: 20). Viracocha's relationship with water cults has been amply demonstrated (cf. Carrión 1955), and he also is found closely associated with mountain deities (Paredes 1976: 35; cf. Reinhard 1984).

Keeping this information in mind, the legend written down by a Spanish magistrate in 1586 becomes more intelligible. It noted that, before the Incas ruled, there came Viracochas, and paths were built to them (Mejía 1940: 569). Although the name Viracocha may not have been the one used in this area in ancient times, its underlying meaning could well have been the same. Viracocha was the name used for the creator deity when he was worshipped as the god of water (Zuidema 1978: 134).

Although ethnographic data from Nazca is relatively limited, we do know from the reports of several anthropologists that mountain deities are still important for fertility in areas to the east of Nazca. This includes Puquio, which is ca. 90 kms from Nazca and a town with which it has had close contacts for at least several hundred years (Arguedas 1956) (cf. Figure 2). Indeed, Puquio provides some of the best information we have on current-day ceremonies for water and mountain worship. In this town there is a myth about culture heroes who were able to follow the veins of water into the centers of the sacred mountains. Each August ritual specialists climb one of the mountains near Puquio to make offerings for water (Arguedas 1956: 203). The people share many of the beliefs referred to previously about mountains. They believe the most important local deities reside in them, that they are responsible for the fertility of livestock in addition to fields and that the spirits of the dead go to a mountain (Coropuna) to reside (Arguedas 1956). Given the importance of the rains in the mountains and other sources of water for the agriculture of the Nazca people and the beliefs that date at least to Inca times,
it seems highly probable that worship of water sources, including mountains (both nearby and further into the Andes) played a prominent role in their beliefs at the time the geoglyphs were constructed.

**Straight Lines**

Ethnographic information exists concerning the use of straight lines (or "paths") in areas of the Andes southeast of Nazca. Of course reasons for the current day use of lines need not have been the same as those for the construction of the lines at Nazca over a millennium ago. However, they are at least in accord with our understanding of traditional Andean beliefs and customs and with the historical, archaeological and ethnographic evidence available at Nazca. They thus cannot be ignored in any interpretation of the Nazca lines.

In Bolivia and in northern Chile long straight lines frequently lead to hilltops (Morrison 1978: 153; Ryn 1981: 19; Reinhard and Sanhueza 1982). At Chucuyo in northern Chile a straight line extends ca. 2.5 kms to the top of a hill. Until only a few years ago worship was made from this point to the surrounding mountains for rain (see Reinhard 1984).

Southwest of La Paz is a village located at 3,963m (13,000') where a straight line is still used during an important festival. On the night of September 13th villagers and musicians ascend to the top of a hill (4,250/13,940') along the line for over a kilometer. Dancing, as a way of worshipping the mountain gods, continues during the night at a chapel of recent construction which is at the end of the line. In the morning the villagers and musicians descend to the village, then climb the hill again in the afternoon. They return to the village after performing rituals at the chapel (see Figure 8). A few days later families ascend the line to an open area on the hilltop where they have small symbolic fields made of stones. They imitate the planting of crops using miniature plows and make offerings for the success of crops in the coming year.

As with many Andean festivals, a number of Christian elements are incorporated into what was originally a prehispanic ceremony. The date of the festival accords with the Catholic day of the Exaltation of the Cross. However, villagers informed us that the reason for the ceremony was to worship the surrounding mountains to obtain rain for good crops, and no priest took part in the ceremonies at the church. This was also verified by nuns who have worked in the village for several years. The rite of plowing symbolic fields on the hilltop was an additional aspect of the ceremony orientated to this end. The straight line is said to predate the Christian structures on the hilltop and a prehispanic funerary tower (chullpa) located along the line on the hillslope tends to confirm the ancient use of the line and hill for traditional religious practices.

Like the community of Irpa Chico not far distant, villagers consider the high snowcapped mountains, especially Illimani (visible from the hill), to be the most powerful traditional deities (cf. Carter and Mamani 1982). We were told that some elaborately dressed dancers
represented the major mountain gods. Lower mountains near the village are also important and villagers believe their souls will go to reside in them. Dogs are still sacrificed to accompany the dead, a rite that dates back to prehispanic times. According to the nuns, lightning kills two or three people a year from the area around the village and injures as many more. Throughout the Andes lightning is associated with the power of the mountain gods. Although only a limited amount of information could be gathered during the short period we were in this village at the time of the ceremony, it was sufficient to clearly establish that several aspects of the beliefs and customs of the villagers have ancient roots and that use of a straight line for mountain worship can be considered one of them.

Some 250 kms further south another straight line is still being used by the villagers of Sabaya. Although rituals were not performed while we were in the area, excellent information could be obtained from villagers as to its use. Later the unpublished thesis of Gilles Riviere (1982) was obtained which contained a detailed analysis of worship associated with the line and a structural analysis of the way it is carried out. This area is rich in material relating to mountain worship and use of straight lines and only a very brief summary can be presented here. The publications referred to below should be consulted for a better understanding of the complexity of factors involved in traditional Andean religious beliefs and customs.

The straight line of Sabaya leads out of the village to reach the summit of a mountain, Pumiri, ca. 5 kms away and over 1,000m higher. According to villagers, the line is no longer as straight as it once was, although it is still kept cleared in its final section to the summit. Pumiri is the marka qollu ("village mountain") of Sabaya and is associated in legends with the regrowth of Sabaya after it had nearly been destroyed (Riviere 1982). But the most powerful mountain of the region, the progenitor of the people of the Carangas province, is Tata Sabaya (5,385m/17,663') to the west (Paredes 1976: 36, 44). Being somewhat distant from the village, a special place of worship, Tata Sabaya's "house," was built on the outskirts of Sabaya and is within view of the mountain.

One of the most important ceremonies of the village takes place in January. At the beginning of the new year village leaders (four hilakatas and four alcaldes) take over their positions in front of Tata Sabaya's "house". According to one informant, the hilakatas then go to an altar on the slopes of Tata Sabaya to make offerings on behalf of the community. This altar is at 4,171m/13,680' and also is used frequently throughout the year by individuals to make offerings to Tata Sabaya and other mountains of the region for livestock fertility, success in business, etc. Some people still climb to Tata Sabaya's summit to make their offerings and these have included the use of seawater to help "call the clouds" for rain. Due to an eruption (which reportedly took place about 1600 A.D.) no prehispanic ruins were seen on the summit, but an altar, several small niches for offerings, and miniature corrals, fields and houses (for Tata Sabaya's help with them) made of rows of stones can still be seen. Even schoolboys from Sabaya have reached the summit to invoke the mountain's assistance with their studies.
The altar at 4,171m has niches open to the east where offerings are made before sunrise to Tata Sabaya and one of his wives, Phisa, a small mountain (4,782m) nearby to the northeast. Some offerings, such as llama fat, wool and llama foetus, are burned in front of the niches, while libations of alcoholic beverages are made in them. The llama sacrifice is performed in the cleared area in front of the niches and blood offered to the surrounding mountain gods. The llama is cooked and eaten outside this area and its bones burned separately. Not long after the ceremony, about the only visible remains at the altar itself are the bottles, mostly broken, which contained the liquids.

Once the ceremony has been completed at Tata Sabaya, arrangements are made in the village of Sabaya to ascend the straight line to Pumiri. The remains of Tata Sabaya's "son" (a historical personage about whom much mythology has developed; see Gisbert 1980, Reinhard and Sanhueza 1982, and Riviere 1982) are brought from a chapel at Vitalina to Sabaya and placed in Tata Sabaya's "house" where a sacrifice is made. The traditional village leaders later follow the straight line to Pumiri's summit accompanied by their wives. The principal leader (cacique; also referred to in this context as Tata Sabaya) leads the ceremony which should be completed before sunrise. According to one informant, an offering (a sheep or chicken) is made to the Lord to obtain his blessing for the ritual. Then the principal offerings begin in front of a chapel called Pusi Suyu. The participants dance around the worship area and a mesa (arrangement of ritual objects) is made containing traditional Andean offerings such as powders of different colours representing metals, bottles with different liquids, seashells, etc. (cf. Reinhard and Sanhueza 1982). Cotton is placed on the mesa to help attract rain. A llama is also sacrificed to the surrounding mountains for crop and livestock fertility and its blood dispersed in the cardinal directions. As Riviere (1982: 323) noted, Tata Sabaya wants people to climb high to make sacrifices to him, and, if this isn't done, herds will die and land won't produce. At the same time a request is made for the solidarity of the four social groupings (ayllus) of the community (Riviere 1982: 170). One informant said that the mesa items were then thrown away with no one looking, and all participants standing up to yell. (Another informant stated some items were burned and buried.) Following this is the cooking and eating of the sacrificed animals.

The participants do not return to the village by the straight line, but rather by a ridge that drops down to the village. There are worship places along this route, each of which is also associated with rituals that take place at other times of the year (see Figure 9). Although terminologically associated with Christian rites, worship at these places corresponds with important moments in the agricultural cycle, making a kind of materialization of time in space (Riviere 1982: 177). Each place has a function, such as the producing of rains, thunder, wind, etc. No special ayllu is in charge of these places, rather responsibilities change each year. Riviere (1982: 179, 191) noted how all the mounds associated with mountain deities face east, and that east is generally associated with fertility rites and traditional deities.

There is another use of the straight line for a Catholic festival (Virgin of Candelaria) in early February. In this case men
(mayordomos) who are in charge of Catholic rites bring the cross from Pusi Suya's chapel on the summit down to the village where it remains in the church two weeks before being returned (Riviere 1982: 170). Considerable mythology has arisen around the apparition of the Virgin on Pumiri's summit after the destruction of Sabaya following the death of Tata Sabaya's son. As Riviere (1982) and Gisbert (1980) have shown, there has been an active attempt to substitute Christian beliefs and rituals for traditional ones and that these have been only partially successful, as can be seen in the two distinct ceremonies of January and February.

We were told that the straight line is very old and related to the traditional rites, not the Catholic ones. It was said to be straight because this adds to its religious power. The deity looks directly down the line to Sabaya and focuses its attention, and bounty, upon it. Those who participate in the maintenance of the line gain merit by doing so.

We found that our plan of the principal area of worship on Pumiri's summit did not accord well with that of Riviere's (1982: 164), but this may be due to his being more concerned with concepts than with specific physical details. He was less interested in the reasons why the rituals take place than with demonstrating the ways in which these rites and associated structures tie in with Andean categories of thought. The straight line, for example, divides Sabaya into two moieties or sayas, each of which in turn is divided into two ayllus (see Figure 9). Pusi Suya means '4 divisions' and both the area at Tata Sabaya's "house" and the mesa on Pumiri's summit are divided into four parts. Thus a microcosm of the four fundamental divisions of the community is formed there.

Visible evidence (aside from modern structures) on the summit consists mainly of low walls to mark off the worship area, stone benches to sit on, flat stones to eat off, and a stone mound, representing the mountain deity. At this mound are bottles which held the liquids offered. Off to the side is a pile of stones and ashes where sacrificed animals are cooked. Other mounds exist outside this main worship area. Little remains to be seen of the variety of offerings and the complexity of the ceremony, which could only briefly be summarized here. The use of stone mounds to represent the mountain gods also existed at nearby Chipaya, where one of its inhabitants, Justino Mamani, stated that those radiating out in straight lines represented mountain deities. Veronica Cereceda (personal communication) was able to identify many of the particular hills or mountains represented by these mounds. At Sabaya small cones represent the mountain deities at mesas (Riviere 1982: 185).

Not far from Sabaya across the border in Chile straight lines have also been used until recent times, e.g. at Cariquima. Tata Sabaya is linked in mythology with the mountains Cariquima and Tata Jachura with whom he is alleged to have battled (Reinhard and Sanhueza 1982). We will see later the importance of Tata Jachura and of its possible linkage with the prehispanic geoglyphs on Cerro Unitas (see Figures 1, 12 and 19). The distance to Cerro Unitas from Tata Sabaya is not great (ca. 150 kms) and both of these are situated near trade routes which connected the highlands with the coastal desert in prehispanic times.
(Nuñez 1976). We have here a rare case where at least some evidence exists to relate the current day use of straight lines with figures and lines constructed over a millennium ago.

Today crosses and chapels are often found at the ends of lines leading to hilltops, but it is well known that the early priests built Christian sites on those already held sacred in traditional religion in an attempt to destroy it (see Arriaga 1920). In northern Chile and adjacent areas of Bolivia chapels on hilltops can also be repositories for items used in mountain worship (Reinhard and Sanhueza 1982: 33; cf. Gisbert 1980: 23). In some areas the beliefs relating to these sites have not changed and the crosses are thought to represent the traditional mountain deities believed to reside there (Conlin 1974: 147; B. Isbell 1978: 60). Of course, even small hills can be perceived as inhabited by deities important for controlling meteorological phenomena and fertility.) The use of hilltops to make offerings to more important distant mountains has been reported in Inca times as well (Hernández 1923: 62; Avila 1975).

Looking back at the information presented above, it seems possible to draw a number of parallels between current day and prehispanic use of lines: The mounds along or at ends of lines, the relative absence of long lasting ritual items, the presence of broken vessels and plates (presumably used at Nazca to hold offerings), the keeping of lines rigidly straight, and the use of objects to provoke rain (seashells at Nazca possibly fulfilled this role). Differences, of course, remain. For example, figures are not drawn on the earth, but then again figures of clay are made and used in mountain/fertility rites today. The use of numerous ground lines in a concentrated area does not currently take place, however (see Figures 10 and 11). Lines thus far studied and that are currently in use have not been found to have roles in making astronomical observations (cf. Morrison 1978: 181), but such use still remains to be substantiated for Nazca as well. Particularly interesting was Riviere's (1982) demonstration of how a line is used as part of a coherent system in accord with Andean dualistic thought categories. Unfortunately, deciphering the maze of lines at Nazca from this perspective, without access to information about the social groups at the time they were made, will prove a formidable, if not impossible, task.

In the case of the system of sacred lines the Incas utilized at Cuzco, sacred places were located along them, a substantial number of which involved water sources and hilltops (Cobo 1964: 169-86; cf. Gow 1974: 56-7). Indeed, in some cases direct correlation of lines with water sources have been found at Nazca, e.g. at Cantalloc where they appear to intersect canals (see Lancho n.d.). Not far distant, at Paracas, a few appear to have had a similar purpose (Craig and Psuty 1968: 97-8). There, each line radiating from a mound was found to ultimately intersect one of the irrigation canals at points where they make changes in direction. Rather than being associated with surveying purposes, as the authors suggest, it seems more likely that these lines played a role in a water ritual by connecting a central place of worship (the mound) with critical places of the irrigation system, similar to the practice at Cuzco where some lines led to irrigation canals.
Kinship groups were assigned to perform worship along specific lines at Cuzco (Cobo 1964: 169). Bolivian lines today may still belong to individual families or to entire villages (Morrison 1978: 177). This could explain why there are so many lines on the plateau near Nazca and why some cross over others. Through time different groups could have desired to make their own lines, including making offerings at slightly different points. Aveni (1986) has also demonstrated that many lines were used to connect line centres, and thus crossed over other lines in the process. He feels the lines were used as paths and the centres were places where offerings were made.

In Bolivia those who followed the straight lines were thought to be pardoned for their sins (Paredes 1976: 203). That the lines were kept straight was obviously due to their roles as delimiting sacred space. This would help explain why some of the "lines" are relatively short and/or wide, i.e. they could have served in these cases not as actual "paths," but rather as the sacred space in which worship was performed (cf. Morrison 1978: 189). However, it must be stressed that the majority of lines at Nazca appear to be sacred paths leading to places of worship and not in themselves pointing at anything on either the celestial or geographical horizon.

Nonetheless, the possibility of a few of the "lines" serving as symbolic "connectors" for ritual use arose during our research in northern Chile. On the summit of one mountain, Jatamalla, a cleared rectangle (10m x 3m) was found which had small white stones scattered down the centre of it. This rectangle was directed at the summit of a higher mountain, Tata Jachura, which is still believed to be the husband of Jatamalla. These are the only two mountains, among several in the area, which are invoked in a current-day ceremony for rain and both have ruins on their summits (Reinhard and Sanchez 1982). The white stones had to have been brought from the river below. Given this and further evidence to be presented below, it can be concluded that the rectangle served as a ritual connector or link between the two mountains and played a role in a water cult.

Further west from Jatamalla on the coast south of Iquique we observed two lines several hundred metres long leading away from a large mound of considerable antiquity. One line led to the ocean in the direction the sun set and another led towards the highest mountain visible from this point. Little research has been done in the area due to its proximity to an Air Force base, but we know that human sacrifices dating to Inca times were found on a similar coastal mountain not far to the north. It seems that here too we have a case of lines serving as symbolic links, possibly combining with solar observations.

This idea of symbolic links has also been pointed out by Morrison (1978: 73), who presented a drawing of a site that shares features with the one on Jatamalla. He located the rectangle on a hill near Ica to the north of Nazca as part of a number of Nazca-like lines.

Far more striking similarities with the Nazca lines and figures are found on a hill about 70 kms to the southwest of Tata Jachura and Jatamalla. This hill, Co. Unitas, has narrow straight lines and wide "paths" (actually cleared rectangles several metres across) leading to
the summit ridge where generally they end at mounds where offerings were made. As at Nazca, some large lines pass over ones previously made and end at slightly different points. There is also a large feline figure, a bird, and without doubt one of the best preserved and most detailed anthropomorphic geoglyphs yet discovered (see Iensen 1971: 190; also Figure 12). The Co. Unitas complex, other features it shares with Nazca, and its association with a mountain/fertility cult will be discussed in more detail below.

A hill similar in size to Co. Unitas and with ruins on its summit is found south of San Pedro de Atacama. This hill, Co. Mullay, is also isolated in the desert along an ancient llama caravan route. We found that it is still invoked today (along with several other mountains) in a ceremony for water by people in Socaire and Camar besides being viewed as a protector of caravans (see Figure 13). Another isolated mountain to the west of Mullay, Co. Quimal, is also invoked, and this was done because it "called the water from the ocean". This should be compared with Albornoz' comment noted earlier that mountains "looking to the sea" were of special importance and with the fact that mountains in general were perceived as water sources. It would seem highly likely that Co. Unitas also was important in this regard and that the figures and lines were part of this complex.

Offerings to water sources need not necessarily have been made from hills. We find that offerings are still made to the most important water sources (principally mountains) from low-lying areas as well. For example, they are made in a central plaza in the village of Chiapa (northern Chile) (see Reinhard and Sahhueza 1982 and from the beginning of an irrigation canal system near Socaire (northern Chile) (Barthel 1959). In Talabre (northern Chile) we were told of offerings being made on the plateau above the village. The common element appears to be that, if not made at the water sources themselves, the offerings should be made in an open place within view of the most important sources or at places especially associated with them, such as at critical junctions of rivers or water outlets.

The placing of offerings in open places may explain why the 'ray centres' of Nazca are usually located on locally prominent hills or mounds (Urton 1982: 37) (see Figure 14). At the foot of one such centre an ancient water jug was found deliberately buried, and was clearly used for ritual purposes (Cané 1978: 570). Offerings to deities controlling weather were made at high places both in the Inca period (Cobo 1964: 161) and the present day (Mishkin 1946: 464).

The relationship of the lines with water sources is made even more of a possibility when we find that sea shells are found frequently in the mounds near the lines (Reiche 1968: 50) and apparently often at the ends of "lines" as well (cf. Morrison 1978: 37-8). Sea shells were important offerings to water sources for rain (Rowe 1946: 307) due to their being considered "daughters" of the sea (Murra 1975: 257).

A recent study demonstrated that the orientations of the triangles and trapezoids are statistically correlated with the flow of water (Aveni 1986: 38). It was also shown that all of the lines on the Pampa de San José connect to line or ray centres which in turn are
generally situated relative to the water flow. The conclusion of this
detailed study was that, taken as a whole, the lines were most likely
associated with "a ritual scheme involving water, irrigation and
planting" (Aveni 1986: 39).

That major temples weren't built at the lines is no indication
that offerings weren't made there. In ancient times (and in recent
times as well) important ceremonies for water were carried out at
simple mounds. In any event, sea shells, potsherds and occasionally
remains of animals have been found in the mounds (Rossel 1977: 221),
and clearly some of the mounds at least had ritual significance. Else-
where in the Andes small mounds have been used in ceremonies to
represent mountains (Mariscotti 1978a: 266) as have large stones
(Barthel 1959). The fact that more artefacts haven't been found could
be explained by the offerings consisting of sacred liquids (as they are
today) and other perishable items, besides the fact that some sites
have been pillaged. It should be added that places may become sacred
for reasons not obvious to a later observer, e.g. because an unusual
stone was found or a vision occurred to someone there. Although many
places were selected based on their locations relative to fertility
sources in the region, there may well be places chosen for reasons
which we will never be able to explain.

Mountains were sometimes used in making astronomical observations
by the Incas (Zuidema 1982). Indeed, prominent features of the land-
scape were commonly used throughout the Americas in establishing a
solar calendar (Aveni 1981: 41) (see Figure 15). Urton (1981: 54)
found that in central Peru landmarks (mainly sacred mountains) provide
points of orientation from which lines of sight can be extended into
the night sky. Because every point in the sky is in motion in the
southern hemisphere, the villager can only extend lines upward from
fixed points on earth. This does not mean they have to be in perfect
alignment, rather the mountains serve as aids. However, given the data
available, it would seem that few lines at Nazca would have been useful
for such observations, being either unnecessary or inadequate for them.

Urton (1982: 2) provides an example taken from Nazca itself to
show how mountains and solar observations can combine. At the time of
the December solstice the sun rises behind Co. Blanco, signalling the
beginning of the rainy season in the mountains to the east of Nazca.
We have already seen Co. Blanco's association with water in legends,
and this combining of a mountain, a rainy season, and an important
celestial event must have played a powerful role in indigenous beliefs.
Clearly, no use of lines was necessary in making the observation.
Interestingly, in some areas of the Andes celestial bodies become
important only when they are in association with sacred mountains on
the horizon, forming what might be called a "sacred geographical
astronomy" (cf. Gow and Condori 1982: 7).

With regard to the use of lines in ancestor worship, few of the
lines have been found to be directly related to burial sites. Ancestor
worship may well have played a role in a mountain/fertility cult, but
based on our knowledge of past and present-day practices it was
probably only of secondary significance during the worship of deities
controlling meteorological phenomena which probably took place at the
lines.
Spirals and Zigzags

Straight lines present a particular problem because of the large number of possible interpretations, both functional and symbolic, that can be offered for them. Most archaeologists agree, however, that the spirals and zigzags played a strictly symbolic role (see Figure 16). We know that spirals were common motifs throughout South America. Larrain (1976: 354) noted that in ancient Peru shells with a spiral form were frequently used in cults relating to obtaining water. He feels that the spiral motif of geoglyphs related to a water cult. We have already seen that shells were commonly found in mounds at the Nazca geoglyphs and were important offerings for water in ancient times. The spiral conch shell was a common instrument in ceremonies to call the mountain gods (Roel 1966: 30) or call clouds (Carrión 1955: 80) for rain.

The zigzag and oscillating motifs have particularly puzzled researchers, but a simple explanation relating to fertility arose while reading Kosok (1965: 107). He includes a photograph and drawing of the pre-hispanic oscillating canal system that was found in northern coastal Peru. In that case its function was unmistakable. Bennett (1949: plate 13) noted this as a Chimú irrigation pattern at Chan Chan. Rosell (1977: 215) notes "undulating" furrows still being used in the fields of Nazca. In her lengthy study of the water cult in ancient Peru, Carrión (1955: 59) describes "pacchas" as being canals in a zigzag or oscillating pattern. These are found either in stones or as spouts on containers for liquids (Carrión 1955: 65) and were common throughout ancient Peru, including Nazca (Carrión 1955: 83). Petroglyph zigzag markings have been widely interpreted as part of a water cult, being thought to represent either rivers or lightning (cf. Mostny and Niemeyer 1983: 128). Taken together it would seem a reasonable hypothesis that symbolic zigzag and oscillating forms, such as found at Nazca, also played roles in a water cult.

Animal and Plant Figures

It is obvious that the precise meanings of geoglyphs at Nazca will never be completely known, and this especially holds true for figures such as those representing plants and animals. Symbols can vary in meaning through time and depending upon the contexts in which they occur. However, some underlying concepts may have remained relatively stable. This is indicated by some artistic representations having been only slightly modified since they first appeared over two millennia ago, by basic concepts having been shared throughout the Andes at the time of the Spanish conquest, and by these concepts having persisted, despite considerable Christian proselytism, to the present day. In addition, it is difficult to make sense of any iconography without recourse to a theory based on ethnographic, historical and ecological data. This is essential for any analysis. As noted at the beginning of this paper, we are interested in examining the Nazca geoglyphs from the perspective of a water/mountain/fertility cult, and this is what we will be limiting ourselves to in the following brief overview.
Anthropomorphic geoglyphs are not common and have proven especially difficult for archaeologists to explain. The most impressive of these figures is not at Nazca but rather at Cerro Unitas in northern Chile. It is a well made geoglyph, measures 90m in length and was formed on the side of a hill in the coastal inland desert (see Figure 12). It shares some features with the principal anthropomorphic geoglyphs at Nazca, such as the square, frontal head with rectangularly-shaped eyes and mouth, the lines crossed at the head, and the basic composition of the body and legs with a central "belt" (cf. Figure 17). Numerous elements of Chavin iconography have been found at Paracas near Nazca, and the Paracas textiles in particular indicate strong Chavin influence (Sawyer 1972: 92, 96; cf. Kauffmann 1980: 199; Rowe 1971: 118). One of these textiles (dated to approximately 200 B.C.) has a figure of a "Staff God" (an anthropomorphic deity with staffs held in both hands) (see Figure 18) which is remarkably similar to the geoglyph at Co. Unitas and the petroglyph in the gorge nearby; only the actual staffs are not depicted. The anthropomorphic geoglyphs can be interpreted as representing the anthropomorphized feline figure which is portrayed similarly at both Chavin and Paraças-Nazca (see Kauffmann 1980: 325, 389–92; cf. Pezzia 1968: 170–75).

The role of a feline with bird elements, called the ccoa, was (and in some areas still is) important throughout the Andes with regard to fertility. This "flying feline" is believed to have thrown lightning (a fertilizing agent and source of supernatural power) from its eyes, urinated rain, spit hail and roared causing thunder. It was symbolically associated with the deity that controlled meteorological phenomena and protected crops and was subordinate to him (Mariscotti 1978a: 203). Demarest (1981: 50) believes it to be the manifestation of an ancient and widespread sky god who controlled the weather. Among the contemporary Quechua the ccoa is seen as one of the mountain god's servants and is considered the most active and feared of the spirits. It is closely involved in the daily life of the Quechua people, due to using lightning and hail, and it is also a sponsor of sorcerers (Mishkin 1946: 463–4). This concept of a flying feline associated with meteorological phenomena and ritual specialists is not just limited to the Andes, it is widely held in tropical South America and Mesoamerica as well (cf. Coe 1972: 3; Raichel-Dolmatoff 1972: 58). The feline in its natural state, i.e. the puma, is considered a symbol for the Weather God among the Aymara people. Elsewhere pumas are viewed as assistants of mountain deities (cf. Gow and Condori 1982: 48; Mishkin 1946: 463).

A "Staff God" figure from a vase found at Pacheco near Nazca is similar in design to the Co. Unitas geoglyph, the petroglyph, the anthropomorphic geoglyph at Nazca, and the Paracas textile figure. The Pacheco Staff God is later in time (ca. 700 A.D.), showing clearly the Tiahuanaco-Huari influence at Nazca. However, it provides a greater detail of elements, most of which are shared with representations of similar figures dating back to Chavin. These elements enable us to better interpret the function of the deity. They include the feline facial characteristics, the lines (or rays) at the head (which frequently end in feline, bird-of-prey or serpent heads), the prominent belt and staffs (often with the same motifs as the head rays), the basic stance with similar head characteristics and arm, leg and feet positions (cf. Reinhard 1986).
The ancient origin of this figure, its duration through time, and its wide-spread appearance in the archaeological record should be sufficient to demonstrate that we are dealing with an iconographic style used to present concepts underlying a type of deity of great importance in Andean beliefs (cf. Reinhard 1985a). When we examine the iconographic evidence as a whole, it becomes clear we are dealing with a type of deity that is associated with atmospheric phenomena and thus with fertility (cf. Demarest 1981: 57, 67; Rowe 1967: 86; Valcárcel 1958: 565-68). The interpretation of the anthropomorphic geoglyphs is, therefore, that they portray a deity which controlled meteorological phenomena. As we have seen, at the local level this deity is frequently believed to reside in the mountains. This interpretation obviously fits well with what we know of the ecological situation in these desert areas and of the important role that mountain deities play with regard to fertility.

Perhaps the closest direct evidence we have of a link between anthropomorphic geoglyphs and mountains is provided by the case of Co. Unitas and Tata Jachura (see Figure 19). The mountain Tata Jachura is still a powerful deity over a large area and is worshipped annually for water (Reinhard and Sanhueza 1982). We found impressive ruins on its summit which dated to the Inca period and indicate that it was one of the most important ritual sites in the region for which we have archaeological evidence. Extensive pre-Inca ruins exist near a village where worship of Tata Jachura still takes place. Legends speak of an annual sacrifice of children to Tata Jachura to insure a stable water supply - the only deity to receive this important offering. It seems highly probable that Tata Jachura was worshipped as a fertility deity long before the Incas came to the area.

An anthropomorphic petroglyph, nearly identical to the Co. Unitas geoglyph, is found in the gorge leading from the foot of Tata Jachura. Indeed, as noted earlier, stones from an upper branch of this river were used to mark a "line" on the summit of Jatamalla which pointed towards Tata Jachura, considered Jatamalla's husband. Most anthropologists have interpreted petroglyphs of llamas, snakes, birds, zigzags, etc. as relating to a fertility cult, and there are numerous of these along with anthropomorphic figures in the gorge.

The river flows towards Co. Unitas before it disappears into the sand of the desert plain, but in the past it passed near Co. Unitas. To the south and southwest of Co. Unitas one can see from the air the remains of extensive ancient irrigated fields. These fields were dependent upon the water coming from the mountains to the east. Sacred mountains, like Tata Jachura, were widely perceived as protectors of herds (Martínez 1976: 278) and an additional factor could have been Tata Jachura's (and Co. Unitas') location on a llama caravan route (cf. Nuñez 1976). It would seem a reasonable hypothesis that Tata Jachura, the most prominent mountain in view from Co. Unitas, was considered the place where a deity resided which controlled meteorological phenomena and fertility. The anthropomorphic geoglyph at Co. Unitas - found associated with a naturalized feline figure - can be interpreted as representing this kind of deity.
Bird figures are fairly numerous at Nazca (see Figure 20), and the relationship of birds with mountain deities and water/fertility cults is widespread in the Andes (cf. Arguedas 1956: 199; Mariscotti 1978a: 132, 198). For example, one bird figure has been identified as a condor, believed in many areas to be the manifestation of the mountain gods (Cayon 1971: 143; Kessel 1980: 280). (Indeed, in some areas of the Andes mountain deities are believed to take human form, but fly with wings; cf. Morote 1956: 295. This, of course, leads one to recall the winged anthropomorphic beings common in Nazca iconography.)

Hummingbirds have been interpreted as messengers of mountain gods on the north coast of Peru (Benson 1972: 52) and still figure as intermediaries between humans and condor "supernaturals" in myths at Lake Titicaca (Buechler and Buechler 1971: 97) (see Figure 21). At Puquio near Nazca they are believed to assist in the worship of mountain gods for rain (Arguedas 1956: 207).

Water birds have an obvious relationship with fertility. In northern, Chile flamingo feathers are part of the offerings to the mountain deities for rain (Barthel 1959: 30). Urton (1982: 7-8) notes that today at Nazca the sighting of a heron, pelican or condor is taken as a sign that there will be rain in the mountains. The condor is said to be the only bird from the mountains used for predictions of rain, the others being from the coast.

The geoglyph of a spider can also be interpreted as associated with a water cult. In current beliefs in Peru its presence is taken as a sign of rain (Cayon 1971: 137-8). According to Rossel (1977: 211), the tarantula is perceived as a symbol of fertility in southern Peru.

One geoglyph at Nazca has been interpreted as a dog or a fox (Morrison 1978: 78). The fox is perceived in many areas as the "dog" of the mountain deities (Casaverde 1970: 143; cf. Tschopik 1951: 199 ft. 6). In a legend dating back at least to Inca times, the fox served as a messenger of the mountain gods (Carrión 1955: 130; cf. Cayon 1971: 159). In another legend first published in 1608 the fox was the principal helper of a mountain deity in the construction of an irrigation system in the hills east of Lima (Avila 1975). It was especially important along the coast (Sawyer 1972: 97), and an idol of it was worshipped at the important ceremonial centre of Pachacamac (Duviols 1984: 214). The Agustinos (1918: 38) noted the fox being worshipped so that it would not eat the maize crop.

During droughts the Incas are known to have tied dogs out in the open and left them to cry for hunger until the Weather God took pity on them and sent rain (Rowe 1946: 212). Not far from Nazca it is believed that dogs accompany the spirits of the dead to the mountain Coropuna (Valderrama and Escalante 1980: 258).

The monkey is one of the best known figures at Nazca. As Morrison (1978: 77) points out, it is not strange to find that monkeys were known even in the desert coastal region, as trade between the coast and the Amazon forest was extensive in ancient times. Monkeys and lizards were prominently portrayed on the large stone "paccha" at Sayhuite in the central Peruvian highlands, which was generally been interpreted as
a central element in a water cult (Kauffmann 1980: 688). The monkey and the lizard (also at Nazca) have been interpreted by Carrión (1955: 61) either as protectors of the water or as symbols of it, due to their association with places where water is available. In Bolivia, when there are many lizards about, it means it will rain (Paredes 1976: 123).

One of the geoglyphs at Nazca appears to represent a fish, and generally has been identified as the orca or killer whale (Morrison 1978: 79). Kauffmann (1980: 392) provides the interesting theory that this is a stylistic transformation of the Nazca feline deity. In any event, it can easily be interpreted in terms of a fertility/water cult, as can those geoglyphs of fish.

Some figures at Nazca have been interpreted as plants, such as flowers (Reiche 1968: 41), algae and trees (Rossel 1977: 214-17). All of these, in this desert climate, can be interpreted in terms of fertility. Flowers are used in a ceremony which is annually held to invoke mountain deities for rain at Puquio to the east of Nazca (Arguedas 1956: 207). Rossel (1977: 214-15) notes that algae was used as fertilizer near Nazca, and the tree (which he identifies as the huarango) was utilized in the construction of the filtration canals.

Some figures, such as the spider, dog and monkey, have their sexual parts extended and this has been interpreted as indicating that they had roles in a fertility cult (Hawkins 1973: 147; Cané 1978: 563: cf. Reiche 1975: 137).

Even the puzzling depiction of hands with four fingers can be interpreted within this context. In Inca times it was widely believed that those born deformed, e.g. with less or more fingers than normal, were children of lightning and thunder (Mariscotti 1978b: 365-7) and mountain gods. Animals born deformed were viewed in the same way and considered sacred (cf. La Barre 1948: 165). The drawing of a monkey with four fingers could have been done deliberately as part of a water/fertility cult and not due to anatomical inaccuracy, as some authors have suggested (see McIntyre 1975: 723).

Conclusion

As we have seen, the vast majority of figures and lines found at Nazca can be interpreted in terms of a water/fertility cult. Of course, the geoglyphs can be interpreted in many other ways (cf. Waisbard 1980; Pezzia 1979; Morrison 1978). The data presented here has been deliberately selective in order to demonstrate that a substantial body of material exists which enables a theory to be developed relating a water/mountain/fertility cult with geoglyphs. This theory allows diverse data to be explained in a logically consistent manner and in accord with traditional Andean beliefs and practices. It is by no means final in every detail, and it is hoped that this article will stimulate research which will expand upon or, if it so develops, change the theory presented here. One point at least appears to be clear: Any interpretation of the geoglyphs must take into consideration the ecological situation and the sacred geography of the region.

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The belief that deities residing in mountains controlled meteorological phenomena has a sound ecological basis, since rivers originate from mountains and rain, snow, clouds, etc. normally have them as their places of origin (see Figure 3). This helps explain why this belief is found throughout the Andes, being noted in the oldest legends and known to have been of widespread importance at the time of the Spanish conquest. Several scholars (e.g. Kauffmann 1980; W. Isbell 1978; Rowe 1967; Carrión 1955) have stressed the great antiquity of some basic religious concepts, and clearly mountain worship for fertility must be considered one of these. This conclusion is also in agreement with what we know of beliefs and legends at Nazca and the difficult ecological situation that confronted the ancient Nazcans. Sufficient rainfall in the mountains to the east was critical to the mainstay of the Nazcan economy—agriculture. Mountains were widely perceived as being inhabited by deities who controlled meteorological phenomena and fertility. Ceremonies relating to the worship of these deities must have been of prime importance to the people.

The majority of the lines would likely have served as sacred paths to the places where rituals for water were performed, hence the lines would not have been pointing at anything on the horizon. On the other hand, some lines, especially the large triangles and rectangles, may have served as symbolic connectors with water sources and been sacred areas in which fertility rites were carried out. The various figures would have been formed to invoke water/fertility. Indeed, this is precisely the way that geoglyphs are interpreted by the traditional inhabitants of northern Chile today (Kessel 1976: 234). That the figures can be seen best only from the air is explained as being due to the ability of the mountain deities to oversee the area, such as by appearing as birds or in the form of the flying feline.

The evidence presented here does not lend itself well to statistical analysis. However, although the number of examples is limited, it can be pointed out that in all the cases of current day use of straight lines for which we have the details such lines were used in connection with a water/mountain cult. The ethnographic sources mentioning the most important deities at Nazca at the time of the Spanish conquest state that they were mountains. Past and present day myths about mountains in the Nazca region relate them to a water cult. The recognizable plants and animals depicted in the geoglyphs can be shown to have been, at least in part, associated with water in Andean beliefs. No ecological facts, statistical studies of the orientations of the lines, historical accounts in colonial times, or archaeological findings have come to light to convincingly demonstrate any other theory as being superior to the water/mountain/fertility one. It would seem that the possibility of all the above statements being true would be remote unless this theory was in general terms correct.

That being said, it should nonetheless be stressed that in the case of phenomena so complex and little known as the geoglyphs at Nazca, we will doubtless never be able to completely understand their meanings. They could have served functions of which we are totally unaware and may well have served multiple ends. For example, some figures could have been totems and some lines used in making astronomical observations (as a number of authors suggest), while still playing roles in a fertility cult. It would be over-simplifying a
complex subject to believe everything can be explained with any one approach.

Obviously, much research remains to be done with regard to the archaeology and ethnography of the region, coupled with investigations of the physical environment. A careful study of the directions, numerical sequences, and interrelationships of the lines and figures may reveal patterns explainable within traditional Andean beliefs (cf. Urton 1982; Zuidema 1982). It might be added, however, that positions and numbers, even when clearly culturally significant, may not be sufficient in themselves to explain the reasons for ritual sites. For example, any ceremonial site would tend to have orientations of a sacred nature, but the purpose for its construction may well not be due to this fact. A more holistic approach is necessary if we are ever going to be able to decipher such a complex problem as that posed by the Nazca lines.

One of the reasons that these giant desert geoglyphs have captured our attention is precisely because there are no simple answers. This does not mean, however, that we cannot come closer to a solution, as long as we utilize a theory that is consistent, brings together the available facts into a meaningful whole, and remains in accord with what we know of traditional Andean beliefs and customs. In this way we can not only come closer to understanding the desert geoglyphs but will also have broadened our perspectives regarding ancient man in the process.
NOTES

1. This publication is a revised and shortened version of one entitled The Nazca Lines: A New Perspective on their Origin and Meaning, Lima: Editorial Los Pinos, 1986 (2nd rev. ed.).

2. The study of mountain worship and high Andean ruins was supported in 1983 by a grant (No. 2571-82) from the National Geographic Society and in 1984-85 by a grant from the Joint Committee on Latin American Studies of the Social Science Research Council and American Council of Learned Societies with funds provided by the National Endowment for the Humanities, the Ford Foundation and the Andrew W. Mellon Foundation. Additional financial aid was received from the American Philosophical Society and the American Alpine Club for part of 1983 and from the Explorers Club for part of 1982. I would like to express my sincere gratitude to these organizations for their assistance. Other institutions which assisted research relating to the geoglyphs include: The Corporación para el Desarrollo de la Ciencia, Santiago; the Corporación Nacional Forestal, Santiago; the Instituto Profesional, Iquique; the Museo Arqueológico, Nazca; ENTUR, Peru; Explorandes; and the Museo de Arte Precolombino, Santiago.

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3. "Illa" in Quechua refers to a sacred hill or stone (closely tied to fertility) and "kata" to cloudiness. It seems likely that Illa-kata referred strictly to the higher mountain to the east, just as it does today. The Spanish name Blanco was apparently given as a substitute for the original Quechua name Sañoc Ancauilca, as will be noted below.
4. The name is in Quechua with "anca" meaning "eagle" and "vilca" referring to a "sacred place or object". Anca occurs as a name for other sacred mountains, e.g. near Cuzco (Duviols 1984: 205). Mountain deities are still commonly believed to take the forms of eagles and this is also the case near Nazca (Arguedas 1956: 199). Sanoc refers to clay, especially in relation with pottery, and a group of potters had this name in Cuzco at the time of the Spanish conquest (Murra 1956). Given clay deposits at the foot of Co. Blanco and the sand used in pottery (along with Acosta's comment below), it seems reasonable to assume that Sanoc Ancauilca was Co. Blanco's name.

Moich (see below) if written correctly, is not a Quechua word and thus might have been the name for Cerro Blanco in the local dialect. Uracancana is a Quechua term, "ura" meaning "low" and "canca" meaning a "spit" or "grill" (for roasting). Anyone who has been on a low mountain at Nazca on a sunny day can easily appreciate how this name could have arisen.

5. It might be added that mountain deities were often worshipped by weavers, e.g. in northern Peru (Agustinos 1918: 30) and near Cuzco (Gow and Condori 1982: 53). Exceptional textiles, many with designs similar to some of the geoglyphs, have been found in graves at Nazca. By controlling the water supply, the mountain deities obviously would be directly involved in the success of the cotton crops, as the offerings on Co. Blanco suggest.

6. According to Waisbard (1980), the snow-capped summit of Coropuna is visible on especially clear days from the plateau with the main concentration of geoglyphs near Nazca. This mountain is far to the southeast, but is still worshipped by people living not far from Nazca in Puquio (Arguedas 1956). It was considered one of the most powerful deities of the Inca empire (Cieza 1977: 107; cf. Guaman Poma 1956: 194). It might be added that mountains can be invoked to send clouds so that it will rain on other mountains (cf. Barthel 1959), and major peaks such as Coropuna may well have been invoked at Nazca for this reason (see Figure 1).

7. For a further analysis of this figure, see Reinhard 1985a and 1986.

8. The geoglyph of a feline at Co. Unitas may have figured in this context, i.e. to "protect" herds while at the same time eating the livestock of pastoralists who displeased the mountain gods. Avila (1975: 63-4) noted how puma skins were worn by owners of llamas during a special dance for a mountain deity in order to prevent their herds from being attacked.
9. One well-known anthropomorphic geoglyph at Nazca is that of the so-called "owl-man". Some scholars interpret this as a form of the Oculate Being (Ralph Cané, personal communication). Based on a study of the forms it takes and associated characteristics (e.g. pelage markings, wings) (cf. Dwyer and Dwyer 1975), the Oculate Being can be interpreted in the same manner as the Staff God, i.e. as associated with weather and the fertility of crops. The "owl-man" geoglyph has striking similarities with the anthropomorphic owl noted for roughly the same period in the northern Peruvian coast (cf. Benson 1972: 53). Based on a study of its appearance in various contexts, Benson (1972: 32) noted it as being an important servant of the mountain god. It might be added here that birds are widely associated with mountain gods, which in turn are believed to be most active at night (cf. Avila 1975; Martínez 1976).

10. A figure that commonly appears on Nazca ceramics apparently has been depicted in a geoglyph. This is the "whiskered" feline deity that many believe to represent an otter. Of interest to us here is the relative uniformity of interpretations as to this figure's role. Valcarcel (1958: 578) associates it with agricultural production, Sawyer (1972: 110) notes it as a guardian of agriculture, Rossel (1977: 185) believes it relates to water and Mariscotti (1978a: lam. 7) calls it a "god of rains".

11. Human figures dressed in bird costumes also are depicted on ancient textiles in the Nazca region (cf. Dwyer 1979: 120). Bird feathers still form part of dancers' costumes in the highlands. One of the best known groups using bird feathers is called choqueula. This group dances during ceremonies in which the mountain gods are invoked for fertility (see Reinhard 1985a).
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Fig. 1. General map of the research area
Fig. 2. The Nazca region and its geographical context. Rivers surround the arid plateau with the main concentration of figures. Sacred mountains still noted in myths are located to the southwest, southeast and east of the plateau. Height in metres.
Fig. 3. East-west profile of the central Andes which shows the climatic conditions in relation to mountain systems during the South American summer months. Here one can see the ecological basis for the belief that mountain deities "control" weather and sources of water along the continental divide. Adapted from Rauh 1979.

Fig. 4. These "lines" at Cantalloc are located at the foot of Cerro Blanco, visible in white on the horizon. This mountain was noted in the 1500's as the principal sacred place of the ancient Nazcans. Several legends associated it with a water cult and with higher mountains to the east, Carhuarzo and Illa-kata (see Fig. 2). Photo author.
Fig. 5. Part of a ceremonial structure dating to pre-hispanic times on the summit of Illa-kata, the sacred mountain to the east of Nazca. Mounds of stone where more recent offerings were made are also found at the site. Based on Illa-kata's position relative to water sources, on local legend and on similar sites on other mountains, it is likely that worship was performed on the mountain in pre-hispanic times mainly to obtain water. Photo author.

Fig. 6. Ruins on the summit of Illa-kata (4,327m/14,193'). No. 1 is on the highest point of the summit. Fine stonework of probable Inca origin is found in the wall dividing Nos. 2 and 3 and in the northern and eastern walls of No. 4. No. 3 is about 2.5m lower than No. 1 and No. 4 is ca. 1.5m lower than No. 3, which has steps leading out of it. Nos. 5 and 6 have low walls and are about 25m lower in altitude from No. 1. Nos. 7 and 8 have, in part, well built walls ca. 1m high, and presumably were utilized as residences by those performing ceremonies at the highest structures.
Fig. 7. Ruins located at various points along the summit ridge of the sacred mountain Cerro Tunga. Tunga figures in a myth associating it with fertility and the sacred mountains Cerro Blanco and Illa-kata. The ruins were likely for ritual use. No. 1 is at the highest point of the summit (1,791m/5,874') and is a hole dug during the construction of the adjacent TV antenna. A few undecorated potsherds and the nearby structures of 2 and 3 indicate that a ruin may have once existed here. No. 2 is a simple low walled structure, while No. 3 is an oval structure made by a row of stones. Nos. 4-7 have low walls (ca. 20-30cm) and have been excavated by treasure hunters. Small pieces of wood and seashells (common offerings for water) were observed near them. Potsherds (identified by Helaine Silverman as dating to the Late Intermediate Period, i.e. about 1,000-1,475 A.D.) were found scattered between Nos. 4 and 5 and within a 10m radius (unassociated with structures) between Nos. 5 and 6 at 1,741m just to the west and below summit 1,776m. No. 3 is at 1,785m. No. 4 (1,731m) and No. 5 (1,711m) are in a saddle between the summits at 1,791m and 1,776m. Nos. 6 and 7 are at 1,741m on a saddle to the east of the lower summit. (All altitudes were taken with an altimeter adjusted to the height of Tunga as listed on the 1:100,000 map of the Instituto Geografico Nacional.)
Fig. 8. Villagers and musicians in Bolivia are seen here returning from ceremonies they performed at the end of a straight line. They had followed it to the top of the hill from which they worshipped the surrounding mountain gods to send rain to increase the fertility of their fields. Photo: author.
Fig. 9. The straight line at Sabaya divides the village into two moieties (sayas). The line is used to ascend to Pumiri's summit to perform ceremonies, but participants return down the crest of a ridge which has several places of worship situated along it. The places are associated with seasonal rites. Adapted from Riviere (1982).
Fig. 10. A general overview of a main complex of lines on Pampa de San José near Nazca. It seems likely that most of the lines did not point at anything on the geographical or celestial horizon, but rather led to places where rituals were performed to obtain water and fertility of crops. Adapted from Reiche 1968.
Fig. 11. A different perspective of the lines sketched in Fig. 10. Here one can see the way the "lines" have been constructed on arid land not used for agriculture which is found on the plateau above the Rio Ingenio. Photo: S.A.N.
Fig. 12. Anthropomorphic figure found on Co. Unitas in northern Chile. This is one of the world's largest anthropomorphic geoglyphs, some 90m tall, and one of the best constructed. This figure has been interpreted as a deity which controlled weather. Photo: author.
Fig. 13. Sightlines to sacred mountains from the village of Socaire. These mountains are still worshipped annually for water at the beginning of the cleaning of the irrigation canals. Adapted from Mariscotti (1978).
Fig. 14. Numerous "ray centers" have been found near Nazca. Rather than point towards anything on the horizon, the lines more likely led to places where offerings were made to the gods for water/fertility. Photo: S.A.N.
Fig. 15. A theoretical representation of the way mountains can be utilized in forming a solar calendar. The summer and winter solstices are at the ends of the cycle. Still today at Nazca similar observations are made to determine the start of the rainy season in the mountains to the east. Obviously no lines were necessary for such observations. Adapted from Kirbus (1976).
Fig. 16. The "lines" were made by removing the oxidised surface rocks, leaving the lighter coloured sandy surface free. This spiral ended in a stone mound. Often items of probable ritual significance, such as seashells and finely decorated pottery pieces, were found in such mounds. Spirals are generally interpreted as being associated with water cults. Photo: author.
Fig. 17. Anthropomorphic geoglyph found north of Nazca. It has some features which it shares with Figs. 12 and 18 and can be interpreted as representing a deity associated with a fertility cult. Its height has been estimated at 20m. Photo: author.

Fig. 18. Staff God figure on a Paracas textile dated to ca. 200 BC at the Museo Nacional de Antropología y Arqueología, Lima. According to our interpretation, this would represent a fertility cult deity.
Fig. 19. Co. Unitas region, northern Chile. Ancient fields and irrigation works lie to the south of Co. Unitas. Dotted lines indicate the currently dry riverbed. Here one has the association of a mountain, river, irrigated fields, geoglyphs and petroglyphs (cf. Figs. 1 and 12). Height in meters.
Fig. 20. Some of the better known figures at Nazca. Ethnographic evidence exists which enables all of these figures to be interpreted in terms of a fertility cult. Adapted from Reiche (1968).
Fig. 21. The "hummingbird" is one of the most visible and best preserved of Nazca geoglyphs. This bird has an obvious association with fertility and has been interpreted elsewhere in the Andes as a messenger of mountain gods. Photo: S.A.N.