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The Nature of Moche Human Sacrifice

A Bio-Archaeological Perspective¹

by Richard C. Sutter and Rosa J. Cortez

Archaeologists working in northern Peru have proposed that victims of Moche sacrifice represented either local Moche warriors defeated in ritual battles or enemy soldiers captured in warfare with non-Moche or competing Moche polities. Analysis of bio-distances among eight Early Intermediate Period (200 BC–AD 750) North Coast mortuary samples indicates that the sacrificial victims from the Huaca de la Luna are the least similar to others and the most variable. When iconographic analysis, mortuary treatment, and the available archaeological data are considered, it appears that—contrary to the prediction of the ritual-battle model—the Huaca de la Luna sacrificial victims were drawn not from the local Moche population but from a number of competing Moche polities. This result has implications for the sociopolitical development of and relations among the Moche.

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The Moche, one of the best-known pre-Columbian cultures of South America, was the dominant culture on the North Coast of Peru during the middle and later part of the Early Intermediate Period (200 BC–AD 750) (fig. 1). It is noted for its expertly crafted metallurgy, lifelike mass-produced mold-made ceramics, and impressive adobe architecture. Archaeological investigations in recent decades have produced evidence of Moche human sacrifice. Extensive iconographic studies of fineline painted ceramics reveal that depictions of one-on-one battles, apparent trails of captured warriors, and the sacrifice of captured warriors by anthropomorphic deities are common (fig. 2). These scenes were once thought to represent either mythical or ritual activities (Donnan 1978). Excavations during the past 15 years at Moche sites such as Sipán, Sicán, and San José de Moro have, however, uncovered the tombs of individuals thought to have played the roles of the anthropomorphic deities shown in them (Alva 2001; Alva and Donnan 1993, 1994; Donnan 1988; Donnan and Castillo 1992), and excavations at Cao Viejo, Dos Cabezas, and the Huaca de la Luna have uncovered adult males who had been brutally sacrificed (Bourget 1997, 2001; Cordy-Collins 2001; Verano 2001a, b, c, 2004). These finds indicate that the activities depicted in Moche iconography actually occurred and raise the question whom the Moche were sacrificing and why. Did the sacrificial victims represent warriors captured in combat for territorial expansion, or were they local individuals who had lost ritual battles staged specifically to provide victims for human sacrifice?

We examine three models currently used by archaeologists working on the North Coast to explain Moche warrior sacrifice. The first is based on ethnographically and ethnohistorically documented ritual battles and assumes that the victims were local Moche who participated in battles staged specifically to provide such victims (see Alva and Donnan 1994:33; Donnan 1978:182; Hocquenghem 1978:129; Shimada 1994:108–110; Topic and Topic 1997). The second is based upon the traditional view of Moche state expansion, according to which the Moche were engaged in warfare with non-Moche polities to the south and east (e.g., Gallinazo and Recuay) (see Billman 1997; Proulx 1982; Wilson 1987:66), and it implies that the Moche sacrificial victims would not be representative of other North Coast populations. Finally, the third model assumes that the sacrificial victims represent a number of culturally similar but independent feuding polities, being enemy Moche warriors captured

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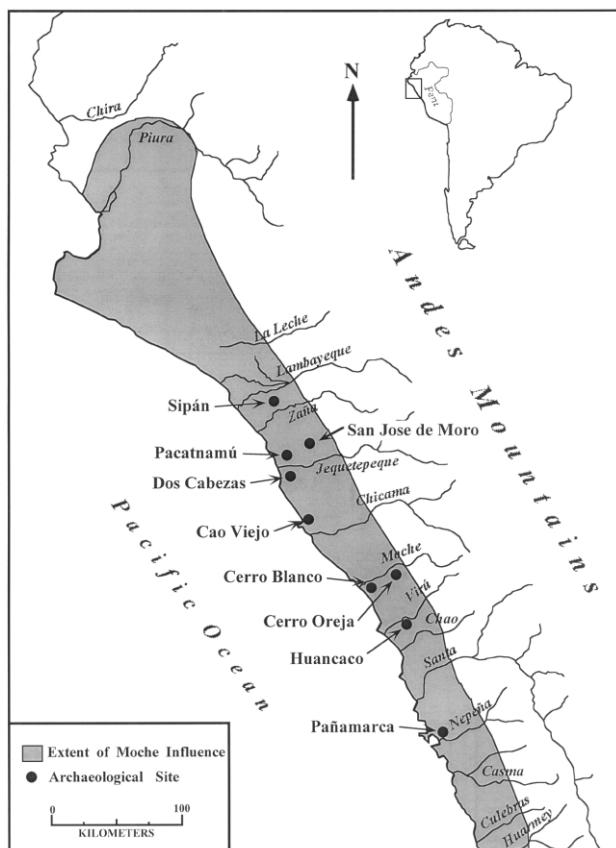


FIG. 1. Selected archaeological sites on the North Coast of Peru (after Donnan and McClelland 1999:12).

during battles with competing neighbors (see Dillehay 2001; Kutscher 1955:28–29; Schaedel 1972; Verano 2001a). We test these models using the available archaeological information and new biodistance data on genetically influenced dental traits for eight prehistoric mortuary populations. In order to elucidate the empirically testable assumptions of these models, we begin by examining current issues and debates regarding Moche culture history and interpretations of Moche human sacrifice.

Moche Culture History

Both archaeological excavations and iconography reveal that Moche society was highly stratified, characterized by a priestly class, elite warriors, craft specialists, merchants, and individuals who dedicated their lives to both agropastoral and maritime subsistence activities (Donnan 1978, 2001, 2004). For the better part of the twentieth century, archaeologists working on the North Coast assumed that Moche was an expansive militaristic state. Although Moche mud-brick pyramids (*huacas*) are located throughout the coastal valleys of northern Peru,

the Huaca del Sol (Pyramid of the Sun) and the Huaca de la Luna (Pyramid of the Moon), both located at Cerro Blanco in the Moche Valley, were hypothesized to form the capital of the Moche state (Larco Hoyle 1938, Moseley 1975, Schaedel 1985, Topic 1982). Moche, with its two massive pyramids, extensive urban center, and large cemetery, is unparalleled among Moche sites. Indeed, the Huaca del Sol is the largest mud-brick pyramid in the New World (Hastings and Moseley 1975; Moseley 1975, 2001) and among the largest structures of any kind in the pre-Columbian New World.

Until recently, this evidence was thought to confirm the traditional culture history of the Moche. However, despite nearly a century of investigations by pioneering archaeologists such as Kroeber (1930), Larco Hoyle (1938, 1946, 1948), Strong and Evans (1952), and Moseley (1975), the Moche remain enigmatic. Some archaeologists continue to accept the traditional interpretation of Moche as an expansive centralized and hierarchical state with its seat of religious and political authority at Cerro Blanco (Billman 1997, 1999; Moseley 2001; Proulx 1982; Wilson 1998). However, problems with the widely employed ceramic sequence have caused archaeologists to reevaluate this interpretation. As Shimada (1994) points out, most of these problems stem from the nature of the data. The pioneering Peruvian archaeologists Rafael Larco Hoyle (1946, 1948) developed a five-stage ceramic chronology for the Moche (fig. 3), largely based upon private collections of stirrup-spout ceramics looted from the Chicama and Moche Valleys. This chronology has undergone some minor revisions since he first proposed it but is still widely employed. The seminal Virú Valley Project provided additional information regarding the relative chronology of the Moche and other prehistoric cultures of the region (Willey 1953). Early survey and excavations in the Virú Valley indicated that the Early Horizon (800–200 BC) Cupisnique influence was replaced by the initial Early Intermediate Period Salinar (~400–100 BC) and the subsequent Gallinazo (~100 BC–AD 200) and these by the Moche (~AD 200–750). Survey data suggested that most Salinar settlements were located in the middle and upper valley (Strong and Evans 1952). They were largely unfortified, and the site hierarchy among them suggested the existence of a number of local “chiefdoms.” On the basis of architectural and ceramic similarities it was hypothesized that the Gallinazo was the result of the sociopolitical consolidation of the Salinar. Gallinazo settlements in the Virú Valley are more densely clustered in the lower valley and are both heavily fortified and located defensibly in an apparent response to intrusions into the upper valley by highland invaders from the east.

Despite some degree of overlap in vessel forms between Gallinazo and Moche ceramics, the abrupt changes detected in ceramic iconography, settlement patterns, and ceremonial structures led archaeologists to suggest that the Gallinazo of the Virú Valley were replaced through military conquest by the Moche from the valley immediately to the north (Larco Hoyle 1938, 1946, 1948; Willey 1953). On the basis of this early work, the

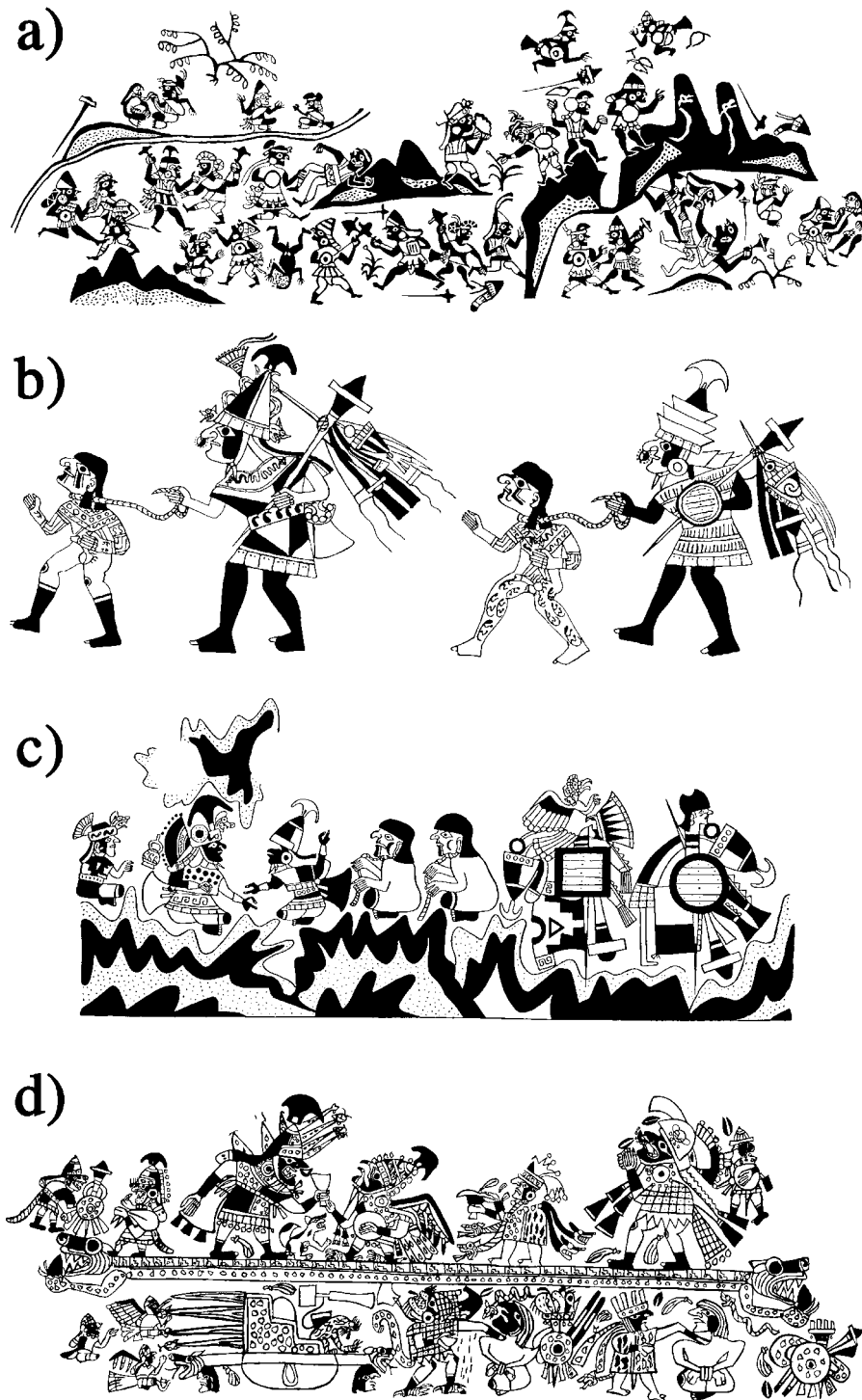


FIG. 2. Fineline drawings from Moche IV and V ceramics. a, Moche combat; b, warrior capture; c, apparent trails of captured warriors; d, the Sacrifice Ceremony (Donnan 1978), showing (top, from left to right) the presentation of blood to the Warrior Priest by the Bird Priest, Priestess, and Feline Priest, (below) the Warrior Priest's litter and staff, and (right) two bound captives having their throats slit, with their weapon bundles behind them (drawings by Donna McClelland).

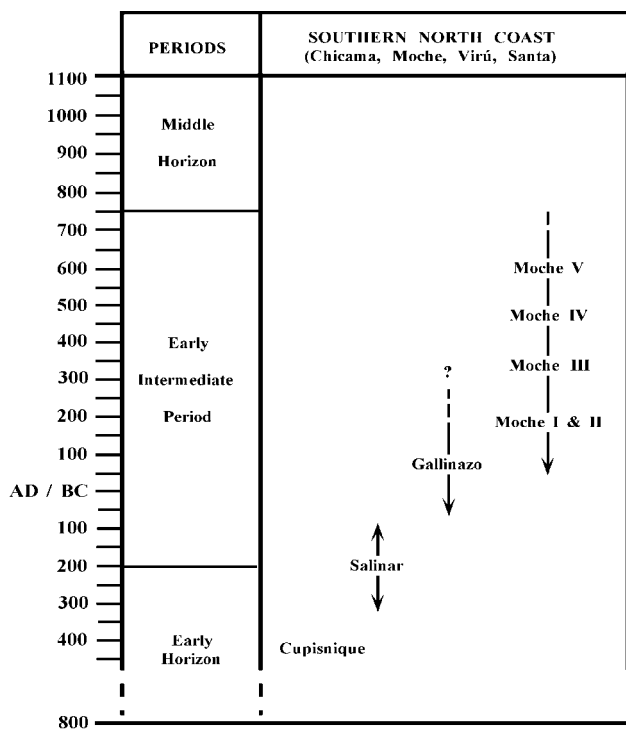


FIG. 3. Relative chronology for the southern North Coast (after Shimada 1994:67).

Moche were assumed to have initially expanded from the Moche Valley into the valleys immediately to the south (the Virú, the Santa, the Huarvey, and others) during the Moche III and IV periods (Larco Hoyle 1948, Topic 1982) and subsequently (in Moche V) into the coastal valleys to the north (the Lambayeque and the Piura). Limited surveys and excavations on the North Coast in the years that followed appeared to confirm this interpretation. In the Moche (Billman 1997, 1999; Uceda 2001) and Santa (Proulx 1982, Wilson 1988) Valleys it appeared that there was indeed an abrupt and complete change from Gallinazo to Moche in the central and southern areas of Moche influence. In many instances, Moche constructions were detected immediately overlying Gallinazo ones.

In recent years, additional survey and excavations in the lower Virú and Santa Valleys have revealed a somewhat more complex incorporation of these southern valleys into the Moche sphere of influence (Bourget 2004, Chapdelaine 2004, Millaire 2004a). The Moche and the Gallinazo may have coexisted in these valleys well into Moche IV. These studies suggest that in some instances the Moche may have established relations with the Gallinazo elite to secure local resources (Millaire 2004a), while in other instances they may have either threatened or resorted to military force in order to incorporate the Gallinazo (Chapdelaine 2004).

These investigations have also prompted archaeologists to question the established chronological sequence.

Donnan and McClelland's (1999) meticulous study of Moche fineline ceramics reveals that the iconographic styles and themes depicted on Moche I and II vessels are indistinguishable; the ceramics of these two phases differ only slightly in their stirrup-spout forms. They make the same argument for Moche III and IV fineline ceramics and suggest that the Moche ceramic sequence be collapsed into only three phases: Moche I-II, Moche III-IV, and Moche V. The Moche's presumed chronological relationship to the Gallinazo is also unclear. Ubbelohde-Doering (1967) and Donnan and McClelland (1997) report that tombs at Pacatnamú contained both Gallinazo and Moche V ceramics. While this association could be dismissed as the inclusion of Gallinazo heirlooms in Moche-period tombs, other investigations in the Lambayeque (Shimada 1994) and Piura (Kaulicke 1992) Valleys indicate that the Moche and the Gallinazo coexisted well into the Moche sequence (Moche III). Excavations at Batán Grande in the Lambayeque Valley reveal the association of Gallinazo and Moche molds in a ceramic workshop (Shimada 1990). This evidence indicates a far more complex relationship between the Gallinazo and the Moche than was previously recognized.

Beginning in the 1960s archaeologists began to challenge the notion that the Moche originated in the Moche Valley. Under the traditional model it was assumed that the northern valleys were not incorporated into the Moche interaction sphere until the latest periods of their influence (Larco Hoyle 1948) and that the earliest Moche ceramics were associated with the Moche and Chicama Valleys. However, Moche I and II ceramics are rare at the Moche site (Hastings and Moseley 1975, Topic 1982), and Moche I and II ceramics have been reported (Kaulicke 1992, 1994; Larco Hoyle 1963, 1966; Shimada 1990, 1994) in the northernmost reaches of the Moche's influence (the Piura and Lambayeque Valleys). Further, the tomb of the Lord of Sipán in the Lambayeque Valley, the wealthiest Moche tomb excavated to date, was associated with Moche III ceramics dated to AD 290 (Alva and Donnan 1994). These data make the traditional model to Moche state origin and expansion unlikely.

Other investigations point to the discontinuous geographic and temporal distribution of Moche ceramics. Archaeological surveys in the regions north of the Moche Valley indicate a geographic hiatus in the expression of Moche in the Pampa de Paijan (the region between the Jequetepeque and the Chicama Valley), leading some archaeologists to suggest that there were at least two Moche polities, one in the north and one in the south (Castillo and Donnan 1994, Donnan and McClelland 1999, Kaulicke 1994, Shimada 1994). Others claim that regional (Donnan 2004, Klein 1967) and in some instances valley-to-valley variations exist in Moche material culture and iconography (Cordy-Collins 2001:23–28). Berzkin (1978) proposes that the five Moche deities he identified on Moche ceramics are likely associated with five elite lineages. Donnan (2004:19) reports that Moche portrait vessels are unknown in the northern valleys and were probably manufactured and used only in the Chicama, Moche, and Virú Valleys. This regional cultural

variation leads some archaeologists to suggest that the Moche represent a series of culturally similar feuding polities or confederations of polities (Dillehay 2001; Kutscher 1955; Schaedel 1972, 1985; Verano 2001b).

Excavations at San José de Moro in the Jequetepeque Valley by Donnan and Castillo (1994) further complicate our understanding of the Moche ceramic sequence. These investigators' analysis of ceramics from graves and residential areas reveal a complete absence of Moche IV ceramics and an abundance of Moche III and Moche V. They suggest that some of the different Moche phases may represent different contemporaneous styles. Indeed, Donnan and McClelland's (1999) iconographic analyses indicate that both combat and sacrificial scenes are found far more frequently on Moche IV ceramics, while Donnan (2001, 2004) asserts that Moche portrait vessels represent local leaders killed or sacrificed by the Moche and were perhaps used as propaganda.

The collapse of the Moche, especially in the south (Chicama, Moche, Virú, Santa, Huarmey), likely began during Moche V (ca. AD 500–750). Moseley (1983) has documented that the Moche Valley's irrigation system would have been greatly compromised by tectonic uplift and the creeping of sand dunes at the Moche site during Moche IV. Further, Shimada and his colleagues' (1991) examination of high-resolution ice-core data indicates an extended drought between AD 563 and 594 and frequent floods between AD 602 and 635. These events have also been detected in the Jequetepeque Valley (Dillehay 2001) and at the Moche site itself (Bourget 2001, Uceda 2001). Such environmental stress would have required some form of social response. In fact, Uceda (2001:61) notes that construction at the Huaca de la Luna ended sometime during late Moche IV, while Bawden (1996) suggests that the Moche Valley population center shifted inland to the Galindo site so as to be closer to a more stable water source. While Moseley (2004) argues that both El Niño flooding and subsequent dune formation likely led to the abandonment of the Jequetepeque site Dos Cabezas, Dillehay (2001) has documented that, with the beginning of Moche V, fortified sites became abundant in the lower Jequetepeque and Zaña Valleys to the north. Dillehay (2001) and Shimada (1994) both suggest that stress may have been responsible for apparent population shifts toward the northern Moche sphere. Such disruption to the Moche's economy would almost certainly have caused social stress that may have resulted in frequent local skirmishes. Did this stress result in a breakdown of alliances among Moche elites of different valleys? Did it cause the Moche elites to attempt to buffer themselves through military conquest?

From our brief synopsis of the current state of knowledge regarding Moche culture history it is apparent that the relative chronology, place(s) of origin, sociopolitical organization, and spread of Moche culture all require additional investigation. It is unclear whether the Moche represented a single state, a confederation of culturally related but independent polities, or a number of culturally similar but autonomous feuding chiefdoms, and we do not know whether combative relations occurred

throughout their cultural evolution or characterized only its final stage. It may be that all of these descriptions fit the Moche at different times during their development and collapse.

Moche Iconography

Given its apparently narrative nature, Moche iconography has played an important role in our understanding of Moche civilization. Undeniably, combat and human sacrifice are among the more common themes depicted. Early interpretations of Moche iconography lent support to the notion of expansion through military conquest. Depictions of human sacrifice occur on fineline vessels, containers, adobe friezes, metalwork, and a variety of other objects. They are most common during Moche III and IV times and usually depict captured warriors, but there are also instances of mountain sacrifices and sacrifices occurring on guano islands (Donnan 1978). Donnan identified a frequently occurring scene that he called the "Sacrifice Ceremony" (fig. 2,d). In the upper portion of this scene we see an individual with a conical helmet adorned with a crest, a nose ring, and a back flap—an individual whom Donnan called the "Warrior Priest"—receiving a cup (apparently filled with blood) from an anthropomorphic bird or "Bird Priest." Two additional attendants—a "Priestess" and a "Feline Priest"—are also participants in the ceremony. Below these characters Donnan identified the litter and associated scepter of the Warrior Priest and two bound warriors having their throats slit by attendants who are collecting their blood in bowls. Immediately behind each of the warriors is his paraphernalia (shield, mace, etc.). Given the highly stylized depictions of the individuals presiding over the event, Donnan originally speculated that this scene might be mythical. However, Alva's excavations at Sipán in the Lambayeque Valley revealed tombs containing individuals buried with adornments indicating that they were Warrior Priests and Bird Priests (Alva 2001; Alva and Donnan 1993, 1994; Donnan 1988). (Here the figure previously referred called the Warrior Priest is called the "Lord of Sipán.") Subsequent excavations at San José de Moro (Donnan and Castillo 1992) revealed elite tombs of women thought to have played the role of Priestess.

While these discoveries offer evidence that these individuals were real (or at least that real individuals played the roles of the deities depicted), the exact meaning of these scenes is debated. Most scholars point out that the majority of the Moche iconographic battle scenes depict similarly dressed individuals engaged in one-on-one combat (Alva and Donnan 1994, Bourget 2001, Castillo 2000, Donnan 2004, Hocquenghem 1987, Topic and Topic 1997, Shinoda et al. 2002). They note that it is exceedingly rare for foreigners to be depicted in these combat scenes, and, indeed, the maces, shields, and helmets of both fighting and captured warriors are indistinguishable from those associated with the Moche (fig. 2,a). Because of this, they contend that the combat depicted is ritual designed to produce victims for sacri-

fice. Others, however, interpret the iconography as representing real warfare for the purpose of territorial expansion (Wilson 1987, 1988; Verano 2001a).

Moche Human Sacrificial Remains

Despite the numerous depictions of Moche human sacrifice, there are relatively few finds of sacrificial remains. The remains that exist are of two kinds: those that are buried in formal graves, often accompanying high-status individuals who were not sacrificed, and those that were not afforded a proper burial. Perhaps one of the first instances of sacrificial human remains from Moche contexts to be documented is reported by Strong and Evans (1952:152). The remains in question were females sacrificed and buried with the high-ranking principal burial at the Huaca de la Cruz in the Virú Valley. Similar sacrificial burials were associated with the Moche III principal burials from tombs I and II at Sipán (Alva and Donnan 1993). Three individuals were sacrificed and buried in a large Moche III tomb and four in a tomb dated to Moche V at the Jequetepeque Valley site Pacatnamú (Ubbelohde-Doering 1983:53, 107–13). Eighteen adult male heads were uncovered at Dos Cabezas (Cordy-Collins 2001). The association of cervical vertebrae and mandibles with these skulls indicated that soft tissue was present when they were removed, and the cut marks present on the ventral portions of some of the vertebrae are reminiscent of depictions of Moche sacrifice (pp. 28–29).

During his excavations of the Moche IV (ca. AD 500–600) Plaza 3A at the Huaca de la Luna, Bourget (1997, 2001) discovered more than 75 adult male victims of sacrifice. Verano's (2001b) osteological analysis of these victims reveals that they had often had their throats slit (judging from the cut marks on the ventral portions of their cervical vertebrae). Many of the victims also showed evidence of massive blunt-force trauma to the back of the skull.

These sacrificial victims had muscoid fly pupae associated with their torsos (Bourget 2001), indicating that their corpses had been left uncovered on the surface of the plaza. Unfired clay effigies had been smashed on top of some of the victims. They were found in at least five layers of mud sediment derived from the adobes used to construct the mound (Bourget 2001:91). Given that precipitation is rare in the coastal desert and usually occurs during torrential El Niño downpours, Bourget (1997, 2001) suggests that the victims were sacrificed during the El Niño episodes documented by Shimada et al. (1991) in an appeal to the Moche deities to stop the devastating rains. Many of the victims showed evidence of healed trauma (healed parry fractures of the left forearm, healed compression fractures on the left frontal and parietals, broken noses), and some showed signs of recently broken bones still in the process of healing. These fracture patterns have led Verano (2001a, b) to suggest that they were professional warriors.

Verano (2001a, b) has documented 24 intact adult male

human sacrifices and numerous incomplete remains and isolated bones from Huaca de la Luna Plaza 3C. Unlike those uncovered in Plaza 3A, these victims were buried both above and within the floor of the plaza. They had been killed by having their throats slit or (in one case) with a bone point projectile. Many of the remains demonstrated cut marks on both muscle attachment sites and locations with little overlying flesh. Verano interprets this evidence to indicate that these victims had been both tortured and flayed in ways similar to those depicted on some Moche vessels. Four radiocarbon dates on the remains date between AD 120 and 580 (Verano 2004). Indeed, the similar age and sex profiles, the distribution of healed premortem fractures characteristic of trauma, the nature of the sacrifices, the association of vessels depicting nude bound warriors, and the lack of any formal burial among remains from Plazas 3A and 3C suggest considerable time depth for the sacrifice of adult male warriors at the Huaca de la Luna.

During our research on the dentitions of human remains from the Huaca de la Luna, we identified further evidence of sacrifice in looters' backfill from Plaza 2. One male mandible demonstrated a spiral fracture and premortem cut marks on the attachment points of the tongue muscles, suggesting that the individual had been subjected to blunt-force trauma to the right side of the face and had had his tongue and the floor of his mouth cut out around the time of death. There was a frontal bone that had probably been struck with a mace and a cervical vertebra with unhealed premortem fractures consistent with strangulation. The lack of contextual information makes this evidence of limited value, but Uceda (2001:63) suggests that all the plazas at the Huaca de la Luna may have been used for human sacrifice.

Finally, adult male human remains interred in both the friezes and the Ceremonial Plaza at Cao Viejo may be another example of Moche sacrifice (Franco, Galvez, and Vasquez 2003:163; Verano 2001c). These remains demonstrate marks consistent with the cutting of a bone from a living or a recently deceased individual. The adobe wall from which these bones were recovered is decorated with a frieze of elite individuals celebrating hand in hand. The contemporaneous wall immediately below this frieze is decorated with naked bound male prisoners being led by captors who are carrying the defeated warriors' paraphernalia.

Interpretations of Moche Human Sacrifice

The one-on-one nature of battles and the style of dress most commonly portrayed on Moche ceramics have led most scholars to suggest that these are scenes of ritual battles rather than warfare (Alva and Donnan 1994, Bourget 2001, Castillo 2000, Donnan 2004, Hocquenghem 1987, Topic and Topic 1997, Shinoda et al. 2002). The object of these battles, these scholars contend, was not to kill their opponents but to defeat them in ritual combat for the purpose of sacrificing them in bloodletting ceremonies. Given the similar appearance of the warriors

TABLE 1
Prehistoric Mortuary Samples Examined

Mortuary Sample	Abbreviation	Sample Size	Location of Site	Distance from Coast (km)	Time Period
Cerro Oreja Salinar	CO-SAL	65	Moche, Coastal Valley	61	Early Early Intermediate (~100 BC)
Gallinazo 1	CO-G1	128	Moche, Coastal Valley	61	Early Early Intermediate (~AD 1)
Gallinazo 2	CO-G2	93	Moche, Coastal Valley	61	Middle Early Intermediate (~AD 100)
Gallinazo 3	CO-G3	76	Moche, Coastal Valley	61	Middle Early Intermediate (~AD 200)
Huaca de la Luna Urban Sector	HLL-US	37	Moche, Coastal Valley	6	Late Early Intermediate (~AD 600)
Platforms I and II	HLL-PLATS	63	Moche, Coastal Valley	6	Late Early Intermediate (~AD 600)
Plaza 3A	HLL-SACS	42	Moche, Coastal Valley	6	Late Early Intermediate (~AD 600)
Pacatnamú H45CM1	PACAT	31	Jequetepeque, Coast	1	Late Early Intermediate (~AD 600)

depicted, the sacrificial victims presumably represent warriors drawn from the local Moche population. These investigators contend that the Moche's imagery is analogous to that of ethnographically known *tinkus*—ritual battles that occur among traditional Andean communities—or the ritual battles that were staged in Cuzco among young Inca warriors. Others (Proulx 1982; Wilson 1987:66), in contrast, point to depictions of combat between Moche and foreign warriors and suggest that the Moche sacrificial victims represent foreign warriors captured in warfare for territorial expansion.

Verano (2001*b*) argues that both the osteological and the mortuary evidence from the sacrificial victims of the Huaca de la Luna are atypical for Moche burials. He cautions against a literal interpretation of Moche depictions of combat and points to parallels in Mesoamerican iconography, where pairs of individuals are engaged in one-on-one combat but the accompanying glyphs indicate that they represent one independent polity's conquest of another. He reports that all these victims were well-muscled, healthy men ranging in age from 15 to 35 and had far more healed fractures than other Moche burials. Indeed, the fracture patterns he reports are those one would expect from trauma due to battle. He contends that the manner in which the sacrificial victims were tortured, killed, and disposed of communicates the lack of respect that one might have for enemies. For him this indicates that the victims were professional warriors captured in warfare with competing Moche polities rather than individuals drawn from the local population to participate in a ceremonial battle. Others have also suggested that internal warfare explains relations among the Moche (Kutscher 1955:28–29; Schaedel 1972), with some scholars suggesting that it may have resulted from social disruptions following repeated environmental disturbances toward the end of Moche IV (Dillehay 2001, Moseley 1983, Shimada et al. 1991).

Each of these explanations has testable implications regarding the nature of the Moche sacrificial ceremony, the origins of the sacrificial victims, and the sociopolitical relations among the Moche located in different valleys. Using biodistance comparisons among eight Early Intermediate Period mortuary samples from the region, we endeavor to determine which of the competing explanations best matches both the biological and the available archaeological data.

Materials and Methods

For this study, we analyze eight mortuary samples from three Peruvian coastal sites in the Moche and Jequetepeque Valleys (table 1). In total, these eight samples represent the dentitions of 545 individuals. Four of the samples are from the Moche Valley site Cerro Oreja (fig. 1). Cerro Oreja is an initial Early Intermediate Period site on the south side of the Moche Valley at a distance of 61 km from the coast. Survey and excavation indicate that there was a limited occupation of Cerro Oreja during the Early Horizon Cupisnique phase (Billman 1997, 1999; Carcelén 1995). Recent excavations (Carcelén 1995) uncovered more than 900 burials, the vast majority of which date to the beginning of the Early Intermediate Period's Salinar phase (~200 BC) and the subsequent Gallinazo phase (~100 BC–AD 200). The Salinar-phase occupation was limited, but during the Gallinazo phase Cerro Oreja was the principal site in the Moche Valley (Billman 1997, 1999). On the basis of his survey of the lower and middle Moche Valley, Billman suggests that the increased Gallinazo occupation at Cerro Oreja coincides with evidence for abandonment of the middle Moche Valley in the face of large-scale incursions by highlanders from the east. A relative chronology of the Gallinazo tombs at Cerro Oreja is based upon the mor-

tuary features' relative positions (Carcelén 1995). The earliest Gallinazo tombs contained burials in simple pits with relatively few ceramic offerings. More elaborate tombs with formal floors and walls were constructed on top of these graves. Finally, less elaborate Gallinazo burials were placed on top of the tombs. To detect possible trends such as gene flow into the Moche Valley, we treated the burials associated with Salinar and each of three Gallinazo subphases at Cerro Oreja as distinct samples.

Three further samples are from the Moche site at Cerro Blanco. This site is located 6 km from the coast and, as we have seen, consists of two monumental adobe structures—the Huaca del Sol and the Huaca de la Luna—and both residential sectors and cemeteries (Bawden 1996, Chapdelaine 2001, Hastings and Moseley 1975, Larco Hoyle 1938, Moseley 1975, Topic 1982). Moche was the primary Moche site in the valley and is thought by many to have been the capital of the Moche state. Excavations at the Huaca del Sol revealed structures and refuse pointing to both secular and domestic activities of a political elite (Hastings and Moseley 1975, Topic 1982). The Huaca de la Luna, consisting of three platforms and four plazas (Uceda 2001), yielded no evidence for residential activities; the colorful friezes of Moche deities, the elite tombs of the Moche priests in the platforms, and plazas containing human sacrificial victims all attest to its ceremonial function. A vast urban sector stretches over 500 m on the valley floor between the two pyramids. Excavations in the site's urban sector have detected numerous ceramic, metal, and textile workshops. Burial and architectural evidence suggest some degree of social stratification in this part of the site (Topic 1982). However, recent excavations indicate that it may have been more homogeneous than previously thought, with most of the architecture and house burials representing elite craft-specialist residents (Chapdelaine 2001). The three samples examined here include Moche IV human remains from the urban sector, remains from Huaca de la Luna platforms I and II,² and the adult male sacrificial victims from Huaca de la Luna Plaza 3A.

2. Elite status is assigned to these burials because of both their interment within the Huaca de la Luna platforms and their association with rectangular chambers. We did not include any specimens designated by the excavators as Chimú. For Platform I the sample included relatively complete individuals from tombs 1 (1), 3–4 (1), 5 (6), 8 (1), 9 (1), 10 (1), 12 (1), 15 (1), and 17 (4). The remainder of the dentitions scored from Platform I consisted of fragmented jaws and loose teeth from either the aforementioned tombs or looters' backfill associated with tombs 2, 5, 12, and 16. We included these materials because excavators' descriptions indicated that they were associated with both Moche cultural materials and the designated tombs. In no instance did we include specimens whose cultural association was ambiguous or dentitions from surface collections with no contextual association. The sample also included the dental traits recorded for tombs 1 and 2 from Huaca de la Luna Platform II.

The size of this sample is deceptive. Some of the fragmented and commingled dental remains had been curated in bags with the faunal remains recovered from each of the aforementioned tombs. We attempted to match fragmented remains and fit loose teeth to other specimens from the same tomb. We also tried to match possible

The final mortuary sample is from Pacatnamú, on the coast in the Jequetepeque Valley (Donnan and Cock 1986). Pacatnamú lies on a natural plateau on the north side of the valley overlooking the river mouth and is characterized by numerous adobe pyramids, walled compounds, and spatially discrete cemeteries. The eastern side of the settlement was enclosed by two fortifications and a dry moat. We examined the dentitions of 42 individuals excavated from Pacatnamú cemetery H45CM1 (Donnan and McClelland 1997, Verano 1994). Radiocarbon dates associated with intact burials from this cemetery indicate that the cemetery was used during both Moche IV and V. Donnan (1997:12) reports that the remains were primarily commoners and that their graves were largely representative of other burials from the site.

All the dental remains were inspected and scored for 31 morphological tooth cusp and root traits (table 2) using standardized casts and descriptions (Turner, Nichol, and Scott 1991). Nonmetric dental traits are highly heritable (Berry 1978, Escobar, Melnick, and Michael 1976, Harris and Bailit 1980, Hassanali 1982, Nichol 1989, Scott 1980) and have been used to reconstruct genetic relations among both prehistoric and living populations (Green 1982, Haydenblit 1996, Sofaer, Smith, and Kaye 1986, Turner 1983). They also have the advantage of being scoreable for highly fragmented skeletal material.

Standard data analysis procedures were used to make the results presented here comparable with those reported by other studies of nonmetric dental traits. We calculated dental trait frequencies for each mortuary sample using the "individual count" method (Turner and Scott 1977). In cases where an individual exhibited asymmetry in the expression of a given trait, the higher level of expression was used. This scoring procedure assumes that a single genotype is responsible for the trait's expression and that when asymmetry exists among bilateral traits the side exhibiting the maximum expression is closest to the true underlying genotype for the trait. The procedure also maximizes sample sizes; in cases where a given trait is observable for only one antimer, the observable side is counted as the maximum expression for that trait. This scoring procedure counts individuals for the calculation of trait frequencies.

Prior to calculating biodistances among the samples, we eliminated dental traits that did not exhibit significant contingency χ^2 values ($p < 0.05$) (Rothhammer et al. 1984). For each sample, we combined males and females in order to produce acceptable ($n > 10$) sample sizes. However, because the Huaca de la Luna Plaza 3A mortuary sample consisted exclusively of males, we eliminated dental traits that were significantly related to sex as determined by χ^2 analysis. Finally, traits significantly correlated with one another were also eliminated.

specimens on the basis of age, sex, and wear patterns. However, because it was not always possible to match mandibular and maxillary fragments, each fragment was recorded on a data sheet as an individual specimen. Therefore the sample size represents the Number of Identified Specimens (NISP) measure employed by archaeologists, which tends to overestimate the actual number of individuals represented.

TABLE 2
Tooth Cusp and Root Traits Examined

Trait	Abbreviation	Teeth Examined for Trait
Winging	WING	Maxillary central incisors
Shoveling	SHOV	Maxillary and mandibular incisors and canines
Labial convexity	LABC	Maxillary incisors
Double shoveling	DSHOV	Maxillary incisors, canine, and first premolar
Tuberculum dentale	TD	Maxillary and mandibular canines
Canine distal accessory ridge	CDAR	Maxillary and mandibular canines
Accessory mesial and distal cusps	UPMD	Upper premolars
Mesial ridge	UPMR	Upper premolars
Metacone	META	Maxillary molars
Hypocone	HYPO	Maxillary molars
Metaconule	CUSP ₅	Maxillary molars
Carabelli's trait	CARAB	Maxillary molars
Parastyle	PARA	Maxillary molars
Enamel extensions	EE	Maxillary molars and premolars
Upper molar root number	UMRT#	Maxillary molars
Premolar root number	PMRT#	Maxillary premolars
Peg-shaped tooth	PEG	Maxillary 3d molar and lateral incisor
Congenitally absent tooth	CA	Maxillary 3d molar, lateral incisor, and 2d premolar
		Mandibular 3d molar, 2d premolar, and central incisor
Odontome	ODONT	Maxillary and mandibular premolars
Groove pattern	PATT	Mandibular molars
Cusp number	CUSP#	Mandibular molars
Protostylid	PROTO	Mandibular molars
Cusp 5 (Hypoconulid)	CUSP ₅	Mandibular molars
Cusp 6 (Entoconulid)	CUSP ₆	Mandibular molars
Cusp 7 (Metaconulid)	CUSP ₇	Mandibular molars
Lower molar root number	LMRT#	Mandibular molars
Deflecting wrinkle	DEFWR	Mandibular 1st molar
Anterior povea	ANTFV	Mandibular 1st molar
Premolar cusp number	LPCUSP	Mandibular premolars
Tome's root	TOME	Mandibular first premolar
Canine root number	CRT#	Mandibular canine

Prior to calculating the biodistances (estimates of genetic relatedness), dichotomized (present/absent) dental trait frequencies for each mortuary population were arcsine-transformed (Green and Myers-Suchey 1976). The resulting frequencies were used to estimate the genetic relatedness among the mortuary samples by calculating the mean measure of divergence. When there is very little or no difference in the arcsine-transformed frequencies across the traits for the two samples being compared, the mean measure of divergence can produce negative values (Green 1982, Sjøvold 1973). While these negative values are not statistically meaningful, they indicate that the two mortuary samples being compared are statistically indistinguishable. Because the sample sizes differed among themselves, we also calculated standard deviations and standardized distances for the divergence values (Sofaer, Smith, and Kaye 1986). Standardized distances are statistically significant at the 0.05 level if their value is greater than 2.00 (Sjøvold 1973).

Finally, we calculated a measure of uniqueness for each of the eight samples (Donlon 2000). This value indicates the degree of difference of a given mortuary sample's biological relatedness from that of the other samples being compared: a low value indicates that a given sample is closely related to the other samples.

We analyzed the matrix of standardized mean measure of divergence values using nonmetric multidimensional

scaling procedures, which yield easily interpretable graphic representations of complex distance matrices using the number of dimensions specified by the investigator (Kruskal 1964, Kruskal and Wish 1984). Nonmetric multidimensional scaling is appropriate here because it accurately reflects the rank orders of dissimilarity matrices when those matrices are non-Euclidean, as in the case of standardized mean measure of divergence values.

Results

The calculation of the mean measure of divergence requires that all of the traits used vary significantly among the samples in question and that the traits' expressions not be significantly associated with one another. Using contingency χ^2 analysis, we found only 14 of the 31 dental traits examined to vary significantly at the 0.05 level. Five of these traits' frequencies were found to be significantly correlated with each other, and 2 more were significantly correlated with sex. The frequencies and numbers of individuals examined for the remaining 7 traits for each sample are shown in table 3. Subsequent statistical analyses used dichotomized frequencies of these 7 traits. The mean measure of divergence, its standard deviation, its standardized value, and the uniqueness value for each sample are provided in table 4.

TABLE 3
Frequencies and Number of Observations for Statistically Significant Dental Traits in Eight Mortuary Samples

	CO-SAL		CO-G1		CO-G2		CO-G3		HLL-US		HLL-PLATS		HLL-SACS		PACAT	
	freq	n	freq	n	freq	n	freq	n	freq	n	freq	n	freq	n	freq	n
Maxilla																
3MMETA	.30	20	.18	34	.19	21	.29	14	.21	14	.67	9	.09	23	.63	8
1MPARA	.21	34	.18	67	.12	41	.08	37	.06	17	.00	26	.38	24	.10	20
UP2CA	.03	30	.00	60	.00	44	.00	37	.00	27	.00	24	.08	26	.00	22
UI1WING	.71	21	.68	28	.81	26	.84	19	.81	21	.46	26	.57	23	.50	22
UI1SHOV	1.00	29	1.00	36	1.00	24	1.00	28	1.00	11	.80	5	.68	19	.88	16
Mandible																
LM3CA	.00	34	.05	60	.02	46	.03	38	.05	19	.11	27	.24	21	.05	21
LI1SHOV	.94	35	.97	36	.95	19	.88	17	.80	5	.83	12	.67	21	.58	12

Our results indicate that the Huaca de la Luna Plaza 3A sample differs significantly from all of the mortuary samples from Cerro Oreja and substantially though not significantly from all the others. Statistically, the samples from the urban sector at Huaca de la Luna and all four samples from the Cerro Oreja site are indistinguishable from one another. Assuming that the relative chronology for the Moche Valley is valid, our results indicate that the Huaca de la Luna urban population was indigenous to the region. Indeed, the sample's uniqueness value is the lowest of the eight samples being compared. Further, if the biodistances among the Huaca de la Luna urban sector and Cerro Oreja mortuary populations are representative of those among other Early Intermediate

Period Moche Valley coastal populations, then relatively little external genetic influence was involved in the cultural changes of the time. Indeed, these results suggest a relatively coherent breeding population in the Moche Valley during the Early Intermediate Period.

Although not significantly different from the Moche samples, the Huaca de la Luna sacrificial sample is the most biologically distinct and most variable of any of the samples, and we suggest that these individuals were likely drawn from a number of nearby populations.

Interestingly, the elites from the platforms at the Huaca de la Luna are more similar (though not significantly so) to the Pacatnamú than to the other Moche Valley

TABLE 4
Mean Measure of Divergence, Standard Deviation, Standardized Distance, and Uniqueness Value for Eight Mortuary Samples

	CO-SAL	CO-G1	CO-G2	CO-G3	HLL-US	HLL-PLATS	HLL-SACS	PACAT
CO-SAL	–							
CO-G1	–0.01	–						
	0.08	–						
	0.15	–						
CO-G2	–0.02	–0.03	–					
	0.10	0.08	–					
	–0.25	–0.36	–					
CO-G3	–0.02	–0.01	–0.05	–				
	0.11	0.09	0.11	–				
	–0.16	–0.05	–0.43	–				
HLL-US	–0.01	–0.01	–0.05	–0.08	–			
	0.16	0.14	0.16	0.17	–			
	–0.06	–0.06	–0.32	–0.45	–			
HLL-PLATS	0.20	0.22	0.21	0.15	0.11	–		
	0.16	0.14	0.15	0.16	0.21	–		
	1.28	1.62	1.35	0.92	0.50	–		
HLL-SACS	0.26	0.24	0.26	0.27	0.16	0.27	–	
	0.11	0.10	0.11	0.12	0.17	0.17	–	
	2.29	2.55	2.33	2.23	0.94	1.61	–	
PACAT	0.14	0.20	0.18	0.11	0.05	–0.04	0.18	–
	0.14	0.12	0.14	0.15	0.20	0.19	0.15	–
	1.00	1.62	1.27	0.74	0.26	–0.19	1.18	–
Uniqueness	3.95	5.16	3.59	2.78	0.80	7.09	13.12	5.88

NOTE: Standardized MMD values greater than 2.00 (italicized) are significant at $p < 0.05$.

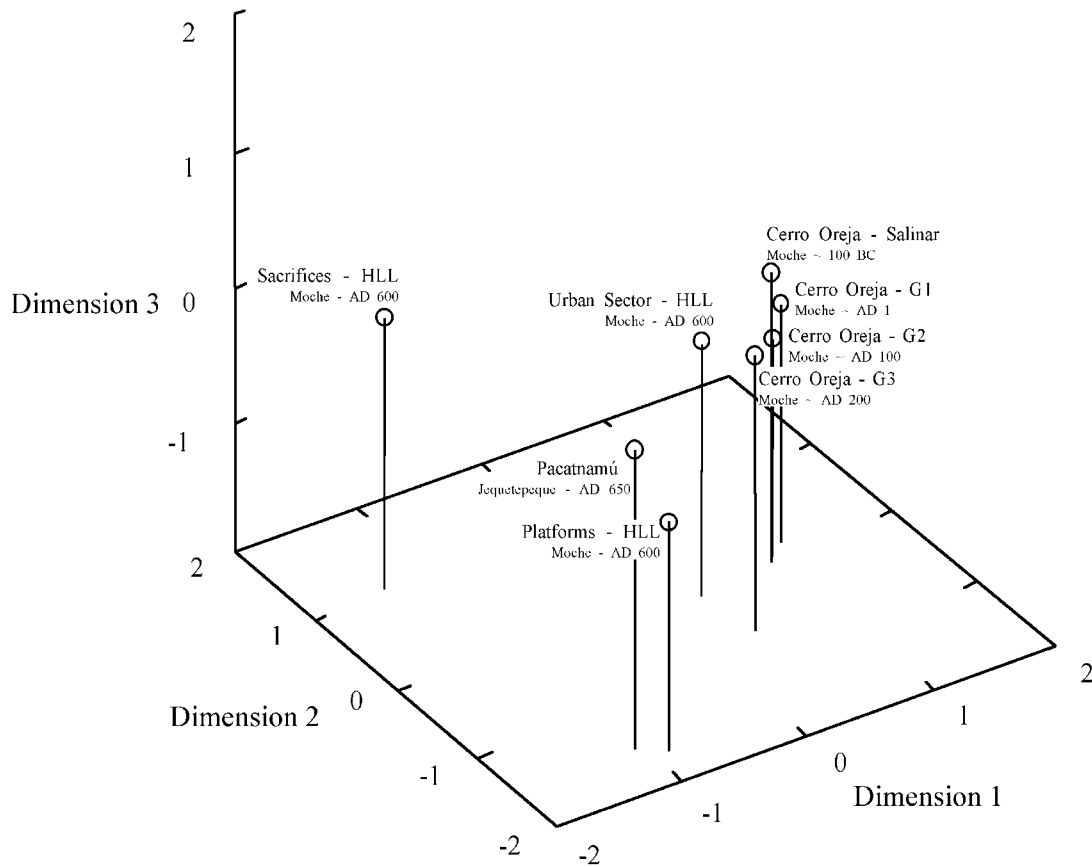


FIG. 4. Multidimensional scaling solution of standardized mean measure of divergence values for eight mortuary samples from the North Coast of Peru.

samples. This result is noteworthy and calls for further investigation.

The three-dimensional multidimensional-scaling solution (fig. 4) provides a similar impression of the biodistances presented in table 4. The urban sector sample and the four samples from Cerro Oreja are all located at the upper left and closely related in multivariate space. The first dimension clearly separates the platforms and Pacatnamú samples from the others: these two samples are both located at the lower right and similar to one another in multivariate space. Finally, the sacrifices sample is intermediate to the other samples along dimension 1 but clearly separated from the other samples along dimension 2. The multivariate location of the sacrificial victims indicates that they do not represent a local Moche Valley population.

Discussion

It is clear that the indigenous population of the Moche Valley experienced little external genetic influence during the Early Intermediate Period; the samples from Cerro Oreja and the urban sector at the Huaca de la Luna

are closely related. Given that most archaeologists working in the region posit that in situ sociopolitical developments best explain the cultural changes detected in the Moche Valley during the Early Intermediate Period, this is not surprising, but ours is the first study to report biodistance data in support of this assertion.

One of the more intriguing results of our study is the close relationship between the Pacatnamú and the Huaca de la Luna platforms samples. We tentatively suggest that this relationship indicates that the ruling elite interred at the Huaca de la Luna may have had a recent common ancestor with populations from the nearby coastal valleys to the north. This assertion raises more questions than it answers. Did the Moche ruling elite all belong to the same family line, and, if so, does this imply an initial northern origin for the Moche's influence as some archaeologists have suggested (Kaulicke 1992, 1994; Larco Hoyle 1963, 1966)? Given the limited number of samples examined here, answering these questions will require additional research.

Perhaps the least ambiguous and most important conclusion from our biodistance analysis is that the sacrificial victims from the Huaca de la Luna Plaza 3A were not drawn from the local Moche population. This result,

when considered along with other lines of independent evidence and compared against the three models examined by this study, has implications for our understanding of the nature of the Moche and of the socio-political relations among Early Intermediate Period populations. The implicit assumptions of the ritual-combat model are that (1) the apparent Moche-on-Moche nature of the combat is inconsistent with battles fought between enemies and (2) the one-on-one nature of that combat is consistent with ritual battles but not with warfare. While this interpretation has some basis in ethnohistoric and ethnographic analogies, we reject it because it does not take into account the preponderance of the biological, mortuary, and Andean ethnohistoric evidence. The second model, which assumes a centralized Moche state characterized by territorial expansion through warfare with nonlocal populations, is also not the best match with the biological and archaeological data. While proponents point to Moche depictions of foreign warriors in its support, most scholars find these depictions rare, pointing out that the overwhelming majority of Moche iconography portrays Moche-on-Moche combat (Alva and Donnan 1994, Bourget 2001, Castillo 2000, Hocquenghem 1987). The mortuary treatment of the Huaca de la Luna Plaza 3A sacrificial victims is, however, entirely consistent with the predicted mortuary treatment of this model. While we cannot categorically reject it, we suggest that if it were correct, then the biodistance results would indicate statistically significant differences between the victims and the other mortuary populations considered here. It may well be the case, however, that the Huaca de la Luna Plaza 3A sample consists of both nonlocal Moche and foreign individuals and that independent Moche polities were engaged in warfare with both other Moche polities and non-Moche polities at different times during their history.

The third model, local warfare among competing Moche polities, is the explanation that is best supported by the available biological, archaeological, and iconographic data. It is consistent with iconographic depictions of Moche-on-Moche combat and with the lack of respect demonstrated by the sacrificial victims' mortuary treatment. Verano's (2001a, b) conclusion that the Moche sacrificial victims' torture, manner of execution, dismemberment, and lack of a proper burial are consistent with the treatment that might be inflicted upon enemies is supported by ethnohistoric accounts indicating that enemy warriors conquered by the Inca were disgraced by being bound and paraded through Cuzco before being trampled on by the Inca and/or tortured and then beheaded (de la Vega 1994 [1609]:554, 567; Sarmiento de Gamboa 1999 [1572]:83, 92, 95, 142). In some instances leaders' heads were flayed and their skin used to make drums, while their skulls were kept as trophies and drinking vessels (Sarmiento de Gamboa 1999 [1572]:98, 125, 142). Indeed, contrary to some scholars' assertion that this treatment was not demeaning (Donnan 2004:139), Garcilaso de la Vega (1994[1609]:141) informs us that the Incas' parading warriors with bound hands and necks showed that they

deserved death for having taken up arms against the Inca. While we recognize the dangers of overextending ethnohistorical analogies, our point is that the record provides more support for the local-warfare than for the ritual-battle model.

Furthermore, the biological data presented here indicate that the Moche sacrificial victims from Huaca de la Luna Plaza 3A probably came from nearby North Coast populations. This interpretation is supported by regional distinctions in ceramics associated with either different elite lineages or different polities (Berezkin 1978, Cordy-Collins 2001). Furthermore, our review of both ethnohistoric accounts of Inca battles and cross-cultural data on warfare indicates that the Moche's fineline depictions of combat are entirely consistent with warfare conducted by centralized political organizations. Keeley (1996:46) explains that one-on-one combat is far more common among chiefdoms and states than among less centralized societies, while Otterbein (1989:44–46) finds that the use of maces and other shock weapons is commonly associated with professional armies and centralized political organizations. Further, ethnohistoric accounts for the Inca clearly indicate that Inca warriors were both trained for and engaged in one-on-one combat using maces and other close-contact weapons (de la Vega 1994 [1609]:340, 344, 352, 368; Sarmiento de Gamboa 1999 [1572]:83, 97, 140).

One Moche depiction of a sacrificial ceremony (fig. 5) in particular argues against the ritual-combat model. Here nude warriors are depicted carrying their elite leaders on litters to a sacrificial altar. In the background (at the upper right) a nude bound male is about to have his throat cut with a ceremonial knife (*tumi*), while in the foreground there are dead and dismembered sacrificial victims. We suggest that this scene is a symbolic representation of the conquest of one polity and its leaders by another. This interpretation is consistent with Donnan's (2001) assertion that Moche ceramics and portrait vessels were used as a form of celebratory propaganda.

Whether internal Moche warfare characterized Moche relations prior to the sacrificial events represented by the Huaca de la Luna Plaza 3A sample or whether it was a final attempt by elites of the southern Moche to secure additional territory following years of environmental stress is unclear. However, the local-warfare model does not exclude the possibility that these sacrificial victims were killed in response to environmentally induced social stress within the polity. As we have seen, an increase in the number of fortified settlements in the lower Jequetepeque and Zaña Valleys during Moche V was probably due to such stress, and the Moche site was abandoned shortly after the sacrificial event, with the valley's population shifting inland. The implication is that the southern Moche began to collapse following the environmental disruptions documented by Moseley (1983) and Shimada and his colleagues (1991). It may well be that some of the valleys within the southern sphere of Moche influence began to rebel toward the end of Moche IV or the beginning of Moche V. Do the sacrificial victims from Huaca de la Luna Plaza 3A represent captured war-



FIG. 5. Fineline drawing from a Moche IV pot depicting a procession of naked prisoners carrying leaders on litters, (upper right) a bound prisoner having his throat slit by an attendant, and (below) dead and decapitated prisoners (drawing by Donna McClelland).

riors from the northern Moche region? Did elites at the Moche site choose to make examples of their Gallinazo clients or ethnically Moche allies from the valleys to the south during late Moche times?

Given the unique circumstances of the sacrificial event represented by the Huaca de la Luna Plaza 3A victims, we must be careful not to extrapolate our conclusions to all documented examples of Moche sacrifice at all times and places. However, the local-warfare model should tentatively be considered the most likely explanation in other contexts given both the evidence for the long-standing practice of warrior sacrifice at the Huaca de la Luna and the prevalent depictions of Moche warrior sacrifice on Moche III and IV fineline vessels. What is clear is that, whatever the ultimate causes of Moche warfare, the sacrificial victims from Plaza 3A were not warriors drawn from the local population.

The local-warfare model also provides alternative explanations for other well-studied Moche iconography. For example, what should we make of the Sacrifice Ceremony? Does it represent the celebrated conquest of one Moche polity by an alliance among others? The seventeenth-century chronicler Huamán Poma de Ayala (1978 [1613]:28) informs us that pre-Inca warriors would disguise themselves for battle as powerful animals, birds, and winds and that they passed their achieved status down to their offspring. Once again, this interpretation is consistent with the multiple Warrior Priest and Priestess burials uncovered at Sipán and San José de Moro, respectively.

We do not suggest that warrior sacrifice was common or that warfare was the only strategy employed by the Moche. Warfare and territorial expansion are costly endeavors, and the Moche probably used multiple strate-

gies for acquiring resources and expanding their influence. Archaeologically invisible strategies such as alliance formation, negotiation, and the recruitment of local elites were almost certainly among them. Additional archaeological investigation will reveal whether warfare was more widespread than has been supposed.

Conclusions

While a case can be made that no single line of evidence rises to the level of explaining the nature of Moche sacrificial victims, the combined weight of the data considered here makes the most widely accepted model—that of ritual combat among local Moche for the purpose of providing victims for ceremonial sacrifice—unlikely. This is not to suggest that victims were not sacrificed in an elaborate ceremony that was an integral part of Moche power and authority; rather, it is a rejection of the notion that such combat was staged with sacrifice as its end. Moche scholars point out that war and combat typically have ritual and ceremonial elements (Dillehay 2001, Verano 2001*b*), but this is neither the proximate nor the ultimate reason for such conflict.

The iconographic, archaeological, mortuary, osteological, and biodistance data we have considered run counter to the assumptions of the ritual-combat model, and we tentatively conclude that the model of local warfare among Moche polities best describes the nature of Moche human sacrifice. It clarifies the apparent cultural similarities among combatants in the Moche's depictions of battle and captured prisoners while indicating that the sacrificial victims were captured enemy combatants who were not drawn from the local population.

It does not rule out the idea that some Moche polities may also have been involved in territorial conquest and warfare with non-Moche polities.

Comments

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I am very supportive of utilizing the extensive human osteological record of the Moche society of the North Coast of Peru to complement and extend understanding gleaned from more traditional archaeology. As a study of a major human skeletal sample in its broader comparative context, this study is well conceived and implemented and should pave the way for more such studies. However, the article has one major problem in applying its very useful analyses to sociopolitical interpretation. It seeks to explain the political significance of sacrifice in northern coastal Peru for the time-span AD 1–750 through the biological analysis of a large skeletal sample dating to the later sixth century AD, toward the end of the Moche period.

The problem is that this approach uses information relating to events that occurred over a brief segment of time to explain long historic process. Sutter and Cortez base their work on two assumptions. First, they agree, quite correctly I believe, that the more than 70 bodies found by Steve Bourget in 1995 in the corner of a plaza in the Huaca de la Luna ceremonial complex were sacrificed male warriors. Second, and less convincingly, they assume that this mass sacrifice and its motivation are representative of general Moche practice over several centuries. On the basis of their biological analysis they find that the victims were members of the North Coast population but that they had their closest affinity with nearby populations to the north. They then use this evidence to shed light on the commonly portrayed Moche combat theme and its related ritual cycle. They conclude that these depictions represent a kind of local warfare between competing Moche polities. This explanation counters recent suggestions that Moche combat was the assertive component of a regional political ideology. Shared by all Moche rulers, this ritualized practice both emphasized the autonomy of neighboring coastal polities and reinforced the shared social order that sustained their leaders while binding the protagonists as ritual partners.

These conclusions raise several concerns. First, these bodies were deposited unceremoniously in an exclusive and formal location of central ritual and power. We have no other archaeological instances of such indiscriminate deposition in the numerous Moche centers that have been investigated. Where present, sacrificial victims were carefully placed in or adjacent to tombs of rulers

in formal burial contexts. Second, we have no evidence from other mortuary contexts that such large numbers of victims were killed at one time. Such well-known sites as Sipán and San José de Moro contain a few attendants carefully buried in close proximity to the principal interment. Third, Bourget in his reports of the Huaca de la Luna excavations associates many of the sacrificed individuals with the relatively short time period when the North Coast was experiencing the disruptive impact of El Niño inundations at the end of the sixth century AD. Sutter and Cortez accept his suggestion that sacrificial killing on the scale evidenced by their sample may have been instigated in response to such environmentally induced stress.

These three points, taken in combination, strongly suggest to me that the Huaca de la Luna victims represent at best an aberrant form of the usual sacrificial ritual prompted by extreme stress. All the available mortuary evidence suggests that earlier sacrifices were conducted in a more formal setting as part of regular ritual practice. Donnan's recently published work on Middle Moche portrait vessels supports this interpretation. Donnan convincingly suggests that these portraits were important symbols of political ideology and depicted rulers with their accouterments of high status. Significantly, he identifies rulers who engaged in hand-to-hand combat and were captured and bound and ultimately sacrificed. This genre of portraiture disappears from the artistic repertoire with the coming of the latest Moche period—at the precise time that Moche society was being affected by the major disruptions of which the Huaca de la Luna floods were certainly part. The subsequent period was one of decline and ideological fragmentation. In this context the excessive form of sacrifice represented by the Huaca de la Luna bodies can best be interpreted as the acts of rulers desperately attempting to reverse the decline of their social order and political position. This failed, and the entire ideological custom that gave potency to traditional ritual sacrifice was abandoned. Given this wider contextual evidence, I conclude that it is unwise to regard the Huaca de la Luna sample as the yardstick with which to measure the meaning of sacrifice in historic Moche political structure and that the local-warfare model is correspondingly compromised.

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As a bioarchaeologist working in the Andes, I welcome this addition to the growing body of literature on bio-distance (e.g., Blom et al. 1998, Lozada 1998, Lozada and Buikstra 2002, Rothhammer et al. 1984, Soto et al. 1975, Sutter 1997, Verano 1987) and origins of sacrificial victims (e.g., Knudson et al. 2004, Verano and DeNiro 1993) in the region. I would like to limit my comments here to two general areas—the contribution of the study to

methodological concerns in biodistance analyses and suggestions for developing a richer, more nuanced interpretation of the data.

In addition to providing insight into Moche society, Sutter and Cortez's data can be used to address significant questions in biodistance studies. Their comparisons of Cerro Oreja samples over time show no discernible biodistances, leading them to argue that there is little evidence of breeding with "external genetic influences." The data also indicate that genetic drift in isolated populations may produce negligible changes over time in biodistances as measured by discrete dental traits, a point that has not been extensively addressed by other studies.

Another key issue in studies of biodistance is defining what exactly constitutes a "large biodistance." Over the years Sutter has compiled data from areas throughout the Andes. It would be wonderful to see here how these North Coast samples compare with those he has analyzed from the South-Central Andes (e.g., Sutter 2000). This might provide additional support for the conclusion that the sacrificial victims hail from the North Coast.

Several other observations may allow Sutter and Cortez to expand upon their current interpretations. One interesting point made is that the Huaca de la Luna "elites" are not local and appear to be related to the Jequetepeque Valley populations from Pacatnamú. They say that this likely means that they had a relatively recent common ancestor. Other interpretations include the possibilities that Pacatnamú was populated in part by people from the Moche Valley or that marriage alliances or reproductive sex were common between the groups. This is especially true if "retainers" are present in the Platforms I and II multiple burials. Additional information from the archaeological record may help them to evaluate the plausibility of these various possibilities. The suggestion that "the Moche ruling elite [might] all belong to the same family line" will potentially benefit from a discussion of research from other related sites (e.g., recent reports of genetically related elite at Dos Cabezas by Alana Cordy-Collins [2002]). This may also shed light on the interactions between the southern Moche state and the autonomous, local northern Moche polities.

In noting comparisons with the Moche urban sector sample, Sutter and Cortez might develop their interpretations further by considering the fact that they are sampling only one area of the urban habitation. Several studies in the Americas have established the presence of neighborhoods affiliated with distinct regions or lineages. Examples of urban areas with residential segregation include Teotihuacán in central Mexico (Paddock 1983) and Tiwanaku in the southern Andean highlands (Janusek 1999, Rivera 1994). This acknowledgment of intrasite variation is especially important for Sutter and Cortez's study given Cranio's (1997) findings of lineage cemeteries (based on craniofacial morphology) in Moche contexts at Pacatnamú.

A richer interpretation will also be possible if the researchers expand on their discussion of ethnicity and biodistance. The line between local/Moche and foreign/

not-Moche seems to be viewed as a fixed, genetically based line rather than a dynamic, negotiated boundary. Furthermore, Moche state expansion appears to focus on "introduction of Moche settlements into [other] regions." Individuals living in these regions are, therefore, described as "ethnically Moche." Decoupling ethnicity and genetics, as suggested in the classic work of Barth (1969) and explored in many fields of anthropology since, is crucial for the development of a more nuanced interpretation of issues involving identity and ethnicity. Likewise, expanding the view of biodistance to include gene flow instead of simply relying on common ancestry will aid them in developing a more dynamic interpretation of interactions within the Moche sphere and allow them to realize the potential of the important data that they present here.

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Sutter and Cortez's paper is a very interesting attempt to identify Moche sacrificial victims and thus to understand the nature of the combat portrayed in Moche art. I do not feel competent to evaluate the authors' techniques in studying the dentition or the statistical procedures they employ to determine biodistances between the various sets of individuals. My comments will be restricted to what they conclude from the results of their analysis.

They suggest three possible explanations for the combat depicted in Moche art: (1) It was ceremonial combat, with participants drawn from the local population. (2) It was expansionist warfare by the Moche against non-Moche people. (3) It was warfare between independent Moche polities that fought one another over resources. The second explanation can be readily eliminated; the combat scenes portray only Moche warriors. Sutter and Cortez argue that the third explanation is confirmed by their study of the dentition, which appears to indicate that the sacrificial victims were not from the local population. Moreover, they feel that the dismemberment and brutality inflicted on the victims and their lack of proper burial indicate that they were not members of the local community.

While I am intrigued by this argument, I am not convinced by it. If it was warfare between local polities, there should be an abundance of fortified Moche sites, but the only significant fortifications occur in phase 5 of the Moche style, whereas all of the excavated remains of sacrifice and nearly all of the artistic depictions of combat, capture, parading of captives, sacrifice, and dismemberment are from phases 3 and 4, when there is a conspicuous absence of fortifications.

At the same time, during phases 3 and 4 every major river valley inhabited by the Moche appears to have had at least one ceremonial precinct where a set of priests and priestesses consistently dressed in the same rigidly

prescribed ritual garments to perform their role in the sacrifice ceremony. This ceremony was the central focus of Moche religion and involved a series of activities that led up to and followed it. It was not simply the occasional sacrifice of individuals captured in local warfare.

Because the warriors had very elaborate clothing, weapons, and ornaments, they must have been people of high status—similar to the medieval knights who dressed themselves and their horses at great expense to perform jousting matches with splendid pageantry. The participants must have done so willingly, even though their capture and sacrifice might be the outcome.

How, then, is it possible to account for the dental evidence put forth by Sutter and Cortez suggesting that the victims were not local people? There are many possible explanations. Here are three:

1. Since the samples that Sutter and Cortez are working with are small, they may not prove to be representative when additional samples are available. It is curious, for example, that the sample most similar to that of the sacrificial victims excavated at the pyramids at Moche is from common fishermen at Pacatnamú. It is unlikely that any of those individuals participated in combat. Were there also elite men from Pacatnamú, genetically affiliated with these commoners, who served as warriors? How can we tell? Clearly we need larger samples before the evidence presented by Sutter and Cortez can be fully understood.

2. The sacrificial victims excavated at the pyramids at Moche were actually local residents but were genetically affiliated with people living elsewhere. After all, the populations inhabiting large urban centers usually include people from many different places. It might even be that some males came to a center like the pyramids at Moche from distant areas specifically to engage in ritual combat.

3. The sacrificial victims were indeed captured in combat with another local polity but the combat was arranged by the two groups in advance so that each group would be able to return to its own ceremonial precinct with the captives necessary to perform the sacrifice ceremony in its prescribed manner.

Sutter and Cortez are to be commended for their study and the light it sheds on one of the most important issues of Moche research. It will be interesting to follow this issue as more evidence becomes available. Meanwhile, I suggest caution in accepting their conclusions.

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Sutter and Cortez present an interesting synthesis of their study of epigenetic dental traits with a comprehensive review of the published literature on the archaeology, osteology, and ethnohistoric analogy involving Moche mortuary behavior and human sacrifice. To test cultural models used to explain warrior sacrifice and

its role among the Moche, they quantify the genetic distance of seven skeletal series within the Moche Valley and one outlying sample from Pacatnamú.

What is often overlooked in any analysis of aggregate skeletal remains is sample bias and composition. Does a skeletal series across broad or even short chronological periods represent the human population from which it is derived? Discrimination in mortuary behavior by age, sex, or social status will contribute to the overall unrepresentativeness of skeletal series. Dudar, Wayne, and Saunders (2003) have shown that kinship burial customs over 100-year time periods may confound the reconstruction of population history events. Wood et al. (1992) conclude that the majority of samples of the dead inevitably do not represent the biology of the living populations from which they were derived. In fact, as anthropologists we strive to recognize and explain such biocultural differences using the available tools and methods.

A biodistance approach using dental traits may not be an appropriate method for Sutter and Cortez's study, however, as Scott and Turner (1997:262) maintain that "dental traits might prove to be only minimally useful for assessing relationships among subgroups of a population because of their slower rates of differentiation." Compounding the issue is the mode of trait expression, which entails the combination of an unknown genetic component with shared and/or individual exposure to environmental factors whose relative contributions may be difficult to disentangle (Hillson 1996). This is reflected in Sutter and Cortez's nonsignificant mean measure of divergence results for most of the regional Moche Valley sites spanning 750 years. Except for the sacrificial victims from Huaca de la Luna Plaza 3A and the four comparisons with earlier Cerro Oreja sites, these skeletal series cannot be statistically distinguished from each other. Yet they persist in using such phrases as "nonsignificant but substantial and positive," "relatively distinct," and "close biodistance relationship" to interpret these results. In his modification of the mean measure of divergence statistic, Sjøvold (1973:213) specifically outlines the null hypothesis that is tested—"that the proportions of the variants in the samples compared [are] equal"—and says that if not found to be significant "the samples may be regarded as deriving from a common population." While there should be little room for misinterpretation of null results (there is no discernible difference, end of story), it is also misleading in that the two samples should also not be interpreted as being biologically indistinct.

This is a common breach of scientific rigor not only in anthropology but also in clinical medicine, prompting Altman and Bland (1995) and Alderson (2004) to remind us that absence of evidence is not evidence of absence. Their take-home message is that technically one cannot interpret differences in nonsignificant results but that meaningful differences may be identified if sample sizes are increased or other independent tests are performed. Since the additional statistical analyses performed by Sutter and Cortez (measure of uniqueness and multidimensional scaling) involve utilizing the same dental trait

frequency data, they are not independent assessments of biodistance relationships. One of the great philosophers of science, Karl Popper (1959), would say that better tests and/or other data sources are needed to resolve this dilemma. Ancient DNA, in particular, or cranial metric and nonmetric approaches may help to elucidate these biological relationships.

With their available biodistance data and a command of the published literature, Sutter and Cortez derive appropriately tentative suggestions and conclusions about the biological continuity of the Moche Valley. They are also correct in unambiguously stating that extrapolations to other Moche sacrificial sites are impossible given the uniqueness of the event at Huaca de la Luna Plaza 3A. This uniqueness also raises the specter of alternative explanations; the sacrificial sample is composed of only adult male warriors and is therefore likely biased, and its biodistance would therefore not reflect any true regional population relationship. However, by using alternative data sources such as ancient DNA to identify individual heritable lineages of these sacrificial victims, their biological relationship to other geoproximate Moche skeletal remains might be clarified.

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This paper is part of a growing body of work dedicated to human biological analysis in archaeological contexts that contributes to the discussion of anthropologically informed hypotheses. In this case it takes advantage of the highly publicized Moche (or Mochica) academic “boom” on the North Coast of Peru, which has focused on the attractive art style characterized by common and explicit representations of violence and by gruesome supportive evidence of mutilated and tortured human bodies. The authors delve into the morass of intermingled old and new opinions and contrasting definitions of style, space, and time and their possible social and cultural implications. It should come as no surprise that they have become mired in it.

In this general context, style is understood as the material expression of “real” populations and their authentic histories; Salinar, Gallinazo, and Moche represent ethnic groupings differentiated in time and space. However, it is increasingly clear that all these styles share an extensive geographical space during a millennium-long period that is poorly dated by radiocarbon methods. The three cultures represent complex societies with a common cultural background, including representations of formalized violence and other kinds of social interactions. Sutter and Cortez present supporting evidence for the homogeneity of these three cultures from their study of Moche Valley skeletal populations. This material shows differences from that for another biological group from the Jequetepeque Valley, but this database is too limited to allow generalization about the nature of the

skeletal population in the study area. Further, related material that is not studied may represent populations that served as “potential enemies” from outside the area (e.g., Cajamarca and Recuay [see Lau 2004]). From an archaeological perspective, both local and regional differences should lead to relative and absolute chronologies derived from reliable stratified sites. These sites should represent local and regional populations undergoing complex and dynamic political and economic transformations through time. But most of the burial contexts have not yet been published and dated (for a detailed discussion related to Mochica, see Kaulicke 2000). As a result, most archaeologists still employ the simplified and out-of-date definitions and seriations of Larco Hoyle (1948). It is still unclear who can be archaeologically identified from these styles. Is pottery style enough to determine ethnicity? Are stylistically defined elites (and the little-considered nonelites) sufficient evidence to infer politically distinct and potentially competitive polities (e.g., Moche versus Gallinazo)?

Rather than attempting to answer these and other questions, Sutter and Cortez focus on problems of armed conflict and human sacrifice in the Mochica context. This is an old topic of study on the Peruvian coast that has regained new life through the construction of “narratives” based on fine-line drawings and on the recovery of sacrificial victims at one archaeological site, Huaca de la Luna. But, according to Lau (2004:176), the “problem of taking Moche imagery literally . . . lies in assuming that Moche images provide real, impartial, or complete texts of the past.” This imagery on pottery has usually been found in burials or in ritualized contexts and therefore could be related to themes other than political history. Furthermore, this type of evidence cannot provide the whole range of armed combat or warfare behavior, much less the amount and intensity of organized conflict and the mechanisms by which sacrificial victims were obtained from wider time-space frames. Again, we should be asking other questions. Can the Huaca de la Luna and Huaca Cao victims be taken as general evidence for intensified sacrifice in late Mochica times and as responses to social and/or natural crises? Should we be envisioning more diversified practices that varied significantly in time and space, including both local victims and foreign victims drawn from cultures in which warfare is not a regularized practice? Can we differentiate between ritualized warfare or combat and institutionalized armed conflict as formal elements of state formation? Did the Mochica polities have standing armies of professional warriors who formed a formal social class? As far as I know, the presence of weapons in burial contexts does not reflect social regularities and practices which would support these suppositions. However, it does seem that male elite groups were particularly involved in violence and sacrifice, even as the high-ranking individuals who were ritually killed (see Donnan 2004).

I sympathize with Sutter and Cortez’s preference for smaller localized polities over aggressive large-scale state polities, but their analysis is not convincing because their sample is too limited quantitatively, spatially, and

temporally. Further, the inferred foreign sacrificial individuals cannot resolve problems already present in the literature on warfare and sacrifice. This literature is plagued by confusing and biased statements that are based more on art-historical interpretations and speculation than on more sophisticated approaches taking into account a steadily growing body of archaeological (and biological) evidence.

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Questions concerning the origins and political character of Moche society have long formed a central focus of archaeological research on the North Coast of Peru. Despite past and ongoing research efforts, however, broad consensus has yet to be reached regarding the structure and geographic extent of the Moche polity(ies). The approach taken by Sutter and Cortez of using the biological affiliation of sacrificial victims as a means of establishing political behavior is both innovative and intriguing. More to the point, it offers an independent means of testing existing models of Moche political relations within and beyond the Moche Valley based on studies of Moche art and architecture (and their distribution in the landscape). As a result, this provocative study will likely elicit productive response and serve to generate new data and avenues of inquiry.

However, there are a few aspects of the study that are somewhat problematic. Foremost among these is sample composition. First, the authors state that they “combine males and females [in each sample] in order to retain acceptable ($n > 10$) sample sizes.” Although this practice is understandable in terms of the statistical analyses they wish to perform, it is based on the unsubstantiated assumption that males as a group do not differ from females in some or all of the mixed-sex cemetery samples. (The only sex-based comparisons conducted compare all males and all females for the purpose of identifying sex biases in individual trait frequencies.) In consequence, any sex-based differences in trait frequency or degree of variability across traits that might exist could effectively be masked, which in turn could have important implications for interpretation. For example, if marriage/residence practices of men and women in Moche society (or perhaps in elite sectors of Moche society) differed along gender lines, then men may have comprised a more, or less, heterogeneous group than women in some or all of the groups sampled. If this is true, then the mixed-sex cemetery samples could look different from the all-male Huaca de la Luna Plaza 3A sample for reasons other than cultural practices associated with human sacrifice.

A second problem with the sample for addressing the questions posed has to do with geographic representativeness. While the demonstration of biological continuity among Moche Valley residential samples is impor-

tant for establishing the nature of cultural transitions within the Moche Valley, the largely internal focus of the study precludes assessment of biological similarity (or variability) across valleys. With the exception of the Jequetepeque Valley, the reader can only speculate as to the degree of biological difference that might exist among valleys to the north and south of the Moche Valley or between lowland and highland regions. Without these baseline data it is difficult to assess the meaning of the differences observed between the Huaca de la Luna Plaza 3A sample and other samples included in the study. Actually, the greatest differences observed by the authors are between Cerro Oreja (100 BC–AD 200) and Moche (AD 600) samples, and these could be explained by chronological attributes.

Finally, the data presented by Sutter and Cortez do not necessarily serve to refute models 1 and 2. Regarding the first, if the “ritual battles” depicted on Moche ceramics did occur, they need not have been limited to warriors from the Moche Valley. Rather, broad participation of warriors from different political subunits of an intervalley polity could have resulted in the biological uniqueness of the Huaca de la Luna Plaza 3A sample. Regarding the second, without knowing how biologically different (in terms of discrete dental trait frequencies) the various coastal and highland populations were from each other during the Moche phase, it is difficult to evaluate what constitutes a level of difference sufficient to warrant the identification as non-Moche (i.e., foreigner). This is not to say that Sutter and Cortez are incorrect in their interpretation, only that explanations for the observed biological variation between the Huaca de la Luna Plaza 3A sample and the other samples may be a bit more complicated than presented.

I do not mean my comments to detract from the study, which presents one of the most creative uses of discrete dental trait data I have seen in the literature. The focus on biological characteristics of population samples is relatively recent in Moche archaeology (but see Verano, various), and this study should encourage other scholars to explore the uses of human biological data for addressing significant anthropological problems. Rather, I simply wish to encourage the authors to broaden their conceptual framework to include other geographic locations and other aspects of cultural behavior in order to shed more light on the interesting and important questions they pose.

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Sutter and Cortez are to be applauded for bringing rigorous analysis of skeletal remains to bear on a cultural question using clearly stated objectives and well-defined hypotheses. The conclusions are extremely interesting and shed new light not only on these specific hypotheses

but also on issues of population continuity and interaction on the pre-Columbian Peruvian North Coast.

The statistical techniques used in this article are well established and have been used successfully by a variety of researchers in the past. One concern with the interpretation of the results in this case is that many are not statistically significant. Of course, culturally meaningful results can be wrought from patterns that do not meet strict levels of significance, and the authors are very careful to qualify their conclusions. Perhaps the examination of other studies and some modifications to the statistical protocol might help to support the conclusions.

First, aside from the issue of sacrifice, the interpretation of biodistance among the North Coast samples would benefit from a broader analytical context. Part of that contextual breadth comes from previous studies of North Coast material. Some 90 years ago, Hrdlička (1914) suggested that all coastal Peruvians were of the same physical type. However, Lauenstein (1973) suggested that there were valley-to-valley differences among North Coast valleys, including the Moche Valley, on the basis of a discriminant-function analysis. Verano (1987) and Verano and DeNiro (1993) also suggested that discriminant-function analysis could differentiate among Chicama and Jequetepeque Valley individuals and a highland sample from Cajamarca. Thus the existence of valley-to-valley differences suggested in this study appears to be supported by others. At the same time, I think it would be helpful to include an outgroup in the data matrix. This would help the reader to assess the measures of distance and uniqueness within the North Coast sample. An appropriate outgroup could be Sutter's (2000) South Coast sample.

Within-valley studies have demonstrated both apparent temporal continuity and discontinuities. Stewart (1943) suggested that the Cupisnique and Moche occupants of the Chicama Valley (one valley north of the Moche Valley) represented a single lineage. This conclusion is consistent with the Cerro Oreja results documented by Sutter and Cortez. However, Verano (1987, 1997) has argued for intrasite differentiation within the single Moche period at Pacatnamú (his study included the H45CM1 sample used here). Farther north, Shimada et al. (2004) have suggested temporal continuity from Moche to Sicán periods for part of the skeletal sample from Huaca Loro (the "North Women") while the remainder of the sample appeared to be intrusive, yielding a picture of a multiethnic Sicán society. Recently, we have taken a slightly different approach to population movements and affiliations by analyzing hair, bone, and teeth samples from Ubbelodhe-Doering's (1983) excavations at Pacatnamú for carbon, nitrogen, and oxygen isotopes (White, Nelson, and Longstaffe 2005). Our conclusions are that individuals from both the Moche and Lambayeque periods were moving around a great deal, both on a long- and on a short-term basis.

The point of citing these studies is that the people buried at a site or indeed in a particular cemetery may actually be derived from a variety of different geographic locales. Sutter and Cortez note this possibility in the case

of the Huaca de la Luna Plaza 3A sacrificial victims, but they do not present statistical results to corroborate it. Their conclusions (regarding both variability and the biodistance figures) would be greatly strengthened if they could demonstrate the ranges of variability within their samples. Of particular interest in this regard are the studies by White et al. (2002) and Spence et al. (2004) of sacrificial victims from the Feathered Serpent Pyramid at Teotihuacan. There the range of oxygen isotope values (interpreted as an indicator of geographic variability) for sacrificial victims is about five times that of any of the reference site-specific samples (see White et al. 2002:fig. 2). In this case variability is easy to demonstrate, as the isotope values are continuous variables. I do not know of an appropriate statistic for use with nonmetric data, but perhaps something along the lines of the "variance of the variants" discussed in Berry (1968:122–25) would suffice.

In the end, the prospect of being able to infer population relations, movements, and the participation of particular groups of individuals in such activities as warfare and human sacrifice is tremendously exciting and brings dynamism and agency to the archaeological record that are not accessible in any other way. I hope that Sutter was able to study the Pacatnamú "mass burial" individuals during his time in Trujillo and that we will soon have his perspective on Verano's (1987; Verano and DeNiro 1993) suggestions of locals and foreigners in that particular context.

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This article has important conclusions that fit the data presented, but a more cautious approach would be to consider the "local-warfare model" but *one* explanation for the nature of Moche human sacrificial victims. I also differ on certain points on the basis of my reading of the ethnohistorical record, particularly manuscript sources on the sixteenth-century populations that occupied the North Coast between the Santa and La Leche Valleys, identified broadly as the Chimú, and the adjacent highlands, identified as [or called] the Guambos, Cajamarca, and Cajatambo.

These post-1532 primary sources commonly associate events with the reign of a given Inca king. Despite the temporal distance, the model favored by Sutter and Cortez is consistent with the overall picture emerging for later cultural groups.

The images of the Moche conjured up by Sutter and Cortez's analysis are clearly analogous in many ways with later societies as described in archival sources. My imagining of the organization of the coastal Chimú and Inca-dominated local societies is of nested semi-autonomous groups made up of lineages that shared a culture and believed that they had (a) common founding ancestor(s) related to or created by a/the god(s). Over time,

groups grew and often splintered, and junior groups of various sizes and complexities developed their own ancestral cults but continued (under ideal conditions) to participate, perhaps intermittently, in the cult of the apical ancestor and to maintain ties with the original group. Exchanges of women, pilgrimages to common shrines, participation in rituals, and visitations by leading dignitaries were integrative mechanisms. As physical distances between these junior and senior groups increased, unifying linkages may have become attenuated.

Scattered, interdigitated, and multiple, even seasonal, housing sites and shared resources (consistent with the geographical distribution of Moche ceramics) meant that mutually exclusive territories did not define groups and were not the basis of their identities. Although individuals and family units, even on the irrigated coast, held individual fields until soil infertility and low yields mandated a fallow spell, a given and bounded territory of the larger population unit was not a reality before the *reducciones* of Spanish colonial times.

The broader integration of local competing groups was difficult; ties were vertical and allegiances shallow. The Incas expanded after defeating the Chancas, challenging and incorporating other groups. The defeated expected to serve the victors, and defeated leaders, the personifications of divine ancestral power, were the most likely to be sacrificed. Hegemony proved difficult to maintain and met with resentment, hostility, and even rebellion, despite the periodic visitation of the king. Ongoing hospitality and reciprocity, military victory, and continued prosperity or aid in crises contributed to but did not guarantee unity.

Prolonged environmental stress discredited elites when the ancestors did not provide despite proper propitiation. The tarnished ruling cult seemed, in these circumstances, powerless. People fled or switched allegiances to lords and deities offering stronger protection. Religious and political realignment followed.

The Moche seem to have been similar, representing a people with a common culture but shifting dominion among competing groups, each with its own divine apical ancestor. During crises, a ruling group might lose its legitimacy and integrating ability, resulting in fracturing of the body politic. When diplomacy, visitations, gift giving, hospitality, threats, and negotiations failed and appeals to a common ancestor faltered, the population might shift north and inland as Sutter and Cortez suggest it did. Unresolved rivalries could result in warfare in which the elite and its god might be labeled “defeated” and certain warriors sacrificed. This scenario explains the non-foreign origin of the sacrificial population. The remainder of the defeated then served the victors, underscoring the fact that the Moche expansion was probably not territorial. The real object of warfare was additional labor service, the native definition of “wealth.”

Problems with the analysis include the possibility that, perhaps in other contexts, some individuals volunteered for or were resigned to a sacrificial death. Another is terminology. Exactly what is the unit of analysis? Certainly it was a demographic unit, not a strictly ter-

ritorial one. Was it an ethnicity, a mega-lineage, or an *oikos* (as suggested by Kolata), and how should these be defined? The terms “polity” and “group” are used generically here, specifically because of their unspecified and vague meanings. Shifting loyalties give each unit “social frontiers,” making them hard to identify in the field. Finally, perhaps the search for a capital is misleading. Native leaders at both the imperial and the local level of administration were itinerant. What might seem like a capital to an ethnocentric European may represent the oldest and most elaborate of several ceremonial sites and pilgrimage centers of a successful and growing ruling group. The paramount lord, be he Inca or curaca, was the center of the center of a preliterate society. Wherever he might travel was the center of administration, ritual, and gift exchange. These remarks also remind us of the importance of the native point of view.

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This paper presents new data and stimulating ideas on the long-standing debate regarding the nature, roles, and identities of participants in combat depicted in Moche art and Moche political organization and relations. Our comments focus on three methodological and conceptual aspects and a brief description of the results of our mtDNA analysis of Moche samples.

1. Much information is lost when the 31 original traits are reduced to 7 by rather strict expectations of significant intersample variation, sex homogeneity, and independence. Many traits that are nonsignificantly different in univariate form may combine to produce a significant multivariate result. All the information should be inputted into the biodistance analysis. Sex and correlation properties will vary along a continuum upon which Sutter and Cortez impose a cutoff point according to statistical significance. Redundance could have been better addressed through a data reduction protocol such as principal components analysis. More information and statistical precision are lost by scoring the traits as present/absent when for many of them the ASU system standardizes scoring along a multistate continuum.

As Sutter and Cortez note, their results do not really support the principal conclusion. The Huaca de la Luna sacrificial sample is not significantly divergent from the Moche. In attempting pattern recognition from the mean measure of divergence, two problems present themselves. First, sample sizes may influence these results. For example, in table 3 we see that 3MMETA involves two samples with frequencies far higher than those for the other samples, but these result from a count of 6 out of 9 and 5 out of 8 present. UP2CA is statistically “independent” of other traits only because of its very low frequency (at most showing presence in 2 out of 26 cases). The mean measure of divergence may itself be dependent on sample size. The only significantly large values for

this measure involve the 4 Cerro Oreja samples (table 4), which are much larger than the others.

Since there were so many univariate and mean measure of divergence tests, a Bonferroni “protected” critical probability would be much less than the standard 0.05. Another idea might be to examine relatively “fine-grained” structure among interindividual biodistances (see Corruccini and Shimada 2002, employing dental traits similar to those of Sutter and Cortez).

2. We urge greater caution in applying historical information (particularly Garcilaso de la Vega) derived primarily from the highlands of Peru to North Coast cultures some 1,000 years earlier. While the modes of Moche and Inca combat may have been similar, the comparability of the attitudes toward and motives for combat remains to be elucidated. The apparent discrepancy between the inferred lack of respect in the documented mutilation of sacrificial victims and the inferred honoring of deceased and/or sacrificed warriors in the form of portrait vessels also requires further consideration of attitudes and motivations. Given that only a few cases of Moche human sacrifice have been documented, we cannot assume that the Plaza 3A case is typical (Shimada et al. n.d.).

3. Recent mtDNA analyses of samples from the Moche sites of Sipán, Moche, and El Brujo (Shimada et al. n.d.) present a picture that both concurs with and diverges from the findings of Sutter and Cortez. Elite individuals at each of these sites appear to belong to a distinct breeding group, although pre-Hispanic North Coast groups for which we have some mtDNA data are, as a whole, relatively homogeneous. Our analyses of the sacrificial victims from Plaza 3A and burials from the urban sector of Moche indicate overall genetic homogeneity, suggesting that sacrificers and sacrificial victims pertained to the same population living in the Moche Valley. It is not surprising that mtDNA and biodistance data do not agree, considering the distinct inheritance mechanisms (maternal versus bilateral) involved (Corruccini, Shimada, and Shinoda 2002). Additional testing and comparison of the two methods are required.

Sutter and Cortez often use the term “local population” without indicating geographic location, size, genetic composition, or cultural or ethnic identity. An implicit assumption commonly made by those working on the North Coast is that the physical proximity of populations correlates with political and/or genetic closeness. We have no convincing evidence to this effect. In fact, the sort of complex and shifting mosaic pattern of ethnic settlements and polities that Ramírez (1985, 1996) argues for the late-pre-Hispanic North Coast has not been adequately considered by archaeologists and bioarchaeologists. The insular character of contemporary Moche archaeology has similarly hindered an in-depth examination of biological and cultural interaction between the Moche people and their contemporaries on the coast and in the adjacent highlands (Shimada (2004a, b). The “genetic influence” of these interactions remains to be clarified. Our poor understanding of pre-Hispanic North

Coast demography should be clearly kept in mind in extrapolating limited biodistance data.

In sum, the conclusions presented by Sutter and Cortez exceed the strength of the biodistance and other evidence that they present. Reanalysis and more cautious interpretation are urged. They have embarked on an important long-term biodistance study, and we hope that these comments will serve to inform their future work.

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Sutter and Cortez take a novel approach to the issue of the identity of captives sacrificed by the Moche at the Huaca de la Luna. They develop explicit hypotheses about Moche warfare and prisoner sacrifice and then test them using biodistance data. Their results lend support to the hypothesis that captives sacrificed at the Huaca de la Luna were not members of the local population. Limitations of the study include the small number of comparative samples and the disturbed contexts from which some Moche skeletal material was recovered at the Huaca de la Luna. Both of these limitations reflect the fact that few large samples of well-provenienced and well-preserved Moche skeletal material exist. These problems will perhaps be overcome as more Moche skeletal remains become available for study.

Sutter and Cortez’s study addresses a subject of active debate among Moche scholars. Some see Moche combat as a strictly ritual one-on-one contest between members of the ruling elite of Moche society, with the defeat of one’s opponent providing a victim for blood sacrifice. Others believe that Moche artistic representations of combat depict more large-scale (and secular) conflicts between Moche polities in different coastal valleys or, in some cases, confrontations with non-Moche groups. In between these two extremes are scholars who see both religious and secular elements in Moche combat and captive sacrifice. Although the debate continues, recent studies provide new support for the existence of armed conflict among the Moche and between them and their neighbors (Arkush and Stanish 2005, Dillehay 2001, Lau 2004).

Traditionally, hypotheses about the nature of Moche warfare were based largely on indirect evidence. Only since 1995 have skeletal remains of sacrificed captives been available as a potential data source for exploring the question whether these victims were members of the local population or “outsiders.” To date, several problems have hindered such studies. Identifying outliers from skeletal analysis requires adequate comparative samples—both from the local population at the site where victims were sacrificed and from potential external groups that may have been the source(s) of captives. Unfortunately, despite more than a century of archaeological excavations on the North Coast of Peru,

very few large collections of well-preserved Moche skeletons exist. Elite tombs at Moche sites have been preferentially targeted for looting since the early colonial period, and as a result only a small number of intact elite Moche tombs have been excavated scientifically. Although over the past ten years a relatively large sample of Moche burials has been excavated from the Urban Sector at Moche (Millaire 2004b, Tello, Armas, and Chapdelaine 2003), skeletal preservation is generally poor because of irrigation and farming of this area by the Chimú following the Moche abandonment of the center, precluding the biodistance studies based on craniofacial measurements that have proven informative in better-preserved skeletal material elsewhere (Verano 1997, Verano and DeNiro 1993). And with the exception of the sites of El Brujo in the Chicama Valley and Pacatnamú and San José de Moro in the Jequetepeque Valley, there are no large comparative samples of Moche skeletal material. These limitations make Sutter and Cortez's task challenging, and their results should be seen as preliminary until more comparative data can be included in their analyses. For example, the inclusion of skeletal samples from the Chicama and Virú Valleys (the adjacent valleys to the north and south of the Moche Valley) would create a better comparative framework for evaluating the Plaza 3A sample.

Despite the limitations of their samples, the results of Sutter and Cortez's study are important in indicating the distinctiveness of the Plaza 3A sacrificial victims from all comparative samples and, in particular, from burials from the site of Moche. Interestingly, this result is in contrast to that of a pilot study of mitochondrial DNA (mtDNA) reported by Shinoda and colleagues, which found surprising homogeneity of mtDNA in a sample of Plaza 3A sacrificial victims and high-status burials from the Huaca de la Luna (Shinoda et al. 2002). The conflicting results of these two studies may be due to the fact that the dental morphological traits employed by Sutter and Cortez reflect differences in nuclear (nDNA) and not mitochondrial DNA. A recent study by Williams and colleagues comparing nDNA and mtDNA as measures of genetic relationships found some interesting discordances between these data sets (Williams, Chagnon, and Spielman 2002), suggesting that reconstruction of genetic relationships from ancient mtDNA data may be more complex than previously assumed.

Other approaches to determining the identity of Moche sacrificed captives employing new techniques such as strontium and oxygen isotopic analysis of enamel and bone may be the next route to explore. Such methods have been applied with great success at Teotihuacan and in the Maya area to infer geographic origins and migration patterns and might prove useful in the Moche case as well. For the moment, this chapter of Moche history remains unfinished.

Reply

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We are grateful to the commentators for their insights and constructive criticisms. It is apparent that despite more than a century of intensive study there are a number of unresolved issues in Moche archaeology. As Kaulicke points out, temporal and spatial issues persist regarding the Moche and their presumed relationship to early archaeological cultures. A more immediate methodological problem, however, is the failure of many scholars to consider more than one empirically testable model for Moche sociocultural organization, combat, and human sacrifice. By addressing some of the methodological concerns we raise here, Moche archaeologists may play a much greater role in our understanding of the development of archaic states.

We fully recognize the concerns of Donnan, Dudar, Lambert, Nelson, and Verano about the mortuary samples we used and agree that our conclusions should be considered tentative. However, as Verano points out, there are relatively few well-provenienced Moche mortuary populations available for study, and these suffer from near-ubiquitous cranial deformation and poor preservation. Lambert's point that marriage patterns may influence our results is well taken, but eliminating traits that vary with sex would greatly reduce any patterns in our data that are due to marriage networks. It was not our goal to investigate marriage patterns, but with the addition of more samples in the near future we hope to explore this and other topics. Contrary to Donnan's and Blom's misunderstanding of our results, we did not argue that the platforms sample was directly related to the commoner cemetery at Pacatnamú. What we said was that it may have had a recent common ancestor with Moche from the northern sphere of influence. Assessing this possibility will require additional data and analysis.

While Shimada and Corruccini argue for alternative ways of analyzing our data, we chose C. A. B. Smith's mean measure of divergence because it is well understood and both widely used and accepted by scholars conducting biodistance studies using epigenetic traits such as the dental traits we employ. This measure is highly correlated with others (Constandse-Westermann 1972, Finnegan and Coopridge 1978, González-José, Dahinten, and Hernández et al. 2001, Hecht Edgar 2004, Sokal and Sneath 1973) and more conservative (Hallgrímsson et al. 2004:265). The measure requires that all traits employed vary significantly among the samples analyzed and that they not be intercorrelated. We had previously presented preliminary biodistance analyses of the Moche sacrificial victims and other mortuary samples using all dental traits scored with essentially the same results (Sutter and Cortez 2002).

Shimada and Corruccini erroneously recommend that we should have applied Bonferroni's adjustment to our

contingency chi-square levels of significance (see, e.g., Perneger 1998, Rothman 1990, Savitz and Olshan 1995, Thomas et al. 1985) Bonferroni's adjustment is commonly applied in analyses of variance, when multiple correlations are calculated, or when one is testing the same hypothesis multiple times using different data (Bland and Altman 1995). We were asking a different question—whether a given trait varied significantly over the samples being considered. Given that the expressions of these dental traits are independent (Scott and Turner 1997), we were testing a different hypothesis each time we considered a trait's significance across the samples. Further, their recommendation ignores the well-established criteria for trait selection for the calculation of the mean measure of divergence (Haydenblit 1996, Higa et al. 2003, Prowse and Lovell 1996, Rothhammer et al. 1984). It is perplexing that they would recommend the dental analyses they have used with Sicán burials (Corruccini and Shimada 2002, Corruccini, Shimada, and Shinoda 2002). The fragmented nature of many of the specimens we considered makes such analyses inappropriate. Their analyses utilized relatively few, young specimens with fairly complete dentitions and involved calculations of Euclidean distance between individuals using a battery of dental traits. Even if our specimens were characterized by relatively complete dentitions, the large number of individuals we considered would make it computationally cumbersome to complete the factorial of 535 distance calculations they suggest.

Bawden's assertion that the Plaza 3A sample is aberrant is simply incorrect. The Plaza 3A sample consists of sacrifices from at least five separate sacrificial events (Bourget 2001), and Moche sacrificial contexts from Dos Cabezas and Cao Viejo and 250 years of sacrificial activities at Huaca de la Luna Plaza 3C are also composed of adult males that were either tortured or dismembered. Bawden implies that retainer burials associated with Moche elites are more representative of Moche human sacrificial practices. Retainer burials are, however, qualitatively distinct from the remains uncovered at Plaza 3A (see Verano 2001a).

While we acknowledge Dudar's concerns regarding epigenetic dental traits, we feel that he overstates the possible problems involved for microevolutionary studies at the regional level. While Nichol's (1989) study reports varied levels of environmental influence and heritability among epigenetic dental traits, many other studies indicate high heritability among many of the traits examined by this study (Berry 1978; Biggerstaff 1970, 1973; Corruccini and Sharma 1985; Escobar et al. 1976; Harris and Bailit 1980; Hassanali 1982; Lease and Scuiilli 2005; Portin and Alvesalo 1974; Scott 1980), and dental traits have been used successfully to discriminate among populations and individuals to reconstruct known relationships (Brewer Carias et al. 1976, Sofaer, MacLean, and Bailit 1972, Sofaer, Niswander, and MacLean 1972, Sofaer, Smith, and Kaye 1986, Wijsman and Neves 1983). Further, the solutions Dudar recommends are equally affected by environmental influence and sampling bias.

Contrary to Donnan's misreading, we did not confirm

any of the three models we considered. Rather, we tentatively accepted the model of feuding Moche polities because it had the greatest explanatory appeal. Dudar takes issue with our drawing conclusions from nonsignificant results, while Shimada and Corruccini suggest that our biodistance data do not support our principal conclusions. They would have us either draw no distinctions between the Moche sacrificial victims from Plaza 3A and the other mortuary samples we studied or conclude that the null hypothesis cannot be rejected. We disagree with their Popperian view of science. Following the approach of Hanson (1958), we tested three currently viable models of Moche sacrifice in the hope of identifying the model with the greatest explanatory appeal. The literature on prehistoric populations of the North Coast of Peru suggests that we should expect nonsignificant results under the competing-polities model. Ancient mtDNA analysis of both sacrificial and other remains from the Huaca de la Luna site (Shimada et al. 2003, Shinoda et al. 2002) and a limited number of both Moche and Gallinazo remains from the Virú Valley (Shimada 2004a) has failed to show any variability among the individuals sampled, while a study that compares 44 prehistoric samples from throughout the Andes (Sutter n.d.) shows that Early Intermediate Period samples from northern Peru form a relatively coherent breeding population compared with the other Andean samples analyzed.

Further, a subsequent study by Sutter and Verano (n.d.) which included, in addition to the samples considered here, the human sacrificial remains from Huaca de la Luna Plaza 3C has produced statistically significant results. In addition to the dentally derived biodistances, this study compared the observed biodistance matrix with hypothetical matrices derived from competing models and determined correlations and levels of significance among competing matrices. Here the model of nonlocal origin was significantly correlated with the observed matrix.

Unfortunately, there is no such elegant solution to the issue of dental trait variability as Nelson requests. The measure of uniqueness provides a simple rank order of sample variability within a given study, and, given the data and the analysis we employ, we recognize that the Huaca de la Luna Plaza 3A sample may be composed of males from multiple locations. These results are, however, in stark contrast to the ritual-combat model as articulated by most proponents, including Alva and Donnan, who say that as far as they can tell, "the Moche warriors fought with one another, not against some foreign enemy" (1994:33), and Bourget (2001:94), who claims that "there is currently no evidence to suggest that the victims sacrificed at Huaca de la Luna were foreigners." Given the limitations of the biodistance techniques employed by our study, we share the sentiments expressed by Dudar, Lambert, Nelson, and Verano and eagerly await the results of studies that may provide us with greater resolution regarding the origins of the human remains in all of our samples. For the time being,

we hope that our work will provide useful models to be tested.

In agreement with Blom, Kaulicke, and Shimada and Corruccini and as others have suggested (Berezkin 1978; Cordy-Collins 2001; Donnan 1995:154; Galvez and Briceño 2001:152), we suspect that ethnic variation of some kind characterized the Moche at different times. Further, as others have implied (Bawden 1996, Millaire 2005, Shimada 2004a), we think that the Moche and the Gallinazo may have come from a single breeding population with numerous shared cultural characteristics. Indeed, iconographic depictions of apparently Moche-on-Moche combat may occasionally represent Moche-on-Gallinazo combat: to our knowledge, the apparel and weaponry of Gallinazo warriors have not been identified. A cursory investigation of Gallinazo ceramics from the Museo Larco's online catalogue (2005) provides evidence for depictions of warriors with square shields, *porras*, and ear spools similar to those depicted in Moche iconography (see MLO16300, MLO16299, MLO16304, MLO16265, MLO16294, and MLO16298). In addition, Millaire's (2005) recent comparison of Gallinazo textiles from Huaca Santa Clara in the Virú Valley with Moche textiles from Pacatnamú indicates that their weaving techniques, dyes, and motifs are indistinguishable.

These issues aside, we respectfully disagree with Bawden's, Donnan's, and Kaulicke's views on the lack of archaeological correlates of warfare and the evidence for ritual battles. Rather than reiterate the arguments of Arkush and Stanish (2005) on warfare in the Andes, we will point to issues that they do not consider. First, Donnan argues that because Moche sites are not fortified until Moche V there was no warfare among earlier Moche polities. Billiman's (personal communication) surveys of sites in the Moche Valley indicate, however, that middle-period Moche sites in the middle valley were located in defensive positions through Moche III-IV. Further, Gat's (2002) survey of data from a number of archaic states around the world indicates that fortifications are usually absent during the initial occupations of sites that are known to have participated in combat with neighboring city-states. Defenses develop gradually out of natural defenses such as location on a slope of a hill or adjacent to a river. Fortifications are usually found where siege tactics were employed. However, siege tactics require logistic support and infrastructure to supply warriors as they venture into their enemy's territory. Hassig (1988: 148) explains that logistical limitations would necessitate raids of relatively short duration, while Roys (1943: 67) contends that combat between Mayan polities occurred in the regions between the opposing centers instead of within them. These characterizations of archaic state warfare may explain why Moche scenes of combat generally depict confrontation in the desert. Webster (1998) characterizes conflict among Classic and Post-Classic Maya centers as status-rivalry-based combat between Maya elites. This analogy would explain why only elite warriors are depicted in Moche iconography.

Ramírez and Shimada and Corruccini express concerns

regarding the application of ethnohistorical data on the Inca Empire to the Moche, and the latter take exception to our having cited Garcilaso de la Vega. We share their concern about the misapplication of ethnohistorical data (and see Kuznar 2001) but do not believe that our study suffers from this problem. We would suggest that it is the analogies used to argue for the ritual-combat model that are inappropriate. To begin with, the practices on which the model is based—modern ethnographic *tinkus* and the *kamay* of Inca nobles—would have produced very different material records from that observed for the Moche victims. Death is quite uncommon in the *tinku* (Gorbak, Lischetti, and Muñoz 1962), and while death occasionally occurred during *kamay* (Molina 1873 [1570–84]:34, 41–46) it was rare. Further, the losers were not subjected to sacrifice. Finally, both of these analogies come from the Andean highlands and are removed in time by 1,000 years or more. At the same time, the ethnohistoric analogy we employ has support from multiple chroniclers. There are accounts describing one-on-one combat between the Incas and other ethnic groups (Sarmiento de Gamboa 1999 [1572]:83, 97, 106, 140), the removal of the prisoner warriors' clothing, weaponry, and objects of value followed by the denigrating parading of captured prisoners in the principal plaza in Cuzco (Betanzos 1996 [1557]:31–32, 89–90, 94, 95, 113, 127), the Incas' torture, flaying, and mutilation of enemy warriors' bodies (Betanzos 1996 [1557]: 89–90, 95, 113, 127, 147, 244; Cieza de León 1959 [1553]:84; Huamán Poma de Ayala 1978 [1613]:51; Sarmiento de Gamboa 1999 [1572]: 97, 164–65), and the leaving of enemy warriors' and traitors' dead bodies unburied on penalty of death (Betanzos 1996 [1557]:41, 94; Cieza de León 1959 [1553]:50; Huamán Poma de Ayala 1978 [1613]:50–15). It is also noteworthy that the Inca nobility of Cuaco were mistreated in a similar way as other enemies by Atahualpa and his generals following their victory in the civil war (Betanzos 1996 [1557]:244). Such treatment of enemy warriors closely corresponds to both the mortuary and iconographic data currently available for the Moche and is supported by other cross-cultural data. In contrast, individuals sacrificed during Inca festivals or as attendant burials were adorned with high-quality metals, textiles, and ceramics and interred in formal graves (Betanzos 1996 [1557]:95; Cieza de León 1959 [1553]:150; Cobo 1990 [1653]:117; Huamán Poma de Ayala 1978 [1613]:63, 64, 68; Sarmiento de Gamboa 1999 [1572]:102–3), while the bodies of Inca warriors killed in combat were returned to Cuzco, mummified, and returned to their families for veneration (Betanzos 1996 [1557]:95). Significantly, Moche attendant burials follow the Inca's burial practices for attendant burials.

References Cited

- ALDERSON, PHIL. 2004. Absence of evidence is not evidence of absence. *British Medical Journal* 328:476–77. [JCD]

- ALTMAN, DOUGLAS G., AND J. MARTIN BLAND. 1995. Statistics notes: Absence of evidence is not evidence of absence. *British Medical Journal* 311:485. [JCD]
- ALVA, WALTER. 2001. "The royal tombs of Sipán: Art and power in Moche society," in *Moche art and archaeology in ancient Peru*. Edited by Joanne Pillsbury, pp. 233–46. New Haven: Yale University Press.
- ALVA, WALTER, AND CHRISTOPHER B. DONNAN. 1993. *Royal tombs of Sipán*. Los Angeles: Fowler Museum of Cultural History.
- . 1994. Tales from a Peruvian crypt. *Natural History*, May, pp. 26–30, 33–34.
- ARKUSH, E., AND C. STANISH. 2005. Interpreting conflict in the ancient Andes: Implications for the archaeology of warfare. *CURRENT ANTHROPOLOGY* 46:3–27. [JWV]
- BARTH, FREDRIK. 1969. *Ethnic groups and boundaries: The social organization of culture difference*. Boston: Little, Brown. [DEB]
- BAWDEN, GARTH. 1996. *The Moche*. Cambridge: Blackwell.
- BEREZKIN, YURI. 1978. The social structure of the Mochica through the prism of mythology (ancient Peru). *Vestnik Drevnei Istorii* 3:38–59.
- BERRY, A. CAROLINE. 1978. "Anthropological and family studies on minor variants of the dental crown," in *Development, function, and evolution of teeth*. Edited by P. M. Butler and K. A. Joysey, pp. 81–98. New York: Academic Press.
- BERRY, R. J. 1968. "The biology of non-metrical variation in mice and men," in *The skeletal biology of earlier human populations*. Edited by D. R. Brothwell, pp. 1103–33. Oxford: Pergamon Press. [AN]
- BETANZOS, J. D. 1996 [1557]. *Narrative of the Incas*. Austin: University of Texas Press.
- BIGGERSTAFF, R. H. 1970. Morphological variations for the permanent mandibular first molars in human monozygotic and dizygotic twins. *Archives of Oral Biology* 15:721–30.
- . 1973. Heritability of the Carabelli cusp in twins. *Journal of Dental Research* 52:40–44.
- BILLMAN, BRIAN R. 1997. "Population pressure and the origins of warfare in the Moche Valley, Peru," in *Integrating archaeological demography: Multidisciplinary approaches to prehistoric population*. Edited by Richard R. Paine, pp. 285–310. Carbondale: Center for Archaeological Investigations.
- . 1999. "Reconstructing prehistoric political economies and cycles of political power in the Moche Valley, Peru," in *Settlement pattern studies in the Americas: Fifty years since Virú*. Edited by Brian R. Billman and Gary M. Feinman, pp. 131–59. Washington, D.C.: Smithsonian Institution Press.
- BLAND, J. M., AND D. G. ALTMAN. 1995. Multiple significance tests: The Bonferroni method. *British Medical Journal* 310:170.
- BLOM, DEBORAH E., BENEDIKT HALLGRÍMSSON, LINDA KENG, MARÍA C. LOZADA C., AND JANE E. BUIKSTRA. 1998. Tiwanaku "colonization": Bioarchaeological implications for migration in the Moquegua Valley, Peru. *World Archaeology* 30:238–61. [DEB]
- BOURGET, STEVE. 1997. "Las excavaciones en la Plaza 3A de la Huaca de la Luna," in *Investigaciones en la Huaca de la Luna 1995*. Edited by Santiago Uceda, Elias Mujica, and R. Morales, pp. 51–59. Trujillo: Universidad Nacional de La Libertad.
- . 2001. "Rituals of sacrifice: Its practice at Huaca de la Luna and its representation in Moche iconography," in *Moche art and archaeology in ancient Peru*. Edited by Joanne Pillsbury, pp. 89–110. New Haven: Yale University Press.
- . 2004. A case of mistaken identity? The Moche presence in the Viru Valley. Paper presented to the Sixty-ninth Annual Meeting of the Society for American Archaeology, Montreal, Canada, April 1.
- BREWER CARIAS, C. A., S. LE BLANC, AND J. V. NEEL. 1976. Genetic structure of a tribal population, the Yanomama Indians. 13. Dental microdifferentiation. *American Journal of Physical Anthropology* 44:5–14.
- CARCELÉN, JOSÉ. 1995. *Proyecto de rescate arqueológico chavimochic: Informe de entrega de obra*. Vol. 2(4). *Rescate ar-*
- queológico Flanco Norte y Arenales al oeste de Cerro Oreja, Canal Madre, II Etapa: Variante Cerro Oreja*. Trujillo: Instituto Nacional de Cultura—La Libertad.
- CASTILLO, LUIS JAIME. 2000. *The sacrifice ceremony: Battles and death in Mochica art*. Lima: Rafael Larco Herrera Archaeological Museum.
- CASTILLO, LUIS JAIME, AND CHRISTOPHER B. DONNAN. 1994. "La ocupación moche de San José de Moro, Jequetepeque," in *Moche: Propuestas y perspectivas*. Edited by Santiago Uceda and Elias Mujica, pp. 93–146. Travaux de l'Institut Français d'Etudes Andines 79.
- CHAPDELAINE, CLAUDE. 2001. "The growing power of a Moche urban class," in *Moche art and archaeology in ancient Peru*. Edited by Joanne Pillsbury, pp. 69–88. New Haven: Yale University Press.
- . 2004. The Moche occupation of the Lower Santa Valley and the nature of the southern Moche state. Paper presented to the Sixty-ninth Annual Meeting of the Society for American Archaeology, Montreal, Canada, April 1.
- CIEZA DE LEÓN, P. 1959 [1553]. *The Incas of Pedro de Cieza de León*. Norman: University of Oklahoma Press.
- COBO, B. 1990 [1653]. *Inca religion and customs*. Austin: University of Texas Press.
- CONSTANDESE-WESTERMANN, T. S. 1972. *Coefficients of biological distance: An introduction to the various methods of assessment of biological distances between populations, with special reference to human biological problems*. Oosterhout N. B.: Anthropological Publications.
- CORDY-COLLINS, ALANA. 2001. "Decapitation in Cupisnique and Early Moche societies," in *Ritual sacrifice in ancient Peru*. Edited by Elizabeth P. Benson and Anita G. Cook, pp. 21–34. Austin: University of Texas Press.
- . 2002. Archaeological context of the Dos Cabezas giants. Paper presented at the 4th European Meeting of the Paleopathology Association, Coimbra, Portugal, August 31. [DEB]
- CORRUCCINI, R. S., AND K. SHARMA. 1985. Within- and between-zygosity variance in oral traits among U.S. and Punjabi twins. *Human Heredity* 35:314–18.
- CORRUCCINI, ROBERT S., AND IZUMI SHIMADA. 2002. Dentally determined biological kinship in relation to mortuary patterning of human remains from Huaca Loro, Peru. *American Journal of Physical Anthropology* 117:113–21. [IS, RC]
- CORRUCCINI, ROBERT S., IZUMI SHIMADA, AND KENICHI SHINODA. 2002. Dental and mtDNA relatedness among thousand-year-old remains from Huaca Loro, Peru. *Dental Anthropology* 16(1):9–14. [IS, RC]
- DE LA VEGA, GARCILASO. 1994 [1610]. *Royal commentaries of the Incas and general history of Peru*. Austin: University of Texas Press.
- DILLEHAY, TOM D. 2001. "Town and country in the Late Moche times: A view from two northern valleys," in *Moche art and archaeology in ancient Peru*. Edited by Joanne Pillsbury, pp. 259–84. New Haven: Yale University Press.
- DONLON, D. A. 2000. The value of infracranial nonmetric variation in studies of modern *Homo sapiens*: An Australian focus. *American Journal of Physical Anthropology* 113:349–68.
- DONNAN, CHRISTOPHER B. 1978. *Moche art of Peru: Pre-Columbian symbolic communication*. Los Angeles: Fowler Museum of Cultural History.
- . 1988. Unraveling the mystery of the Warrior Priest. *National Geographic* 174:551–55.
- . 1995. "Moche funerary practice," in *Tombs for the living: Andean mortuary practices*. Edited by T. D. Dillehay, pp. 111–59. Washington, D.C.: Dumbarton Oaks.
- . 1997. "Introduction," in *The Pacatnamú papers*, vol. 2, *The Moche occupation*. Edited by Christopher B. Donnan and Guillermo A. Cock, pp. 9–16. Los Angeles: Fowler Museum of Cultural History.
- . 2001. "Moche ceramic portraits," in *Moche art and archaeology in ancient Peru*. Edited by Joanne Pillsbury, pp. 127–40. New Haven: Yale University Press.
- . 2004. *Moche portraits from ancient Peru*. Austin: University of Texas Press.

- DONNAN, CHRISTOPHER B., AND LUIS JAIME CASTILLO. 1992. Finding the tomb of Moche priestess. *Archaeology* 45(6):38–42.
- . 1994. "Excavaciones de tumbas de sacerdotes moche en San José de Moro, Jequetepeque," in *Moche: Propuestas y perspectivas*. Edited by Santiago Uceda and Elias Mujica, pp. 415–25. Travaux de l'Institut Français d'Etudes Andines 79.
- DONNAN, CHRISTOPHER B., AND GUILLERMO A. COCK. Editors. 1986. *The Pacatnamú papers*. Vol. 1. Los Angeles: Fowler Museum of Cultural History.
- DONNAN, CHRISTOPHER B., AND DONNA MC CLELLAND. 1997. "Moche burials at Pacatnamú," in *The Pacatnamú papers*, vol. 2, *The Moche occupation*. Edited by Christopher B. Donnan and Guillermo A. Cock, pp. 17–188. Los Angeles: Fowler Museum of Cultural History.
- . 1999. *Moche fineline painting: Its evolution and its artists*. Los Angeles: Fowler Museum of Cultural History.
- DUDAR, J. CHRISTOPHER, JOHN S. WAYE, AND SHELLEY R. SAUNDERS. 2003. Determination of a kinship system using ancient DNA, mortuary practice, and historic records in an Upper Canadian pioneer cemetery. *International Journal of Osteoarchaeology* 13:232–46. [JCD]
- ESCOBAR, VICTOR, MICHAEL MELNICK, AND P. MICHAEL. 1976. The inheritance of bilateral rotation of maxillary central incisors. *American Journal of Physical Anthropology* 45:109–16.
- FINNEGAN, M., AND K. COOPRIDER. 1978. Empirical comparison of distance equations using discrete traits. *American Journal of Physical Anthropology* 49:39–46.
- FRANCO, REGULO, CÉSAR GALVEZ, AND SEGUNDO VASQUEZ. 2003. "Modelos, función y cronología de la Huaca Cao Viejo, Complejo El Brujo," in *Moche: Hacia el final del milenio*, vol. 2. Edited by Santiago Uceda and Elias Mujica, pp. 125–78. Lima: Pontificia Universidad Católica del Perú.
- GALVEZ, C., AND J. BRICEÑO. 2001. "The Moche in the Chicama Valley," in *Moche art and archaeology in ancient Peru*. Edited by J. Pillsbury, pp. 141–58. New Haven: Yale University Press.
- GAT, A. 2002. "Why city-states existed? Riddles and clues of urbanization and fortifications," in *A comparative study of six city-state cultures*. Edited by M. H. Hansen, pp. 125–38. Copenhagen: Danish Royal Academy.
- GONZÁLEZ-JOSÉ, R., S. DAHINTEN, AND M. HERNÁNDEZ. 2001. The settlement of Patagonia: A matrix correlation study. *Human Biology* 73:233–48.
- GORBAK, C., M. LISCHETTI, AND C. P. MUÑOZ. 1962. Batallas rituales del chiaraje y del tocto de la provincia de Kanas [Cuzco, Perú]. *Museo Nacional* 31:245–304.
- GREEN, DAVID L. 1982. Discrete dental variations and biological distances of Nubian populations. *American Journal of Physical Anthropology* 58:75–79.
- GREEN, RICHARD F., AND JUDY MYERS-SUCHEY. 1976. The use of inverse sine transformations in the analysis of nonmetric cranial data. *American Journal of Physical Anthropology* 45:61–68.
- HALLGRÍMSSON, B., B. Ó DONNABHÁIN, G. BRAGI WALTERS, D. M. L. COOPER, D. GUÖBJARTSSON, AND K. STEFÁNSSON. 2004. Composition of the founding population of Iceland: Biological distance and morphological variation in early historic Atlantic Europe. *American Journal of Physical Anthropology* 124:257–74.
- HANSON, N. R. 1958. *Patterns of discovery*. Cambridge: Cambridge University Press.
- HARRIS, EDWARD F., AND H. L. BAILIT. 1980. The metaconule: A morphological and familial analysis of a molar cusp in humans. *American Journal of Physical Anthropology* 53:349–58.
- HASSANALI, JAMEELA. 1982. Incidence of Carabelli's trait in Kenyan Africans and South Africans. *American Journal of Physical Anthropology* 59:317–19.
- HASSIG G., R. 1988. *Aztec warfare: Imperial expansion and political control*. Norman: University of Oklahoma Press.
- HASTINGS, CHARLES, AND MICHAEL E. MOSELEY. 1975. The adobes of the Huaca del Sol and the Huaca de Luna. *American Antiquity* 40:196–203.
- HAYDENBLIT, REBECCA. 1996. Dental variation among four Prehispanic Mexican populations. *American Journal of Physical Anthropology* 100:225–46.
- HECHT EDGAR, H. J. 2004. Dentitions, distance, and difficulty: A comparison for two statistical techniques for dental morphological data. *Dental Anthropology* 17:55–62.
- HIGA, T., T. HANIHARA, H. SUNAKAWA, AND H. ISHIDA. 2003. Dental variation of Ryukyu islanders: A comparative study among Ryukyu, Ainu, and other Asian populations. *American Journal of Human Biology* 15:127–43.
- HILLSON, SIMON. 1996. *Dental anthropology*. Cambridge: Cambridge University Press. [JCD]
- HOCQUENGHEM, ANNE MARIE. 1987. *Iconografía mochica*. Lima: Pontificia Universidad Católica del Perú.
- HRDLIČKA, ALEŠ. 1914. *Anthropological work in Peru in 1913, with notes on the pathology of the ancient Peruvians*. Smithsonian Miscellaneous Collections 61(18). [AN]
- HUAMÁN POMA DE AYALA, FELIPE. 1978 [1613]. *Letter to a king: A Peruvian chief's account of life under the Incas and under Spanish rule*. Translated by C. Dilke. New York: E. P. Dutton.
- JANUSEK, JOHN W. 1999. Craft and local power: Embedded specialization in Tiwanaku cities. *Latin America Antiquity* 10:107–31. [DEB]
- KAULICKE, PETER. 1992. Moche, Vicús-Moche y el Mochica Temprano. *Bulletin de l'Institut Français d'Etudes Andines, Lima* 21:853–903.
- . 1994. "La presencia mochica en el Alto Piura: Problemática y propuestas," in *Moche: Propuestas y perspectivas*. Edited by Santiago Uceda and Elias Mujica, pp. 327–58. Travaux de l'Institut Français d'Etudes Andines 79.
- . 2000. *Muerte y memoria en el Perú antiguo*. Lima: Pontificia Universidad Católica del Perú, Fondo Editorial. [PK]
- KEELEY, LAWRENCE H. 1996. *War before civilization: The myth of the peaceful savage*. New York: Oxford University Press.
- KLEIN, OTTO. 1967. *La cerámica mochica: Caracteres estilísticos y conceptos*. Scientia 131. Valparaiso: Universidad Técnica Federico Santa Mari.
- KNUDSON, KELLY J., T. DOUGLAS PRICE, JANE E. BUIKSTRA, AND DEBORAH E. BLOM. 2004. The use of strontium isotope analyses to investigate Tiwanaku migration and mortuary ritual in Bolivia and Peru. *Archaeometry* 46(1):5–18. [DEB]
- KROEBER, ALFRED L. 1930. Archaeological explorations in Peru. Pt. 2. The North Coast. *Field Museum of Natural History, Anthropological Memoirs* 2(2):45–116.
- KRUSKAL, JOSEPH B. 1964. Multidimensional scaling by optimizing goodness of fit to a nonmetric hypothesis. *Psychometrika* 29:1–27.
- KRUSKAL, JOSEPH B., AND MYRON WISH. 1984. *Multidimensional scaling*. Vol. II. Newbury Park: Sage Publications.
- KUTSCHER, GERDT. 1955. *Ancient art of the Peruvian North Coast*. Translated by W. H. Bell. Berlin: Gebr. Mann.
- KUZNAR, L. A. 2001. "Introduction to Andean ethnoarchaeology," in *Ethnoarchaeology of Andean South America: Contributions to archaeological method and theory*. Edited by L. A. Kuznar, pp. 1–18. Ann Arbor: International Monographs in Prehistory.
- LARCO HOYLE, RAFAEL. 1938. *Los Mochicas*. Lima: Museo Arqueológico Rafael Larco Herrera.
- . 1946. "A cultural sequence for the North Coast of Peru," *Handbook of South American Indians*, vol. 2, *The Andean civilizations*. Edited by Julian H. Steward, pp. 149–75. Washington, D.C.: Smithsonian Institution Press.
- . 1948. *Cronología arqueológica del Norte del Perú*. Buenos Aires: Sociedad Geográfica Americana.
- . 1963. *Las épocas peruanas*. Lima: Santiago Valverde.
- . 1966. *Vicús 2: La cerámica de Vicús y sus nexos con las demás culturas*. Lima: Santiago Valverde.
- LAU, GEORGE F. 2004. Object of contention: An examination

- of Recuay-Moche combat iconography. *Cambridge Archaeological Journal* 14:163–84. [PK, JMV]
- LAUENSTEIN, KURT. 1973. Moche Valley skeletal remains. B.A. thesis, Department of Anthropology, Harvard University, Cambridge, Mass. [AN]
- LEASE, L. R., AND P. W. SCUILLI. 2005. Brief communication: Discrimination between European-American and African-American children based on deciduous dental metrics and morphology. *American Journal of Physical Anthropology* 136: 56–60.
- LOZADA C., MARIA C. 1998. The Señorío of Chiribaya: A bioarchaeological study in the Osmore Drainage of southern Peru. Ph.D. diss. University of Chicago, Chicago, Ill. [DEB]
- LOZADA C., MARIA C., AND JANE E. BUIKSTRA. 2002. *El Señorío de Chiribaya en la Costa Sur del Perú*. Lima: Instituto de Estudios Peruanos. [DEB]
- MILLAIRE, JEAN FRANÇOIS. 2004a. Gallinazo-Moche interactions at Huaca Santa Clara, Virú Valley (North Coast of Peru). Paper presented to the Sixty-ninth Annual Meeting of the Society for American Archaeology, Montreal, Canada, April 1.
- . 2004b. The manipulation of human remains in Moche society: Delayed burials, grave reopening, and secondary offerings of human bones on the Peruvian North Coast. *Latin American Antiquity* 15:371–88. [JWV]
- . 2005. Woven identities in Gallinazo textiles from Huaca Santa Clara, Virú Valley. Paper presented at the 45th annual meeting of the Institute of Andean Studies, Berkeley, Calif.
- MOLINA, C. 1873 (1570–84). "The fables and rites of the Yncas," in *Narratives of the rites and laws of the Yncas*. Edited by C. R. Markham, pp. 3–64. London.
- MOSELEY, MICHAEL E. 1975. Prehistoric principles of labor organization in the Moche Valley, Peru. *American Antiquity* 40:191–96.
- . 1983. The good old days were better: Agrarian collapse and tectonics. *American Anthropologist* 85:773–99.
- . 2001. *The Inca and their ancestors*. New York: Thames and Hudson.
- . 2004. Rain and sand: A mega-Niño horizon marker in Late Moche times. Presentation given at the Fourth D. J. Sibley Family Conference on World Traditions of Culture and Art, "The Arts and the Archaeology of the Moche," University of Texas–Austin, November 14–16.
- MUSEO LARCO. 2005. *Catalogo en linea*. <http://catalogomuseo-larco.perucultural.org.pe/index.asp>.
- NICHOL, CHRISTIAN R. 1989. Complex segregation analysis of dental morphological variants. *American Journal of Physical Anthropology* 78:37–59.
- OTTERBEIN, KEITH F. 1989. *Evolution of war: A cross-cultural study*. New Haven: HRAF Press.
- PADDOCK, JOHN. 1983. "The Oaxaca barrio at Teotihuacán," in *The cloud people: Divergent evolution of the Zapotec and Mixtec civilizations*. Edited by Kent V. Flannery and Joyce Marcus, pp. 170–75. New York: Academic Press. [DEB]
- PERNEGER, T. V. 1998. What's wrong with Bonferroni adjustments. *British Medical Journal* 136:1236–38.
- POPPER, KARL. 1959. *The logic of scientific discovery*. London: Hutchinson. [JCD]
- PORTIN, P., AND L. ALVESALO. 1974. The inheritance of shovel shape in maxillary central incisors. *American Journal of Physical Anthropology* 41:59–62.
- PROULX, DONALD A. 1982. Territoriality in the Early Intermediate Period: The case of Moche and Recuay. *Nawpa Pacha* 20:83–96.
- PROWSE, T. L., AND N. C. LOVELL. 1996. Concordance of cranial and dental morphological traits and evidence for endogamy in ancient Egypt. *American Journal of Physical Anthropology* 101:237–46.
- RAMÍREZ, SUSAN E. 1985. "Social frontiers and the territorial base of curacazgos," in *Andean ecology and civilization*. Edited by S. Masuda, I. Shimada, and C. Morris, pp. 423–42. Tokyo: University of Tokyo Press. [IS, RC]
- . 1996. *The world upside down: Cross-cultural contact and conflict in sixteenth-century Peru*. Stanford: Stanford University Press. [IS, RC]
- RIVERA CASANOVAS, CLAUDIA S. 1994. Ch'iji Jawira: Evidencias sobre la producción de cerámica en Tiwanaku. Licenciatura thesis, Universidad Mayor de San Andrés, La Paz, Bolivia. [DEB]
- ROTHHAMMER, FRANCISCO, SILVIA QUEVEDO, JOSÉ A. COCILOVO, AND ELENA LLOP. 1984. Microevolution in prehistoric Andean populations. 2. Chronologic nonmetrical cranial variation in northern Chile. *American Journal of Physical Anthropology* 65:157–62.
- ROTHMAN, K. 1990. No adjustments are needed for multiple comparisons. *Epidemiology* 1:43–46.
- ROYS, R. L. 1943. *The Indian background of colonial Yucatan*. Washington, D.C.: Carnegie Institution of Washington.
- SARMIENTO DE GAMBOA, PEDRO. 1999 (1572). *History of the Incas*. Translated by C. Markham. Mineola: Dover.
- SAVITZ, D., AND A. OLSHAN. 1995. Multiple comparisons and related issues in the interpretation of epidemiological data. *American Journal of Epidemiology* 142:904–8.
- SCHAEDEL, RICHARD. 1972. "The city and the origin of the state in America." *Actas y Memorias del 39 Congreso Internacional de Americanistas*, vol. 2, pp. 15–33.
- . 1985. "The transition from chiefdom to state in northern Peru," in *Development and decline: The evolution of sociopolitical organization*. Edited by Hans J. Claessen, P. Van Der Velde, and M. Smith, pp. 156–69. New York: Bergin and Garvey.
- SCOTT, G. RICHARD. 1980. Population variation of Carabelli's trait. *Oral Biology* 52:63–78.
- SCOTT, G. R., AND C. G. TURNER. 1997. *The anthropology of modern human teeth: Dental morphology and its variation in recent human populations*. Cambridge: Cambridge University Press.
- SHIMADA, IZUMI. 1990. Excavaciones en hornos de cerámica de la época formativa en Batán Grande, Costa Norte del Perú. *Gaceta Arqueológica Andina* 5:19–43.
- . 1994. *Pampa Grande and the Mochica culture*. Austin: University of Texas Press.
- . 2004a. Discussion: The southern Moche. Paper presented at the 69th Annual Meetings of the Society for American Archaeology, Montreal. [IS, RC]
- . 2004b. Mochica sociopolitical organization: Rethinking our data, approaches, and models. Paper presented at the conference "Moche Political Organization: New Data and Perspectives," jointly organized by Dumbarton Oaks, the Catholic University of Peru, and the Larco Museum, Lima. [IS, RC]
- SHIMADA, IZUMI, CRYSTAL BARKER SCHAAF, LONNIE G. THOMPSON, AND ELLEN MOSLEY-THOMPSON. 1991. Cultural impacts of severe drought in the prehistoric Andes: Application of a 1,500-year ice core precipitation record. *World Archaeology* 22:247–70.
- SHIMADA, I., K.-I. SHINODA, S. BOURGET, W. ALVA, AND S. UCEDA. 2003. "MtDNA analysis of Mochica populations: Results and implications." *Midwest Conference on Andean and Amazonian Archaeology and Ethnohistory*, Chicago, 2003.
- . n.d. "MtDNA analysis of Moche and Sicán populations of pre-Hispanic Peru," in *Biomolecular archaeology: Genetic approaches to the past*. Edited by David Reed. Carbondale: Southern Illinois University Press. In press. [IS, RC]
- SHIMADA, IZUMI, KEN-ICHI SHINODA, JULIE FARNUM, ROBERT CORRUCINI, AND HIROKATSU WATANABE. 2004. An integrated analysis of pre-Hispanic mortuary practices: A Middle Sicán case study. *CURRENT ANTHROPOLOGY* 45:369–402. [AN]
- SHINODA, KEN-ICHI, IZUMI SHIMADA, WALTER ALVA, AND SANTIAGO UCEDA. 2002. DNA analysis of Moche and Sicán populations: Results and implications. Paper presented at the Sixty-seventh Annual Meeting of the Society for American Archaeology, Denver, March 21.
- SJØVOLD, TORSTEIN. 1973. The occurrence of minor non-

- metrical variants in the skeleton and their quantitative treatment for population comparisons. *Homo* 24:204–33.
- SOFAER, J. A., C. J. MAC LEAN, AND H. L. BAILIT. 1972. Heredity and morphological variation in early and late developing human teeth of the same morphological class. *Archives of Oral Biology* 17:811–16.
- SOFAER, J. A., J. D. NISWANDER, AND C. J. MAC LEAN. 1972. Population studies on Southwestern Indian tribes. 5. Tooth morphology as an indicator of biological distance. *American Journal of Physical Anthropology* 37:357–66.
- SOFAER, JEFFEREY A., PATRICIA SMITH, AND EDITH KAYE. 1986. Affinities between contemporary and skeletal Jewish and non-Jewish groups based on tooth morphology. *American Journal of Physical Anthropology* 70:265–75.
- SOKAL, R. R., AND P. H. A. SNEATH. 1973. *Numerical taxonomy: The principles and practice of numerical classification*. San Francisco: W. H. Freeman.
- SOTO, P., F. ROTHHAMMER, C. VALENZUELA, E. LLOP, AND Z. HARB. 1975. Aplicación de un método de distancia genética en la comparación de poblaciones prehispánicas de América. *Chungará* 5:73–79. [DEB]
- SPENCE, MICHAEL W., CHRISTINE D. WHITE, FRED J. LONGSTAFFE, AND KIMBERLY R. LAW. 2004. Victims of the victims: Human trophies worn by sacrificed soldiers from the Feathered Serpent Pyramid, Teotihuacan. *Ancient Mesoamerica* 15:1–15. [AN]
- STEWART, T. D. 1943. Skeletal remains with cultural associations from the Chicama, Moche, and Virú Valleys, Peru. *Proceedings of the U.S. National Museum* 93:153–85. [AN]
- STRONG, WILLIAM DUNCAN, AND CLIFFORD EVANS. 1952. *Cultural stratigraphy in the Virú Valley, Northern Peru: The Formative and Florescent epochs*. New York: Columbia University Press.
- SUTTER, RICHARD C. 1997. Dental variation and biocultural affinities among prehistoric populations from the coastal valleys of Moquegua, Perú, and Azapa, Chile. Ph.D. diss., University of Missouri, Columbia, Mo.
- . 2000. Prehistoric genetic and cultural change: A bioarchaeological search for Pre-Inka altiplano colonies in the coastal valleys of Moquegua, Peru, and Azapa, Chile. *Latin American Antiquity* 11:43–70. [DEB, JWV]
- . n.d. "Prehistoric population dynamics in the Peruvian Andes," in *The foundations of south highland Andean civilization: Papers in honor of Michael E. Moseley*. Edited by P. R. Williams and C. Stanish. Los Angeles: Cotsen Institute of Archaeology, UCLA. In press.
- SUTTER, R. C. AND R. J. CORTEZ. 2002. "Who were the Moche sacrificial victims? An epigenetic perspective." *The 30th Annual Meeting of the Midwest Conference on Andean and Amazonian Archaeology and Ethnohistory, Kalamazoo, Michigan, 2002*, pp. 333–34.
- SUTTER, R. C., AND J. VERANO. n.d. Human sacrificial remains from Huaca de la Luna Plaza 3C: Analyses and implications. MS.
- TELLO, R., J. ARMAS, AND C. CHAPDELAIN. 2003. "Prácticas funerarias moche en el complejo arqueológico Huacas del Sol y de la Luna," in *Moche: Hace el final del milenio*, vol. 1. Edited by S. Uceda and E. Mujica, pp. 151–87. Trujillo: Universidad Nacional de Trujillo/Pontificia Universidad Católica del Perú. [JWV]
- THOMAS, D., J. SIEMIATYCKI, R. DEWAR, J. ROBINS, M. GOLDBERG, AND R. ARMSTRONG. 1985. The problem of multiple inference in studies designed to generate hypotheses. *American Journal of Epidemiology* 122:1080–95.
- TOPIC, JOHN R., AND THERESA LANGE TOPIC. 1997. La guerra mochica. *Revista Arqueológica "Sian"* 3(4):10–12.
- TOPIC, THERESA LANGE. 1982. "The Early Intermediate Period and its legacy," in *Chan Chan: Andean desert city*. Edited by Michael E. Moseley and K. C. Days, pp. 255–84. Albuquerque: University of New Mexico Press.
- TURNER, CHRISTY G. 1983. "Dental evidence for the peopling of the Americas," in *Early man in the New World*. Edited by R. Shutler, pp. 147–57. Beverly Hills: Sage Publications.
- TURNER, CHRISTY G., C. R. NICHOL, AND G. RICHARD SCOTT. 1991. "Scoring procedures for key morphological traits of the permanent dentition: The Arizona State University Dental Anthropology System," in *Advances in dental anthropology*. Edited by Mark A. Kelly and Clark S. Larsen, pp. 13–32. New York: Wiley-Liss.
- TURNER, CHRISTY G., AND G. RICHARD SCOTT. 1977. "Dentition of Easter Island," in *Orofacial growth and development*. Edited by Albert A. Dahlberg and T. M. Graber, pp. 229–50. Chicago: Mouton.
- UBBELOHDE-DOERING, HEINRICH. 1967. *On the royal highways of the Inca*. London: Thames and Hudson.
- . 1983. *Vorspanische Gräber von Pacatnamú, Nordperu*. Materialien zur Allgemeinen und Vergleichenden Archäologie 26. München: Verlag C. H. Beck.
- UCEDA, SANTIAGO. 2001. "Investigations at Huaca de la Luna, Moche Valley: An example of Moche religious architecture," in *Moche art and archaeology in ancient Peru*. Edited by Joanne Pillsbury, pp. 47–68. New Haven: Yale University Press.
- VERANO, JOHN W. 1987. Cranial microvariation at Pacatnamú: A study of cemetery population variability. Ph.D. diss., University of California, Los Angeles, Calif. [DEB, JWV]
- . 1994. "Características físicas y biología osteológica de los Moche," in *Moche: Propuestas y perspectivas*. Edited by Santiago Uceda and Elias Mujica, pp. 7–8. Travaux de l'Institut Français d'Études Andines 79.
- . 1997. "Physical characteristics and skeletal biology of the Moche population at Pacatnamu," in *The Pacatnamu papers, vol. 2, The Moche occupation*. Edited by C. B. Donnan and G. A. Cook, pp. 189–214. Los Angeles: Fowler Museum of Cultural History. [DEB, AN, JWV]
- . 2001a. "The physical evidence of human sacrifice in ancient Peru," in *Ritual sacrifice in ancient Peru*. Edited by Elizabeth P. Benson and Anita G. Cook, pp. 165–84. Austin: University of Texas Press.
- . 2001b. "War and death in the Moche world: Osteological evidence and visual discourse," in *Moche art and archaeology in ancient Peru*. Edited by J. Pillsbury, pp. 111–26. New Haven: Yale University Press.
- . 2001c. Apéndice 2: Análisis de restos óseos humanos. *Boletín del Programa Arqueológico "El Brujo"* 2:56–57.
- . 2004. Communality and diversity in Moche human sacrifice. Paper presented at the Fourth D. J. Sibley Family Conference on World Traditions of Culture and Art, "The Arts and the Archaeology of the Moche," University of Texas–Austin, November 14–16.
- VERANO, J. W., AND M. J. DE NIRO. 1993. "Locals or foreigners? Morphological, biometric, and isotopic approaches to the question of group affinity in human skeletal remains recovered from unusual archeological contexts," in *Investigations of ancient human tissue: Chemical analysis in anthropology*. Edited by M. K. Sandford, pp. 361–86. Langhorne, Pa.: Gordon and Breach. [DEB, AN, JWV]
- WEBSTER, D. 1998. "Status rivalry warfare: Some Maya-Polynesian comparisons," in *Archaic states*. Edited by G. Feinman and J. Marcus, pp. 311–52. Santa Fe: School of American Research.
- WHITE, CHRISTINE D., ANDREW J. NELSON, AND FRED J. LONGSTAFFE. 2005. Peripatetic people from Pacatnamu, Peru: Paleodietary evidence from hair. Paper presented to the American Association of Physical Anthropologists meeting, April. [AN]
- WHITE, CHRISTINE D., MICHAEL W. SPENCE, FRED J. LONGSTAFFE, H. STUART-WILLIAMS, AND KIMBERLY R. LAW. 2002. Geographic identities of the sacrificial victims from the Feathered Serpent Pyramid, Teotihuacan: Implications for the nature of state power. *Latin American Antiquity* 13: 217–36. [AN]
- WIJSMAN, E. M., AND W. A. NEVES. 1986. The use of non-metric variation in estimating human population admixture: A test case with Brazilian blacks, whites, and mulattoes. *American Journal of Physical Anthropology* 70:395–405.
- WILLEY, GORDON. 1953. *Prehistoric settlement patterns in*

- the Virú Valley*. Washington, D.C.: Smithsonian Institution Press.
- WILLIAMS, S. R., N. A. CHAGNON, AND R. S. SPIELMAN. 2002. Nuclear and mitochondrial genetic variation in the Yanomamö: A test case for ancient DNA studies of ancient populations. *American Journal of Physical Anthropology* 117: 246–59. [JWV]
- WILSON, DAVID J. 1987. "Reconstructing patterns of early warfare in the lower Santa Valley: New data on the role of conflict and the origins of complex North Coast society," in *The origins and development of the Andean state*. Edited by J. Haas, S. G. Pozorski, and T. Pozorski, pp. 56–69. Cambridge: Cambridge University Press.
- . 1988. *Prehispanic settlement patterns in the Lower Santa Valley, Peru: A regional perspective on the origins and development of complex North Coast society*. Washington, D.C.: Smithsonian Institution Press.
- . 1998. *South Americans of the past and present: An ecological perspective*. Boulder: Westview Press.
- WOOD, J. W., G. R. MILNER, H. C. HARPENDING, AND K. M. WEISS. 1992. The osteological paradox. *CURRENT ANTHROPOLOGY* 33:343–70. [JCD]