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ANIMALS AND ASTRONOMY IN THE QUECHUA UNIVERSE

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At the beginning of his treatise on the "errors and superstitions of the Indians" written in 1571, Polo de Ondegardo gives us one of our longest accounts of the constellations recognized by the Incas. Among the constellations are several animals and birds including llamas, a feline, and a serpent. By reference to other Spanish and indigenous chroniclers of Inca culture, the list of animal constellations can be expanded to include the tinamou, the condor, and the falcon.[1]

In addition to the list of animal constellations, Polo gives us the following explicit statement concerning the relationship between celestial and terrestrial animals:

> . . . in general, [the Incas] believed that all the animals and birds on the earth had their likeness in the sky in whose responsibility was their procreation and augmentation (Polo, [1571] 1916: cap. 1; my translation).

The identification of the Incaic animal and bird constellations has eluded us for some time. In fact, it is not surprising that this has been the case because apparently their recognition even by the Incas was sometimes something of a problem. The chronicler Garcilaso de la Vega gives us the following confession concerning his early astronomical training:

> They fancied they saw the figure of an ewe [llama] with the body complete suckling a lamb [uñallamacha], in some dark patches spread over what the astrologers call the Milky Way. They tried to point it out to me saying: "Don't you see the head of the ewe? There is the lamb's head sucking; there are their bodies and their legs." But I could see nothing but the spots, which must have been for want of imagination on my part. (Garcilaso, [1609] 1966, Bk. II, cap. XXIII).

What was apparently the same llama, and its suckling baby, is also described in the chronicle of Francisco de Avila (1608) in the central Andean community of Huarochirí. The llama, says Avila, was "blacker than the night sky" (Avila, [1608] 1966; cap. 29).

From the testimony of Garcilaso and Avila alone it should have been clear that in order to identify the animal constellations of the Incas, we should look first to the "dark spots." However, the literature on Incaic ethnoastronomy is full of attempts to explain away, or to dismiss entirely without comment, the testimony on the dark cloud animal constellations in the Milky Way (eg. Lehmann-Nitsche, 1928: p. 36).

Constellations of the type we are discussing have only rarely been reported in the ethnoastronomical literature,[2] and it will be one of our goals here to present as complete a description as possible in light of the data collected thus far in the field. Our major objective is to arrive at an understanding of the general principles of Quechua astronomy and cosmology incorporated in this one category of celestial phenomena. It should be emphasized at the beginning that we would expect to find a close correspondence between Quechua celestial and terrestrial classifications and symbolism. For example, we would expect that the principles of opposition, mediation, and unification which have been found to operate among natural and supernatural forces (eg. Earls, 1973; Isbell, 1974 and 1979; Mayer, 1974; Ossio, 1976; Urbano, 1974 and 1976; Wagner, 1978; and Zuidema, 1973 and 1977), will be fundamental to the conceptualization and mechanics of Quechua astronomy.

Through ethnoastronomical fieldwork carried out in a number of communities around the city of Cuzco, Peru, it has been possible to identify several animal constellations which conform to the general descriptions given in the Spanish chronicles (*cf.* Urton 1978*a* and *b*, 1979 and 1980; the Zuidema and Urton, 1976). In addition to the identifications of the celestial locations of these "dark cloud" animal constellations, information was obtained relating to their role in the life of the various communities, especially in the community of Misminay where the most extensive fieldwork was carried out (Urton, 1979).

The *runa* of Misminay possess an extremely rich and complex body of astronomical lore. At least 48 different single stars, constellations and "dark clouds" are named and observed for purposes ranging from the reckoning of time at night to the timing of the planting of the crops. As has been discussed elsewhere (Urton 1978*b* and 1979), the Quechua recognize two major types of constellations: a) star-to-star constel-

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[2] Dark cloud-like constellations have been described elsewhere in South America (Nimuendajú, 1948: p. 265; Tastevin, 1925: pp. 182 and 191; and Weiss, 1969), among Australian aboriginal populations (Maegraith, 1932), and in Java (Pannekoek, 1929: pp. 51–55; and Stein Callenfels, 1931).

lations, western-type stellar groupings which represent *inanimate* architectural and geometric forms, and b) the *yana phuyu* ("dark cloud") constellations, all of which represent *animate* forms. The dark cloud constellations are located in the southern portion of the Milky Way where one sees the densest clustering of stars and the greatest surface brightness, and where therefore, the fixed clouds of interstellar dust which cut through the center of the Milky Way (the dark cloud constellations) appear in sharper contrast.

In recent fieldwork in Misminay (June, 1979), it was found that in addition to these two primary classes of *constellations*, the celestial *animals* are apparently also divided into three color categories: *yana* ("dark"), *muru* ("spotted" or "multi-colored") and *rojo* ("red"). We will discuss here the "dark" and "spotted" animal forms, since they appear to represent two types of *yana phuyu*, and leave for another time a description of the "red" animals which are perhaps related to single red stars such as Antares and Betelgeuse.

Celestial Locations and Periodicities of the Yana Phuyu

The dark cloud constellations which have been identified are as follows, listed in the order in which they rise along the south-eastern horizon (see Fig. 1):

mach'acuay	—serpent
hanp'atu	—toad
yutu	—tinamou
llama	—llama
uñallamacha	—baby llama (/or llama's umbilicus/or serpent)
atoq	—fox
yuthu	—tinamou

From the head of the Serpent in the west to the tail of the Tinamou in the east, the dark cloud constellations stretch in a line through about 150° of celestial space, straight along the central course of the Milky Way (= *Mayu*—"River"). Figure 1 is a drawing which shows all of the dark cloud constellations in the sky at the same time. The view is toward the south from a hypothetical location in the southern Andes near the city of Cuzco (i.e., Cuzco's latitude is −13°30′; thus, as shown in the drawing, the unmarked south celestial pole stands 13°30′ above the southern horizon).

As the sky appears to revolve at night throughout the course of a year, it will be unusual to actually see the entire line of dark cloud constellations in the sky on the same night. The time of greatest visibility occurs when the center of the line (i.e., the area around the Southern Cross and the *Yutu*) stands along the north/south meridian at midnight; this occurs around the 23rd of March, the day of the autumnal equinox (in the southern hemisphere). If we rotate the sky so that the entire line of dark cloud constellations is underground at midnight (which will therefore be the night on which the *fewest* dark clouds will be seen), we arrive at a date of September 26, very near the vernal equinox.

In addition to this temporal relationship to the two equinoces, we see in figure 1 that there is an orientational relationship to the December solstice; that is, the most extreme *northerly* rising and setting points of the dark clouds coincides with the most *southerly* rising and setting points of the sun. Thus, at midnight on the night of the March equinox, the line of dark cloud constellations stretches in an arc through the southern skies from the rising point in the southeast to the setting point in the southwest of the December solstice sun (see the discussion of the relation between the dark cloud constellation of the Llama and the solstices and equinoces in Zuidema and Urton, 1976: pp. 90–94).

Another important observational and temporal characteristic of the dark cloud constellations is their relationship to the rainy season. In the southern Andes, the rainy season begins in October and ends in early April with the heaviest period of rains lasting from December through February. While discussing one of the dark cloud constellations (the Serpent) with informants in Misminay, it was said that the dark cloud Serpent is seen in the sky at night during the rainy season while, during the dry season (May–July), it is below ground at night. A similar description of the relationship between the rainy season and the celestial Llama (*Yacana*) was recorded in the early seventeenth century in Huarochirí by Avila (1966; cap. 29).

In addition to their relationship to the rainy season, the dark cloud constellations are associated in another direct way to water; as mentioned before, they are located along the center of the Milky Way which is called *Mayu*, the "River." While we cannot describe in great detail here the Quechua conception of the Milky Way (*cf.* Urton, 1979), it is important that we establish well the cosmological significance of these fixed clouds of interstellar dust, in the form of animals, which float through the sky along the celestial River.

In Misminay, the designation of the Milky Way as a celestial river goes beyond the mere metaphorical equation of a linear stream of water on the earth with a stream of stars in the sky. One informant in Misminay explained the relationship between the two rivers by etching a line on the floor of his hut; the line, he said, represented the Vilcanota River which is like a mirror (*espejo*) reflecting the *Mayu*, the River in the sky. Therefore, the Milky Way is equated *directly* with the Vilcanota River which flows from the southeast to the northwest through the Dept. of Cuzco.

Second, the celestial River is believed to carry into the sky the actual water which flows through the Vilcanota River. As the Vilcanota River flows from the southeast to the northwest, it carries terrestrial water to the edge of the earth. The water then flows into the *mar*, the cosmic sea, which completely encircles the

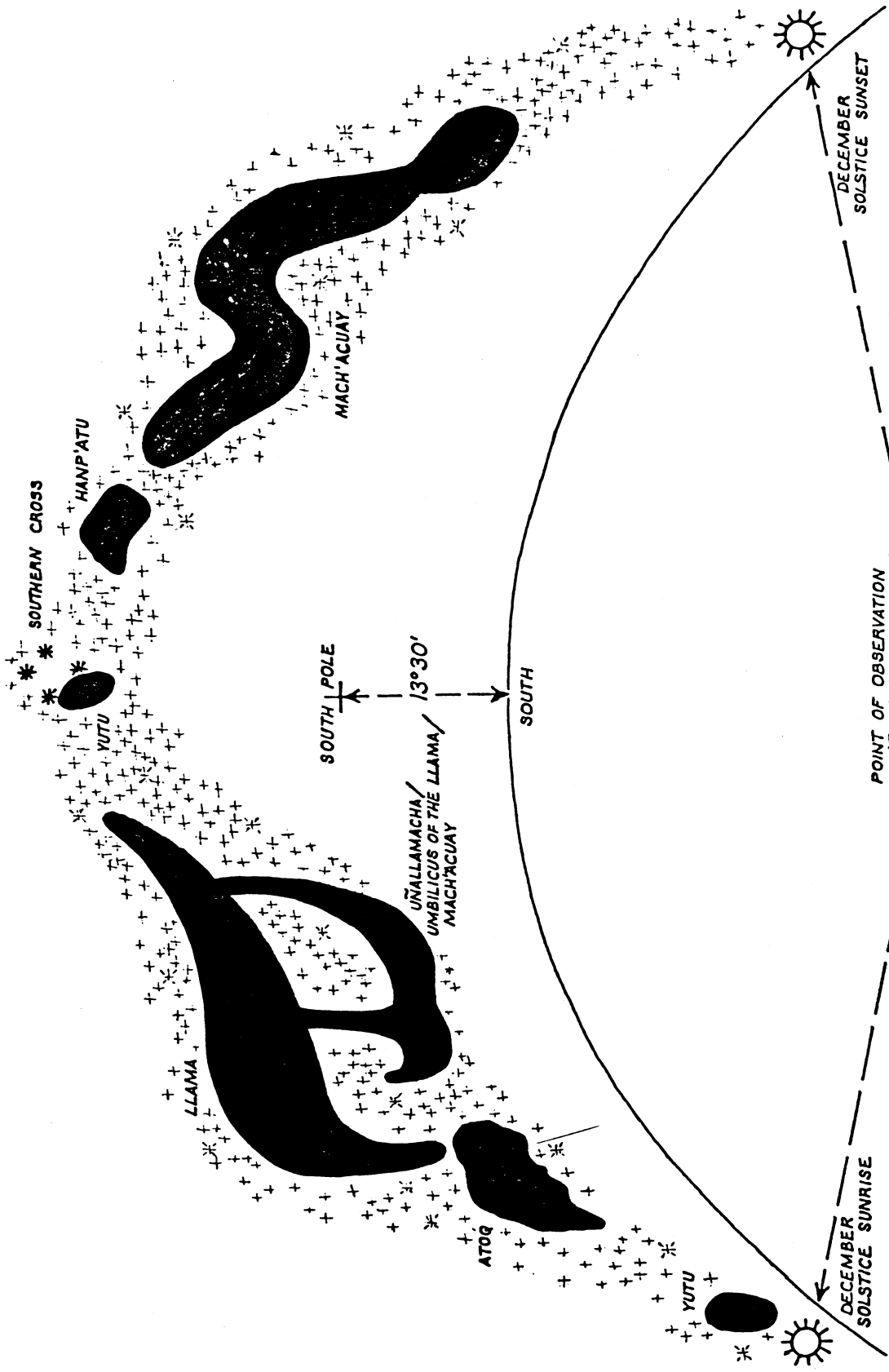
SOUTHERN CROSS
HANP'ATU
YUTU
MACH'ACUAY
SOUTH POLE
13°30'
SOUTH
UÑALLAMACHA/
UMBILICUS OF THE LLAMA/
MACH'ACUAY
LLAMA
ATOQ
YUTU
DECEMBER
SOLSTICE SUNSET
POINT OF OBSERVATION
AT LATITUDE OF CUZCO
DECEMBER
SOLSTICE SUNRISE

FIG. 1.

earth. As the Milky Way revolves around the earth, it dips into the cosmic sea in the west, takes in the terrestrial water, passes underground and rises again in the east. As the Milky Way moves slowly through the sky above the earth, it deposits water throughout the celestial sphere. The water then returns to the earth in the form of rain where, in its continuous cosmic cycle, it again flows along the tributaries which feed into the Vilcanota River. In this way, the celestial and terrestrial rivers act in concert to continuously recycle water, the source of fertilization, throughout the universe.

It is clear from this description of the cycling of the Milky Way that in order to understand the full significance of the dark cloud animal constellations within it, we must consider the three elements, or parts of the universe, with which they are therefore associated: sky, water, and also earth (since they are subterranean for at least half of every day). There are a number of additional factors which must be considered such as the specific types of animals represented, their biological cycles and behavior patterns, and the question of the correlation between astronomical and biological cycles as suggested in the quotation from Polo de Ondegardo (above, p. 110). These factors will be discussed later in this article.

Of the three factors mentioned above—sky, water and earth—water occupies a position of mediation since it is the element which is cycled through the other two. It is therefore essential to study the dark cloud constellations by analyzing the connections between sky and water and earth and water.

Sky and Water

In his monumental studies of the natural sciences in South America, Alexander von Humboldt made the following observation:

> I have endeavoured to describe the approach of the rainy season, and the signs by which it is announced. . . . The dark spot in the constellation of the Southern Cross becomes indistinct in proportion as the transparency of the atmosphere decreases and this change announces the approach of rain. (von Humboldt [1850] 1975: pp. 138–139).

In my own fieldwork in Misminay, I was also told that the dark cloud constellations are observed in the prediction of rain. While informants in Misminay did not describe the specific methods used, nor the times when the observations are made, we have explicit testimony from elsewhere in the southern Andes that such predictions are made during the month of August at the beginning of the planting season and at the time of transition from the dry season to the rainy season. Padre Jorge Lira has recorded the following meteorological and crop predictions in use today in communities around Cuzco:

> If the stars of the sky appear bright and beautiful, everything will be good, materially and spiritually. If, in the Milky Way, there is an *accentuation of the dark areas*, or the "sacks of carbon," it will be a year of pestilence and death. (Lira, 1946: pp. 18–19; my translation and emphasis)

If we combine the accounts of von Humboldt and Lira, we can conclude that since the *obscuring* of the dark clouds indicates the approach of rain, their *accentuation*, as described by Padre Lira, indicates the absence of rain. Therefore, we find a curious kind of inversion in the relationship between water and the dark cloud constellations; their *appearance* in the night sky is associated with the period of the rainy season, but their gradual fading out, or "*disappearance*," as a result of increasing atmospheric moisture, announces the actual approach of rain. Since the dark cloud constellations are located in the celestial River, which spreads water from the cosmic sea throughout the celestial sphere, the weather predictions described by Padre Lira reflect a coherent and logical explanation of the operation, and inter-relation, of certain natural phenomena. But beyond the "convenience" of a consistent explanation of the natural universe, the data and processes we have outlined provide a system of prognostication, an essential element in the survival of communities whose livelihood depends upon the success of the crops which, in turn, depends upon the amount of rainfall.

It should also be pointed out here that the basic system we have described above was also understood by the Incas. In order to demonstrate this knowledge, we have only to combine the following statements from Bernabé Cobo and Francisco de Avila. First, with regard to our description of the cosmic circulation of water in modern Quechua cosmology, Cobo tells us the following concerning Inca cosmology:

> They say, in addition, that through the center of the sky there crosses a great river which they take to be that white band which we see from here below and call the Milky Way. . . . Of this river, they believe that it takes up the water which flows beyond the earth. (Cobo [1635] 1956, II: pp. 160–161; my translation)

And concerning the relation between the dark cloud constellations and the transport of water to the celestial sphere, Avila says:

> This Yacana [in the sky] . . . is like the shadow of the llama. They say that this Yacana comes down to earth at midnight when it cannot be noticed or seen and drinks all the water from the sea. They say that if she did not drink this water, the entire world would be drowned. (Avila [1608] 1966: cap. 29; my translation)

Therefore, the dark cloud animal constellations were, and continue to be, important elements in the cosmological relationship of water and sky, and as a category of celestial phenomena, they are important observable indicators of continuity and change in the physical universe.

Earth and Water

Since the water within the celestial River has a terrestrial origin, it is therefore not surprising to find that the animals of the Milky Way also originate from the earth. According to one informant in Misminay, the *yana phuyu* ("dark clouds") are actual pieces of earth which are taken up into the sky by the Milky Way. The informant was uncertain whether the animals are taken up under the earth, during the subterranean passage of the Milky Way, or if they enter it from the mountain-tops where, he said, there are a lot of wild animals.

The terrestrial origin of these celestial animals is further indicated by the fact that even though they are located in the sky, they are classified as *pachatira* (*pachatierra*), a name which combines the Quechua and Spanish words for "earth." The name *pachatira* was obtained in a situation which throws additional light on the symbolic significance of the term as used in relation to celestial phenomena. In a long conversation which I had with a group of men and women in Misminay, I asked about the sexual association of various astronomical bodies. It was generally agreed that single stars, as well as the star-to-star constellations, are masculine. When asked about the dark cloud constellations, one man answered immediately that they are female. Later, however, he pointedly returned to the question and said that he had been wrong earlier in calling them female; they are, he said, *pachatira*. Thus, while the dark cloud animals may be thought of as more female than male in opposition to the stars which are male, they are actually neither—they are *pachatira*.

Pachatira is an important concept in Quechua cosmological thought. In the community of Kuyo Grande, Casaverde found that *Pachatierra* is classified as female and is considered to be the malevolent twin sister of *Pachamama*, "Earth Mother" (Casaverde, 1970: p. 150). Oscar Nuñez del Prado gives the following description of the malevolent nature of *Pachatierra* as found in Kuyo Chico:

> She is wicked and eats the hearts of men, who then die spitting blood. She is generally found by cliffs and precipices, and her preferred victims are children or adults who stay asleep in bad weather. (O. Nuñez del Prado, 1973: p. 36)

The femaleness of *Pachatira*, and the relationship of *Pachatira* to the Earth Mother (*Pachamama*), is also found in the area of Ocongate where three feminine forms of earth (*pacha*) combine to express the total concept of *Pachamama*; the three are *Pacha Tierra*, *Pacha Ñusta*, and *Pacha Virgen* (Gow and Condori, 1976: p. 6).

> Since the dawn of the universe, Pachamama has said: I am Santa Tierra. I am the one who nurtures and gives suckle. I am Pacha Tierra, Pacha Ñusta, Pacha Virgen (Gow and Condori, 1976: p. 10; my translation)

In the community of Songo, when blowing a coca *k'intu*, one often calls upon "Mother Earth" which includes *Santa Tira*, *Pachamama* and *Pachatira Mama* (Wagner, 1976: p. 200). There is no clear-cut distinction made in Songo between *Pachamama* and *Pachatierra*; they are both female and both related to *hallp'a* and *pampa* ("soil, ground"; Catherine A. Wagner, personal communication, 1978).

From these accounts, we find that *Pachatira* refers primarily to the earth and to its powers of fecundity. It is also often associated with a concept of femaleness in relation to *Pachamama*, but the latter does not appear to be a necessary nor invariable characteristic (e.g., J. V. Nuñez del Prado, 1970: pp. 75–76). This slight ambiguity in the sexual classification of *pachatira* is well illustrated by the man in Misminay who first called the dark cloud constellations female, but then insisted that they are more properly classified as *pachatira*.

That pachatira refers to a concept of earthly or subterranean fecundity is important to our discussion of celestial animals which originate from, and are actually composed of, the earth. We find in the Andes a general belief in the subterranean origin of all animals (*cf.* Aranguren Paz, 1975: p. 108; and Duviols, 1976: p. 283). As stated by an informant of the Gows in the area of Ocongate:

> It was a very long time before alpacas existed. When it first dawned, they were hidden under the earth where there are springs. Then, when the sun rose again, all the animals came out of a spring. For this reason, we make an offering to a spring and the lakes at the foot of Ausangate. If there had been no subterranean spring, we would not have had animals. The spring and the lakes are the owners of the animals (Gow and Gow, 1975: p. 142; my translation)

With this quotation, we can begin to understand the relation not only between animals and the earth (*pachatira*), but also between animals and earthly, or subterranean, *water*. Since the animals of the earth, those actually used by humans as food, clothing, and transport, originate from subterranean springs, it is not surprising to find that the animals which inhabit the waters of the celestial River are also related to the concept of the earth as a fecund force (i.e., to *pachatira*). As we saw earlier in our description of the diurnal rotation of the Milky Way, the celestial river passes beneath the earth after first entering the cosmic sea in the west. We can well imagine the tremendous mixing and crossing of subterranean water, earth, and animals which occurs as the Milky Way passes beneath the earth and how, therefore, the animals in the sky are intimately connected with the animals of the earth.

With these observations on the general nature of the category of Dark cloud constellations as a background, we can now examine the specific characteristics of each of the terrestrial and celestial animals in order to determine what relationship exists between the behavior of the animals and the behavior of the constellations. Our investigation is prompted by the statement of Polo de Ondegardo to the effect that the

animal constellations are responsible for the "procreation and augmentation" of their animal counterparts on the earth. We will begin with the Serpent, at the head of the line of dark cloud constellations and then proceed eastward along the line of constellations as they rise after the serpent.

Mach'acuay ("serpent")

Snakes are a relatively rare part of the southern Andean fauna, especially when considered in light of the fact that one of *the* herpetaria of the world, the Upper Amazonian rainforest, lies just to the east and north. The only naturally occurring species of snake above 12,000 feet in the Andes is the mildly poisonous Colubrid, *Tachymenis peruviana. T. peruviana* (fig. 2) ranges in size up to about one-half a meter and its coloring is a yellowish or pale brown with dark spots and longitudinal streaks running along the upper part of its body. An oblique dark streak runs from the eye to the angle of the mouth. A pair of grooved fangs are positioned below the back of the eye (*cf.* Boulenger, 1896: pp. 117–119). *T. peruviana* gives birth to live young and its birthing period is between September–October (Fitch, 1970: p. 156). Its altitudinal range is between 6,000–15,000 ft.

The term *Mach'acuay* is commonly found in the literature on the reptilian fauna of Cuzco, and I would suggest that it refers primarily to the indigenous snake *T. peruviana.* Cayón (1971) gives the term *mach'acuay* for snakes in general and he also mentions three other terms that are in current use:

machato	—"drunken"
uru	—"worm"
maqta uru	—"*mozo* (young man) worm"

The following two reptiles have also been described for the Cuzco area and may be considered as varieties of the *mach'acuay* group: *yana-muroq*("dark spotted"), a small green and white snake; and *oje-muroq* ("grayish spotted"), a small brown to dark brown snake (Cayón, 1971: p. 144; also see Roca, 1966: p. 61). The more impressive South American reptiles, such as the anaconda and the boas, do not occur naturally in the area we are discussing. However, Garcilaso de la Vega tells us that the inhabitants of the Inca empire who lived in the jungle to the east of Cuzco brought huge reptiles (*amarus*) to the Inca as tribute (Garcilaso, Bk, 5, cap. 10). In addition, I would suggest that the present distribution of the medium-sized *Constrictor constrictor ortonii* along the Upper Marañon, and the *Boa hortulana hortulana* of the Upper Madre de Dios east of the Dept of Cuzco (*cf.* Schmidt and Walker, 1943*a*: p. 280; and 1943*b*: p. 305) is a good indication that the large Amazonian reptiles are known today by the inhabitants of the high Andes.

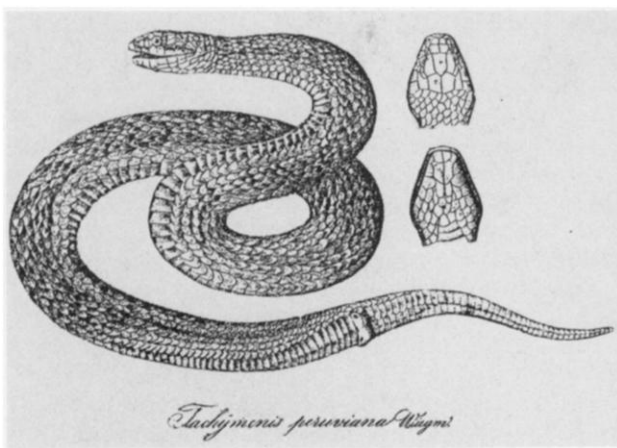

FIG. 2.

In the community in which I carried out fieldwork (altitude *ca.* 13,000 ft.), it is common to travel far down the Urubamba Valley for work and to consult the shamans of the lowlands for purposes of divination. Since a similar pattern of lowland travel was common among Pre-Columbian Andean populations, it is entirely feasible to suppose that the medium to large reptiles of the Upper Amazon have been a part of the faunal knowledge of Andean peoples for some time.

In addition to the Serpent constellation called *Mach'acuay*, I have elsewhere (Urton, 1978*a*) described a constellation, *Sulluullucu*, which was mentioned by an informant immediately after a discussion of *Mach'acuay*. I now think that the word *sulluullucu* may be related to the name Surucucú, the deadly Bushmaster (*Lachesis mutus*—fig. 3) of the tropical forest (*cf.*, Ditmars, 1937: p. 137; the Tastevin, 1925: p. 172). If this derivation or relationship of the Quechua term is correct, it is all the more impressive since the constellation *Sullullucu* was mentioned in the community of Songo, at an altitude of *ca.* 14,500 ft. A further suggestion that large Amazonian serpents are known in the Andes today is found in the Quechua dictionary of Padre Jorge Lira. Lira gives the term *mach'acuay* for serpent, but he also gives a name for the boa, *A'ti mach'akkway*. Lira relates the name *A'ti mach'akkway* to *amaru*, the monstrous serpent of Andean mythology and also, as mentioned earlier, the large serpents which were given as tribute to the Incas.

Amarus are important for our study because the name is applied to rainbows which are believed to be giant serpents. The body of the Rainbow Serpent rises up out of one spring, arches through the sky, and buries the opposite end of its body in another spring. *Amarus* are thought of as double-headed; one head is buried in each spring.

From these data, we find a relationship between the dark cloud constellation serpent *Mach'acuay* and the rainbow serpent *Amaru*; this is a relation of dark and multi-colored reptiles. Precisely the same relationship or opposition of coloring is found in the ethnoastronomy of tropical forest reptiles. As described in Tas-

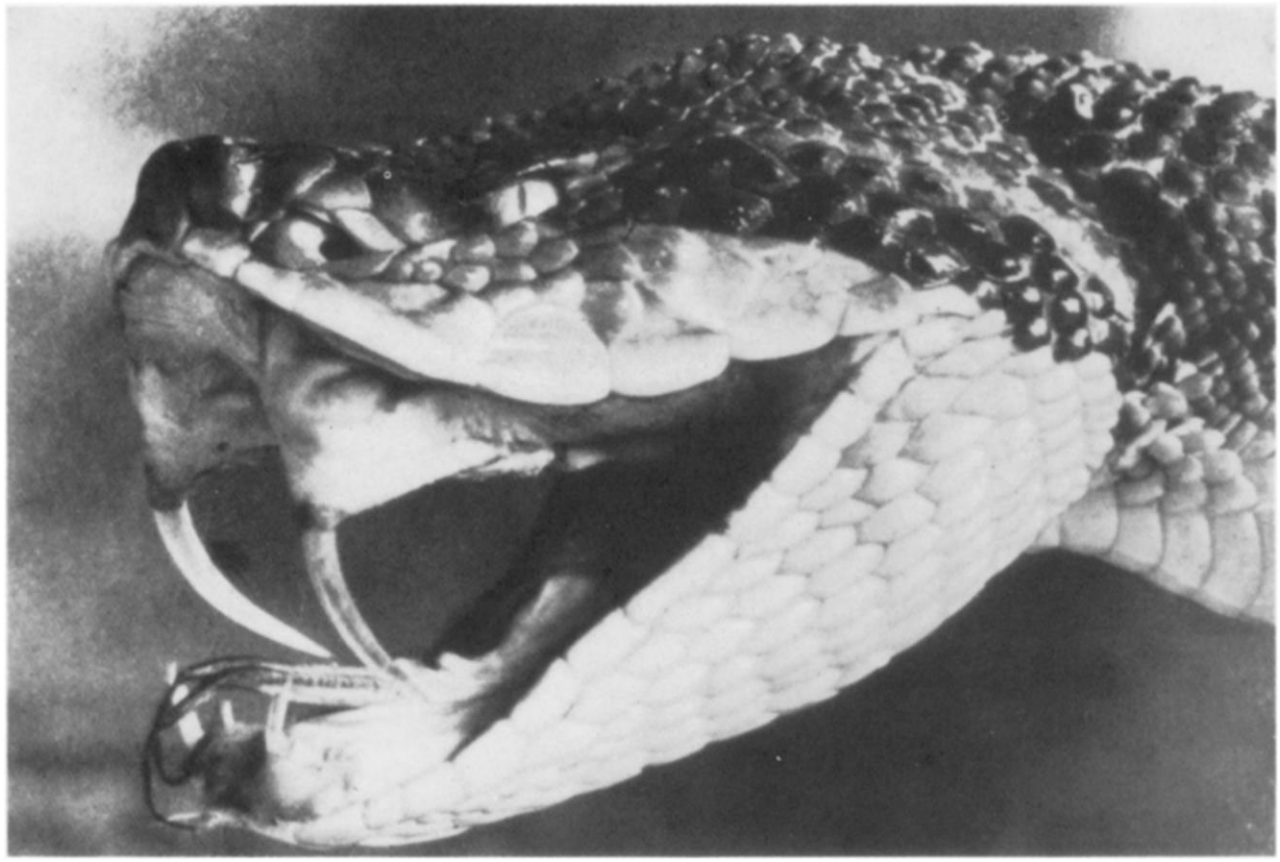

FIG. 3. Bushmaster; Surucucú (from Ditmars, 1937: plate 70).

tevin's study of the Amazonian legend of *Bóyusú* (= *surucucú*, the Bushmaster): ". . . the celestial Bóyusú appears during the day in the form of the rainbow, and at night in the form of a dark spot . . ." (Tastevin, 1925: p. 183; my translation). Tastevin further shows that the dark spot serpent is a dark cloud in the Milky Way which winds itself round the constellation of Scorpio. Scorpio is important in the Amazonian calendar because when it stands in the zenith in November, it signals the beginning of the rainy season (Tastevin, 1925: p. 173).

In the tropical forest, the relationship of large dark/multi-colored serpents is not without an observable basis in the fauna since the Ringed or Rainbow Boa (*Epicrates cenchris*—fig. 4) exhibits just this opposition or union of colors. The Rainbow Boa has a brownish hue with blackish rings; however:

> Gliding into the sun the reptile is transformed. As the light catches the upper surface at certain slants, patches of iridescence glow in green and blue, like the wings of the morpho butterfly . . . (Ditmars, 1937: caption to Plate 8).

In addition, the coloration and habits of the anaconda (*Eunectes murinus*—fig. 5) are similar to the descriptions of the celestial and aquatic (rainbow) serpents of Amazonian tradition. Anacondas, which are olive green with large, round black spots, are the most aquatic of the boas. They are nocturnal and spend their days in swamps or sunbathing in low branches over the water. Significantly, the few observations that have been recorded of the anaconda breeding cycle report that they give birth (of anywhere from 20–100 young) ". . . in the early part of the year" (Burton, 1975: p. 206). Thus, at the same time that the dark cloud serpent of the Amazon, Bóyusú, stands in the zenith to signal the beginning of the rains, the large aquatic boas of the earth (anacondas) have recently given birth to their young.

Celestial serpents in the Amazon are therefore related to rainbows (water), dark clouds in the Milky Way, and to the beginning of the rainy season. This is the same complex of associations found in Andean astronomy:

mach'acuay—dark cloud in the Milky Way observed at the beginning of the rainy season
amaru —the double-headed, multi-colored rainbow serpent

The emergence of "meteorological" serpents (*amarus*) from the ground immediately following a rain shower, and their reentry as the atmosphere becomes less moist, is an important clue to understanding the relation between terrestrial and celestial reptiles in the

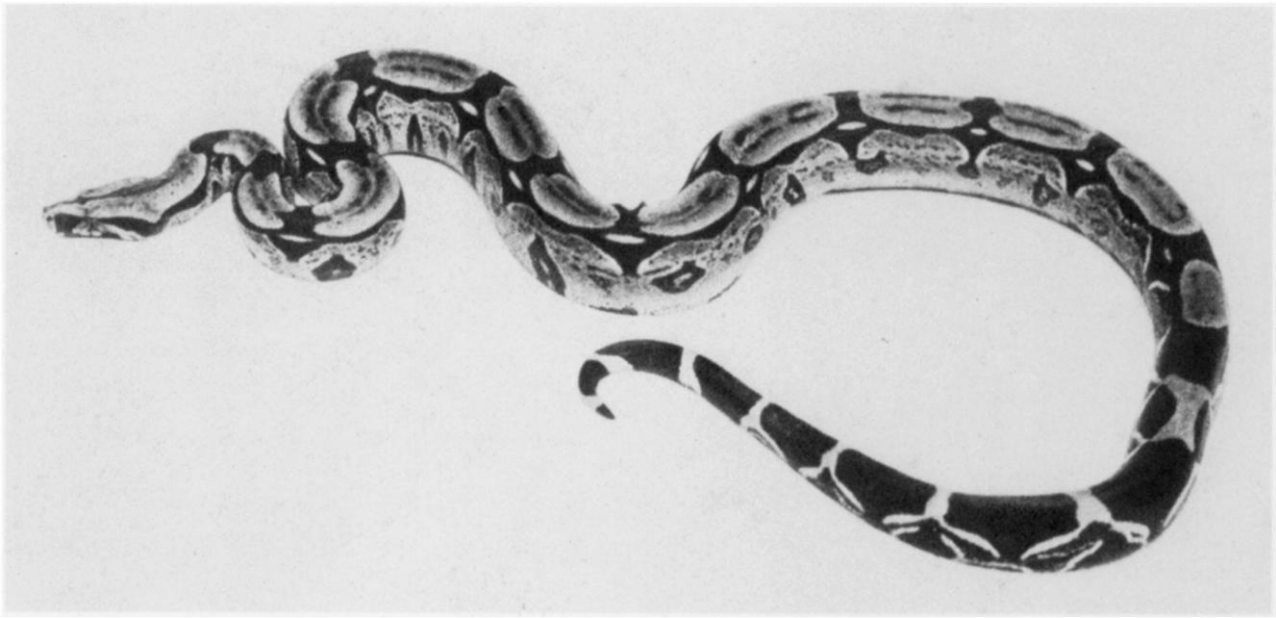

FIG. 4. South American Boa (from Ditmars, 1937: plate 6).

FIG. 5. Anaconda (from Ditmars, 1937: plate 4).

Andes. The *amaru* which rises out of a spring after rain, exhibits a climatological behavior pattern similar to terrestrial serpents which, at the *end* of the cold/dry season and at the *beginning* of the warm/rainy season, emerge from subterranean hibernation. The Andean dry/cold season (May–July) is a period not only of reduced activity among reptilian fauna but also among the fauna upon which reptiles prey. Therefore, terrestrial reptiles in the Andes are variably active and inactive in direct relation to pronounced alternations between dry/cold and warm/rainy seasonal changes (*cf.* Schoener, 1977: pp. 115–116). Since meteorological serpents (rainbows/*amarus*) only appear during the rainy part of the year, they exhibit a seasonal activity cycle similar to that of terrestrial reptiles.

The principal identification of the dark cloud Serpent (*Mach'acuay*, see fig. 1) is a large zig-zag-like streak of interstellar dust which stretches from a point near the Southern Cross to Adhara (in the Western constellation of Canis Majoris). The head of the Serpent precedes the tail in rising; thus, the movement of the constellation through the night sky can be likened to terrestrial serpents and rainbow serpents which rise out of the earth headfirst and reenter headfirst. Since the dark cloud Serpent stretches over such a large celestial area, we must select a part of its body as a point of departure for our analysis of the cycles of visibility and invisibility of the celestial Serpent. I would suggest for this purpose that we consider the head of the Serpent since the head is crucial in determining the time and place of the emergence and reentry of *Mach'acuay*. The heliacal rise of the head of the Serpent occurs during the first week of August; its heliacal set occurs during the first week of February. Related to the latter date is the observation that *Mach'acuay* stands along the north/south meridian (i.e., at its zenith point) at midnight on February 1st. When we recall that the most intense period of rain in the Andes occurs between the months of December and February and that the planting period begins at the beginning of the change from dry to rainy in August, it is apparent that the periodicity of the celestial Serpent's rising out of the earth and its reentry into the earth during the night brackets the rainy season. In effect, the celestial Serpent, like meteorological serpents, emerges from the earth with the warm/rainy season and reenters the earth at the beginning of the dry/cold season. In addition, we have found that the principal serpent of the Dept. of Cuzco (above 12,000 ft.), *T. peruviana*, gives birth to its young in September–October, just after the onset of the warm/rainy season.

In this first analysis, then, we can suggest that Polo de Ondegardo's statement concerning the responsibility of celestial animals for their terrestrial counterparts, refers to the easily observable, and cosmologically important correspondence between the periodicity of the presence and absence of terrestrial, celestial, and meteorological reptilian fauna in the universe.

Hanp'atu ("toad")

That the celestial Toad appears to "pursue" the Serpent across the sky is ironic in light of the fact that snakes are the greatest predators upon toads and frogs. While certain toads are occasionally known to get the better part in combats with snakes (*cf.* Noble, 1931: p. 383), this is by no means the usual outcome. In Quechua, a distinction is made (as in our own classification of the amphibia) between the more aquatic frogs (= *ococo*, *k'ayra* and *ch'eqlla*) and the terrestrial toads (*Hanp'atu*). We will be concerned here primarily with toads rather than frogs since every reference I have collected myself, or have encountered in the literature, regarding a celestial amphibian has been in relation to *hanp'atu*, the toad (*cf.*, Roca 1966: p. 43; Cobo, 1964, v.1: p. 352; and Gonzalez Holguin, 1952).

The principal Andean toad is *Bufo spinulosus*. *B. spinulosus* which is very resistant to dryness and altitude, breeds principally at the onset of the rainy season in permanent bodies of water (Fig. 6). The range of *B. spinulosus* in South America extends along the cordilleras southward to −43° latitude; the altitudinal range to which they are adapted varies between 1,000–5,000 meters (Cei, 1972: p. 83).

In a study of the behavior of assorted fauna on the plain of Anta (west of Cuzco), Demetrio Roca recounts that in addition to the name *hanp'atu*, toads are also referred to by the following names: *Pachakuti*—"turning of the earth"; *Saqra*—"devil"; *Pachawawa*—"earth child"; and *Jacinto*—"hyacinth" (Roca, 1966: p. 45).

Toads are called "devils" (*saqra*) because they were created by the devil; because they foretell bad luck when seen (Cobo, 1964, **1**: p. 353); and because they are used in the malevolent practices of witches (Roca, 1966: p. 45). The two terms *pachawawa* and *pachakuti* are important for our study because they refer to the common habit of toads to burrow within the earth during the dry/cold season and, like *mach'acuay*, to reemerge with the warm/rainy season (*cf.* Noble, 1931: p. 421; and Grzimek, *et al.* 1974: pp. 360–367). It is also important to note that amphibia are most active at night when the humidity is much greater than during the day. Therefore, toads are the "children of the earth" (*pachawawa*) in that they hibernate within, and later emerge from, the earth. This cyclical entry and reemergence, coinciding with the cycling of the dry/cold and warm/rainy seasons is a behavioral pattern well-described by the name *pachakuti* ("turning of the earth").

From his fieldwork and observations of the behavior of toads on the plain of Anta, Roca gives us the following description of this cycle of subterranean hibernation:

> The earth is alive during the month of August, being intensely animated by the toad or *pachakuti* which emerges from the interior of the earth in great numbers. It is noted

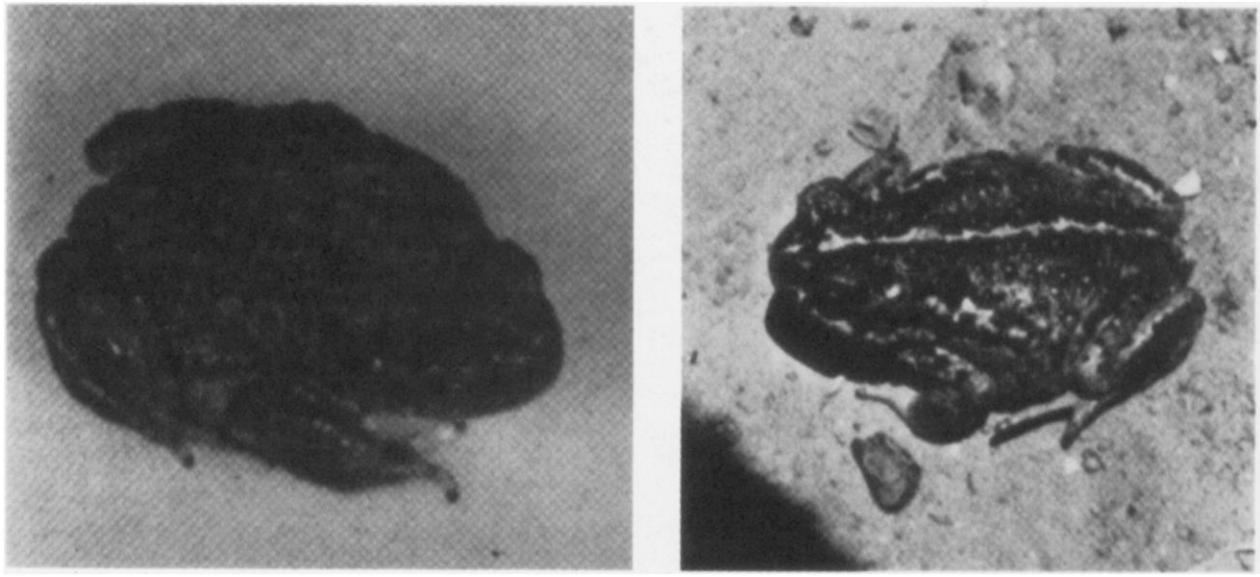

FIG. 6. Two Varieties of B. spinulosus (from Blair, 1972: plate II).

in the plain (of Anta) that beginning in the month of May, wide deep cracks appear in the earth through which the toads return to the womb of the earth, reappearing in the month of August (Roca, 1966: p. 42; my translation).

After the initial emergence of the toads in August, their behavior (mating, croaking, etc.) is observed closely for divinatory purposes:

If in the months of September and October they croak day and night in great numbers, it is an augury that there will be much rain and, as a consequence, the crops will be abundant; but, if during these months they croak only a little and softly, it is a sign that it will not rain and that the frosts will be strong (Roca, 1966: p. 58—59; my translation).

In addition to a divinatory connection between toads, weather, and the crops, toads are also related to agriculture because at the beginning of the planting season in August, toads encountered in great numbers indicate that the year's crop will be abundant; if only a few small ones are encountered, the crop will be small (Roca, 1966: p. 59).

If we now summarize the cyclical behavior of toads, we arrive at the following calendar of activities in relation to agriculture and the seasonal cycle (fig. 7). In this "calendar of toads and agriculture," we see a very close coincidence between the cycles of agriculture and amphibian behavior. The points of transition occur along the temporal boundaries defined by the cycling of the cold/dry season and the warm/rainy season. As we have found earlier in our discussion of *Mach'acuay*, a similar correlation is found in the relationship between the seasons and the terrestrial, meteorological and celestial reptilian fauna.

The dark cloud constellation of *Hanp'atu* (*cf.* figure 1) is a small patch of inter-stellar dust in the Milky Way which moves between the tail of *Mach'acuay* and the Southern Cross. If we consult a celestial globe, we find that during the first days of the month of October (i.e., at the time of the mating period of terrestrial toads), *Hanp'atu* rises about one and one-half hours before the sun; thereafter, *Hanp'atu* will rise progressively earlier than the sun each morning. In effect, the celestial toad rises into the sky in the early morning just after terrestrial toads have emerged from their long period of subterranean hibernation and just at the time of their most intense croaking and mating period.

Yutu-(tinamou)

Near the center of the line of Dark Cloud constellations, at the point where the Milky Way flows nearest to the south celestial pole, sits the Tinamou (*Yutu*). The *Yutu* of Quechua astronomy is equivalent to the Western constellation of the Coalsack, one of the few dark spots recognized, and named, in our own system of astronomy.

The partridge-like birds called *Yutu* (Quechua) and *Tinamou* (Carib), resemble game-birds with their short legs, compact bodies and small heads with slender necks (fig. 8). There are some 9 genera and 43–45 species of Tinamous distributed throughout South America and northward to the Tropic of Cancer (*cf.* Grzimek, 1972: p. 82; and Lancaster, 1964*a* and *b*).

The range of vertical habitat of Tinamous is from the tropical rainforests up to the high, cold puna-land of the Andes (*cf.* de Schauensee, 1970: pp. 3–9; Roe and Rees, 1979: pp. 475–476; and Traylor, 1952). Tinamous eat mostly seeds and fruits, although they are occasionally known to swallow small animals whole. Lancaster, for instance, observed Tinamous eating frogs and lizards on several occasions (Lancaster, 1964*a*: p. 171). This observation is especially interesting in the present context since the Dark Cloud

constellation of the Tinamou (*Yutu*) "pursues" the celestial Toad through the sky. In a somewhat less antagonistic characterization, one Quechua informant described to me the nightly race between the Toad and the Tinamou. The Toad, said the young woman, always wins the race and therefore, her husband likes to characterize himself as a Toad in opposition to others who are Tinamous.

The characterization of the *Yutu* as a slow animal in relation to other celestial animals is based perhaps not only on these nightly celestial races, but also on the terrestrial behavior of Tinamous. Tinamous are notoriously slow, "stupid" birds (*cf.* Cobo, 19, vol. **1**: p. 321). Not only are they disinclined to flight, but when flushed, they fly low and poorly. Long ago, W. H. Hudson made the following observations on the flight of Tinamous:

> The Tinamou starts forward with such amazing energy, until this is expended and the moment of gliding comes, that the flight is just as ungovernable to the bird as the motion of a brakeless engine, rushing along at full speed, would be to the driver. . . . In the course of a short ride of ten miles, I have seen some of these Tinamous dash themselves to death against a fence close to the path, the height of which they had evidently misjudged. I have also seen a bird fly blindly against the wall of a house, killing itself. (quoted in Knowlton, 1909: 78–79).

In fact, the most common reaction of the Boucard Tinamou when startled is not to fly but rather to do nothing, to simply "freeze" (Lancaster, 1964*a*: p. 171). Barring escape by freezing or flying, a Tinamou hard-pressed in open country will often crawl into a hole dug by another animal.

Aside from the above "un-bird-like" features which no doubt make the Tinamou a noticeable part of the bird population in Andean communities, there are a number of additional characteristics which may contribute to its celestial projection in the form of a Dark Cloud constellation. First, Tinamous are distinctive in their solitary, unsociable nature. They are rarely found in coveys, either with members of their own or other species. This unsociable or solitary behavior is extended to breeding and incubation habits. Males begin calling in the early mornings and late evenings at the beginning of the mating season. This pattern increases until the height of the breeding period after which time calling begins to subside. During the breeding period, males attract a number of females by their persistent calling. The females all lay their eggs in the male's nest and depart, wooed to the nest of another male by the flute-like whistle of the male Tinamou. After the several (2–5) females have deposited their eggs in the nest, the eggs are incubated by the *male* (Grzimek, 1972: p. 84).

Thus, unlike most birds, Tinamous are solitary and polygynous, and the typical male/female roles in incubation are reversed. The Tinamou is therefore a model not only of bad social behavior, but in their breeding habits, they exemplify what would be extremely undesirable reproduction habits if practiced by humans, i.e., inconstancy in mating and the abandonment of the children by the mother.

Before leaving the Tinamous of the earth to describe those of the sky, we should mention one other unusual feature; the eggs of the Tinamou: "They [the eggs] may be green, turquoise-blue, purple, wine-red, slate-gray or a chocolate color, and they often have a purple or violet lustre." (Grzimek, 1972: p. 85).

Thus, Tinamou eggs are like segments of a rainbow, cast in an oval and placed in a nest. In the mythology of the Desana Indians, Tinamous are believed to have been the sole survivors of a world fire and were responsible for preserving, through their eggs, all the colors of the rainbow (Reichel-Dolmatoff, 1978: p. 280). One might say, then, that Tinamous lay rainbows, and the Dark Cloud consellation of the Tinamou is located at the center of the arc of the Milky Way which, in Quechua thought, is considered equivalent to a nocturnal rainbow (*cf.* Urton, 1979: pp. 142–143). Therefore, we find in the example of the Tinamou the elaboration of an idea which appeared with the celestial Serpent (*Mach'acuay*); that is, the equation of a celestial dark spot with the rainbow, an equivalence of black and multi-colored.

As mentioned earlier, the Dark Cloud constellation of the *Yutu* (*cf.*, fig. 1) is located at the foot of the group of stars which, in Western astronomy, is known as the Southern Cross (*Crux*). Therefore, the astronomical periodicities of the Southern Cross will be virtually identical to those of the *Yutu*. The heliacal rise and set dates (September 3 and April 22, respectively) of the principal star of the Southern Cross, α

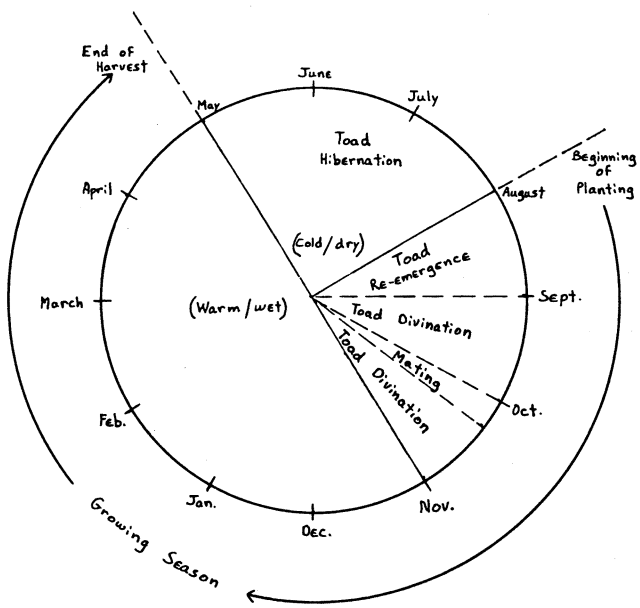

FIG. 7. A Calendar of Toads and Agriculture.

FIG. 8. Varieties of Tinamou (from Blake, 1977: Plate 1).

Crucis, give a very close approximation of the agricultural season in the Andes. In addition, α Crucis and the *Yutu* transit the upper meridian on the morning of the December solstice sunrise, and on the morning of the June solstice they are transiting the lower meridian. Phrased another way, the *Yutu* is at its zenith point on the morning of the December solstice, and it is at its nadir point on the morning of the June solstice. The periodicities of the *Yutu* therefore relate the celestial animal both to agriculture and to the solstices.

The mating season of Tinamous in the Cuzco area is not reported in the literature. However, the breeding season of several varieties of Tinamous in the northern hemisphere extends from February through April (*cf.*, Pearson, 1955; and Friedmann, 1950). This period, in the northern hemisphere, is related to the onset of longer days, warmer weather, and the approach of the rainy season following the December solstice. Skutch has shown that "birds transported across the equator seem to adapt their nesting to the season appropriate to their new environment" (Skutch, 1976: p. 72). Thus, when translating the factors related to the breeding season of northern hemisphere Tinamous to the high Andes of the southern hemisphere (that is, lengthening of the day and the onset of the warm/rainy season) we arrive at a period of a couple of months after the *June* solstice, i.e., July through early September. Another factor related to the beginning of breeding in birds is the increased availability of food, a condition which is met for the seed-eating Tinamous not only by the beginning of the rainy season, but also by the August-September planting of seed-crops such as maize.

In his description of the various Incaic agricultural duties of the year, Guaman Poma records the times when the crops must be guarded from birds and animals; the guard duties begin with the planting in late August and end with the harvest in early May. If we combine, in a single calendar, the times when Guaman Poma mentions explicitly the need to guard the crops (Guaman Poma, 1936: pp. 1130ff.) with the times of the heliacal rise and set dates of the celestial Tinamou, we arrive at the close correlation shown in figure 9.

When we compare this figure to the earlier calendar of toads and agriculture, and to the data which we discussed earlier concerning the relationship of rainbow/Serpents and the rainy season, we can understand the larger set of associations between agriculture, rainbows and the celestial Tinamou. Rain, and therefore rainbows, occur in the southern Andes primarily during the period from September through April. As we see in figure 9, this is also the period of time when the celestial Tinamou is in the sky. The beginning of the calendrical correlation between the celestial Tinamou and the crops is also related to the breeding period of terrestrial Tinamous, and the total span of the calendar (i.e., from September through late April) is the total period when terrestrial Tinamous represent a threat to agriculture.

Llama

Perhaps the most conspicuous Dark Cloud constellation, since it virtually fills the sky overhead during the rainy season, is the Llama. We are in a considerably stronger position when we discuss the symbolic and ritual associations of the Dark Cloud Llama since the Spanish chroniclers were much more explicit in their descriptions of this animal and its relation to Inca rituals (the reader is referred to the article by Zuidema and Urton, 1976, for a more complete discussion of the ethnohistorical material). As our concern here is primarily with the relationship between constellations and the "procreation and augmentation" of animals on the earth, we will confine our discussion to a comparison of the biological and astronomical cycles of terrestrial and celestial llamas.

As Professor John Murra has demonstrated so well through the ethnohistorical documentation (Murra, 1965), the llama has for sometime been an essential animal in Andean life. In Inca times, the llama was used primarily as a beast of burden but it also provided meat for food, wool for clothing, dung for fertilizer, and it was, and still is, considered an appropriate gift to the gods in the form of a sacrifice (fig. 10).

The breeding period of llamas begins in late December and the gestation period lasts 11 months. Llamas begin to give birth from late November to early December with the birthing period ending in March. Llamas, and the closely related camellid alpaca, give birth between 6:00 a.m. and 12:00 noon (Dr. Jorge Velasco N., personal communication, 1977). Thus, for Andean pastoralists, the early morning hours of the rainy season in December are important times for caring for newly born calves and for attempting to ward off predators such as the fox.

For the herder who rises early in the morning during the birthing period, an especially fortuitous sight will be the appearance, over the southeastern horizon, of the two bright stars α and β Centaurii. In Quechua astronomy, α and β Centaurii are referred to as *llamacñawin* ("the eyes of the llama"); they are the first part of the huge body of the llama to appear over the horizon. After the heliacal rising of the eyes of the llama in late November, the eyes and the body rise progressively higher in the sky each morning until, in late April, at the end of the birthing season of llamas, the Dark Cloud constellation of the Llama stands along the north/south meridian at midnight.

Llamas were also incorporated in the Inca calendar system in the form of sacrifices which were made at fixed intervals during the agricultural season. Brown and brownish-red llamas were sacrificed from August to September at the beginning of the planting season. White llamas were sacrificed and black ones were tied to a post and starved to death to induce rain and

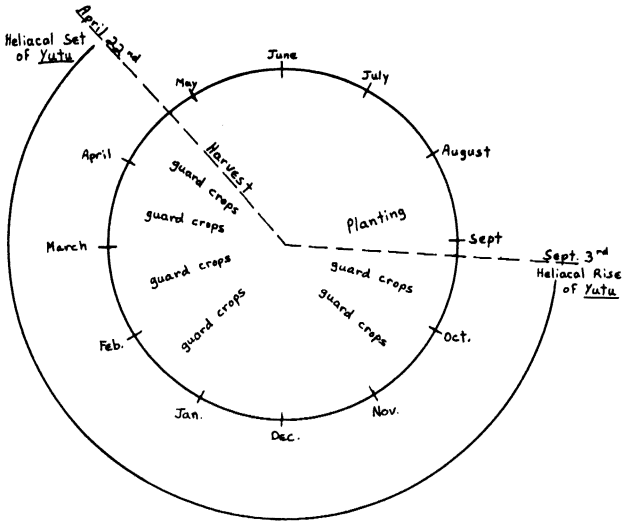

FIG. 9. A Calendar of Tinamous and Agricultural Guard Duties.

FIG. 10. Llamas (*L. peruana*) (from Walker, 1964, **2:** p. 1375).

growth of the crops, and multi-colored llamas were sacrificed at the time of the harvest in late April, early May (Polo de Ondegardo, 1916, chapter 6).

The black llamas which were starved in October and the multi-colored ones sacrificed in April–May are of special interest in our study because the dates which they mark in the calendar define an important solar axis in the Inca calendar. It has been shown (Zuidema and Urton, 1976: p. 86) that the inferior culmination of α and β Centaurii at midnight on October 30 was coupled with the zenith sun (which occurs on the same day) as a way of fixing the solar dates for the initiation of young Inca nobles one month later in late November. The superior culmination at midnight of α and β Centaurii in April occurred on the same night that the sun stood in the nadir at midnight. Thus, the alternation of the superior and inferior culmination at midnight of the eyes of the Llama was seen in relation to the alternation of the zenith and nadir sun in October and April and these dates were marked in the ritual cycle by the sacrifice of black and multi-colored llamas. Francisco de Avila, who wrote an account of the beliefs and customs of the Indians of the community of Huarochirí in the early seventeenth century, has given us a description of the Dark Cloud constellation of the Llama in which we find explicit references of the Llama descent to the earth at midnight. The Llama drinks the waters of the swollen rivers at the beginning of the rainy season, she is then shorn of her wool which turns out to be multi-colored despite the fact that Avila describes her as having the color of a shadow, and finally she returns to her position in the celestial river (Avila, 1966: cap. 29). Therefore, we find in the case of the llama the same theme of dark and multi-colored symbolism which has appeared earlier and we also find the correlation of a Dark Cloud constellation with rain and the sun.

Atoq ("fox")

The South American fox (*Dusicyon culpaeus*) inhabits wooded, hilly country ranging up to 4,000 meters in the Andes (fig. 11). Most of the six South American fox species are nocturnal hunters which may contribute to their projection in the dark clouds of the night sky. The diet of the fox is omnivorous and includes birds, rabbits, frogs, toads and an occasional sheep. In addition, Franklin, in a study of the "Social Behavior of the Vicuña," reports that foxes prey both on adult and baby vicuña. The vicuña defense against attacks by foxes is "group mobbing" (Franklin, 1974: 486). In fact, we have an excellent description of the group mob of vicuñas on foxes in the seventeenth-century chronicle of Bernabé Cobo:

> There are usually a large number of foxes where vicuñas live; and the foxes chase and eat the young of the vicuñas. The vicuñas defend their children in the following way. Many vicuñas rush together to attack the fox, striking it until it falls to the ground. They then run over it many times without giving it a chance to get up until they kill it by their blows. The cries of the miserable fox are useless as he succumbs to the feet of the vicuñas. (Cobo, 1964, **1:** p. 368).

When we note the position of the celestial fox in relation to the baby llama and the hind legs of the mother llama (fig. 1), we would appear to have fixed in the clouds of interstellar dust in the Milky Way this well-recorded motif of pursuit and trampling. Like the Tinamou, the fox has a tendency to freeze when endangered. There is one account of such a "frozen" animal being approached by a man and remaining motionless even when struck with a whip-handle (Walker, 1964, **2:** p. 1160).

The mating season of foxes falls in mid-winter; in South America, the season extends from late June through September (*cf.* Ewer, 1973: p. 309). With a

gestation period of around 10 weeks, baby foxes generally appear from October through December. In the community of Misminay, it is commonly believed that foxes give birth principally on one day of the year: December 25, four days after the solstice. In addition, the *runa* of Misminay pinpoint exactly the spot where baby foxes are born every year. It occurs, they say, on the side of a nearby mountain called Wañumarka ("Storehouse of the Dead"); at a point which is precisely the setting point of the *June* solstice sun as viewed from the community. However, as we will see below, the solsticial relation of foxes goes beyond their birth near the time of the December solstice sunrise at the place of the June solstice sunset.

The Dark Cloud constellation of the *atoq* (Fox) is a rather amorphous dark spot which stretches at a right angle from the tail of Scorpio crossing the ecliptic between the Western constellations of Scorpio and Sagittarius. The importance of this celestial position is that as the sun travels along the path of the ecliptic throughout the year, it "enters" the constellation of the fox at the time of the December solstice. Therefore, as the sun rises in the southeast with the constellation of the fox around the time of the December solstice, terrestrial foxes are born on the earth in the anti-solsticial direction (that is, in the direction of the *June* solstice sunset; see fig. 12).

If we extend this solsticial/fox analysis further, we find that the other passage of the sun through the Milky Way occurs at the time of the June solstice, the time when the sun sets on the side of the mountain Wañumarka. Therefore, since we have found earlier that the breeding season of foxes begins in late June and baby foxes are born in December, the life cycle of the fox is directly associated not only with the sun in its two solstice positions, but also with the times and places of the intersection of the sun with the celestial river, the Milky Way.

Conclusions

Aside from the close correlation which we have found between biological and astronomical phenomena in these data, the Dark Cloud animal constella-

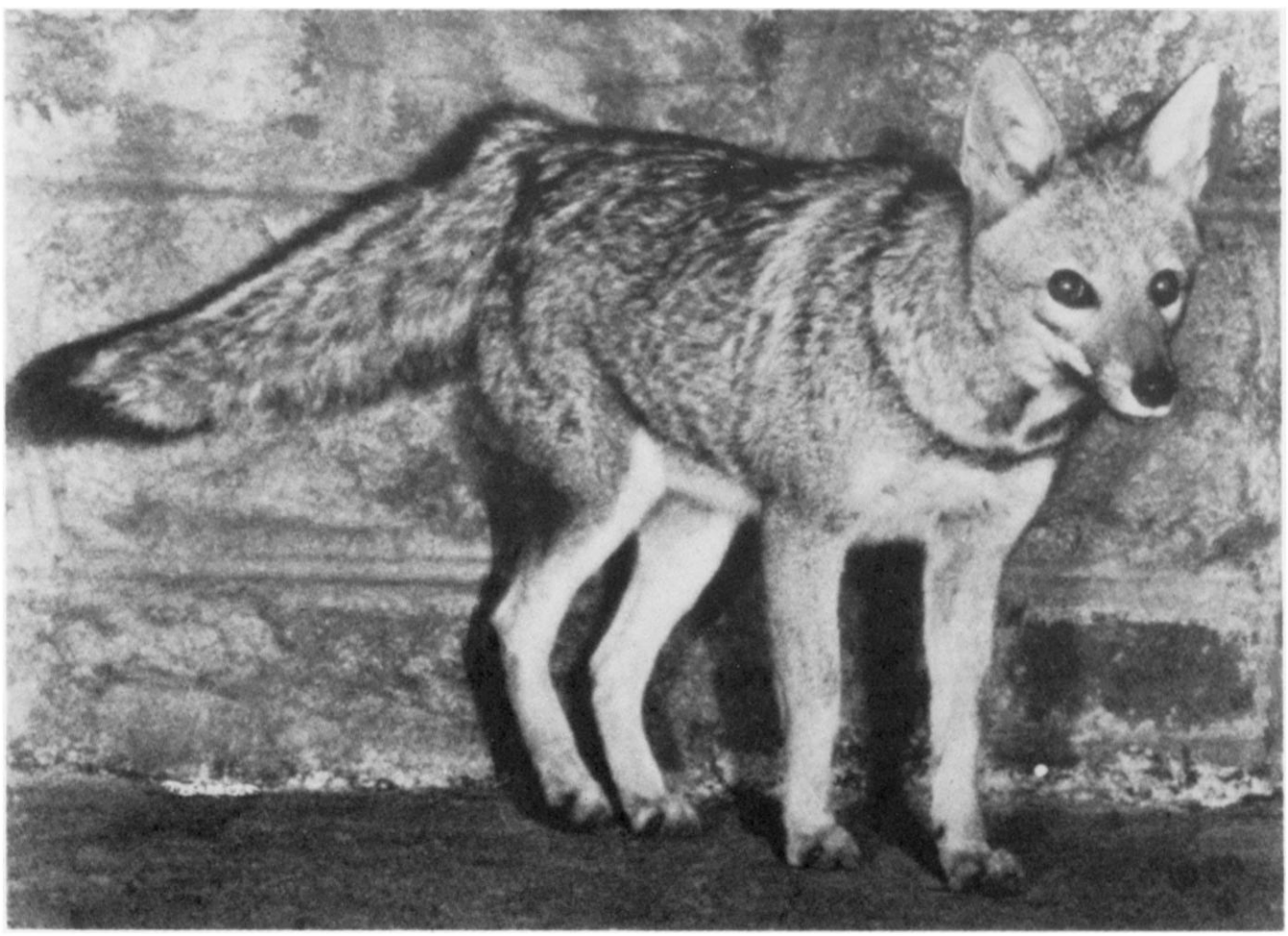

FIG. 11. South American Fox (from Walker, 1964, **2**: p. 1160).

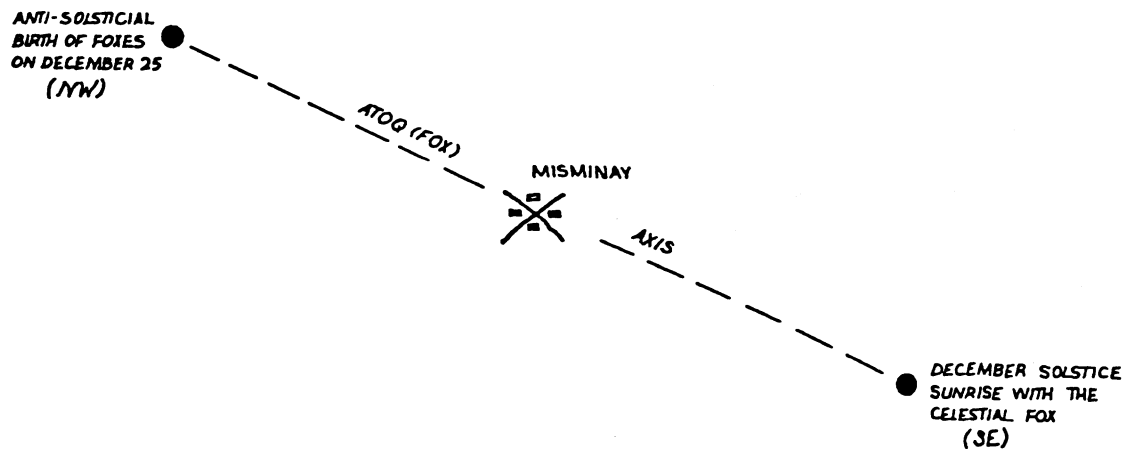

FIG. 12. The Axis of the Fox (from Urton, 1979: p. 108).

tions serve as the focus for a number of important classificatory and symbolic principles in the Quechua universe. Principal among these are color (dark, light and multi-colored); fertility (the cosmic circulation of water, *pachatira*, animal procreation, etc.); and orientation. The latter is seen primarily in the relationship between rainbows, the Milky Way (as a nocturnal celestial river) and the sun. In the section on the *atoq* (fox), we saw a coincidence in the orientations of the sunrise points of the solstices, as viewed from the community of Misminay, with the orientations of the two axes of the Milky Way during the early evenings at the times of the solstices. These coincidences are diagramed in figure 13.

On the evening of the June solstice, when the sun sets in the northwest, the Milky Way will slowly begin to appear in a line stretched across the sky from the northeast to the southwest (i.e., it will form an arc *opposite* the sun). At the time of the December solstice, the sun sets in the southwest and the Milky Way is seen as a celestial arc running from the northwest to the southeast. Thus, as illustrated in figure 13 on the evenings of the solstices the Milky Way is seen as an arc opposite the setting sun. This, in fact, is exactly the same relationship that exists between rainbows and the sun; rainbows are always seen as arcs (or circles) stretching across the sky directly opposite the sun. Therefore, rainbows and the Milky Way may be equated and opposed to the sun not only because they are continuous arcs passing through the sky, but also because there is a consistently observable relationship between the sun and the celestial arc. In his studies of tropical forest astronomical symbolism, Prof. Lévi-Strauss has described a similar pattern of relationships among the sun, rainbows, the Milky Way and the moon (Lévi-Strauss, 1979: pp. 110–113).

These observations suggest then a synchronized pattern of celestial and meteorological lines and points of orientation which are in constant motion but which retain, throughout the annual cycle, a persistent, internal pattern of oppositions; as the sun moves south, the arcs of rainbows and the Milky Way rotate slowly

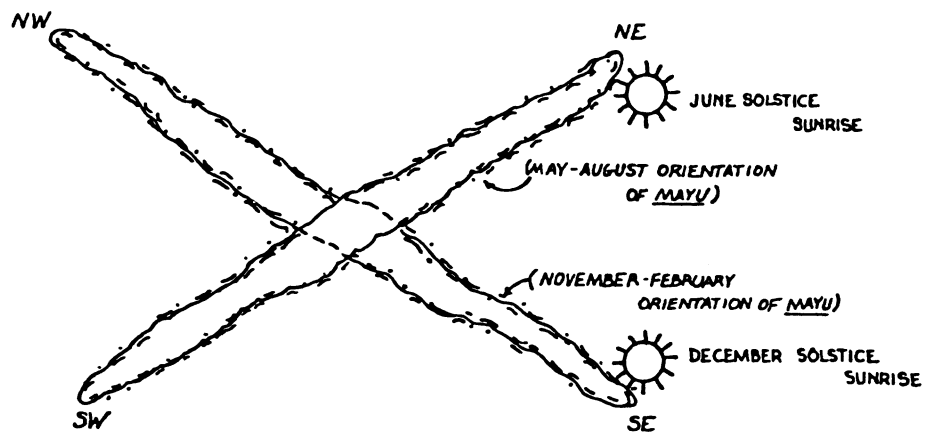

FIG. 13. The Solstices and the Seasonal Axes of the Milky Way (from Urton, 1979: p. 94).

northward so as to maintain their opposition to the sun. This implies as well that the seasons are not determined by the sun alone but also by celestial arcs of a certain orientation at a certain time of the day, night, or year (fig. 13).

One other major conclusion which we can draw from the material presented in this paper concerns a similar system of correlations, that between the cyclical behavior of animals in the Andes and the astronomical cycles of the Dark Cloud constellations. The universe of the Quechuas is not composed of a series of discrete phenomena and events, but rather there is a powerful synthetic principle underlying the perception and ordering of objects and events in the physical environment. This principle is clearly seen in operation in Quechua astronomy and cosmology, and I would suggest that with a slightly different orientation in our studies, a shift from astronomy to iconography, we could develop a more coherent approach to the study of animal motifs in Andean art from Chavin times onward. At the least, it is hoped that our exegesis of one short sentence from the chronicle of Polo de Ondegardo has contributed toward an understanding of his observation that, ". . . in general, they believed that all the animals and birds on the earth had their likeness in the sky in whose responsibility was their procreation and augmentation" (Polo, 1916: cap. 1).

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