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Maritime Foundations and Multilinear Evolution: Retrospect and Prospect

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Introduction

How did the sea contribute to the development of ancient societies? For the Pacific coast of South America, new data and fresh interpretations appear in the papers that comprise the maritime thematic section of this volume. Their accompanying bibliographies reflect upon the general history of the topic. Coastal adaptations were of minor concern and generated few publications until the 1960s. Then interests changed and maritime inquiry experienced ongoing growth that now accounts for most of the relevant literature. Contributing to this turnaround, a number of scholars independently proposed that the initial rise of social complexity along the arid Andean coast was sustained by marine resources. *The Maritime Foundations of Andean Civilization* (Moseley 1975a) later popularized the proposition, and continuing arguments for productive coastal adaptations comprise the core of an evolving "MFAC" hypothesis. It is not easy to summarize the rich diversity of opinion which has arisen around the study of Andean maritime adaptations. Therefore, this essay is a narrative of my views about the development of the MFAC and its future prospects. Debatable though it is, I believe that MFAC has been valuable in forcing archaeologists to recognize maritime adaptations as legitimate and vital areas of study. Accordingly, I will turn first to a contextual overview and then to the early history of MFAC. Thereafter, I discuss various themes arising from the attempts to understand the early developments on the Andean coast. If I stray from issues with a strictly marine focus, it is both because maritime adaptations in the region cannot be understood outside of their broader, Andean context, and because Andean prehistory cannot be understood without reference to the maritime contributions.

Conceptualizing Andean adaptations

By the 1960s information about early occupations of the desert coast had reached a point where a number of scholars proposed arguments along the following lines: the rich near-shore fishery had provided caloric support for 1) preceramic sedentary residence; 2) population growth; 3) large communities; and 4) the rise of complex societies which constructed very large architectural monuments before the advent of intensive irrigation agriculture. Fortunately, these propositions were testable, because the hypothesis that fishing rather than farming supported the rise of cultural complexity challenged two theoretical expectations. The first was the traditional belief that only agriculture could support the rise of complex cultures, and the second was a common view that seafood could only sustain societies which were economically, if not socially, deficient.

Fishing and farming

Prejudice against the potential productivity of maritime adaptations entered evolutionary theory with its founders in the biological and social sciences. Her Majesty's ship Beagle carried Charles Darwin to the shores of Tierra del Fuego. Observing coastal natives exploit littoral resources, the great naturalist concluded, "To knock a limpet from the rocks does not require even cunning, that lowest power of the mind. Their skill in some respects may be compared to the instincts of animals, for it is not improved by experience" (Darwin 1906: 206). Similar views prevailed when Lewis Henry Morgan (1877) codified cultural evolution in his classic work, *Ancient Society, or Researches in the Lines of Human Progress from Savagery through Barbarism to Civilization.* One step beyond living in trees and foraging on fruit, the discovery of fishing was portrayed as the most primitive of human economies following the invention of fire. For Morgan, maritime societies of Pacific North America represented the lowest level of savagery still to be found among ethnographic populations. Thus,

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branding maritime adaptations with primeval stigmata, the founders of evolutionary theory rendered fishing an unacceptable basis for the cultural advances traditionally attributed to farming.

A generation ago, modeling Andean evolution was not simply in the shadow of Lewis Henry Morgan, but also in the stranglehold of the "Spinden Hypothesis". H.J. Spinden's widely accepted argument held that all significant aspects of American civilization arose first in Middle America and then diffused outward. This reduced South America to the status of a developmental clone. Maize was portrayed as the main-spring of Middle American achievement. Therefore, through the 1950s Andean archaeologists subscribed to the premise that civilization in the South American Cordillera could not arise until this crop had been introduced from Mexico (Bushnell 1956; Mason 1957). The notion that maize was the economic midwife of New World civilization was not without glaring problems in the Central Andes. Ever since the Spaniards arrived, it was obvious that the largest of all native populations resided at high elevations where this crop does not grow. Nor did maize thrive in the southern altiplano where the ancient civilization of Tiwanaku once flourished. The many imposing ruins of Tiwanaku were visited and explored by the pioneers of Andean archaeology, including Morgan's great disciple, Adolph F. Bandelier (1911). Yet, the economic implications of the monuments and the millions residing where maize does not grow went unrecognized by those who modeled evolutionary development. Thus, with farming as well as with fishing, I believe that the discipline had difficulty acknowledging conditions that run contrary to its theoretical expectations.

Adaptive scenarios

During the 1960s New World archaeology entered a healthy era of reassessment. Concomitantly, certain scholars in America and in the Soviet Union began to argue independently that foods other than maize were important to cultural development in the southern hemisphere. These propositions marked a gradual shift away from the Spinden Hypothesis toward a more multilinear perspective on indigenous evolution. The shift was fostered by increasing realization that marked contrasts in environmental factors such as elevation and rainfall were associated with divergent ecological conditions requiring distinct economic adaptations.

Between 1965 and 1975 "revisionist" models were pioneered for three different adaptive strategies and their associated evolutionary pathways in South America. While many contributed, each model has had its own champion: Donald W. Lathrap (1970) for the moist lowlands, John V. Murra (1972) for the highlands, and Edward P. Lanning (1967) for the arid coast and oasis valleys. These were creative scholars and charismatic spokesmen for their theories. Curiously, I meet Lanning only once, yet excavated sites he had discovered and popularized his ideas. Although enjoying cordial relations with Murra, it was Lathrap I came to know best.

Initially, the revisionist models seemed competitive, with proponents arguing for one and against the others. This was certainly the case with Don, who envisaged the Amazon as the singular hearth of Formative development. Yet, I believe that each model has proven useful in explaining adaptations to a particular set of distinct ecological conditions, and I see them as complementary. I have call these the tropical forest, arid mountain, and maritime-oasis scenarios, and use the term scenario to encompass the varying renditions of the models by different scholars. MFAC is an archaeological facet of the last scenario, as are irrigation and the transformation of desert valleys into agricultural oases. The maritime-oasis and arid mountain scenarios concern the Andes where the Cordillera is highest, widest, and driest, while the tropical forest scenario relates to the Amazon and to the northern mountains where the Cordillera is low, humid, and vegetated.

Ethnohistorical components

Today, the three scenarios may be understood as having a central ethnohistorical component that reconstructs and defines a particular subsistence strategy and mode of economic organization. Prehistoric manifestations of each strategy are covered by the scenario's archaeological components.

Although each scenario emphasizes very different plants, animals, and organizational principles, they all support propositions that South American root crops were major agricultural staples, with maize having a variable economic role. For both the arid and tropical lowlands, fish were a significant protein source, whereas camelids and smaller domesticated animals met this dietary need among high altitude agropastoralists. Two decades ago, arguments for the primacy of root crops represented a significant departure from traditional presumptions about the evolutionary role of maize. Even more heretical was the argument for the high yields of fishing versus early desert farming. Attempts to convince skeptical colleagues that caloric support for complex societies could indeed come from underwater or underground organisms were most compelling when both historic and prehistoric evidence could be brought to bear on the issue. In retrospect, it is noteworthy that the ethnohistorical components and archaeological components of both the mountain and the tropical forest scenarios developed in an integrated manner. The ethnohistorical formulations provided economic models that both justified and made expectable reinterpretations of the archaeological record which broke away from earlier evolutionary propositions. Unfortunately, the maritime-oasis scenario did not arise in a similar manner. The ethnohistorical component detailing the important role of maritime resources among late coastal populations has been admirably documented by the distinguished Peruvian scholar María Rostworowski de Diez Canseco (1970, 1977, 1981). However, this vital aspect of the scenario appeared after the formulation of MFAC. Consequently, when initially articulated, the archaeological hypothesis seemed untenable to some because it was not backed by local ethnohistorical data that would have made littoral adaptations expectable evolutionary antecedents for later coastal civilizations.

Ethnographic components

Indigenous populations continued to pursue adaptive strategies elucidated by the tropical forest and arid mountain scenarios, and these populations proved vital to testing and refining propositions about economic and social organization. Ethnographic analogy was considered far less reliable for the desert coast because native languages were gone, farming was mechanized on large plantations, and fishing was commercialized for large markets. I now believe that the resources supporting mechanization and commercialization are little different than those of prehistory, and that drawing analogies between the present and past may provide insight into certain situations. Yet, such views did not prevail in the 1960s when Peru was emerging as the world's leading fishing nation.

If the conditions shaping modern fishing and coastal farming had been scrutinized, perhaps MFAC could have been formulated on a purely deductive basis proceeding from three global extremes in environmental conditions. First, the Central Andean Cordillera is second only to the Himalayas in height and ruggedness (Zeil 1979). Although the range often plunges directly into the sea, only 10% of all highland precipitation drains through the Pacific watershed. Second, the coastal slopes and plains are enveloped by the New World's driest desert, stretching between 4° and 30° South Latitude (Lettau and Lettau 1978). Third, hugging the arid littoral from 9° to 25° South Latitude is the richest fishery of the Western Hemisphere, with a carbon fixing budget surpassing all other rich marine upwelling systems with the single exception of the smaller Benguela Current off Africa (Cushing 1969; Walsh 1981). Yields capable of sustaining millions of people are obtained from the fishery by netting small schooling fish from small craft employing small crews. Comparable agricultural yields require irrigation, and watering the world's driest desert with runoff from the hemisphere's most rugged mountain range depends upon large canal systems and the coordinated labor of large numbers of individuals. Yet, less than 10% of the desert can be farmed (Robinson 1964), whereas all of the coastal waters can be fished. From these considerations, it should have been possible to predict both that coastal fishing would precede farming as a means of supporting sedentary life, and that the fishery could sustain maritime societies which were larger if not more complex than those of Pacific North America. However, MFAC did not develop in this manner.

Origins and development of the MFAC hypothesis

The maritime hypothesis was formulated as an inductive, *ad hoc* explanation for a corpus of information on early coastal sites that accumulated gradually. Drawing upon this pool of data in the 1960s, Soviet and American scholars independently proposed that marine resources had supported the development of complex societies along the arid littoral zone.

Early contributors

Max Uhle, the so-called father of Andean archaeology, was the first to recognize correctly that along the littoral of Peru and Chile, remains of "shell mound people" predated later civilizations with well-developed arts and agriculture (Rowe 1954). Typical of the times, he considered the ancient fisherfolk "primitive" and "barbaric." More enlightened study of maritime adaptations was subsequently pioneered by the late Junius B. Bird. During his 1937 explorations of the southern Chilean coast, including the Beagle Channel and the Straits of Magellan, Bird (1938, 1946) pursued a "direct historical approach." This entailed ethnographic work among the littoral Alacaluf, investigation of their sites, and excavation at contemporary and earlier middens. Located beyond the frontiers of farming, this research established a clear archaeological definition of maritime adaptations. Moving up the coast, Bird (1943) then explored early occupations along the arid shores of northern Chile and in 1941 identified long use of marine resources by preagricultural populations. Subsequently, Chilean archaeologists carried out exemplary investigations of maritime adaptations, establishing their great antiquity as well as their contributions to sedentism and to the maintenance of sizable populations (Llagostera 1979; Muñoz 1985). This research is well summarized in the accompanying article by Llagostera (1992 [this volume]). Indeed, if monumental architecture were present, then MFAC would have excellent documentation in Chile. However, monumental construction was negligible among farming societies in this coastal region, and it lacks preceramic representation in this area with the arguable exception of the Ring Site (Sandweiss *et al.* 1989).

Nonetheless, considerable energy was expended on sacred ends. Like Uhle (1922) before him, Bird (1943, 1946) encountered expressions of the early Chinchorro mortuary tradition in northern Chile. All corpses were not treated equally, but many underwent artificial mummification of remarkably elaborate nature. This included skinning, evisceration, tanning or stabilizing tissues, cane bracing of the skeletal frame, reassembly of the body, and application of a clay covering for modeling facial features. As Llagostera (1992 [this volume]) notes, Chinchorro mummies are the earliest in the world. I believe that they stand at the beginning of an enduring tradition of venerating intact ancestral corpses, curating the deceased, and manipulating mummies for ritual ends as later practiced by the Incas.

Made of rocky fill quarried from adjacent hills, the site of Aspero, near the mouth of the Supe Valley, has six prominent platform mounds surrounded by darker refuse. It was at this site that Peru witnessed its first encounters with monumental preceramic architecture, although the event went entirely unnoticed even by the participants. Discovered by Uhle, the dark midden led him to describe the site as looking like an old foundry and to associate it with "shell mound people" (Uhle 1925). Resembling the hills from which they were made, the platforms went unrecognized, and Uhle excavated at a nearby cemetery with early pottery. In 1941, the same year that Bird explored northern Chile, Gordon Willey and John Corbett (1954) excavated both in the cemetery and the settlement. There was little notion that sedentism or public works might be supported by anything other than maize agriculture. Accordingly, the mounds continued to go undetected, and the preceramic refuse was considered that of an anomalous ceramic stage agricultural community. This interpretation prevailed until Aspero was reinvestigated three decades later (Moseley and Willey 1973; Feldman 1980).

Early interpretations of Aspero were hindered by expectations that sedentism, agriculture, and ceramics would originate together in an interrelated manner. Preceramic sedentism was not

demonstrated until 1946, when Bird joined the Virú Valley Project and carried out excavations at Huaca Prieta near the mouth of the Río Chicama. Recent posthumous publication of his explorations by John Hyslop has significantly clarified the results of this pioneering research (Bird *et al.* 1985). Huaca Prieta is a large, high mound rich in refuse and honeycombed with rooms, leaving little question that the site was a product of a permanent, resident population. Domestic refuse included marine foods as well as early cultigens, among them cotton, gourd, beans, *achira* (*Canna edulis*, a root crop), capsicum peppers, and fruits. Bird (1948a) initially billed Huaca Prieta as the site of America's oldest known farmers. This was something the discipline was looking for at the time, and the label maintained the expected associations of agriculture and sedentism but placed them in a preceramic context. Bird acknowledged the dietary contributions of sea foods, but he never formally addressed the issue of whether farming was more important than fishing, nor did he move his dietary analysis in a quantitative direction. Rather, Bird simply regarded both marine *and* terrestrial resources as important, without stipulating which might have provided the greater caloric support (Bird *et al.* 1985: 239).

How the Huaca Prieta occupation first arose and how it subsequently ended were addressed only tangentially. Bird (1948b) had found early "Paiján" projectile points on inland desert flats of the Chicama Valley, and reported these as hunter-gatherer remains predating those of Huaca Prieta (*cf.* Chauchat 1988). The implication was that coastal adaptations had grown out of earlier inland adaptations, although the two were separated by an archaeological hiatus. Flanking Huaca Prieta, Bird investigated early ceramic stage deposits which he interpreted as reflecting a well-developed, intensive agricultural economy which--along with heddle weaving and pottery--appeared shortly after abandonment of the preceramic occupation. With little evidence of gradual economic transition, the implication seemed to be that irrigation agriculture had spread to the coast as a well-formulated technological complex.

Subsequent to Bird's Huaca Prieta excavations, the exploration of early coastal settlements has been most vigorously pursued by Fréderic-André Engel. Beginning in the 1950s with reconnaissance reports and continuing over the course of three decades, Engel has surveyed greater areas, excavated more sites, and written more profusely about early occupations of Peru's Pacific watershed than any other scholar. Among many contributions, he drew attention to the antiquity of certain cultigens, and he was the first to propose that the widespread use of cotton for netting and fabrics could be employed as a temporal horizon marker or "type fossil" for distinguishing the so-called Cotton Preceramic Period at the end of the Archaic stage, predating the Initial Period of ceramic use (Engel 1964). Likewise, Engel must be credited with firmly establishing the preceramic presence of large-scale monumental architecture with excavation programs at major centers such as Culebras, Río Seco, and El Paraíso (Engel 1966). To a very large degree, Engel generated the data base and pioneered interpretations that other scholars drew upon in early discussions of maritime adaptations. To his further credit, over the decades Engel has repeatedly attracted highly talented field assistants and associates. Particularly noteworthy is his collaboration with Robert A. Benfer in the multidisciplinary investigation of Paloma which has set new standards in the study of early coastal adaptations (*inter alia*, Benfer 1984, 1986, 1990; Quilter 1989; Reitz 1988; Weir and Dering 1986).

By the 1960's Uhle, Bird, and Engel had generated the corpus of information which gave rise to propositions that marine resources had sustained the development of complex preceramic societies. It is noteworthy that these propositions were independently but concurrently advanced by Soviet scholars and American investigators.

Soviet formulations

In a letter to to me dated June 12, 1986, Dr. Vladimir Bashilov outlined early Soviet interpretations of Andean maritime adaptations, and his interest in the coastal societies of Peru. I will simply paraphrase and quote from his correspondence.

At the 1968 annual session of Soviet Archaeologists, Professor V.M. Masson presented his hypothesis of the "three models of the Neolithic Revolution"--Near Eastern, Mesoamerican, and Peruvian. The latter model was based on information in the general works of F. Engel, J. Bird, J. A. Mason, and D. Collier. Masson (1971) later published his hypothesis in his book *Djeitun Settlement.* Prof. Masson describes his Peruvian Model as a "chiefly agricultural economy in which fishing and sea-animal hunting were of great importance and led to the very early sedentarism. This factor had been very favorable at the first stage of the origin of agriculture but later slowed down its victory because it provided the population with a very stable food supply."

Seeing a greater role for marine resources, Bashilov took exception with Masson's position. He went on to postulate that the appearance of agriculture as an economic system, rather than the cultivation of plants, was of secondary importance on the coast. Bashilov's position was based on the fact that to him the available data indicated that a maritime economy, not an agrarian one, had produced the many developed sites which arose early along the desert littoral of Peru. In 1975 he formally presented these interpretations at a Soviet-American conference dealing with correlations between the ancient cultures of Siberia and the Pacific. Later, in 1981, an English version of Bashilov's maritime paper was read at the X Congress of pre- and proto-historians in Mexico.

American formulations

While a number of scholars were concurrently thinking along the same lines, I believe that Edward Lanning must be credited with first articulating the MFAC hypothesis for American audiences. Many of his ideas came from personal field experience. As a student assistant, Lanning worked with Engel during the first investigations of monumental architecture at preceramic sites such as Culebras and Río Seco. Receiving his degree in 1960, Lanning initiated a survey and testing program of early sites in the Ancón-Chillón region north of Lima while serving as a Fulbright scholar at San Marcos University. With the participation of both Peruvian and U.S. students, the program generated a data base on which many scholars have subsequently drawn. In 1963, Lanning outlined his views about the succession of hunting, fishing, and farming economies in the Ancón-Chillón area in a seminal article (Lanning 1963). These ideas were elaborated upon the following year in an settlement pattern article coauthored with Thomas C. Patterson (Patterson and Lanning 1964), and again in a 1965 popular article (Lanning 1965). In his 1967 development of the broader maritime hypothesis, Lanning basically employed the Ancón-Chillón area as a model for organizing preceramic data from the coast in general (Lanning 1967). He envisaged an inland hunting-gathering adaptation as giving way to a maritime one by about 2,500 B.C. Once begun, the exploitation of marine resources supported sedentism, growth in population, increased settlement size, and eventually the construction of large architectural works, including El Paraíso near the mouth of the Río Chillón, discussed in Quilter's contribution to this volume (Quilter 1992; also Quilter 1985; Quilter *et al.* 1991). Although Lanning recognized that cultigens were present at some inland hunting camps and at later coastal settlements, he felt that a strong maritime subsistence pattern persisted after the introduction of pottery. By Chavín times, however, irrigation agriculture allowed farming to displace fishing as the coastal economic mainstay.

A number of investigators subsequently elaborated upon the maritime hypothesis. After working with Lanning at San Marcos University, Rosa Fung independently investigated preceramic and early ceramic settlements. In 1972, she presented her own insightful theory of coastal development. Within the broad array of marine resources, her article was the first to identify correctly small schooling fish that could be net harvested as the potential maritime mainstay (Fung 1972). This and other early formulations of MFAC contained propositions which were not simply debatable but, more importantly, were testable. In 1975, Robert Benfer (1984, 1986, 1990) combined such testable postulates in a proposal to investigate the large pre-Cotton Preceramic settlement of Paloma. This was not the first project to carry MFAC to the field for scrutiny and assessment, but it was certainly the largest and longest multidisciplinary research to focus on early adaptations to the arid seaboard. By testing maritime propositions and developing refreshing new questions for investigation, these field

projects transformed MFAC into an evolving hypothesis about human relationships with the sea and the land.

My own involvement with the maritime hypothesis was not by design, but by happenstance. In 1964, I enrolled in a graduate seminar on South America taught by Gordon Willey. By this time, the evolutionary notion of a "neolithic revolution" had been replaced by the more fashionable concept that Old and New World civilizations arose after crossing a "village agricultural threshold" that set the economic and organizational stage for ensuing social complexity. I was assigned the task of evaluating this theoretical threshold in coastal Peru for a seminar paper. My sole South American field experience had been in Colombia. Therefore, I could only draw upon the existing Peruvian literature to address the seminar topic. Lanning's (1963) initial views about the maritime orientation of preceramic sites were available. Equally important, Engel (1957, 1958, 1961, 1963, 1964) and his student assistants (Donnan 1964; Wendt 1964) had reported upon the predominance of marine foods at many preceramic settlements, including sites with platform mounds. While preceramic cultigens were often present, the types and frequencies of the reported plants did not suggest to me that the plants served as dietary staples. Therefore, my paper concluded that coastal sedentism, village life, and ceremonial architecture all arose in a maritime context well before a significant agricultural threshold was crossed. In retrospect, if this was perceptible to a student novice, then similar interpretations were certainly obvious to professionals who independently put forward maritime evolutionary propositions at the same general time.

I considered my paper an academic exercise and had no plans to pursue the topic. However, violence erupted in the area of Colombia where I had intended to carry out doctoral research, and this left me without a dissertation topic. Thomas Patterson kindly provided an alternative project of investigating preceramic sites in the Ancón-Chillón area. Armed with a traveling fellowship, a modest dissertation improvement grant, and a previously formulated hypothesis, I reached Peru in 1966 and carried out small-scale investigations at six early settlements. The resulting dissertation (Moseley 1968) concurred with the central tenets of Lanning's maritime scenario, but differed on issues of how littoral adaptations first arose, and how they were later surpassed by irrigation agriculture.

With the exception of a brief 1971 restudy of the Aspero complex with Gordon Willey (Moseley and Willey 1973), my subsequent field research shifted to other aspects of Andean civilization. Hope that the dissertation might appear as a monograph languished. Therefore, I accepted an offer to develop the topic of Andean littoral adaptations as a short case study for undergraduates in what was to be a popular publication series. As an inaugural 1975 volume, *The Maritime Foundations of Andean Civilization* sold poorly and the series shortly went out of business!

While my book may have been too controversial for introductory courses, it provided good grist for the graduate mill and sparked student rebuttals from major universities. Yet, by the time these academic critiques appeared in print, MFAC was undergoing analysis and refinement in the field by other students and scholars. Debate, testing, and new data have changed the maritime hypothesis from my original portrayal of it, and I will touch upon some of the permutations and transformations.

The Economic Basis of MFAC

The central tenet of MFAC has always been that fishing provided early coastal populations with greater caloric support than did farming. Quantifying caloric consumption of sea foods is challenging even in the context of exceptional archaeological preservation found along the hyperarid coast. In the 1960's when the tenet was put forward, the recovery of subsistence remains generally relied on 1/8 inch mesh screen, with excavators doing their own floral and faunal identifications. Thus, inferences about diet were rather intuitive. What I consider my worst interpretive error was pointed out in a 1974 discussion with the distinguished marine biologist, Rogger Revell, while my volume (Moseley 1975) was still in press. The volume implied that mollusks and large fish were key resources, but Revell

observed that the caloric support base for the scenario would have to come from small schooling fish, particularly *anchoveta*. Whereas yields from invertebrates or large fish would be limited, *anchoveta* could be abundantly net-harvested throughout the year, then dried and stored--either whole or as meal. Given the nutritional values for anchovy, and harvests of 10 million metric tons per year with a cropping rate of 50 to 60% of the stock (UNESCO 1980; Walsh 1981), there would be a support base for more than 6,500,000 individuals eating nothing but small fish. Without that implying preceramic populations ever achieved such numbers, these data simply indicate that from the perspective of marine biology there is nothing untenable about MFAC so long as the economic mainstay is understood to entail small schooling fish.

Had I previously read Fung's 1972 work, this problem with the economic component of MFAC might have been avoided; she was the first to note the high yields and simple technology associated with early *anchoveta* exploitation. Likewise, a technological focus upon small fish should have been apparent from the copious preceramic net fragments that I recovered in my Central Coast excavations. All were characterized by small mesh size, a characteristic of small fish capture (Moseley 1978). Yet, initial failure to define correctly a maritime staple provoked justifiable criticism. This took the form of arguments that invertebrates or large fish could not serve as an early demographic support (Osborn 1977; Raymond 1981; and Wilson 1981). While these arguments are essentially correct, they are all biased by a systematic failure to assess the economic potentials of *anchoveta* or small fish (Quilter and Stocker 1983).

Environmental dynamics

The emergence of multilinear perspectives on Andean evolution has been fostered by growing awareness that dissimilar environments called for distinct subsistence strategies and contributed to different trajectories of development. There has also been an increasing awareness that Andean environments are exceptionally dynamic, and that the Cordillera is subject to change and stress predicted by the paradigms of ocean-atmosphere interaction and plate tectonics. Some types of change, such as sea level rise, have affected patterns of archaeological preservation, which in turn can bias interpretations of the past. More important, awareness of environmental dynamics opens evolutionary modeling to considerations of stress and adaptive response. In the Cordillera, some forms of stress, such as anoxia at high altitudes, are constant. Some, such as sea level rise, were of long duration, while other forms of stress have been short, recurrent, and stochastic.

Assessment of the MFAC hypothesis has generated comparisons of fishing and farming that have involved estimates of relative productivity as well as propositions about environmental stress leading to economic disruptions. Critics of the hypothesis have typically focused upon the disruption of fishing by natural disasters without considering what the same disasters do to farming (*cf.* Moseley and Feldman 1988). Portrayed in an idyllic manner, farming is held up as the most productive and stable of economic adaptations. Unfortunately, this view does not account for the fact that the largest of all archaeological phenomena in the continent are abandoned agricultural systems. Spread over millions of hectares, these vast works are apt testimony to the fact that while Andean agriculture is certainly productive, it is demonstrably unstable. After a decade of studying abandoned irrigation systems, I believe that they provide very sensitive records of environmental stress and change in hydrological conditions (Clement and Moseley 1991). Therefore, if fishing and farming are to be compared, the comparison can proceed on a factual basis. However, my main concern here is to touch upon aspects of the environment which relate to maritime adaptations.

Eustatic change

When MFAC was formulated, there was little awareness among New World archaeologists that glacial meltback resulted in rising sea levels that biased patterns of archaeological preservation. If eustatic change went unacknowledged, then there was no recognition that the evolution of maritime

adaptations was divided into successive environmental epochs of dynamic change followed by stable conditions.

Antiquity of marine exploitation. The third millennium B.C. is marked by a quantum increase in the number and size of sites situated in near-shore locations. The earliest of such settlements in the Ancón-Chillón area yielded C-14 dates on the order of 2,500 B.C., while older dates were produced by inland lithic scatters with shallow deposits. Lanning and I mistakenly thought that the initial appearance of littoral settlements reflected the "discovery" of fishing by people who had previously relied upon interior hunting and gathering in *lomas* plant communities supported by seasonal fogs. To explain the apparent shift in settlement and subsistence patterns, I naively proposed that population growth had exceeded the sustaining capacity of inland resources and the quest for additional food led to reliance upon the sea. Lanning (1965) felt that the shift was due to environmental change. At the time, the only way to account for environmental change was by climatic change. Lanning incorrectly believed that desert land snails were supported exclusively by *lomas* vegetation (see Craig 1992 [this volume]). Finding vast beds of old snail shells in areas below and beyond modern fog plant communities, Lanning concluded that the lomas had contracted over time due to decreasing fog and increasing aridity. The loss of inland resources, in turn, explained why people turned to the sea for subsistence. Given that we were dealing with the juxtaposition of the driest desert and the richest fishery in the western hemisphere, I would now see both explanations as failed exercises in "minimal foraging" theory. They proceeded from the unstated premise that if the continent's first colonists were hunter-gatherers, then their descendants would perforce scrounge around the hyperarid landscape of the barren coast for millennia before discovering that there was considerably more to eat in the sea.

Fortunately, James B. Richardson III (1981) later demonstrated that the seemingly sudden appearance of numerous near-shore sites was best explained in terms of post-glacial eustatic change and a 100+ m rise in ocean levels. When the sea was lower, littoral settlements, *lomas* stands, and other ecological zones occupied lower elevations. As the sea rose, early shoreline sites were submerged, and lomas--which are altitudinally stratified relative to ocean level--shifted to higher elevations. When sea levels eventually stabilized near modern levels around 3,000 B.C., the submergence of littoral settlements abated and increasing numbers of such sites survived in the archaeological record.

Dating to the era of sea level rise, the earliest evidence of significant reliance upon marine resources comes from the Ring Site in the far south of Peru (Sandweiss *et al.* 1989) and from sites in northern Chile which Llagostera (1992 [this volume]) discusses in his accompanying article. In this region, the Andean coastal range plunges directly into the sea and descends into an abyssal ocean trench. When sea levels rose in this steep topographic setting, the ocean did not intrude great distances inland, and this enhanced the survival chances of early seaboard settlements. A very different situation prevails in northern Peru. Here, a widening continental shelf with an expanding coastal plain emerges at 9° South Latitude. When sea levels rose in this gently sloping region, the shoreline moved inland 10 to 50 km or more, leaving little opportunity for early littoral sites to survive. The one exception is the far North Coast of Peru around Talara, where Richardson (1973, 1978) has found early evidence of maritime resource utilization in a small area where the continental shelf is very narrow.

The origins of maritime adaptations lie beyond the chronological scope of the original MFAC hypothesis. There is little doubt that the utilization of marine foods has great antiquity. Yet, how this began is made speculative by the spotty evidence which has survived rising sea levels. In pondering issues of origin, we must remember that the fishery is exceptionally rich, whereas the desert and its streams and rivers are comparatively impoverished. Given the near-absence of fluted points, it is evident that specialized hunters were not drawn to the hyperarid coast. Yet, the coast would have been inhabited at this time by people utilizing marine resources to varying degrees, if the earliest C-14 dates on the Ring Site (Sandweiss *et al.* 1989) and on the Paiján Complex (Chauchat 1988) are taken

at face value. Although the dates are of arguable validity, I would expect some use of marine resources by the colonizing populations of the coast. Even if the settlers entered as generalized foragers, sea foods would have a role to play due to the comparative impoverishment of terrestrial resources. Alternatively, the sea rather than the desert may have attracted colonization and, as Richardson (1986) proposes, the initial settlement could have been by maritime-adapted populations.

Dynamic and stable ocean levels. To date there has been little archaeological concern with eustatic change as a source of environmental stress upon littoral societies in the Andes (see Richardson 1981; Sandweiss and Richardson 1992 for examples). Yet, during the height of glacial meltback, the ocean was rising on the order of one meter per century and the configuration of the littoral zone was in constant flux, as was the distribution, if not nature, of aquatic resources. Therefore, evolution of maritime adaptations must be modeled in terms of two markedly different environmental eras, with exceptionally dynamic conditions shifting to far more stable ones around 3,000 B.C. when the ocean assumed modern levels.

If the desert coast was first colonized by populations which utilized fabrics, such as satchels, of single element looped or knotted construction, as well as atlatls or lances, then they were in a sense preadapted for spear and net fishing. How early coastal populations responded to littoral conditions that changed from one generation to another was probably affected by the northern presence of a wide continental shelf and by its southern absence. Where the mountains plunge directly into the sea, small sandy bays probably appeared and disappeared in the course of eustatic rise, as did rocky headlands. I would speculate that these transformations favored relatively generalized maritime adaptations supported by a broad array of tackle, including nets, hooks, and harpoons. Where the continental shelf is wide and sandy shorelines prevail, littoral conditions may have remained more constant as the coastal plain underwent submergence. Here, the Paiján Complex, with its apparent harpoon points (Chauchat 1988), might reflect greater specialization. However, Paiján littoral sites, with a potentially broader array of tackle, do not survive. I would see the onset of relative sea level stabilization around 3,000 B.C. as generally coincident with the beginning of the Peruvian Cotton Preceramic Period. This era of more placid littoral conditions was coincident with increasing specialization in Central and Northern Peru, where the netting of small fish became the most prominent of maritime activities. This specialization developed in the region in which the contemporary *anchoveta* fishery has its productivity maxima (Walsh 1981), and these foci of exceptional marine yields would not have become stationary until sea levels stabilized. Below 15° South Latitude there are no productivity maxima, although the fishery is still extremely productive. As a corollary, I suggest that Chilean seaboard adaptations remained more generalized, and that diversified fishing tackle persisted in use (*cf.* Llagostera 1992 [this volume]).

As noted, stress from eustatic change was by no means similar along the entire Andean coast. Northern Peru appears to have undergone substantial inland environmental reorganization as sea level rose and ocean currents shifted into contemporary placement. Ranging from tropical mollusks in preceramic middens at the mouth of the Río Santa (Sandweiss *et al.* 1983) through relic stands of tropical forest in the Rio Zaña (Dillehay 1992 [this volume]; Dillehay and Netherly 1983; Dillehay *et al.* 1989), there are multiple lines of evidence suggesting that the Inter-Tropical Convergence Zone (ITCZ) was situated some 500 km to the south of its modern position during the last glacial maximum (Rollins *et al.* 1986). If this was the case, then early coastal adaptations to northernmost Peru shared close similarities with those discussed for Ecuador by Karen Stothert (1992 [this volume]). With sea-level rise, the ITCZ shifted northward with a concomitant displacement of the warm tropical Panamic Province by the cool arid Peruvian Province. Therefore, northern seaboard societies had to adjust to new maritime conditions, as well as to changing terrestrial conditions. Thus, there may well have been environmental reasons for migration and population replacement along the coast some 6,000 years ago, as Engel (1966) first proposed and Benfer (1990) now finds tenable.

In discussing potential responses to eustatic change and stability I have intentionally entered a highly speculative arena. Propositions I have raised may not be valid, but they and a rich array of alternative hypotheses cry out for testing. Rising sea levels created among the most dynamic and rapidly changing of environmental conditions ever confronted by human societies. When future research addresses the inherent issues of stress and adaptation, evolutionary modeling will be truly enhanced.

Ocean-atmosphere perturbations

Contemporary marine currents and meteorological circulation patterns have prevailed during the last 5,000 years following the onset of relative sea level stabilization. In a review article, I have pointed out marine and meteorological conditions along the arid coast are subject to long-, intermediate-, and short-term perturbations of varying intensity and nature (Moseley 1987). The Little Ice Age exemplifies a long-duration anomaly (Thompson *et al.* 1986), an intermediate example is the great Andean drought of 560-592 (Shimada *et al.* 1991), while El Niño-Southern Oscillation (ENSO) events on the order of 18 months duration constitute short-term deviations. I suspect that perturbations lasting longer than a generation may prove to have exerted the greatest stress on Andean societies. By way of analogy, it now appears that Chumash maritime populations of California underwent profound organizational transformations when upwelling currents abated for a century or more and marine productivity declined (Arnold 1992). However, intermediate- and long-term anomalies have attracted little attention in the Andes, where inquiry has focused largely on the often dramatic effects of El Niño events.

ENSO Events. El Niño events have long been recognized as a source of environmental stress on the desert coast. In 1970, Mary Parsons argued that periodic disruptions of the Andean fishery by El Niño perturbations made maritime adaptations unstable and economically unable to support sedentary populations. Accordingly, large preceramic settlements could only have been based upon farming. This contention was later elaborated on by David Wilson (1981). In both cases, the negative effects of ENSO events upon agriculture were not considered. Instead, farming was portrayed in an idealized and abstract manner, particularly by Wilson (1981), who proposed that only maize agriculture could sustain the rise of complex societies and the construction of large monuments. Below (section on variation/expectations), I discuss the problems Wilson encountered in applying this proposition as a research premise to settlement survey in the Santa Valley (Wilson 1988).

To avoid idealizing fishing or farming and the stress that ENSO events exert upon both, it must be understood that strong perturbations of ocean and atmospheric conditions are capable of altering the velocity of the earth's rotation (Salstein and Rosen 1984) and therefore have fundamental effects upon both terrestrial and aquatic food chains on a global scale (Webster 1984). There is ample documentation from the 1972 and the 1982-83 ENSO events that the Andean fishery does not simply close down, as Parsons (1970) and Wilson (1981) implied. Rather, there is a complex reordering and shift in species distributions. Initially, schools of *anchoveta* move closer to shore and concentrate in pockets of upwelling water, making them more accessible. With increasing sea surface temperatures, they may disperse to deeper waters or move south to enhance the Chilean fishery. In the north, warm temperatures bring an influx of marine life from equatorial waters and there is a biological enrichment (tropicalization) of species (Arntz 1986; Glantz 1984; UNESCO 1980). During the 1982-83 event, many people employed by the trawling industry were out of work. This was because the industry was not geared to net, process, and market the temporary abundance of new species (Arntz 1984, 1986). It was not because there were no fish in the sea.

During the 1982-83 event, commercial fishing in Peru suffered a sharp decline when pelagic fish populations migrated to cooler, southern waters. However, commercial yields from southern waters increased significantly, and Chile rose to be one of the major fishing nations in the world (Glantz 1984). Thus, El Niño can be a two-edged sword creating winners as well as losers. *Lomas* vegetation is another resource which changes dramatically with El Niño. Although coastal storms are most intense

in the north, showers accompanying the 1982-83 event reached south at least as far as Tacna. Great tracts of normally barren desert bloomed, supporting transhumant highland livestock and even small-scale farming.

The impact of strong ENSO events extends beyond the sea to include the Cordillera, and major events are of pan-Andean scope. In calling for an integration of MFAC with scenarios of early inland development, Burger (1985) has noted that highland-lowland linkages were probably quite important in mitigating economic disruptions of El Niño events. How people sought to mitigate disruption will depend upon where they lived. This is because the terrestrial impact of ENSO events is dramatically different in the north than in the south, and also varies between the coast and the highlands.

Torrential rainfall generated by strong El Niños only doubles normal precipitation in the headwaters of the far northern drainages. Yet, precipitation is 40 to 60 times greater than normal in the desert and coastal sections of these drainages (Waylen and Caviedes 1986). Because rainfall is most intense where irrigation systems are the largest, catastrophic flooding destroys the economic production system of the largest segment of the northern population. Because this segment of the population is nucleated in desert valleys where rainfall and flooding are worst, it experiences large scale losses in housing, roads, and sources of potable water. The latter contributes to a dramatic increase in disease and infant mortality (Caviedes 1984). Thus, pestilence and famine go hand in hand with El Niño.

Although storms move down the length of the Peruvian coast, in the highlands, increased precipitation only occurs in the north. In the southern uplands strong ENSO perturbations are associated with decreasing precipitation (Thompson *et al.* 1984). During the 1982-83 event the Titicaca Basin was enveloped by devastating drought. Crops failed, herds lacked pasture and suffered pestilence, while people experienced widespread famine. Searching for relief, large numbers of people moved to lower elevations, and thousands of head of cattle were moved to the coast to forage on the expanded *lomas* bloom.

The destructive impact of ENSO perturbations upon coastal agricultural systems is well documented for the 1982-83 event (Caviedes 1984). During strong El Niño episodes, there are storms and torrential deluges over the course of several months broken by days of more clement weather. During the latter, fishermen can go to sea and fish, but agriculturalists cannot go to the field and farm. The first storms to generate flash flooding of rivers will destroy the intakes and initial channel sections of canal systems. Beyond the confines of river flooding, canals will be cut by the flooding of quebradas and normally dry drainages. Furthermore, surviving channel sections will be silted in by sheet wash. Therefore, the reconstruction of large canal systems takes longer than the normal 18 month duration of strong ENSO events. The largest of traditional irrigation systems are on the North Coast where ENSO rainfall and flash-flooding is most intense, and here recovery time for farming may span several years. Moore (1991) has presented a case of Imperial Chimú agrarian response to ENSO stress in the Casma Valley. This response entailed large-scale reclamation of near-shore terrain by construction of ridged fields. If building such fields, sowing them, and waiting for a harvest took longer than 18 months, then fishing probably normalized before the fields came into production.

It is necessary to scale back fishing and farming technologies to estimate the potential impact of strong ENSO events upon early agricultural and maritime economies. If early cultivation relied upon seasonally inundated flood plains, or upon contracted versions of later canal systems, then agricultural terrain was situated where El Niño flooding is most severe. Severe river flooding is generally limited to a few months during the course of a strong ENSO perturbation. Therefore, rebuilding agricultural infrastructures might begin before the end of an El Niño and the resumption of cool sea surface temperatures. Reconstruction time would be relative to the size of canal systems, and building small works for flood plain farming involves the least effort. Yet, below about 10° South Latitude, little or no runoff would feed rebuilt canals, because this region of the highlands experiences drought during ENSO perturbations (Moseley 1987).

The impact of strong El Niño conditions upon early maritime adaptations would be relative to perturbed sea surface temperatures, which are generally higher and of longer duration in northern Peru than in northern Chile. During the Cotton Preceramic Period, I believe that coastal societies between about 8° and 15° South Latitude significantly increased their reliance upon *anchoveta* netting and became relatively specialized in comparison with their Chilean contemporaries (*cf.* Llagostera 1992 [this volume]). The modern *anchoveta* industry has highlighted the negative effects of becoming so specialized as to be unable to respond to the temporary replacement of cold species by the tropical marine fauna which accompanies the intrusion of warm waters. Therefore, I would suspect that ENSO events selected against exclusive technological or economic reliance upon *anchoveta* harvesting. If early maritime societies could respond to the influx of different forms of marine life, then famine might have been avoided.

These speculations about early coastal fishing and farming are of narrow focus. Broader modeling of potential responses to El Niño disruptions by later, more complex societies involves additional considerations. First is the relationship between magnitude and duration of ENSO events. Once strong events cross a certain threshold of northern flooding and southern drought, I imagine that stress on human populations becomes less dependent on the intensity of the event and more dependent upon its duration. Second, under normal conditions the mountain subsistence strategy is predicated upon highlanders maintaining direct access to low elevation resources via tenure of low altitude land and satellite communities. When El Niño-induced drought enveloped the Titicaca Basin and altiplano, this may have predisposed, if not preadapted, highland populations for large-scale movement to lowland settings. Third, in promoting local economic autonomy, the maritime-oasis subsistence strategy is unlikely to have preadapted North Coast populations for comparable movement to sierra settings. Rather, I would imagine that here relief came from the movement of highland goods to the coast. Fourth and finally, recovery time for agricultural populations on the North Coast must have been longer than for their southern altiplano counterparts, because flooding destroys the means of agrarian production, whereas drought simply closes them down.

Tectonic stress

Economic and demographic disruption from earthquakes or other tectonic activities has not been considered by MFAC critics. This is probably because tectonic stress is more disruptive of farming than of fishing. Yet, there is evidence suggesting that a *tsunami* inundated the Huaca Prieta area around 700 B.C. and that it may have affected other coastal areas as well (Bird 1987). This is an apt reminder that seismic sea waves were certainly a recurrent source of stress on near-shore settlements. Tectonic events resulting in episodic coastal uplift have a negative effect upon littoral fauna. Although I once thought that these were recurrent events, it is now evident that Quaternary uplift along the coast of Peru and Chile is predominantly gradual and averages on the order of 0.1 to 0.5 m. per thousand years (Sandweiss *et al.* 1989).

Synergistic interactions. Evidence from the Moche Valley suggested that the coast experienced very rare, but recurrent cycles of exceptional erosion and deposition that were potentially attributable to the synergistic consequences of strong tectonic events preceding ENSO events. Time lapse, high altitude imagery monitoring the Río Santa coastline has provided a modern analogue for such cycles (Moseley *et al.* 1992). Here, the 7.7 Richter Scale earthquake of May 1970 resulted in land slides and mass wasting that left vast quantities of loose debris in repose on the lower, normally rainless watershed. The debris underwent subsequent transport during the strong ENSO event of 1972-73, when the Río Santa disgorged an excessive sediment load. This resulted in the shoreline rapidly prograding up to one kilometer seaward of its original position. Further, but less dramatic progradation transpired again during the very strong ENSO event of 1982-83, when there was less debris to flush off the landscape. After El Niño flooding, material disgorged by the Río Santa was reworked, transported northward, and deposited along the shore for 20 km or more by the resumption of normally strong longshore currents. These findings confirmed the model for ridge formation first

proposed by Sandweiss *et al.* (1983). The addition of fine sediment to beaches provided a renewed source of sand for the formation of dunes gradually propelled inland by strong daily winds off the ocean.

This recent cycle of erosion and deposition carries a number of implications. First, episodic progradation is likely to have buried mollusk beds and disrupted littoral habitats along a significant length of coast line. If several ENSO events move sediment off a tectonically disturbed landscape, then successive episodes of progradation will contribute to relatively long-term littoral instability. Second, progradation leading to episodic dune formation can have disastrous effects upon inland populations if agricultural systems lie within the pathway of dune migration. Third, if the synergistic consequences of earth movement and El Niño precipitation result in exaggerated erosion and deposition, then there is likely to be tectonic "noise" in the paleoflood record.

Extending 1,500 years back in time, ice cores from the Quelccaya Glacier, south of Cuzco, provide the most detailed record of the date and duration of past El Niño events (Thompson *et al.* 1984, 1985). The glacial cores not only reflect events of 1925-26 and 1982-83 magnitude, but also rarer ENSO episodes of longer duration or greater intensity. However, it is going to be very difficult to identify which paleofloods of exceptional severity were exclusive products of El Niño rainfall and which were severe simply because they followed seismic events. Another problem with tectonic noise is that paleoflood sequences will vary from region to region due to regional differences in seismic activity. For example, Moore (1991) did not find a chronological correlation between the Casma episode of severe flooding he studied and more northerly episodes of severe flooding during Chimú times. This could be a product of different earthquakes with different epicenters.

Variation

The archaeological record should reflect considerable variability between sites and within them. This is because the Cordillera is a dynamic landscape, and resources are irregularly distributed locally as well as regionally from north to south. Furthermore, human activities at small residential sites must have differed from those at large monumental centers such as El Paraíso, which Jeffrey Quilter discusses in his accompanying article (Quilter 1992 [this volume], also Quilter 1985; Quilter *et al.* 1991). After assessing expectations about variability, I will consider some of its potential sources and consequences.

Expectations

The fishing and farming components of early coastal sites have traditionally been subject to contrasting expectations about variability. Initial formulations of MFAC tended to stereotype coastal economies and therefore downplay variance. Nonetheless, differences were recognized between maritime settlements atop rocky headlands and those along sandy bays. Distinctions in fishing tackle and marine food remains were considered to be the products of adaptations to dissimilar types of shore lines. On the other hand, differences in the frequencies and types of domesticated plants at such sites were not treated in a similar manner. Instead, variances tended to be glossed over in favor of the tacit presumption that early inhabitants of the coast shared basically similar assemblages of cultigens. I certainly maintained a double standard of expectations by accepting heterogeneity in maritime foods, while anticipating homogeneity in plant foods. Perhaps I was laboring under the influence of the Spinden Hypothesis and its presumptions about crop uniformity. At the time, there were simply no models predicting heterogeneity in assemblages of cultigens.

Multilinear modeling now makes variation in plant assemblages understandable, and distinctions between highland and lowland agriculture are widely acknowledged. Yet there are still strong tendencies to expect homogeneity among early coastal domesticates. When differences appear, these expectations can divert explanation away from considerations of adaptive variance. Maize is perhaps the best case in point. By the mid 1960s, the presence of this domesticate had been reported at several

preceramic sites within a limited area bound by the Ríos Supe and Culebras. One was the small Huarmey settlement of Los Gavilanes with relatively shallow deposits (Kelley and Bonavia 1963). In subsequent excavations by Bonavia (1982), specimens of maize were encountered with remains dating back to *circa* 2,500 B.C. Some botanists interpret the Gavilanes material as compatible with early cultivation of maize within the Huarmey drainage (Bonavia and Grobman 1989). However, others consider the cob, kernel, and tassel morphology of the specimens as characteristic of late varieties of maize that came into production less than 1,500 years ago. Therefore, the Gavilanes specimens are argued to be intrusive from later activities in the area which went undetected during the course of site excavation (Bird 1990).

There are inherent dangers in dismissing variation and differences in the archaeological record as products of inept excavations. For example, reports of preceramic maize in the Ríos Supe-Culebras region led Wilson (1981) to postulate that this plant was the economic staple of virtually all early settlements on the coast. He attributed failure to find the crop at numerous excavated sites to poor sampling, biased recovery, and inadequate identification techniques on the part of the many scholars who had investigated the settlements. Explaining away negative evidence left Wilson with the neo-Spinden hypothesis that only maize agriculture could sustain the rise of complex societies and the construction of large monuments. When pursued as a research premise in settlement survey of the Santa Valley, it led Wilson (1988) to conclude that a millennium-long occupational hiatus characterized the Initial Period. In all adjacent valleys (*e.g.*, Casma: Pozorski and Pozorski 1987), the Santa void spanned an era when irrigation agriculture relying on crops other than maize supported the construction of more large monuments than at any other time. The biggest early platform mound in the hemisphere was erected less than 50 km south of Wilson's study area, at Sechín Alto in the Casma Valley (*ibid.*). Initial Period monuments were built immediately upstream of the study area at La Galgada (Grieder *et al.* 1988) and in the Santa headwaters at Huaricoto (Burger and Burger 1985). Architectural complexes consisting of a platform mound fronted by a circular sunken court were erected within Wilson's study area (*e.g.*, Kosok 1965: 192, figure XVIII-15), and elsewhere these complexes do not date after the Initial Period (Williams 1985).

While great variation in the archaeological record is expectable, an early occupational hiatus in the lower Santa Valley--and only the lower valley--is difficult to explain on environmental, economic, or cultural grounds. However, it could be the consequence of defending presumptions about the economic primacy of maize by dismissing contrary evidence and assigning Initial Period sites and monuments without maize to later periods when the crop was present. If this is the case, then rejecting variation that deviates from expectations has resulted in misleading conclusions. From a multilinear evolutionary perspective on early Andean societies, it is necessary to acknowledge deviation in the archaeological record and search for explanation in a framework of adaptation.

Different conditions

If people respond to distinct environmental and social conditions in different ways, then some aspects of variation should be predictable and others expectable. As noted, local changes in littoral topography and shoreline resources correlate with distinctive artifact and dietary assemblages at rocky headland and sandy beach sites. In the Ancón-Chillón area, net fishing was a prevalent activity in sandy bays, but I encountered one small preceramic site, Camino, with exceptional quantities of kelp seaweed represented by rooty holdfasts rather than comestible leaves (Moseley 1975a). At the time, I did not know what to make of such a specialized site. Now, however, I would see it as an early expression of a long tradition of extracting and processing seaweed for consumption elsewhere which persisted through ethnohistorical times and remains important today (Rostworowski 1981; Masuda 1981, 1982, 1985). Other types of early maritime specialization are certainly likely. For example, if Paiján projectiles were, indeed, harpoon points as Chauchat (1988) suggests, then this equipment was geared to particular types of maritime fauna found in specific marine habitats. As noted above,

however, it is doubtful that harpoons would have been the only type of tackle employed by Paiján populations.

If coastal preceramic sites reflect differences in fishing activities, then differences in farming activities might also be expressed. However, fishing could be done over a broad range of diverse marine habitats, whereas hyperaridity limited farming to a far narrower belt of river-related habitats. Preceramic littoral populations presumably farmed mostly within the floodplains of seasonally inundated drainages. Such self-watering land is limited by river entrenchment, and until canals were constructed to reclaim desert terrain, constraints on arable land would not allow farming to out-produce fishing (Moseley and Feldman 1988). Some preceramic sites, such as Huaca Prieta, Aspero, and El Paraíso, were situated near rivers in valley mouth locations. Numerous other littoral communities, including Bandurria, Río Seco, and Huaynuná, were situated in the interfluvial desert far away from arable land. Here, cultigens may have been obtained in either of several ways. The shoreline site of Huaynuná is located in the desert 13 km north of the Río Casma. Preceramic midden includes cultigens represented by comestible and usable plant parts as well as by unusable and inedible parts. This is thought to reflect a pattern of direct procurement in which the inhabitants trekked to the Río Casma to sow. Later, after harvesting, crops were taken back to Huaynuná for processing, at which time waste parts were discarded in the midden. At the nearby, Initial Period site of Tortugas, waste parts largely disappear from the midden after the advent of irrigation agriculture and the introduction of ceramics. This is thought to reflect indirect procurement of processed cultigens by exchange with Casma farmers (Pozorski and Pozorski 1987: 113-116).

Due to a lack of comparable botanical analysis, it is difficult to tell how representative Huaynuná may be of other preceramic sites located away from arable land. The possibility that some outlying littoral communities received plant goods indirectly through exchange should not be ruled out at this point. I believe that the intensification of fishing required ever larger quantities of cotton for netting, as did the production of fabrics to clothe growing populations. In theory, if demands for cultigens increased, then preceramic communities near rivers would have been in a position to monopolize arable land and limit access to it by more distant populations. In this vein, specialization in cotton production has been suggested for two large sites immediately adjacent to rivers, El Paraíso on the coast (Quilter *et al.* 1991) and La Galgada in the interior (Grieder *et al.* 1988).

These two sites exhibit intriguing agricultural differences and similarities. Situated near the coast, El Paraíso is adjacent to an exceptionally large expanse of river flood plain where farming could have taken place with simple ditch irrigation and by seasonal flooding of the Río Chillón. Located at an elevation of 1,000 m amd more than 70 km from the coast, La Galgada is in a narrow canyon with a perennially flowing affluent of the Río Santa. Here, farming would require canal irrigation of land above the flood plain. Water for irrigation would be available throughout the year, rather than seasonally as at El Paraíso. At El Paraíso there is evidence for primary reliance upon marine foods, with plant foods being of secondary importance (Quilter *et al.* 1991). At La Galgada there is no evidence of dietary reliance upon sea food, nor upon game or camelids. At both centers, remains of cotton constitute the most common domesticate. Whereas fiber production at the coastal center was for both nets and textiles, cotton was used principally for making textiles at La Galgada. Textiles are the most ubiquitous of manufactured articles to occur at all at cotton preceramic sites. As in Inca times, I suspect that they were probably a means of "banking" or storing labor in durable prestige commodities. The remainder of the domesticated plant assemblage at La Galgada is surprising because it is not significantly different from that at El Paraíso in either types or frequencies of cultigens! In studying the botanical assemblage, the late C. Earle Smith (1988) stressed the apparent absence of a starch staple and suggested that this role might have been fulfilled by cotton seed meal or oil. If Smith's suggestion is wrong, then it is difficult to imagine how the people of La Galgada made a living in the arid canyon. Because monumental architecture is not the best context in which to recover dietary remains, the sample of plants from La Galgada might be biased. Yet, our expectations about the crops needed for inland farming might also be biased.

Inland preceramic irrigation is also implicated at elevations around 2,000 m in the Zaña drainage by small sites as well as by traces of ditches and planting surfaces (Dillehay *et al.* 1989). The long occupational sequence in the middle and upper Zaña Valley is in part contemporary with the Paiján occupation of the valley mouth and adjacent littoral. However, the two are quite distinct. As noted, relic stands of tropical vegetation and tropical forests survive in the higher regions of the drainage. Here, lithic assemblages without projectile points as well as secondary burial practices suggest general affiliations with tropical forest cultures and adaptations rather different than those at La Galgada.

Turning to a broader regional perspective on variation, both terrestrial and marine conditions on the arid coast change along a north-south axis and frame certain expectable differences in subsistence activities. To begin with, there is something of an inverse relationship between the potentials of fishing and farming. In the tropical north where the Cordillera is low and narrow, rainfall sustains coastal farming. In this volume, Stothert (1992) advances the cogent argument that rainfall in the Ecuadorian north allowed for a more diversified economy and one incorporating agriculture at a far earlier date than characterized Peru's desert littoral. Because the Cordillera becomes significantly drier as the mountains become higher and wider, constraints on plant growth increase to the south. In northern Peru the desert is crossed by large rivers in wide valleys, while to the south average discharge diminishes and drainages are deeply incised. Thus, the Atacama wastelands of Chile constitute a counter pole to the tropical resource potentials of Ecuador. With the longitudinal gradation in hydrological conditions, there is a concomitant gradation in the plant growth potentials of coastal drainages that should find reflection in the archaeological record.

Most cultigens which appear in early coastal sites were first domesticated elsewhere. Therefore, the different pathways by which these plants diffused and were introduced should interject differences in the coastal archaeological record. In theory, there were at least three pathways. Domesticates adapted to lower elevations may have spread down the coast moving from valley to valley. Alternatively, they may have been carried over the Cordillera and then spread laterally from a point of coastal introduction. High altitude domesticates would involve a third pathway, namely down from the mountains potentially followed by lateral spread for those crops tolerant of lower altitude growing conditions. Movement of plants over the Cordillera or down from the high sierra could result in rather disparate points of coastal introduction and divergence among the cultigen assemblages of littoral sites. For example, preceramic maize in the Ríos Supe and Culebras area might be explained in this manner, if the remains are not intrusive from later occupations.

In assessing variation in the adaptive strategies that arose along the Pacific watershed, it is useful to realize that where the potentials for plant growth and agriculture are low those for fishing are high. This inversion of economic potentials reflects a general correlation between the elevation of the Cordillera, the aridity of the watershed, and the strength of the marine upwelling that sustains the *anchoveta* fishery. Beginning in northern Chile where the Andes are highest and driest, strong upwelling currents arise and the near-shore fishery stretches up the Andean coast some 2,000 kilometers. This vast but narrow belt of coastline water has produced commercial fish yields on the order of 100 metric tons per square kilometer of ocean per year. Yet around 8°, 11°, and 15° South Latiude, there are productivity maxima with yields on the order of 1,000 tons/km^2/yr (Walsh 1981). It is not fortuitous that the preceramic distribution of large maritime architectural monuments is confined to the length of coast which is roughly coincident with productivity maxima.

Sea-floor and coastal topography begin to change around 8° South Latitude, near the mouth of the Virú Valley. Here, an increasingly wide continental shelf and broadening coastal plain emerge and stretch northward. This topography creates a westward deflection of upwelling currents. North of the Río Chao, the anchovy belt veers away from the shallow littoral zone and pulls far out to sea. From the Virú Valley north, the fishery was not easily accessible to preceramic populations. I would anticipate regional differences in subsistence patterns above and below about 8° South Latitude; indeed, *anchoveta* are not represented at littoral sites such as Huaca Prieta. To the south of 8°,

upwelling varies in strength. The productivity maxima of the fishery occur in the coastal region where the largest preceramic monuments were built. Therefore, the rise of complex maritime societies engaging in monumental construction activity may only have transpired in a very limited region of exceptional marine productivity. South of this core region, the fishery supported sizable sedentary maritime populations extending well into Chile, but large monuments were rarely erected in this region, even after the appearance of irrigation agriculture.

Fishing and farming: temporal change or early specialization?

Early formulations of MFAC stereotyped not only economic adaptations but economic change, as well. As in other coastal areas, intensive irrigation agriculture, ceramics, and heddle weaving appeared more or less concomitantly in the Ancón-Chillón area. These innovations were interpreted as dating to 1,800 B.C. on the basis of a limited number of C-14 assays. Unfortunately, this date was subtly portrayed as a fixed point in time, as if fishermen suddenly dropped their nets, picked up pots, and marched inland to dig canals and take up farming. This glossed over very complex processes of change. I would now model the situation in terms of a maritime-oasis scenario which sees fishing and farming as separate but complementary ways of making a living. This perspective disengages the two types of subsistence activities and allows irrigation agriculture to be viewed as a distinct adaptation that came to be juxtaposed with previously well-established maritime adaptations. This opens the possibility that non-ceramic-using fishing populations persisted and overlapped in time with ceramic-using farming populations.

When the Spaniards arrived on the coast of Peru, they encountered profound economic specialization that separated the production of protein from the production of carbohydrates. In oases valleys, such as the Santa Valley, there were two discrete classes of food producers, farmers and fisherfolk. Farmers did not fish, and fishermen did not farm. In the north, fisherfolk spoke their own language or dialect distinct from that of agriculturists. Furthermore, maritime populations married among themselves, lived in separate communities, and were governed by their own *kurakas* or hereditary lords (Rostworowski 1981; Netherly 1977; Rabinowitz 1983).

Why the separation of protein and carbohydrate production? In the present and in the past, it seems that people who attempt to both fish and farm do not produce the same level of yields as professionals who engaged in one or the other. Due to constant upwelling currents, fishing goes on year-round. Prior to government regulations, *anchoveta* were harvested some 280 days a year, and most other sea foods are perennially available. Farming is also a year-around occupation. The largest prehispanic canal systems ever erected in the continent occupied the coastal valleys from Santa northward. When coastal farmers are not engaged in plant tending, their labor is generally absorbed in the maintenance of irrigation systems. In addition to occupying people throughout the year, maritime and agrarian pursuits transpire in different spatial settings and are associated with different patterns of residence. Farmers live in the valley interiors, whereas fisherfolk live along the desert littoral. Furthermore, the timing of fishing and farming activities often conflicts. This is because these activities are scheduled by very different phenomena and are subject to equally distinct risks. Maritime folk are concerned with lunar cycles, tides, and turbulent seas, whereas agrarian folk worry about solar cycles, precipitation, and drought. Therefore, farmers and fishermen pray to different saints and emphasize different religious holidays. Ethnohistorical sources indicate that fisherfolk and farmerfolk regularly exchanged subsistence commodities, and indigenous coastal polities sought to incorporate both maritime and agrarian populations in order to maintain economic autonomy.

The maritime-oasis scenario seeks to explain the evolution of the ethnohistorical situation from a uniformitarian perspective. Net harvesting of small schooling fish, from small watercraft employing small crews has long been the most productive means of exploiting the Andean fishery. This adaptation is less demanding in terms of labor and organization than is irrigating the driest of American deserts with runoff from the most rugged of Cordilleras. Along the arid Pacific watershed, marked constraints on irrigation agriculture are reflected by the fact that very little land is irrigated

by canal systems shorter than 5 kilometers. Systems exceeding 20 km in length water the great majority of productive terrain. Because streams and rivers descend an oversteep escarpment, they are deeply incised. To divert water up and out of down-cut channels, lengthy lead-off canals must be constructed before water can be turned on to planting surfaces. River gradients influence lead-off channel length. They may be relatively short where steep gradients prevail, as in the Tablachaca Canyon, but then there is often little arable land. The coastal valleys offer much more land, but shallow river gradients require lead-off channels that are many kilometers long, followed by even longer delivery systems to reach lateral desert lands. The coastal archaeological record indicates that people had access to domesticates long before serious efforts were made to reclaim the desert. Thus, it seems that the rise of intensive agriculture on the coastal desert was constrained not by a lack of plants, but by a lack of land that did not require large-scale reclamation.

Whereas little of the desert can be farmed, all of the upwelling shore waters can be fished. In southern Peru and northern Chile, there is early evidence of seafood consumption and early marine exploitation some 8,000 to 9,000 years ago (Sandweiss *et al.* 1989; Llagostera 1979, 1992 [this volume]). Hereafter, evidence of economic reliance upon the sea increases in the coastal archaeological record. Thus, the maritime-oasis scenario holds that fishing arose well before intensive desert farming and then persisted without interruption into ethnohistoric and recent times (Sandweiss 1986). Although the Andean fishery may feed people, it does not provide fiber for net and line, reed or wood for watercraft, or fuel for fire. Thus, exploiting the sea requires an infrastructure based on terrestrial resources, adding an oasis component to indigenous maritime adaptations. This component came to include domesticated cotton, gourd, fruits, and other crops by about 3,000 B.C. or shortly thereafter.

Most scholars agree that introduction of ceramics was closely associated with the advent of intensive farming supported by large-scale canal reclamation of the desert valley interiors. In a sense, the Initial Period is the time when agrarian oases suddenly became viable as major economic alternatives to the sea. At this time, farming was clearly juxtaposed with fishing as a distinct way of making a living, and the separation of protein and carbohydrate production presumably persisted thereafter.

If preceramic littoral populations relied principally upon floodwater farming, then they would have brought little land into production. River floodplains and other self-watering terrain comprise less than 1% of what is farmed on the coast today. Most farming is sustained by land which was formerly desert and which stretches along the sides of coastal drainages. In the absence of canal irrigation, this terrain would have remained an open, unreclaimed niche. Dramatic radiation into this niche transpired during the Initial Period. Large-scale reclamation of the desert must have supported economic and demographic boom times commemorated by an unprecedented spate of monumental construction. Within many valleys, more large monuments were built during the Initial Period than in any other era before or since. Numerous U-shaped ceremonial centers were erected, of which Sechín Alto was by far the largest. Most of these centers literally turn their back to the sea, face upstream, and open their wings to distant mountains from which came the runoff for irrigation.

The economic origins of Sechín Alto surely rest with desert irrigation. Yet who exactly reclaimed the desert is more debatable. Pioneering formulations of maritime-oases development by Edward Lanning (1967) set forth the proposition that the desert was reclaimed by coastal people who gave up fishing and turned to canal-based farming. Building on this idea, I argued that sea foods supported the rise of large sedentary societies which erected big earthworks, and that these societies were organizationally preadapted for the construction of sizable canal systems which in turn facilitated rapid radiation into the undeveloped coastal valleys (Moseley 1975). While continuing to believe that the preceramic maritime adaptations supported complex littoral societies, I find it increasingly difficult to envisage conditions or processes that would transform fishermen into farmers. There are a number of potential triggering mechanisms, including: limitations in the maritime technology;

strictures on the carrying capacity of marine resources; and El Niño-induced down-turns in fishery productivity. However, none of these possibilities have been demonstrated in late preceramic contexts.

It may prove more parsimonious to propose that intensive fishing and intensive farming were always separate enterprises, and that reclamation of the desert depended less upon coastal people who gave up fishing than it did upon folk who had long prior experience with canal irrigation. La Galgada (Grieder *et al.* 1988) raises the possibility that irrigating the coastal desert was pioneered by small farming populations which gradually moved from higher to lower elevations, and thus radiated out of narrow canyon lands down into the expansive open valleys. The proposition that irrigation advanced down-stream was proposed decades ago by Ford and Willey (1949). It holds that steep upstream gradients allowed for the construction of relatively short canal systems, and reclamation transpired here before it advanced down and out of the coastal valley necks where shallow river gradients required the construction of far larger delivery systems. Relative to this proposition, Grieder *et al.* (1988) interpret the La Galgada radiocarbon dates as indicating that Initial Period transformations, including ceramics and U-shaped ceremonial architecture, appeared around 1900 B.C. in the Tablachaca Canyon. Similar transformations in the lower Casma Valley transpired two or more centuries later according to the Pozorskis' (1990) most recent interpretation of their dates. This situation is compatible with propositions that irrigation agriculture moved down and out of the mountains over time. However, the radiocarbon assays have large standard deviations, and certainly could be read in other ways.

Among other things, La Galgada indicates that productive farming did not require a great deal of irrigated land, nor plants potentially different from those appearing in preceramic littoral settlements. Preceramic fisherfolk may have tended plants in floodplains. Yet there might well have been other people who made an inland living by irrigating modest sections of the desert adjacent to streams and rivers. Physical evidence of small-scale reclamation proceeding down stream and out of the valley necks would likely be obfuscated by the large-scale agrarian transformations of the Initial Period.

Recent research by E. Zechenter (1988) in the lower Supe drainage has identified more remains of inland preceramic settlement and construction activity than is readily compatible with a maritime support base. Yet maritime adaptations are inferred by R. Feldman (1980) to have supported Aspero, a large littoral settlement with preceramic mounds located at the desert edge of the valley mouth. The Supe situation could be interpreted as reflecting either one or two economic adaptations. Zechenter (1988) argues for the former. She disallows modern or ancient netting of small schooling fish from small craft to support the contention that maritime resources could not support large littoral settlements. Therefore, farming is seen as the exclusive support base for the entire early occupation of the Supe drainage. Uniformitarian modeling offers an alternative perspective. At Puerto Supe, a short distance from Aspero, the local *anchoveta* fishery supports several thousand commercial fishermen and their families. Interior canal systems support an even larger population of commercial farmers. If two economic adaptations operate concurrently today, there are few *a priori* reasons that this could not have been the case in Late Preceramic times. This situation would account for the littoral and interior aspects of early settlement in Supe as well as for the contemporary occupation which is not based exclusively on farming.

Propositions of concurrent adaptations raise intriguing questions about concurrence of cultural change. If maritime populations were not in the vanguard of desert reclamation, then they may have remained relatively conservative about the changes fostered by intensive irrigation agriculture. In this vein, the Pozorskis (1990, 1991; *cf.* Quilter 1991) have recently reassessed their radiocarbon dates to argue that nonceramic maritime adaptations at Huaynuná persisted for a century or more after ceramic-using people in the nearby Casma Valley were engaged in intensive irrigation agriculture. Elsewhere, overlap of Late Preceramic and Early Ceramic radiocarbon ages is not uncommon. Indeed,

one-third of the radiocarbon assays from the largest of all preceramic monuments, El Paraíso near the mouth of the Rio Chillón, fall after 1800 B.C. (Quilter 1985), which has traditionally been considered as the opening date for the Initial Period on the Central Coast. Given large standard deviations, overlapping dates must be evaluated with caution. Nonetheless, uniform cultural change is not particularly expectable in the multifaceted landscape of the Cordillera. An imbrication of fishing and farming probably did transpire, with conservative maritime traditions overlapping for a time with more innovative agrarian ways of making a living.

Organization

Local variation in the content and constituents of early coastal sites should accompany the increasing social complexity and activity differentiation that took place during preceramic times. Along the arid coast, organizational complexity underwent much greater elaboration in Peru's central littoral zone, between about 8° and 15° South Latitude, than it did either northward or southward into Chile. In so far as activities at large sites with monumental buildings were certainly different from those at small settlements lacking such constructions, variation is to be expected in more than architectural remains. This complex topic is considered at length in the following section.

Architecture and sociopolitical organization

My excavations in the Ancón-Chillón area focused on midden deposits and subsistence remains because I was more concerned with how preceramic populations supported themselves than with how they were organized. My interest in organization developed later in the course of studying Moche and Chimú architecture. These studies generated concepts that I applied to the 1971 restudy of the Aspero complex and to the 1975 formulation of the MFAC hypothesis. I discussed early organization in reference to non-domestic, preceramic architecture and employed concepts of "corporate" labor, decision-making, and organization. Corporate labor entailed work forces drawn from multiple households. Corporate projects were undertakings in which laborers toiled together in a collective, integrated manner for a specific purpose. This purpose was defined and sanctioned by a decision-making, authoritative body that coordinated the work, and to which the will of individual laborers was subservient while participating in the undertaking (Moseley 1975a: 79).

The decision to employ a corporate perspective was motivated by several considerations. First, in discussing maritime societies, I wanted to avoid terminology and concepts traditionally associated with agrarian societies. Second, I sought to side-step terms, such as "temple mounds," which imputed activities that were often not demonstrable in preceramic contexts. Third and finally, I saw no utility in describing early coastal populations as egalitarian societies, chiefdoms, or states. These cross-cultural categories of sociopolitical formations provided poor characterizations of Andean institutions and they were too few in number to cover the wide array of indigenous organizations that existed at the time of contact or survived into the 20th century. In retrospect, had I known more about coastal ethnohistory in 1975 it might have been possible to use native institutions to model preceramic societies. However, this was not the case, and I retreated to corporate organization as a neutral means of discussing early organization.

Conflicting characterizations

Corporate organization was apparently too prosaic a concept to gain general acceptance. Other investigators have chosen to frame early developments in standard cross-cultural categories of sociopolitical formations. Although multilinear perspectives may be acknowledged for economic adaptations, I believe that unilinear modeling remains in vogue when Andean development is portrayed as a progression from egalitarian societies, through chiefdoms, to states. These sociopolitical formations are not well-suited to the Cordillera. They impute linkages between phenomena that frequently fail to co-occur in preceramic and early ceramic contexts. For example, Late Preceramic societies have been called chiefdoms, not because there is unequivocal evidence of chiefly burials,

but because there are sizable mounds and large monuments. If an investigator does not believe that such buildings could be erected by bands or tribes, then chiefdoms are one of the few available slots for pigeon-holing preceramic societies. In this scheme, early ceramic societies can only be characterized as unchanged chiefdoms or as states.

Citing the enormous architectural works in the Casma Valley, Shelia Pozorski (1987) has proposed that archaic states, in theocratic guise, dominated the coast by the first millennium B.C. Yet there is no coastal burial evidence of Initial Period hereditary rulers of the kind generally associated with archaic states. On the contrary, in the Lurín Valley, the central atrium of the Cardal platform yielded burials with accompaniments that were few in number and principally domestic in nature. The Burgers (Burger and Salazar-Burger 1991) propose that these remains reflect a relatively egalitarian population. They see limited status differentiation as a product of personal achievement and the personal authority of individuals who otherwise engaged in the normal productive activities of the society.

Divergent portrayals of Initial Period organization reflect the difficulties with imposing cross-cultural categories of sociopolitical formations upon Andean populations. Different categories of formations raise different sets of expectations about linkages and relationships between phenomena, such as monumental architecture, hierarchial decision-making, social equality, and inherited rule. Yet these expectations are often not fulfilled by the archaeological record. I believe that there are fewer problems with the record than with the organizational formations used to describe it. Therefore, it is useful to touch upon some of the constraints that cross-cultural categories of sociopolitical formations impose upon evolutionary modeling of Andean populations.

Faith. For millennia the course of world history and the lives of millions have been profoundly influenced by a pervasive, complex, hierarchial organization which lacks inherited offices and rulers, yet operates in a multi-national arena and generates architectural monuments, among other things. This is the Vatican, and it is not readily portrayed as an egalitarian society, chiefdom, or state. If this limited repertoire of cross-cultural sociopolitical formations cannot readily accommodate the Vatican or Mecca, then I submit that it does not provide an adequate framework for portraying the evolution of Western organization.

If Western history cannot be accurately depicted without reference to religious formations, then there is no reason to suppose than Andean history or prehistory can be realistically characterized by social and political formations alone. This would exclude the oracle of Ichma at the pilgrimage center of Pachacamac that attracted millions of devotees over the course of centuries. In *Estructuras andinas del poder*, Rostworowski (1983) provides ethnohistorical documentation for a plethora of influential religious formations and organizations. These phenomena certainly have deep evolutionary roots that may well have taken hold during the Initial Period. For this period, I detect broad scholarly agreement that religion was a pervasive force, if not the organizational keystone for large cooperative undertakings. Standard cross-cultural sociopolitical formations do not adequately describe such a situation, so it may be more profitable to concern ourselves directly with the nature of early *religious* formations. If meaningful sociopolitical characterization of Early Horizon Chavín de Huántar has proven elusive, then it may be equally elusive for the preceding Initial Period.

Inherited Rule. Ethnohistorians rarely characterize indigenous political formations of the Central Andes in terms of chiefdoms. Therefore, searching the prehistoric record for chiefs or chiefdoms seems of dubious value when *kurakas*, *señorios*, and *parcialidades* prevailed at the time of contact. I would argue, by way of example, that the latter provide specific analogues for analyzing the past. Mortuary evidence of inherited elites emerges at cemeteries such as the Paracas Necropolis and becomes wide-spread with the onset of the Early Intermediate Period. If this evidence is interpreted as the genesis of the *kuraka* class, then other concomitant transformations can be modeled in terms of indigenous institutions. Among these are far-reaching changes in the nature of art and style that have lead the period to be called the "mastercraftsmen" era. This metamorphosis may be understood

as reflecting the emergence of wealth finance--with fine arts serving political ends--as an institution integral to *kuraka* rule. In other words, art and style changed with the formation of separate classes, an expectable development in light of how inherited rule was financed at the time of contact (see D'Altroy and Earle 1985). My point in raising this example of ethnohistoric analogy is to suggest that *kurakas* and *señorios* provide more precise tools for modeling the Andean past than do chiefs or chiefdoms.

Inequities. Inequities presumably arose within folk communities before social disparities fostered the *kuraka* class formation. Traditional Andean *ayllu* communities are structured as segmentary kinship systems with lineages ranked relative to founding ancestors and grouped by principles of asymmetrical dual organization into moieties with dissimilar access to resources. Within these kin formations some individuals, families, lineages, and moieties are more affluent than others. Therefore, ethnologists rarely refer to *ayllu* communities as egalitarian societies, and ethnohistorians explicitly warn against such characterizations (Spaulding 1984). Thus, when archaeologists describe early communities as egalitarian, they impute organizational differences, if not evolutionary discontinuities, between past and present folk organization. Yet, why early populations should differ significantly from later *ayllu* is seldom made explicit. The presumption seems to be that time itself mitigated potential similarities.

Patterson (1983) has modeled Late Preceramic and Early Ceramic coastal populations as egalitarian societies composed simply of families and communities. He acknowledges inequities between families--in terms of access to resources, food, labor, and spouses--but argues that disparities could not be perpetuated because families only survived for a generation. Concluding at 500 B.C., his scenario leaves the origins of *ayllu* organization a complete mystery because it does not attempt to assess potential relationships or continuities in past and present community structure. Indeed, such assessment could challenge the presumption that early "egalitarian" societies lacked both the segmentary lineages and the dual organization characteristic of contemporary communities.

In place of egalitarian societies, it may be more profitable to think in terms of potential continuities, rather than presumed discontinuities, and to model early communities as kin-based formations that would evolve into *ayllu.* Indigenous families invest labor and resources in their lineages. Principles of reciprocity allow the investments to be drawn upon by family descendants in subsequent generations. Therefore, lineages contribute to the perpetuation of disparities, and within segmentary kinship systems lineages are inherently unequal. Rather than impute their preceramic absence as Patterson does, I would argue that the Cordillera's colonizing populations were organized as lineages and structured by kinship principles that fostered the early development of segmentary dual organization. Within the Central Andes, the latter form of organization strikes me as far too pervasive to have originated after 500 B.C. Rather, it is simpler to suppose that the basic principles which gave rise to *ayllu* formations were of substantial antiquity. This is not easily demonstrated. However, the Preceramic and Initial Period occurrence of paired platform mounds provides circumstantial evidence for dual organization (Netherly and Dillehay 1986). In Chile, the Chinchorro mortuary tradition, mentioned by both Dillehay (1992 [this volume]) and Llagostera (1992 [this volume]), is characterized by differential treatment of the corpses. Some individuals, and more particularly some presumed families of adults and children were treated to highly elaborate artificial mummification, while multitudes of others were simply interred. I believe that such disparities in mummification are better accounted for by lineage inequities than by some families raising their children to be better morticians than others. Finally, I would suggest that segmentary linage organization provides a framework for modeling the rise of inequities that contributed to the formation of the *kuraka* class.

A uniformitarian approach

The natural sciences pursue principles of uniformitarianism to elucidate phylogenies. Therefore, models of biological evolution in the Andes can generally be evaluated by how successfully they explain the origins of current forms and conditions of life. Evaluated by the same criteria of success,

archaeological models of evolution in the Cordillera fail to elucidate the origins of ethnographic forms and conditions of life, nor do they adequately explain the ancestry of the wide array of organizational formations which existed at the time of contact. The reason for this is that archaeological modeling is not uniformitarian in nature; rather, it uncouples the present from the past. The Spinden Hypothesis was only maintained by turning a blind eye to the economic adaptations of vast populations living at high altitudes. Their organizational adaptations are similarly ignored when indigenous development is portrayed as a cross-cultural progression from egalitarian societies through chiefdoms to states. Thus, archaeological modeling disenfranchises millions of native Andean people from their patrimony, and its procedures may be understood as carry-overs from nineteenth century colonialism (Trigger 1989).

I believe that a uniformitarian approach to the past must be adopted if human evolution in the Andes is to be modeled as successfully as biological evolution. In the near future, unilinear and cross-cultural schemes of development will likely give way to phylogenetic modeling as a consequence of improved techniques for the recovery of DNA and other genetic data from mortuary populations. In conjunction with linguistics and biogeography, the genetic data will generate particularistic scenarios of development that link ethnographic, ethnohistoric, and prehistoric populations. The challenge to archaeology will be to trace indigenous institutions back in time and to elucidate the origins of native adaptations. A direct historical approach to the past requires drawing interpretative models from ethnohistorical and ethnographic sources. As in the natural sciences, a very rich array of hypotheses can be generated by uniformitarianism, and time will be required to explore their potentials. Some may object, arguing that there are time limits to the utility of a direct historical approach. Fortunately, this assertion is itself a testable hypothesis.

To illustrate a uniformitarian approach, let me return to the preceramic sociopolitical formations shich created monuments such as those at Aspero (*e.g.*, Feldman 1992 [this volume]). Pursuing a corporate framework, I briefly review the early architectural record to set some constraints on the nature of organization required for preceramic construction. I will then propose a particular system of indigenous organization which appears capable of producing such works.

Early corporate construction. Failure to apply a multidisciplinary approach to ancient Andean architectural works means that we know less about them than we should (see below, section on Evolutionary scenario). Nonetheless, it is possible to deduce some aspects of how early coastal populations went about building large works. Almost all large platforms are characterized by accretional growth that spanned a number of centuries of use interspersed with building activities. Mounds exhibit frequent remodeling of component courts and compartments, as well as less frequent stages of construction extending to the entirety of a platform, if not its ancillary forecourts and attendant ground-level structures. Accretional architectural growth implies ideological continuity (Burger and Salazar-Burger 1985, 1991), and I would also argue that it implies organizational continuity.

Organizational requirements were greatest for major stages of construction involving a variety of different architectural jobs executed by numerous workers. There is evidence for a division of labor into accountable tasks. Rubble fill was a common construction material used to increase the height and width of early mounds. On the coast, fill was not added in an undifferentiated manner. Instead, it was carried in and deposited within individual mesh bags or *shicra*, which Quilter (1985, 1992 [this volume]) has discussed in detail. I interpret this practice as reflecting the beginning of a long and persistent tradition of segmenting corporate labor into repetitive modular tasks. Segmentation characterizes later monumental construction (Moseley 1975b). Where it persists today, different kin groups undertake separate segments of construction, such as building and maintaining a particular section of church or cemetery wall. The walls, in turn, can be read as a social text with its segments reflecting the fulfillment of labor obligations (Urton 1988).

As in the Biblical story of the Tower of Babel, preceramic construction required coordination. Large-scale building activities could not be undertaken by preceramic people in the absence of some agreed-upon plan and some definition of responsibilities for the execution of tasks. It is simplest to see the architectural works as products of corporate chains of command that provided laborers with guidance about where to work, what to do, and when to do it. In other words, decision-making was vested in offices or positions of leadership which workers recognized and respected. It is also simplest to suppose that chains of command endured and were not invented anew for every episode of construction. In other words, people recognized sets of offices or posts which lasted from one generation to the next, even though individual office holders came and went. If offices in chains of command endured over centuries of accretional building activity, then they probably organized more than construction. Rather than have every collective activity transpire under a different leadership structure, it is simpler to suppose that the chains of command which coordinated construction also organized the activities which transpired *within* the architectural facilities. If activities were both civil and religious in nature, then a single form of corporate decision-making may have provided relatively pervasive organization.

Potential models. These considerations suggest that preceramic architecture reflects organization based on enduring systems of corporate offices. The archaeological record indicates that such offices were not held by hereditary rulers. Shifting from the perspective of corporate organization to one of uniformitarianism, it is possible to ask if there are indigenous precedents for hierarchial office systems which are not linked with inherited rank or position. There is a wide range of potential precedents to choose from, including religious formations. However, I would model at a more basic level of community organization, because local community construction projects were probably the most pervasive preceramic architectural works. The platform structures at Huaynuná (T. Pozorski and S. Pozorski 1990) and Río Seco (Wendt 1964) are apparent examples of local community projects. Preceramic platform mounds have frequently been called temples, and they were certainly settings of devotional activities. Yet they are not accompanied by other architectural facilities which appear to be municipal in nature. There is little reason to suppose that civic affairs were unimportant. Therefore, I hypothesize that platforms and communal facilities served municipal concerns as well as ecclesiastical matters. In turn, this implies corporate chains of command which were both civil and religious in nature.

Prestige hierarchies and cargo offices. There are well-documented ethnographic and ethnohistoric precedents for indigenous civil-religious office systems that organize and coordinate community activities. In Latin America, these systems are associated with the Spanish term *cargo*, denoting posts which individuals hold for limited periods of time on the basis of personal abilities. A common denominator of *cargo* posts is that the execution of requisite civil and religious duties transpires at the expense of the of the office holder. Executing these duties confers prestige. In the Central Andes, the office systems take the form of prestige hierarchies with ranked offices held for one year. Individuals rotate up the chain of positions and then retire out of the system. Ascension to retirement brings prestigious status and the acquisition of an eminent title, such as *señor cesante*, or retired lord. Communal recognition reflects the fact that offices of public service are expensive to hold. Individuals fulfilling the duties of upper positions in prestige hierarchies may expend three or more years of surplus for one year in office (Isbell 1978; see also Mitchell 1991).

In the Central Andes, prestige hierarchies are structured by moiety-based segmentary lineage systems that impart dual organization to indigenous communities and *ayllu*. Parallel hierarchies of mirror-image offices are maintained by the lesser and greater moieties of a community. Chains of command have been truncated under centuries of European influence. Nonetheless, individuals may still spend 15 or more years in public service to ascend a prestige hierarchy and achieve honored retirement. Hierarchies include positions which can be called mayors, aldermen, clerks, and constables. They may also include posts relating to the oversight of waters, fields, herds, and communal works. To enforce civil and moral order, offices are imbued with powers to fine and

punish malfeasance. Furthermore, they are vested with the authority to mobilize labor and coordinate work ranging from the maintenance of canals and roads to the construction of schools and other communal facilities. Transformed under Christianity, offices relating to religious service now pertain to sponsoring the days of patron Saints and other church holidays. Generally, it is not possible to ascend the civil hierarchy without also serving in one or more religious posts. In the past, it appears that females served in religious hierarchies, and the sixteenth century chronicler Guaman Poma (1936: 354) describes Coya Raymi, the great feast of the moon, as a major observance sponsored by women. He also describes prestige hierarchies as chains of command that were subservient to local *kuraka* and instrumental in implementing orders of the governing class.

Beginning with decrees passed by the Spanish Viceroyalty in 1575, prestige hierarchies have undergone great change. Yet, one facet of these institutions with prehispanic antecedents is the *vara* or staff of office. A distinct staff serves as the hallmark of each post in a chain of command. Higher offices are demarcated by progressively more elaborate *varas*, culminating with staffs of exotic wood ornamented with precious metals. Traditionally, *varas* were invested with extraordinary powers, and as instruments of command people supposedly shook at their sight. Iconographically, *varas* have great antiquity extending back to Chavín times if not earlier. However, it cannot be said that prehistoric staffs of authority were necessarily associated with cargo-like office systems simply because supernaturals are depicted with *varas*.

Preceramic organization. A uniformitarian interpretation of preceramic organization can proceed from two interrelated propositions. The first holds that early communities were structured by principles of kinship which evolved into the moiety and lineage organization of historic *ayllu*. The second holds that early communities were governed by civil-canonical office systems which developed into the prestige hierarchies of historic communities. Although difficult to prove, these are testable propositions subject to negation. Together, they imply evolutionary continuities in the fundamental elements of kin and community organization. These elements, in turn, provide basic building blocks for modeling the emergence of more encompassing forms of organization that overarched and integrated separate kin corporations.

I believe that corporate chains of command similar and ancestral to indigenous cargo hierarchies can adequately account for the organizational prerequisites necessary to build and maintain the majority of preceramic monuments. These chains of authority are vested with powers to mobilize labor, based less on coercion than upon sponsorship of communal undertakings. They include sufficient numbers of offices to direct the repetitive and specialized architectural tasks required to erect the platform mounds found at sites such as Huaynuná and Río Seco. Furthermore, they embrace the multi-faceted types of authority capable of promoting mundane construction and then organizing ritual use of the resulting facilities. Finally, the endurance of prestige office systems from one generation to another is consistent with the persistent organization which spanned centuries of accretional growth characteristic of most early monuments.

From a uniformitarian perspective, architecture would be but one expression of early folk formations based upon civic-canonical chains of command. Because prestige hierarchies are both secular and sacred in nature, their preceramic prototypes would have provided comprehensive, unitary structures of decision-making affecting all aspects of communal life. In other words, a single system of communal hierarchical organization structured all collective activities from the economic to the hereafter. This argument implies that there was no "shadow government" behind "temple mounds".

A uniformitarian scenario of development. Inherent in this interpretation is the hypothesis that hierarchial office systems first evolved within the context of kin-based communities. These folk systems in turn provided the organizational precedents for larger undertakings, potentially including preceramic El Paraíso or Aspero, and certainly a number of early ceramic centers. These centers indicate that religious concerns rationalized the initial expansion of hierarchial office systems. Great elaboration leading to multi-faceted chains of command must have underlain the construction of

Sechín Alto and other Initial Period centers of the Casma Valley. However, inherited offices were not included in the blue-print for the early expansion of hierarchial organization. Indeed, such organization had great antiquity prior to its later subversion during the formation of the *kuraka* class which was probably linked with to the circumscription of agrarian expansion.

In overview, my purpose in the foregoing scenario has been to start with preceramic and community level organization and to work upwards through more recent times and more complex sociopolitical formations in a uniformitarian manner. The scenario is admittedly speculative. Yet it is Andean in character and thus an alternative to social-evolutionary portrayals based upon unilinear propositions or cross-cultural categories of sociopolitical organization.

Evolutionary scenario. Dillehay examines and refines this framework in his article dealing with how people transform natural space into cultural space (Dillehay 1992 [this volume]). Architectural form and the structure of building materials certainly remain important avenues for exploring labor organization. Yet, as in paleontology, form and structure only find physical expression after their functional and behavioral correlates have evolved. Therefore, the origins of early architectural monuments precede their initial physical expressions and ultimately lie with the prior evolution of corporate activities that called for the differentiation of special spaces and places. Dillehay aptly illustrates the situation with contemporary Mapuche ceremonial practices and ceremonial places. Although the latter are formally defined and have a repetitive U-shaped configuration, they are not differentiated by enduring architecture which would facilitate archaeological detection.

Dating to 13,000 years ago, the small "wishbone" shaped structure at Monte Verde suggests great antiquity for architectural segregation of special purpose space (Dillehay 1984, 1992 [this volume]). It is reasonable to assume that in the course of more than 10 millennia, many subsequent populations would have elaborated upon the practice of segregating and differentiating special places. Thus, as Dillehay argues, the presence of small, 7,000 year old platform mounds in the upper Zaña drainage or preceramic prototypes of "Nazca lines" in the Chillón drainage need not be surprising. Similarly expectable is the occurrence of special purpose "fiesta" and "charnel" houses at early ceramic-producing sites in Ecuador (Lathrap *et al.* 1977). I concur with Dillehay that there is little utility is supposing that early architectural phenomena had but a single origin and spread via diffusion or migration. This would simply be a fallback to the assumptions of unilinear evolution. Rather, it is more profitable to examine the origins of corporate activity and architecture in terms of independently recurring social, economic, and organizational conditions and concepts.

To my knowledge, the coastal monuments of the Cotton Preceramic period are the largest corporate construction projects for their time anywhere in the continent, if not the hemisphere. Currently, there are no basal dates on the initial building phases of any of the early platform mounds, and most monuments erected in littoral contexts prior to about 3,000 B.C. do not survive due to submergence. Therefore, understanding of the development of coastal corporate activity reflected by monumental architectural is truncated. However, on the coast and in the uplands there has been a significant increase in the known numbers of Cotton Preceramic sites with corporate construction. Robert Feldman (1992 [this volume]) documents regional patterns which can be recognized in ceremonial architecture, and he elucidates a number of significant differences between the highland and lowland complexes of central Peru. The highland or Kotosh Tradition emphasized groups of small, one-room structures with a central hearth. The architectural intent was to accommodate small groups of people and activities focusing upon ritual seclusion. In contrast, the coastal tradition emphasized large platforms with ancillary plazas. Here, the intent was to accommodate big groups and activities focusing upon ritual display. These distinctions have organizational overtones which require investigation. My impression is that the highland tradition is expressing segmentation while the coastal one is commemorating integration. Perhaps the former reflects the existence of small but relatively numerous corporate bodies, and the latter, larger but less numerous bodies. This might be consistent with subsistence patterns if those in the uplands called for population dispersal and small residential

aggregates, while maritime economies fostered nucleation. These are speculative matters, but such potential correlations are worth exploring if the nature of early corporate organization is to be fathomed.

Traditional Andean populations engage in a wide range of corporate activities that do not have architectural or structural corollaries. However, constructions are a major component of the archaeological record and, indeed, they comprise the largest of all prehistoric phenomena. Yet, Andean archaeology currently lacks viable typologies for construction techniques, as well as for architectural forms, and there are no standard formulae for quantifying labor expenditures. I believe that this lack is due to the biases of New World archaeologists concerning appropriate areas for multidisciplinary research. Economy is deemed appropriate for such research, and specialists analyze the floral and faunal content of garbage and coprolites and scrutinize the biology of skeletal populations. However, monuments erected by the same populations are not a standard subject of multidisciplinary analysis. Steeped in anthropology--which was traditionally the study of "primitive," rather than advanced people--Andean archaeologists blithely undertake the exploration of sprawling monuments without a modicum of background training in architecture or engineering, or even appropriate consultants in these areas of inquiry. Perhaps this reflects a prejudiced preconception of Andean peoples which denies them the capabilities of creating phenomena far more complex than most archaeologists are trained to cope with. If the vast preceramic monument of El Paraíso occurred in Greece, or elsewhere in the Mediterranean Basin, then our colleagues in Classical Archaeology certainly would have enlisted architects and engineers in its exploration. Indeed, funding for exploration would very likely be contingent upon such a multidisciplinary research strategy. Failure to extend these research strategies to major South American monuments is to treat them as something less than classical. The fallacy of this approach is shown by architects such as Carlos Williams (1985) and William Conklin (1985), who have admirably demonstrated how professionals can elicit a great deal of information about early monuments which escapes untrained archaeologists.

Multidisciplinary strategies to address corporate construction must also draw upon ethnographic and ethnohistorical expertise so that analysis can proceed within an Andean framework. Ethnographic and ethnohistorical analogy will focus attention on the traditions and continuities as well as on patterns of variation. Analogy, for example, implies that Andean corporate organization was almost always structured by kinship and principles of dual organization. Duality achieved monumental commemoration with the royal families of *hanan* (upper) and *hurin* (lower) Cuzco. It appears to underlie the arrangement of imperial compounds at Chan Chan (Cavallaro 1991; Moseley 1991; Netherly 1991), and may well reach back in time at least to the very early monuments in the upper Zaña drainage (Netherly and Dillehay 1986).

The small ceremonial rooms serving the highland Kotosh Religious Tradition (Burger and Salazar-Burger 1980) provide another context for exploring kin- and moiety-based organization. These rooms were the setting for private rituals carried out by small groups of people. In all likelihood, these were family groups, to judge from the structures at La Galgada (Grieder and Bueno 1985; Grieder *et al.* 1988) where the quarters subsequently appear to have served as family crypts. The fact that some of these private ritual quarters of unequal size occupied the summit of the Galgada platform may reflect a concatenation of unequal kin groups utilizing the structure and mobilizing labor for its construction. Because multiple summit rooms are physically articulated so as to form two separate architectural complexes, this arrangement may well express dual organization. To the degree that biological analysis of skeletal populations can measure and monitor genetic affinity and distance, this proposition should be testable. More such hypotheses are needed to explore Andean organizational principles.

In traditional highland settings, when a number of families join forces in plowing and planting, each couple tills and sows a different field row. The division of work into modular, repetitive tasks executed by different parties is an ancient principle of Andean labor organization. In the coastal

Moche Valley, large construction projects were subdivided into repetitive tasks (Moseley 1975b). In the case of monumental adobe architecture, this so-called segmentary construction extends back at least to Gallinazo times. Rubble fill was a common construction material in Preceramic and Initial Period platform mounds. There are no obvious engineering advantages in segmenting such fill, yet in numerous cases it is contained within individual mesh bags or *shicra* (Quilter 1985, 1992 [this volume]). I believe that *shicra* is an early expression of dividing corporate work into repetitive modular tasks.

Input from ethnologists and ethnohistorians is important not only for understanding the organization of labor, but also for understanding the use and functional connotations of particular forms of corporate architecture. For example, the Aymara residents of Chucuito maintain a high mountain shrine known as "Mother Atoja." Roughly rectangular, it is a U-shaped structure of dry stone masonry, facing due west, in which burnt offerings are made to appease the mountain spirit (Tschopic 1951: 195). The ground plan of the Aymara shrine is the same as that of the Inca *masma*, a one-room, U-shaped structure. At Machu Picchu, *masma* are similar in size and form to normal one-room rectangular structures, with the exception that they are open-fronted with one long wall being absent. In earlier contexts, *masma*-form structures are a major component of the corporate architecture at Chan Chan, and they are represented on Moche and Gallinazo ceramics. I have argued that these structures should to be understood as later transformations of a long architectural tradition that began with monumental U-shaped ceremonial centers erected on the coast during the Initial Period (Moseley 1985). Along with Lanning (1967) and Williams (1985), I am inclined to see the Late Preceramic complex of El Paraíso, which has an irregular U-shaped configuration, as adumbrating the *masma* tradition. In turn, I wonder if a yet far earlier expression of the tradition might not lie with the wishbone-shaped structure at Monte Verde.

The nature of other architectural traditions will certainly benefit from identifying their use in documented historical and recent contexts. Beginning with the early coastal mounds and continuing thereafter, all major platform structures are characterized by sequential epochs of construction and use. Termination of use and initiation of new construction is apparently triggered by cultural factors rather than natural disasters such as El Niño events. This persistent practice of "temple interment" is certainly of fundamental importance, but until ethnographic or ethnohistoric analogies are identified, its significance remains elusive. However, elucidating this and other Andean architectural traditions with their rich implications will not come about until we follow the lead of Classical archaeologists in employing multidisciplinary strategies for addressing major monuments.

Conclusions

Many scholars have contributed to a growing understanding of Andean maritime adaptations. Arguments that marine resources underwrote the rise of complex societies and the construction of great monuments on the coast now have ethnohistorical support and have benefitted from the growth of information on the local fishery. My 1975 exposition of the MFAC hypothesis concluded:

> "Civilization has the potential of arising out of any type of subsistence economy capable of supporting a sedentary and dense population with many people living in daily contact with one another and with a certain amount of time free from food procurement" (Moseley 1975a: 115).

This simply says that calories are the mainstay of complex society and they may come packaged in fish scales as well as potato peels or corn husks.

Documenting and demonstrating the maritime foundations of Andean civilization is certainly much closer at hand today than it was when I wrote.

With more than a decade of hindsight, it is evident that MFAC had many limitations and much need for refinement. Little of the original hypothesis may survive the metamorphosis of ongoing revision. Yet, this is as it should be. The value of MFAC may have little to do with how right or wrong it was. Rather, I suspect that any long-term importance will have more to do with the concurrent, independent formulation of the hypothesis in both American and Soviet academic traditions. This coincidence indicates that traditional stereotyping of the foundations of civilization became untenable in the 1960s. At that time, a number of major scenarios arose that argued for alternative economic pathways to the rise of complex societies in South America. A distinct evolutionary trajectory underwritten by a tropical forest subsistence strategy is now well-documented in Ecuador and the northern Cordillera. In the south, Monte Verde now anchors the great antiquity of certain characteristics of mountain subsistence strategies. Nor is the maritime-oasis strategy without ancient foundations. That elucidation of these strategies and developmental scenarios transpired concurrently is not surprising. In the early 1960s, evolutionary modeling of the rise of civilization pursued a "stretch sock" philosophy in which "one form fits all." There simply was not enough elasticity to stretch standard theory across the world's greatest tropical rain forest, over the hemisphere's highest cordillera, then down to the driest desert and still envelope the richest of fisheries. Viewed in this historical context, the value of MFAC is simply that it helped open multilinear evolutionary perspectives on the development of ancient civilization in the Andes and elsewhere.

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