

Honoring Indigenous Knowledge: Linking Native American Cultural Astronomy with Meteorology and Raptor Migration

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Our world today is coming together as a global society while splitting apart into ever smaller ethnically-defined communities. These rather different social movements created a transnational community of international anthropologists and indigenized anthropological research at home. As a result there now exists a tension between what has been called “metropolitan provincialism” and “provincial cosmopolitanism” (Ribeiro and Escobar 2006: 13). *Metropolitan provincialism* on the part of anthropologists from hegemonic centers (such as the United States, Britain, and France) is their ignorance of the knowledge and practices of anthropologists located in non-hegemonic centers (such as Malaysia, India and Brazil). *Provincial cosmopolitanism* is the knowledge people in non-hegemonic locations have of the anthropological production that takes place in hegemonic centers. These changes have decentered the prior world system of anthropology.

In the late 1980s, practitioners of anthropology, linguistics, and education—together with those in the related fields of history, geography, political science, and cultural studies—began transforming themselves by listening to and learning from non-hegemonic and Indigenous people. The new literacy and science studies of the past two decades brought to light the language, literacy, and scientific knowledge of both non-hegemonic and Indigenous peoples worldwide (Hornberger 1997). The field of Indigenous Studies further strengthened its intellectual ties to anthropology by interweaving Indigenous ways of knowing with Western epistemology.

The Tongan cultural anthropologist Tēvita O. Ka’ili (2012), like Epeli Hau’of, a Fiji Islander anthropologist of Tongan descent (2008) before him, empowered Pacific peoples by calling the geographical region of the world in which they lived Oceania, or “sea of islands.” As *Moana* or “Oceanic” anthropologists, they share an ambivalent relationship with both the English language and anthropological theories. Ka’ili pointed out that his mentor strategically interwove indigenous meanings with English words in order to emphasize the vastness of the ocean, thus countering the image of the smallness and thus the unimportance of their individual nations. By interweaving indigenous with anthropological perspectives, they created a new more balanced pattern for anthropology.

Native Hawaiian anthropologist Ty Kāwika Tengan also interweaves indigeneity with anthropology. He is currently considered a leader in developing Indigenous anthropology. In his field research he involves Kanaka Maoli, “Indigenous Hawaiians” as active producers of anthropological discourse rather than as passive objects of the anthropological gaze. By combining Oiwi Maoli or “indigenous practices” with anthropological ones, he conducts research in ways that are relevant, responsible, and respectful to his co-producers of anthropological data and knowledge (Tengan 2005).

Indigenous ways of knowing are based on languages and other cultural practices passed on from generation to generation. It is by knowing both the inner and outer landscape that holistic relationships become rooted in language and culture.

As a result, Indigenous people's perceptions of the environment and their relationships with it become central elements in the formation of their cultural identity as well as the base of their Indigenous literacy and science.

Indigenous and Western Science

The Tewa scholar Gregory Cajete (2000: 78), from Santa Clara Pueblo in New Mexico, developed a working definition of Indigenous science as a body of environmental and cultural knowledge unique to a group of people which has sustained them through generations of living within a specific bio-region. He pointed out that Indigenous science developed by using the same methods as Western science: questioning, observing, interpreting, and predicting. The main difference between Indigenous and Western science is that Indigenous science operates from a "high-context" point-of-view, including all relational connections, while Western science operates from a "low-context" point-of-view, reducing context to a minimum (Cajete 2012: 109-111).

A further difference is that the Indigenous environmental worldview depends on a logic that is active and dialectical rather than static and rationalistic. In many Native American languages, the terms for east and west indicate a line or vector along which the sun rises, crosses the sky, and sets. The other two common directional terms, only roughly equivalent to north and south, indicate the direction of prevailing winds, highland and lowland, above and below, as well as zenith and nadir. Thus, words indicating the directions ought not be glossed and interpreted as though they were identical with Western cardinal or intercardinal compass points, which are frozen in space and time. Rather they ought to be described in terms of sides, lines, vectors, or trajectories that are inseparable from the movement of the Sun, Moon and stars, and thus the passage of time.

Among the Indigenous peoples living in the American Southwest and Mesoamerica, the celestial paths of the Sun, Moon, and stars are conceived of as cosmic forces whose interactions are responsible for transitions in time, climate, and agricultural cycles. Here the metaphors for cosmic order are based on principles of movement, transition, and reversibility. A key concept is "the center place," or Axis Mundi, around which cosmological forces circulate. It is variously expressed as a world tree, a standing human being, or a cosmic mountain. This vertical axis is surrounded by a circulating flow of energy consisting of opposing dynamic principles, which create and maintain the dialectical tension necessary to maintain both order and motion.

Ethnographers, in past studies of Indigenous Andean and tropical forest astronomical symbolism, noted connections between Indigenous astronomy and directional orientation. While they observed the appearances, disappearances, and paths of the Sun, Moon, and stars in timing agricultural activities; they did not discover the relationship between these events and the important role of raptor migration (Zuidema 1977; Urton 1978, 1980; Isbell 2008).

Indigenous Astronomy, Meteorology, and Hawk Migration

Thirty-three species of North American raptors or diurnal birds of prey—including hawks, eagles, and falcons—have been recorded annually migrating thousands of kilometers between their breeding grounds in the north and their wintering areas in the south (Zalles and Bildstein 2000). To accomplish this, they flock together in groups of hundreds, thousands, and even millions of individuals. Each autumn, more than seven million raptors travel south along a 10,000 kilometer system of regional corridors that stretch from central Canada down through the American West, over New Mexico, Mexico, and Panama and ending deep within South America. This major route, known as the "Trans-American Flyway" (Bildstein 2006: 147-150), consists of an overland system of regional corridors: Eastern, Prairie, Rocky Mountain, and Intermountain, converging in Mesoamerica (figure 1).

Annually in the spring, many of these migrants retrace their southward fall journeys. However, there are slight variations in their routes, due to seasonal meteorological differences. Indigenous Peoples living in Mesoamerica have observed that returning migrants are more likely to track along the Caribbean slopes of central Panama instead of along the Pacific Rim as they did during their autumn migration. Likewise, in the American Southwest, most returning Swainson's Hawks migrate west of their outbound routes. This is due to easterly wind drift in northeastern Mexico and to two north-south mountain chains: the Sandias and Manzanos in New Mexico. These mountains create paths, or flyways, with beneficial updrafts of hot air providing effortless soaring along the ridges for large raptors.

The tendency to aggregate on migration routes varies across species. For example, although Swainson's Hawks are territorial during their breeding season, they become gregarious at other times of year because of the advantage of group foraging efforts for locating the unpredictable but locally abundant rodents and insect prey. Broad-winged Hawks (*Buteo platypterus*) aggregate in huge numbers during migration to capitalize on thermals, or large "bubbles" of hot air that they rely upon for energy-saving lift during their long migratory journey to Central and South America.

The Sandias and Manzanos are in the historical territory of Pueblos of the Tanoan language group (Lippard 2010). Tanoans are known to make observations of stars and the movements of the sun's rising and seasonal positions from circular shrines on hilltops, as described by the Tewa anthropologist Alfonso Ortiz for the Tewa-speaking Pueblos to the north of the Sandias (Ortiz 1972 and 1975). Such shrines also exist at Tanoan archaeological sites closer to the Sandias (Lippard 2010). I have documented such a shrine at the fifteenth-century ruins of Pueblo Shé (figure 2), east of the Sandias and within sight of them. The evidence for the observations of raptor migration in the same region comes from a story told at the Pueblo of Isleta, close to the west side of the Manzanos (Parsons 1932: 386-390). In two versions of the story, "How they began to race for the Sun," a hawk races against a deer. Hawk has the power to make the day sunny and exhaust the deer with the intense heat. Deer, on the other hand, has the power to make the day rainy, forcing Hawk to roost in a tree. This is an allegory of the problem hawks face during their migrations, which is to soar on thermals early enough in the spring and late enough in the fall to avoid being grounded by thunderstorms.

Although past ethnographers reported a connection between astronomy and meteorology in the Americas, there has been little agreement concerning the nature of the correlation. While the appearances, disappearances, and paths of the Sun, Moon, and stars have been described as useful in timing agricultural activities, the precise relationship between these key events and raptor migration have not yet been carefully investigated. The reason for this lack of attention may be that astronomy, the study of the universe outside earth's atmosphere, and meteorology, the study of weather inside the earth's atmosphere, are rarely researched by scientists in the same discipline.

My ethnographic research in the American Southwest and Central America has shown that the change of season from cold and dry to warm and wet and back again is heralded by the migratory flights of mixed flocks of Broad-winged and Swainson's hawks. Over a period of approximately two months during spring and fall, flocks consisting of from 2,000 to 4,000 of these raptors make their 13,000-16,000 kilometer flight from the pampas of Argentina to their breeding grounds in Alaska then return south. They soar together so tightly packed on updrafts that in Central America, they can block out most of the sun's rays in the same way that a partial or total eclipse of the Sun might. The most spectacular flights occur in close conjunction with intense low-pressure areas, or storms, during both spring and fall. Most of what we know today about the migration ecology of diurnal raptors in New Mexico comes from long-term studies in the Sandia Mountains just east of Albuquerque (spring study) and the Manzano Mountains about thirty-five miles farther south (autumn study). These north-south mountain ranges are examples of leading-line landscape features that migratory raptors often follow.

They serve as navigational aids for long-distance migrants, and typically produce strong wind-driven updrafts that migrants ride for long periods of time with little effort.

During their annual northern migration in March, Broad-winged and Swainson's hawks are referred to by K'iche' Maya speakers in Guatemala as *torol k'alaj*, or "openers of the rainy season." They received this name because they are perceived as "lifting" the asterism known as the Southern Cross (figure 3) out of the sea and carrying it with them above the horizon, bringing rain with them as they fly. In Central America Acrux, the brightest star is the southernmost first-magnitude star which can be observed in late February about eleven o'clock at night on the southeast horizon. By late March, it can be seen lying along the horizon about nine o'clock in the evening. It is not until after the flocks of Swainson's and Broad-winged hawks have passed overhead and lifted the Cross out of the sea that it can be seen shortly after sunset from hilltop observatory shrines in highland Guatemala.

From these shrines, hawks may be observed flying before thunderstorms and squall lines located in front of advancing cold fronts. On April 7, 1976, during my initial field research in highland Guatemala, thousands of hawks flew over Momostenango (the Mayan community in which I was living). The next day we learned from one of our Mayan teachers that he had just finished sowing his corn kernels and that rainfall would soon enable him to have a good sprouting. The first rain came within two weeks. He also told me that when the hawks passed over again, in October, they would drop the Bent Cross (figure 4), another Mayan constellation, into the sea, thus bringing the rain to an end. At that time Mayan farmers use the Spanish slang name *asaquanes*, meaning "drought-bringers," to designate these raptors. Upon seeing this hawk flight, many farmers rush into their cornfields and bend over the stalks, causing them to dry and thus ripen more quickly, making them ready for winter storage.

Conclusion

The multidimensional, relational, experiential, local, and land-based aspects of place provide particular contexts that have not only unique but also common elements. Spirituality provides connectivity and is important in understanding both philosophical and pragmatic elements. Place ebbs and flows. It is dynamic and organic: rooted in the cultural traditions and scientific knowledge of particular Indigenous peoples. Identity is intimately connected to place and might be thought of as the soil from which all living things grow, thrive, and regenerate. While seeds may flow into new areas, they may not survive if the new location is too different from the source, or they may form new communities that begin as fragile groups and can be strengthened, given the right conditions. Connecting Indigenous learners to holders of traditional knowledge assists them in understanding their relationship to place and to the people of place.

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Figure: 1



Figure: 2

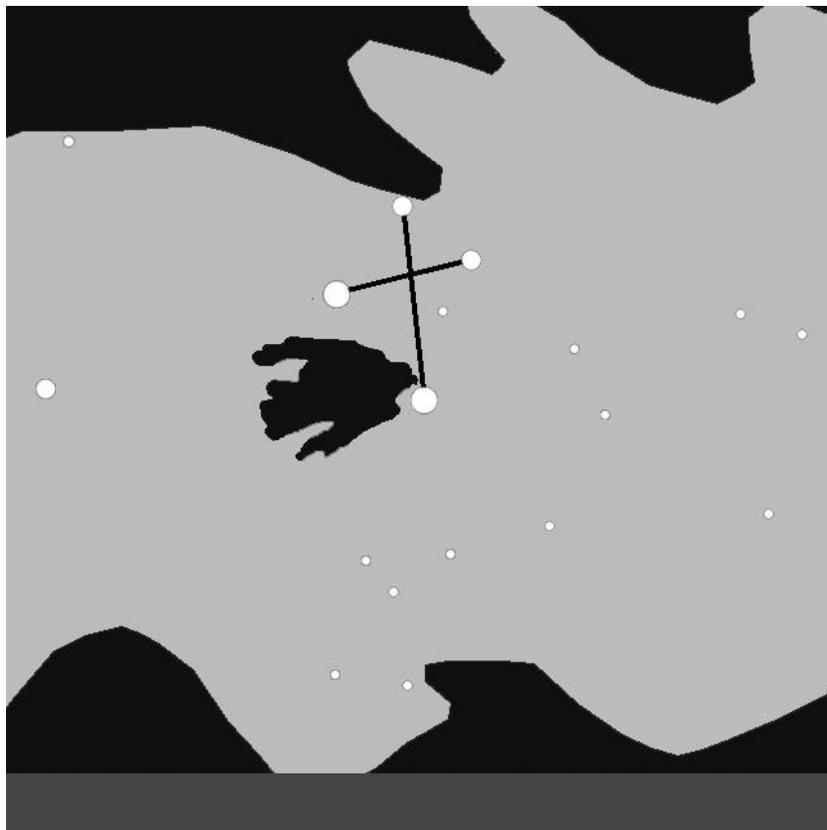


Figure: 3

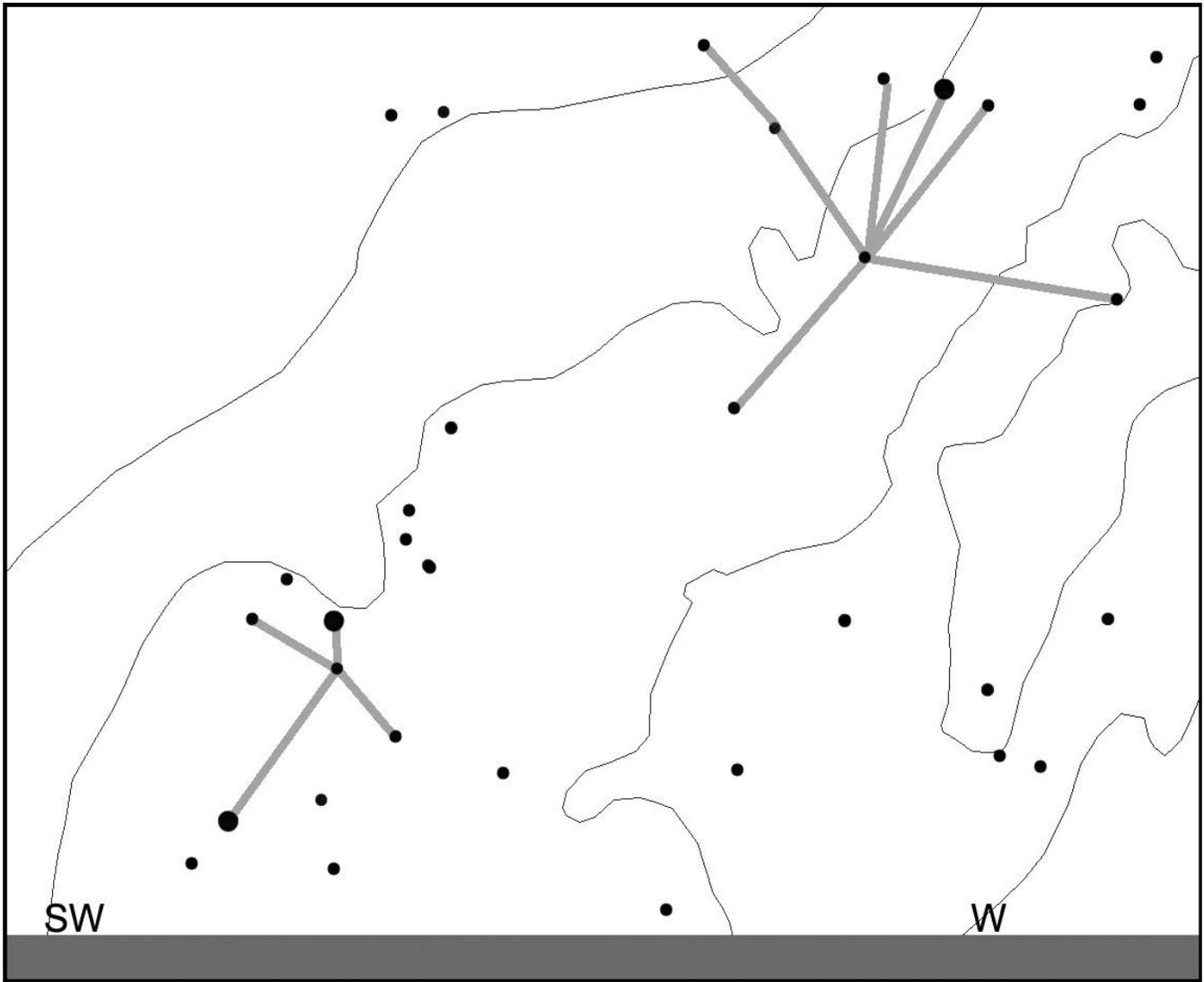


Figure: 4