

FRÉDÉRIC-ANDRÉ ENGEL (1908-2002)

ROBERT A. BENFER, JR.
University of Missouri-Columbia



Frédéric Engel (viewer's far right), his wife Elizabeth (center) and Paloma co-principal investigator Alice N. Benfer enjoy a picnic amid the lomas vegetation of Peru's coastal desert (Photo: Robert A. Benfer, Jr., 1978)

Frédéric-André Engel was born on October 12, 1908, in Switzerland, to a family from Mulhouse, France. Frédéric received his B.A. from Cantinal Classic College in Lausanne, Switzerland and a Diploma in Anthropology from the University of Vienna, Austria. He also studied in Paris, at the Sorbonne, where he received a Master of Arts degree in Law. He earned another M.A. from the Diplomatic Section of the École des Sciences Politiques, Paris. His Sorbonne doctorate was in History, Geography, and Languages including English, Spanish, and German. As a student, he visited the Museum of Man (Musée de l'Homme) where he became fascinated with the Peruvian collections (Miró Quesada 2002). He studied anthropology there, as well as at the Institute of Human Paleontology (l'Institut de Paléontologie Humaine), also in Paris.

His first practical experience in archaeology occurred at age eighteen when he participated in excavations of Swiss and French Neolithic Lake Dweller villages. While still a student he also excavated in Egypt. This latter experience prepared him for a life's work in the archaeology of deserts. However, his classroom training was not helpful for his later work in Peru because it focused on history and typology, rather than on ecology. Engel often sought the active cooperation of foreign archaeologists, because Peruvian excavators were not ecologically oriented when he began his career.

After completing his studies, Frédéric obtained employment with France's Ministry of External Works. However, poor health caused him to spend three years in a Swiss sanitarium. At that time he saw the inevitability of another Great War in Eu-

rope, and he believed that air power would be critical. He took up aviation. In 1937 he participated in the Aéro Club de France's race, the Grand Prix de l'Aviation. In 1938 he became the French national gliding champion. Still anticipating war, he received pilot training in England. Shot down over North Africa during World War II, he re-injured his back, which he had previously hurt skiing. When he was freed at the end of the war, the French government offered him a choice of positions: head of the Ministry of Education or Sub-prefect of Alsace, his home province. Engel refused both offers because, as he once wrote in a report, "his calling was prehistory and the world." He sought and accepted instead a post with the French Ministry of Foreign Relations, which enabled him to travel beyond France. He first served two years in the French Embassy in Vienna. Later he was posted to the Caribbean, Poland, and finally, to Peru. There he eventually entered business, making loans to entrepreneurs. Because he had known Manuel Prado, the Peruvian president, earlier in Paris, in 1953 Engel was able to make the president personally aware of the urgent need to protect Peru's prehistoric patrimony. Prado named Frédéric Treasurer of the Patronato Nacional de Arqueología. Prado also created the Centro Nacional de Prehistoria del Perú, with Frédéric as Secretary General. This was the critical beginning of Frédéric's life-long attempts to save the rich archaeological resources of his adopted home.

President Prado also asked Frédéric to create a new district in Lima, La Molina, and he became its first mayor. La Molina is over the first range of the western Andean foothills. Frédéric often said that the real modern-day Peru, that of indigenous peoples, began there, away from the coast. Frédéric proudly guided the development of La Molina, creating infrastructure that included schools and hospitals. Although he often complained that Peruvians were converting all their arable land to paved cities, he did not see any inconsistency in helping to develop La Molina, the location of the National Agrarian University of Peru (Universidad Nacional Agraria de La Molina or UNALM) in prime agricultural lands.

Interested as he was in the origins of agriculture, UNALM was a good choice as his institutional base because of its specialist resources and the faculty and student interest in agrarian topics. At that time archaeological research was almost entirely conducted through San Marcos University (Universidad Nacional Mayor de San Marcos). Frédéric's moderate-to-conservative political stance was not acceptable at that institution. There was also not much interest in environmental sciences. With the death of Julio C. Tello in 1947 and the retirement of Luis Valcárcel in 1961, Frédéric had sensed that it was time for a new approach to prehistory, one that combined the teaching and study of ancient civilizations with archaeological techniques new to Peru. He felt it was essential to combine archaeology with biology, geology, and climatology. Much of Peruvian archaeology has been driven by ethnohistory, but Frédéric's primary interest was in the preceramic periods, which are clearly too ancient to be guided well by history or ethnohistory.

Frédéric became a professor at UNALM where he taught for three years until a replacement was found to free him for fieldwork. He was also named Director of UNALM's Centro de Investigaciones de Zonas Áridas (CIZA) laboratories. The university appointed Carlos López Ocaña, a plant physiologist and ecologist, as his co-director. Thus biology and archaeology became the two intertwined components of the center. From his CIZA base, Frédéric was able to help many foreign and Peruvian students and archaeologists. Although he only taught briefly at UNALM, his research career there is a source of great pride to the university. One of his students, Miriam Vallejos, taught anthropology at UNALM for many years and remains the director of the fine small museum that Frédéric established in its Santa Beatriz center, a building of the original campus of the Universidad Nacional Agraria which later became CIZA's home. This museum has the best preceramic collections in Peru, holding more than 40,000 cataloged implements.

During the 1950s and 60s Frédéric defended his adopted country's cultural patrimony by issuing a series of formal complaints against foreign archaeologists. These, he believed, were depriving Peruvians

of their collective heritage by exporting all artifacts recovered in excavations. In protesting this practice he took considerable political risks.

Early in his career Frédéric formulated the goal of developing a catalog of Peru's archaeological resources. Under the presidency of Prado's successor, Fernando Belaúnde, Frédéric began maps for the *Gran Atlas del Perú*, a project which was apparently never published. More than fifty years ago he introduced a plan to make an archaeological survey of the western flanks of the Andes from the south of Peru to Colombia. According to Frédéric, the survey became impossible due to subsequent administrative changes. I am reasonably certain that these were meant to remove him from a position of influence because of his politics. The changes resulted in the creation of the Instituto Nacional de Cultura (INC) to replace the Patronato Nacional de Arqueología.

In spite of this setback, Frédéric continued with self-financed research, a tradition known to many Andeanists. Because of practical considerations, including health and finance, he reduced the scope of the survey to elevations below 1,000 m.a.s.l., but he did direct several complete surveys in the central coastal region, from the beaches to the puna at 3,900 m.a.s.l. Throughout the survey, radiocarbon dating was critical for ordering sites chronologically because neither Engel's typologies (Engel 1984b), nor the later studies by Eric White at the stratified Paloma site demonstrated useful changes in stone point styles over time. Peruvian publications often cite Engel's dates without attribution.

Frédéric told some evocative stories about his work in the high Andes. One December he was conducting survey with the aid of sure-footed mountain horses. The rainy season would soon begin. Frédéric and his team had been following narrow paths along the edge of the mountains for days. One of the crew saw a deer and took out a rifle to shoot it for meat. The guide put his hand up and said, "No, don't do that. If you make that noise you will annoy Chiqui Illapa who will bring rain down from the celestial river [the Milky Way]." "Nonsense", Frédéric thought, and he waved for the

animal to be brought down. The next two days were among the most miserable in his life. The incessant, cold rain made further progress impossible.

Engel began his coastal survey in 1954 almost single-handedly, with only workmen to perform some of the more arduous tasks. It was an exciting time for Frédéric and his wife, Elizabeth, who often accompanied him in the field and frequently visited his laboratory. Her support was clearly essential to Frédéric throughout his career. He tested a midden at Curayacu (Engel 1956), an enormous, well-stratified deposit of marine and plant remains at the fishing community and seaside resort of San Bartolo, on the north edge of the Chilca Valley. Tello had excavated there, as did Rosa Fung later (Fung 1976) and the site was central to Edward P. Lanning's ideas on the development of ancient Peruvian culture (Richard L. Burger, personal communication, February 28, 2005).

In 1958 Engel began his first large-scale excavations, at the preceramic site of Asia, Unit 1, in the Asia Valley (Engel 1963a). After work at the village of Asia, Engel began to investigate several preceramic sites on the Paracas Peninsula that Tello had missed. He discovered "fishing camps" with calibrated dates in excess of 11,000 years B.P. at the Paracas site of Santo Domingo (Engel 1981a) and in the lower Chilca valley at the site of La Quipa (Engel 1982, 1984c, 1987b). It was these sites on the Paracas Peninsula that riveted Frédéric's attention to the preceramic periods and led to his boldest interpretations. His team excavated at Paracas between 1964 and 1968, and he summarized major findings in a book (Engel 1966c) as well as in a series of articles (Engel 1957a, 1957b, 1960a, 1963a, 1963b, 1964, 1981c). These results first came to the attention of many North Americans with his publication of some of the Paracas dates in *Current Anthropology* (1969g, 1970a).

In the meantime, cultural ecological currents were developing within the New Archaeology movement as well as within cultural anthropology. North American archaeologists including Edward P. Lanning (Lanning 1967) and Thomas C. Patterson (Patterson 1966; Patterson and Lanning 1964) also

emphasized the natural environment in their broad cultural reconstructions. Lanning, who worked as Engel's paid assistant from 1956 to 1957, was the first archaeologist to state that climate change was a crucial part of understanding maritime adaptations (1963). Later work by Richardson (1969, 1973) and Llagostera (1979) and Sandweiss and colleagues (Sandweiss 1996a, 1996b; Sandweiss *et al.* 1983, 1989, 1999a, 1999b, 2001, 2004) stressed the importance of climate and early coastal adaptations. However, Engel anticipated or paralleled these views in his reports on Santo Domingo and on La Quipa. Both sites lie at 40 meters or less elevation m.a.s.l. and are located less than 2 kilometers from the beach. One of the early radiocarbon dates from La Quipa has been supported by re-excavation and dating of a wooden house pole (Benfer and Duncan 2003). The significance of the earlier dates for understanding the effect of the rise of sea level in an area of ongoing uplift was little noticed by investigators interested in this problem, even those who studied other early sites first reported by Engel.

In the 1950s and 1960s Engel developed an insight that proved to be of major importance in our understanding of the later Peruvian preceramic periods. He noticed a dramatic shift in Cotton (or Terminal) Preceramic sites, including Asia, that could be used to distinguish them from earlier archaic sites, such as the Middle Holocene sites at Paracas. This shift was marked by the appearance of cotton nets and more elaborate domestic architecture. These later sites were often associated with small-scale monumental constructions, as at Asia. Like many other archaeologists, Frédéric had begun his career assuming that staple food production and herding were the most important economic activities in Peruvian prehistory, as they were elsewhere. His excavations in the Cotton Preceramic components of the Chilca I site (Engel 1966b, 1984b) were important in showing how early cultigens, most of them first domesticated elsewhere, had become a part of the diet in preceramic coastal Peru (Quilter 1991). The presence of numerous cultivated plants at Chilca I led Frédéric to overestimate their importance in the caloric base. Nevertheless, the presence of so many cultigens was a surprise to the archaeological community.

Engel could see that cotton nets would expand food gathering abilities enormously and that the maritime component of the human diet supported Andean civilization. He began to write of the "Cotton Preceramic," and some archaeologists, for instance Edward Lanning, Michael Moseley, and Rosa Fung (Fung 1972), came to accept the concept that growing cotton would be important for making the large nets needed to harvest much of the fauna available off shore. Others responded directly to Moseley's formulation of the Maritime Hypothesis (Moseley 1968, 1975, 1992a, 1992b). For example, Alan Osborn (1977), Scott Raymond (1981), and David Wilson (1981), all argued that an agricultural food base is necessary for a society to erect monumental architecture.

Frédéric appreciated the overwhelming impact of the ecology of the coastal Peruvian habitat. The availability of water in the few perennial streams, in subsurface accumulations, and in fog oases was a persistent theme in his discussions of settlement patterns and subsistence (Ojeda 1978; Benfer, Ojeda, and Weir 1987). Perhaps Engel's interest dated to the time in the 1960s when his excavation headquarters at Paracas lay under more than a meter of ocean water that surged over it. At Paracas he also noticed a drained lagoon filled with shells. He suggested the abandonment of the Paracas Peninsula sites at about 2,200 years ago due to lowered levels of near-surface water. He recognized the strong effects of prehistoric climate on the settlement of the coastal areas. Fairbridge (1976a, 1976b) established that sea levels rose and fell during the Holocene, which prompted Frédéric to realize that sea level determined the lower extent of the fog oases. On that basis, he was able to reinterpret settlement patterns near the coast. Although Richardson (1969, 1973) and Paulsen (1976) had recognized the importance of climatic changes, Frédéric (Engel 1981c) was not directly influenced by them, or subsequent work in pollen or malacology.

In 1966, Engel reported on what was perhaps his most astonishing discovery, one that validated his previous theory of the importance of the Cotton Preceramic Period (Engel 1966d). That year, he identified and reconstructed the three-story, dressed-

stone temple at the Cotton Preceramic complex of El Paraíso. The original field goals had not included restoration of such a large structure, but merely to learn the maximum height of one of its walls. When that wall collapsed, Engel and his long-time field collaborator, Bernardino Ojeda, developed a new plan. They decided to raise all of the walls simultaneously. Thus began 18 months of work that culminated in a spectacular reconstruction. Alas, today it is collapsing where looters have dug into it, and the walls that remain are covered with graffiti. Engel had arranged funding for a guard at a small residence he built at the site. He felt that the site could be protected by turning it into a national park that would attract tourists, given its importance and proximity to the Lima airport. Dramatic changes in the government thwarted Engel's attempts. Today, the little house stands empty, and there is no guard to protect the site from depredations.

In happier times, Engel invited the entire Lima archaeological community to a special presentation at the site. Ojeda told me that there had been much complaining from the guests, despite the fine food and drink available at the event. Why, the guests wondered, had they been invited to this small site? When Frédéric stood before them and announced that the temple they were viewing was preceramic in age, he was greeted by incredulity. More than 3,600 years old, this site remains the most ancient dressed stone structure known in the western hemisphere. El Paraíso is located a few kilometers from the coast at a point close to where water wells up from the Chillón River that runs underground for some distance up-valley (Bernardino Ojeda, personal communication 2000). On a grand scale the architectural complex is U-shaped and faces the river. Extensive cotton and gourd remains were uncovered during the reconstruction, and Frédéric quickly recognized the importance of a dual economy in the Chillón Valley. The agricultural plants supported marine subsistence. This concept, well-synthesized thirty years later by Moseley (1992a), still drives my research today (Duncan *et al.* 2003).

Later Terence Grieder and his colleagues (1988) located a highland equivalent of preceramic monumental architecture at the site of La Galgada. Some

years later, Frédéric made another great discovery in recognizing the enormous middle valley site of Chupacigarro in the Supe Valley as being from the Cotton Preceramic. Engel correctly interpreted Chupacigarro as the largest, (Engel 1982, 1987a), and one of the oldest (Sandweiss *et al.* 2001), Cotton Preceramic sites known to date, despite the paucity of local resources. He suspected that there was a Cotton Preceramic polity reaching from the Supe Valley as far south as the Otuma Valley.

Chupacigarro brings us to a persistent problem in Andean archaeology, that of changing well-established site names. Ruth Shady and her colleagues (Shady *et al.* 2001) renamed the site as Carál, despite its first publication as Chupacigarro by Paul Kosok (1965) and its earlier mapping by Ojeda and identification as a Cotton Preceramic site by Engel (1982, 1987a). Carál is the name of a modern town on the Pan American highway. Engel, too, sometimes renamed a site he had mentioned earlier under another name. For example, he renamed "Los Frisos" as Buena Vista, also the name of a local community, perhaps because he found no friezes there, just niches. In another important case, El Paraíso had formerly been called Chuqitanta, for the ejido of that name. In his own writing, Engel was sometimes unclear about which of the Paracas Peninsula sites he meant. Nevertheless, he provided numbers or names for over a thousand sites, and located them accurately on the sheets of Peru's official map, the 1:50,000 series of the Carta Nacional. He published more Peruvian site locations than any other archaeologist. Locations of additional sites are available in the CIZA Archives.

During the late 1960s, Frédéric returned to the coast to direct intensive survey and testing in a single fog oasis, that of the Lomas de Iguanil, north of Lima. Previously most of his work had been conducted to the south of that city. He published the Iguanil work in Spanish (Engel 1970b) and French (Engel 1973b). During the same project, Engel made important maps of Las Haldas.

A source of considerable pride to Engel was the building of the Paracas museum in 1968 with a grant from the National Center for Scientific Research in

France (CNRS). He provided excavated materials for display and materials for further research at CIZA. He named this institution El Museo de Paracas Julio C. Tello in recognition of Tello's pioneering work on the peninsula. In accordance with Engel's wishes, his ashes are interred there.

In 1969, Peru's leftist government had begun to seize large houses, turning many into elementary schools. One across the street from CIZA, for example, was expropriated and turned into a free elementary school. Today it is a private preparatory school for children of the elite. In the early 1970s, Ferderic was concerned that his home also might be confiscated, and so he sold it and moved into the former servant's quarters where he and his wife, Elizabeth, lived for some years until he built another relatively modest residence further up into the foothills of the Andes, in the La Molina district.

Prior to the revolution, two hundred families had owned most of the highly productive arable land in Peru, which they managed so efficiently that, unlike today, the country was a net exporter of food. However, workers were treated almost as serfs. Most of these landlord families did not really live in Peru, but rather commuted back and forth from Europe (as did Frédéric). His view was that the revolution was absolutely necessary, that land had to be redistributed. He nonetheless suffered the consequences of continuing to associate with these families, with whom he differed profoundly on political issues but nonetheless counted as his friends. Frédéric felt that this association caused some in the Peruvian archaeological community to ostracize him until late in his life. Engel's research lab, CIZA, was somewhat protected from criticism by its formal association with UNALM. It stayed in the same Santa Beatriz building that Instituto de Agricultura Protohistorica (IAP), the precursor to CIZA, had occupied, the original campus of the Universidad Nacional Agraria in the Jesús María district of Lima, with its former fields turned into lovely public parks.

In the early 1970s Ojeda continued with coastal surveys, while Engel devoted himself to laboratory work and publication. In 1975 he began an important new phase of research at Paloma. That site was

brought to Engel's attention 1964 by a geologist, and Frédéric tested it that same year. A 6-x-6-meter pit on the edge of the site revealed unusually good stratigraphy for a preceramic site, as well as over a meter of deposit. Paloma provided the focus of my most intense collaboration with Frédéric over a period of more than 30 years. Of all his major projects, it came the closest to fulfilling Frédéric's vision of a well-funded, multi-disciplinary investigation.

In the 1975 field season, Engel and Ojeda placed intersecting 6-meter-wide trenches in Paloma's largest low shell mound, identified as Unit I. They made test excavations in another adjacent low shell mound, Unit II. After five months of fieldwork, Ojeda and Engel had established the presence of a series of stratified villages with well-preserved organic remains, numerous domestic structures and many human burials associated with particular houses. Subsequent work at Paloma by the multidisciplinary team that I assembled involved intensive excavation and extensive laboratory analysis of materials (Benfer 1990, 1999), its materials being used in more than 40 publications and 25 theses.

During the 1970s, encouraged by Carlos López Ocaña, Frédéric's interests became ever more focused on plant and animal remains. On the basis of his midden excavations, Frédéric began to contemplate what economic foundation would have been necessary to support the populations represented by those sites. He began to regard shellfish as more important in the diet (Engel 1978a) than is perhaps warranted by biomass studies published later, after much more intensive analysis by Elizabeth Reitz (2003). We eventually completed the studies of population size that Frédéric had had in mind early on (Benfer 1990; Vradenburg *et al.* 1997). His desire to understand the paleodemography of Paloma is perhaps one reason why he invited me, a bioarchaeologist, to collaborate with him in 1976. He thought that I might find funding for expanded excavations and more ecological methods of analysis, and indeed my first three NSF awards for Paloma had "Human/Environment Interactions" in their titles. In the end, I am not sure whether Frédéric really believed that chemical analyses of human bone, studies of

activity levels preserved in bone, or paleodemography from skeletons would provide as much useful information as the studies of plant and animal remains. On the other hand, he wholeheartedly approved of the involvement of zooarchaeologist Elizabeth Reitz, and the archaeobotanist, Glendon Weir. In 1987 Weir left his successful career in archaeology. Fortunately, Reitz, who visited the Paloma Project in 1976, completed extremely useful studies of the faunal materials (Reitz 1986, 1988, 2003). Weir and his student Philip Dering published several small reports (Dering and Weir 1982; Weir and Dering 1986), but they never finished the vital paleobotanical synthesis. Fortunately, Deborah Pearsall has taken up this work. Alas, this study, which interested Frédéric the most, will appear in print only after his death.

Frédéric began to look for association with an American university in the mid-1970s. At his own expense he undertook visits to colleagues and institutions in New York City and spent time at Cornell University in Ithaca, New York (Thomas F. Lynch, personal communication, 24 February 2005). An appointment would have been offered at Missouri, where he would have been comfortable, but I believe that his wife preferred a city. From 1976 to the early 1980s he taught at the University of Pittsburgh where, in 1977, he was named a Research Associate in the Anthropology Department. At Pitt he worked with colleagues, including James B. Richardson III and Magnus Morner (James B. Richardson III, personal communication, August 18, 2005), but, unfortunately, supervised no graduate students. In the early 1980s Engel was an Adjunct Professor of Anthropology at Hunter College, part of the City University of New York. By the 1990s he was no longer mounting field expeditions in Peru, but he continued with laboratory work.

Frédéric Engel's lifetime achievements were recognized by several important awards. He was made a knight of the Peruvian order of Merit for Distinguished Services (*Al Mérito por Servicios Distinguidos*) when he was given the highly prestigious decoration, "El Sol del Perú", in 1968. He also held France's National Order of Merit, as well as the Silver Medal of the France's National Center of

Scientific Research (CNRS). In 1973 he won the History Prize of the French Academy, for his book *Le monde précolombine des Andes* published the previous year. His native country awarded him its Legion of Honor in 1998.

Throughout his career, Frédéric enjoyed the collaboration of many talented colleagues. He had tremendous respect for Julio C. Tello, and it was from Tello that he obtained one of his most important field crew members, Alejandro "Tio" Guanillo. This man began life as a subsistence fisherman and pot hunter. After working with Tello, he entered Engel's employ. Although he lacked a formal education, Tio was a most careful and useful field crew member. We all learned volumes from him about how to recognize both small and large features in preceramic sites. His stories and explanations of fishermen's attitudes toward various aspects of the environment, and access to and use of resources, were ethnographic lessons of a lifetime, never to be forgotten. To one of my students he presented his grandmother's prized shoulder bag, a priceless gift of incomparable meaning. Tio was indicative of the kind of person that Frédéric found to make up his intimate research team, and of the loyalty that he engendered among team members.

In late 1963, Frédéric recruited Bernardino Ojeda, then a student in Cuzco, to take the place of Christopher Donnan for a multi-year survey of the coast of Peru. As Engel's director of field work, Ojeda went on to locate, map, and excavate many newly discovered and important sites. Bernardino has become one of the best and most respected field archaeologists in Peru. Many other scholars associated with Engel later went on to make major contributions. Among them are Henning Bischof, the late Edward Lanning, Jeffrey Quilter, and the late Gary Vescelius. The latter, unfortunately left less of a publication record that would have been desired (Burger and Lynch 1987).

UNALM students working with CIZA on plants and animals of the lomas were also productive. Juan Torres Guevara and Dora Velásquez Milla wrote master's theses that were later published (Sánchez and Velásquez 1982; Torres and López Ocaña 1981,

1982). Torres took up the directorship of CIZA after López Ocaña.

Frédéric Engel's long career is well reflected in his publications. He is listed as editor, but was really the writer, of the series *Prehistoric Andean Ecology* which appeared between 1980 and 1992 (Engel 1980a, 1980b, 1980c, 1981a, 1983a, 1984b, 1987b, 1988a, 1988b, 1988c, 1992) and which was based on studies undertaken at CIZA. The first five volumes are in English, and the last four are in Spanish. In producing these Engel had assistance from the Swiss Foundation for Arid Zones (FEPTA), from UNESCO, Hunter College of the City University of New York and from other institutions based in France and in the United States. Engel is also the writer/ editor of *Episodios* (Engel n.d. a), a series of small books intended for Peruvian secondary schools, representing the prehistory and history of the world. These text books are complete but, for lack of funding, remain unpublished as of 2005. Frédéric's most important book, *De las begonias al maíz* (1987a), records his finest insights.

Over the years, Engel's work has come to be highly respected by Peruvian archaeologists. Rogger Ravines, an archaeologist who disagrees with much of Frédéric's theoretical framework, nonetheless wrote in a review (1988) that Engel's pioneering research merits an inestimable homage. Such a review was especially appreciated by Frédéric, because he always viewed his role as that of a pioneer. He hoped to attract other archaeologists and specialists from allied disciplines to help him fill in the details of the broad patterns that he had begun see in coastal Peruvian prehistory. In a more recent review of the development of modern archaeology in Peru, at a conference in Lima during 2000, Federico Kaufmann-Doig discussed two major threads in the development of modern Peruvian archaeology. One was the development of the Instituto Nacional de Cultura, and the other was the research of Frédéric Engel's team at the Centro de Investigaciones de Zonas Áridas. This appraisal was accepted by the Peruvian archaeologists present, many of whom had been mentored by Engel. Frédéric was instrumental in the creation of the Patronato

Nacional de Arqueología that became the INC, and so was essential to both developments.

Outside of Peru, Engel's work is perhaps less well known and appreciated. In part, this situation may derive from his extreme generosity to students and colleagues. Some significant findings were, to Frédéric, but small pieces of his overall research design. To give just one example, the house at Chilca I, widely referenced and illustrated in many texts (Donnan 1964), was discovered intact because of what many Americans saw as the unusually large excavation units that Frédéric had perfected, being grounded in similar Old World techniques. Proper credit was acknowledged by then-graduate student assistant, Christopher Donnan, who excavated and published the structure. However, Frédéric's role as sponsor and overall director of research was not as well associated with the substantive finds as it should have been.

Frédéric's accomplishments will, over time, be recognized not only in France and Peru but also internationally. He should primarily be recalled, as he wished to be remembered, as a pioneer, the one who sketched the interesting questions presented by the Peruvian preceramic periods, especially those seen on the Pacific shore. His early demonstration that fishing sites on the Pacific coast were 10,000 years old stimulated the work of a number of archaeologists. His finding of early cultigens in the caves of Tres Ventanas, and at the open sites of Paloma, Chilca I, and Asia, among others, established an unexpected antiquity for experience with domestic plants by peoples who continued to focus most of their subsistence on the rich marine resources or on other terrestrial sources of food. His publications provide the basic data for a rare case in which maritime products fueled the early demographic rise and associated social complexity, which Boserup (1965) would argue, led inevitably to technological and social advances—towards what we came to know as Andean civilizations. Frédéric's early insistence on the influence of climate was not well-received at the time but has proved prescient as more paleoclimatological data have accumulated, from studies of ice and lake cores and from archaeological sources. His early (1963e) series of

radiocarbon-dated sites, which was expanded over the course of his investigations, still permits investigators, such as John Rick (1987), to move quickly to higher-level questions than were possible for Engel to address with his small team. Nonetheless, he was thinking about such questions. His last important and stunning find, like the earlier one of El Paraíso, made absolutely clear the importance of the Cotton Preceramic period in Peruvian prehistory. This was his discovery in the 1980s of the preceramic components of the large Chupacigarro site. His published work and presentations to the Lima community of archaeologists may, like those of Carlos Williams, have stimulated Shady to organize further work there, helped by the published CIZA maps and copies of the originals furnished by Ojeda on behalf of CIZA. Reaching similar conclusions to Engel, her team added substantiating radiometric determinations and more detailed maps. It is unfortunate that her articles (e.g., Shady *et al.* 2001) do not credit Engel's published work.

Frédéric's field methods involved excavating sublevels with a brush. He perfected these methods with Ojeda, and they are essential for doing Peruvian coastal archaeology. Very few archaeologists have been able to establish a stratigraphy for a series of villages in a preceramic site, but an extensive list of 29 radiocarbon determinations as well as a discriminant function study of matrix content and character and of trace element concentration of human bones (Benfer 1999) has established that at Paloma, as at other sites excavated by Engel and Ojeda, the stratigraphy was very tightly controlled.

Theoretical questions and approaches ebb and flow. In the long term, the data-heavy nine volumes in the *Prehistoric Andean Ecology* series, plus other monographs and publications, will form the heart of Frédéric's legacy. Difficult to use because of the publishers' poor presentation of the maps, with the key to the first set published in the second volume, the *Ecology* series monographs merit the effort nonetheless because they are essential sources for field work in coastal Peru.

As John Greer has written with this obituary in mind, "Engel's work was broad in extent, broad in

scope, and looked at broader questions and explanations than were . . . common at the time. In addition, he covered more ground than most people, both at the Paloma site and across Peru . . . Engel helped form, and certainly influenced, many of the approaches behind the kinds of massive excavations now being done. He had an inherent grasp of the kinds of questions that would be meaningful regarding how people lived, and when, who were their contacts, what those contacts could have meant, how people and cultures and exploitation patterns changed, or could have changed, through time and space, and why, and what other ramifications those changes could have had. With his large excavation areas he was able to see a broader picture on his sites. He was able to recognize features that smaller excavations would have missed. He was able to have a better feel for what was going on at the site, what the site was all about. There is no question that I got more out of my association with Engel, and my continual re-appraisal of his work, than I have from any other archeologist. As part of that canvas has come the realization, which I got early on, that nearly all archeology must be done in the laboratory. One needs only the necessary data. Engel realized that also, and it was an integral part of his work – direct field observations gave him the main framework, while archeological specimens and laboratory analysis provided his overviews with details necessary for broader explanations" (John Greer, personal communication, 2001).

Perhaps it was Frédéric himself who best summarized his own philosophy in his choice of a quotation from Leonardo da Vinci as the CIZA motto. In English it reads, "Study the past to understand the present and plan the future." This dictum accompanied all Engel's major works.

Hugo Ludeña offers these words, ones that provide some comfort to those of us of the older generation: "Durante sus últimos años, el Dr. Engel

se dedicó a revisar sus materiales. Su cuerpo estaba cansado pero su mente estaba lúcida”(Ludeña n.d.).¹

Let each of us hope that our minds may remain half so sharp half so long as did Frédéric's. We can be certain that the results of this man's work will be important to Peruvian archaeology for many years to come. If Tello was Peru's first archaeological pioneer, Frédéric extended his explorations from the more recent into the more distant past of Peruvian prehistory. His influence persists.

ACKNOWLEDGEMENTS

This obituary has benefited from the helpful comments and anecdotes of many people, among them Alice N. Benfer, Christopher B. Donnan, Louanna Furbee, John Greer, Hugo Ludeña, Terri Nicho, Bernardino Ojeda, Thomas Patterson, James B. Richardson III, Juan Torres Guevarra, Miriam Vallejos, Pilar Valverde, and Gloria Villarreal.

REFERENCES CITED

Note: This bibliography includes as many publications by Frédéric-André Engel as the author has been able to identify. Works not cited in this paper are indicated by an asterisk (*).

- Benfer, Robert A. Jr.
1990 The Preceramic Period Site of Paloma, Peru: Bioindications of Improving Adaptation to Sedentism. *Latin American Antiquity* 1:284-318.
1999 Proyecto de excavaciones en Paloma: El valle de Chilca, Perú, el período arcaico en el Perú. Hacia una definición de los orígenes. *Boletín de Arqueología PUCP* 3:213-237. Lima, Peru.
- Benfer, Robert A. Jr., and Neil A. Duncan
2003 An Early Fisherman's House, Lower Chilca Valley, Peru. Paper presented at the Sixty-ninth Annual Meeting of the Society for American Archaeology, April 9-13, Montreal, Canada.
- Benfer, Robert A. Jr., Bernardino Ojeda R., and Glendon H. Weir
1987 Early Water Management Strategies on the Coast of Peru. In *Risk Management and Arid Land Use Strategies in the Andes*, edited by David L. Browman, pp. 195-206. Boulder, Colorado: Westview Press.
- Boserup, Ester
1965 *The Conditions of Agricultural Growth: The Economics of Agrarian Change under Population Pressure*. London: George Allen & Unwin.
- Burger, Richard L. and Thomas F. Lynch
1987 Gary S. Vescelius (1930-1982). *Andean Past* 1:1-3.
- Dering, Philip and Glendon H. Weir
1982 Analisis de los restos de plantas del sitio precerámico la Paloma, Valle de Chilca, Perú. Apéndice 3 in *Proyecto Paloma de la Universidad de Missouri y el Centro de Investigaciones de Zonas Áridas* by Robert A. Benfer, pp. 55-59. *Zonas Áridas* 2.
- Donnan, Christopher B.
1964 An Early House from Chilca, Peru. *American Antiquity* 30(3):137-144.
- Duncan, Neil A., Robert A. Benfer, and Bernardino Ojeda R.
2003 The First Season at Buena Vista, Chillón Valley, Peru. Paper presented at the Sixty-ninth Annual Meeting of the Society for American Archaeology, April 9-13, Montreal, Canada.
- Engel, Frédéric-André
n.d.a *Episodios*. [Unpublished series of children's books on the prehistory and history of the world].
*n.d.b El conjunto precerámico de Chuquitanta. *El Arquitecto Peruano*, edición 338-339, pp. 53-55. Lima. (date uncertain).
*1955 Les amas de coquillages de la côte pérouvienne (Ancón-Río Ica). *Journal de la Société des Américanistes* 44:39-47.
1956 Curayacu, a Chavinoid Site. *Archaeology* 9(2):98-115.
1957a Early sites on the Peruvian coast. *Southwestern Journal of Anthropology* 13(1): 54-68.
1957b Early sites in the Pisco Valley of Peru: Tambo Colorado. *American Antiquity* 23(1):34-45.
*1957c Sites et établissements sans céramique de la côte pérouvienne. *Journal de la Société des Américanistes* 46:67-155.
*1958a Algunos datos con referencia a los sitios precerámicos de la costa peruana. *Arqueológicas* 3, Museo Nacional de Antropología y Arqueología, Lima.
*1958b Tejidos y cestería de la agricultura incipiente en la costa Peruana. Presented to the Mesa Redonda de Ciencias Antropológicas, Universidad Nacional Mayor de San Marcos, mimeographed.
1960a Un groupe humaine datant de 5,000 ans à Paracas, Pérou. *Journal de la Société des Américanistes* 49:7-35.
*1960b Datos con referencia al estudio de sitios prehistóricos en su contexto morfológico y climático in *Antiguo Perú: Tiempo y Espacio*, pp. 119-128. Editorial Mejía Baca, Lima.
*1961 Villages et cimetières pre-céramiques de la côte pérouvienne 3,000 à 1,500 avant J. C. *Bulletin de la Société Suisse des Américanistes* 21:30-31.
*1962 *Elementos de Prehistoria Peruana*. Lima: Editorial Stylo.
1963a A preceramic settlement on the central coast of Peru: Asia, Unit I. *Transactions of the American Philosophical Society* 53(3).
1963b Notes relatives à des explorations archéologiques à Paracas et sur la côte Sud du Pérou. *Travaux de l'Institut Français d'Études Andines* 9:1-72.

¹In his last years, Dr. Engel dedicated himself to the re-evaluation of his materials. His body flagged, but his mind remained lucid.

- *1963c Paracas. Paper read at the Simposio Nacional de Arqueología, Ica, Peru.
- *1963d Napas freáticas y silencios arqueológicos. Paper read at the Simposio Nacional de Arqueología. Chiclayo, Peru.
- 1963e Datations à l'aide du radio-carbone 14 et problèmes de la préhistoire du Pérou. *Journal de la Société des Américanistes* 52:101-132.
- 1964 El Precerámico sin algodón en la costa del Perú. *Actas y Memorias del XXXV Congreso Internacional de Americanistas, México, 1962* 3:141-152. Mexico.
- *1965 Historia elemental del Perú antiguo. Lima: Editorial Mejía Baca. Published previously, possibly in 1962, with minor variations, as *Elementos de prehistoria peruana*. Lima: Stylos.
- *1966a Unos problemas de la agricultura precolombina. Paper presented at the Simposio de Arqueología, Universidad Pontificia Católica del Perú, Lima.
- 1966b *Geografía humana prehistórica y agricultura precolumbina de la Quebrada de Chilca*. Lima: Departamento de Publicaciones de la Universidad Nacional Agraria La Molina.
- 1966c *Paracas: Cien siglos de cultura peruana*. Buenos Aires: Editorial Graficolor and Lima: Mejía Baca.
- 1966d Le complexe précéramique d'El Paraíso (Pérou). *Journal de la Société des Américanistes* 55(1):43-95.
- *1966e Adaptation des pérouviens précolombiens à la vie en terres arides. Paper presented to the UNESCO Symposium Sur la Vie dans les Déserts Côtières. Lima, Peru.
- *1967a Notas referentes a la adaptación de los pueblos precolombinos del Perú a la vida en tierras áridas. Paper presented at the Simposio sobre Desiertos Costeños, Ministerio de Agricultura, Lima. (Translation into Spanish of Engel 1966e).
- *1967b Catastro momental precolombino e histórico por estudiar y restaurar. Report presented to UNESCO.
- *1967c El complejo El Paraíso en el valle del Chillón, habitado hace 3,500 años: Nuevos aspectos de la civilización de los agricultores del pallas. *Anales Científicos de la Universidad Agraria* 5(3-4):241-289. Lima.
- *1969a Elements de géographie humaine précolombienne. Résumé des conférences données au College de France. *L'homme* 9(4): 96-102.
- *1969b Patrimonio monumental de Colombia. Report presented to UNESCO.
- *1969c Patrimonio monumental del Ecuador. Report presented to UNESCO.
- *1969d Patrimonio monumental de Chile. Report presented to UNESCO.
- *1969e Patrimonio monumental del Uruguay. Report presented to UNESCO.
- *1969f Notas referentes a la agricultura del Perú precolombino. In *Mesa Redonda de Ciencias Prehistóricas y antropológicas* 3:155-156. Lima: Seminario de Antropología, Instituto Riva-Agüero, Pontificia Universidad Católica del Perú.
- 1969g On Early Man in the Americas. *Current Anthropology* 10(2-3):122-136.
- 1970a Exploration of the Chilca Canyon, Peru. *Current Anthropology* 11(1):55-58.
- 1970b *Las lomas de Iguanil y el complejo de Haldas*. Lima, Universidad Nacional Agraria, Departamento de Publicaciones.
- *1970c Sobre complejos agrícolas prehispanicos encontrados en las lomas y en los arenales costeros de la cuenca del Chilca, Perú. Lima: XXXIX Congreso Internacional de Americanistas.
- *1970d La grotte du Mágathéium à Chilca et les ecologies de Haut-Holocène Péruvien. In *Échanges et communications: Melanges offerts à Claude Lévi-Strauss*, edited by Juan Pouillon and Pierre Maranda, pp. 413-436. The Hague: Mouton.
- *1970e Datos con referencia a la geografía humana del Perú prehistórico. *Atlas histórico geográfico y de paisajes peruanos*, pp. 29-30. Lima: Instituto Nacional de Planificación. Asesoría Geográfica.
- *1971a Céramistes à oeuvre dans la gorge de Chilca, Pérou. *Bulletin de la Société Suisse des Américanistes* 35:21-26.
- *1971b D'Ántival à Huarangal: Notes relatives à l'apparition de maïs et de la céramique dans les Andes occidentales. *L'homme* 11(2):39-57.
- *1972 *Le monde précolombien des Andes*. Paris: Hachette. (Published in English in 1977.)
- *1973a New Facts about Early Holocene Ecologies of Peru. *Current Anthropology* 14(3):271-289.
- 1973b La gorge de Huarangal: Ébauche d'une monographie de géographie humaine préhistorique. *Bulletin de l'Institut Français d'Études Andines* 2(2):1-26.
- *1973c Notes relatives à une ébauche de typologie de l'architecture des Andes précolombiennes. *Actes du Congrès d'Anthropologie de Chicago*. The Hague: Mouton.
- *1973d Notes relatives à des écosystèmes préhistoriques des Andes arides et sub-arides et à leur évolution. Contribution to Project No. 6 Impact of Human Activities on Mountain Ecosystems of the Program Man and the Biosphere UNESCO, Paris.
- *1974 *Datos con referencia a los ecosistemas andinos precolombinos y a su evolución*. Lima: Seminario Nacional de Sistemas Ecológicos. Oficina Nacional de Evaluación de Recursos Naturales (ONERN).
- *1976 L'habitat au cours de haut-Holocène andin. Paper presented at the Congrès International de Préhistoire, Nice.
- *1977a *An Ancient World Preserved: Relics and Records of Prehistory in the Andes*. Translated from the French by Rachel Kendall Gordon. New York: Crown Publishers.
- *1977b Early Holocene Funeral Bundle from the Central Andes. *Paleopathology Newsletter* 19:7-9.
- *1978a Metodología y demografía prehistorica andina. In *Historia, problema y promesa: Homenaje a Jorge Basadre*, edited by Francisco Miró Quesada C., Franklin Pease

- G. Y., and David Sobrevilla A., pp. 217-229. Lima: Pontificia Universidad Católica del Perú.
- *1978b *Towards a Typology of Architecture and Urbanism in the Pre-Columbian Andes*. The Hague: Mouton.
- 1980a *Prehistoric Andean Ecology: Man, Settlement and Environment in the Andes*. Volume 1: Atlas of Archaeological Sites in the Central Andes; Paloma, Village 613; Essays in Taxonomy and Typology: A Preliminary Study of the Lithic Artifacts Collected by CIZA. Papers of the Department of Anthropology, Hunter College, City College of New York. Distributed by the Humanities Press, Atlantic Highlands, New Jersey.
- 1980b Paloma Village 613: A 6000 Year Old "Fog Oasis" Village in the Lower Central Andes of Peru. In *Prehistoric Andean Ecology, Man, Settlement and Environment in the Andes* Volume 1, edited by F. A. Engel, pp. 103-135. New York: Humanities Press.
- 1980c Essays in Taxonomy and Typology: A Preliminary Study of the Lithic Artifacts Collected by CIZA. In *Prehistoric Andean Ecology, Man, Settlement and Environment in the Andes* Volume 1, edited by F. A. Engel, pp. 126-180. New York: Humanities Press.
- *1980d Problemas alimentarios en las regiones andines. *Boletín de Lima* 9-10:15-20.
- *1980e Problemas alimenticios en las regiones áridas. *Boletín de Lima* 9:17-21.
- 1981a *Prehistoric Andean Ecology: Man, Settlement and Environment in the Andes*, Volume 2: The Deep South: From the Chilean Border to the Peninsula of Paracas. Papers of the Department of Anthropology, Hunter College, City College of New York, distributed by the Humanities Press, Atlantic Highlands, New Jersey.
- *1981b Un catastro de los Andes áridos y subáridos. *Boletín de Lima* 15:20-22.
- 1981c Posibles aportes de la arqueología en el campo de la paleoclimatología. *Boletín de Lima* 13:83-93.
- 1982 Informe del área antropológica del CIZA - 15 años de actividad antropológica. *Zonas Áridas* 1: 17-36.
- 1983a *Prehistoric Andean Ecology: Man, Settlement and Environment in the Andes*, Volume 3: I. Essays in Typology and Taxonomy: Objects of Stone, Artifacts made by Chipping or Flaking, II. Notes on Pre-Columbian Fish Hooks and Other Fishing Devices Used in the Cold Water of Southern America, III Three Monuments: Huaytara, Incahuasi, and Tambo Colorado. Lima, Peru, CIZA. Distributed by the Instituto Nacional de Cultura, Perú.
- *1983b Une communauté de mésolithiques heureux a Paloma au Pérou. *Arqueología* 175:55-59. Paris.
- *1983c La playa fósil de las Salinas en la costa norte del Perú. *Boletín de Lima* 29:25-30.
- *1983d La arquitectura prehispánica y sus aportes en materia de datación de los asentamientos: Texto en homenaje a Augusto Cardich, MS.
- *1983e Prehistoria y oceanografía. *Zonas Áridas* 3:23-28.
- *1984a L'exploitation des ressources marines par les sociétés préhistoriques des Andes. *Akadémiai Kiadó, Académie des Sciences de Hongrie*, Budapest.
- 1984b *Prehistoric Andean Ecology: Man, Settlement and Environment in the Andes*, Volume 4: Chilca. I. Chilca, an Andean Hydrological Basin, Chapter A Highlands and Valleys; Sites Found Near a Stream II. Essays in Typology: The Pottery of the Chilca Basin III. Atlas of Archaeological Sites of the Central Andes Sector II: Pisco to Lurín Drainages. Papers of the Department of Anthropology Hunter College, City College of New York. Distributed by the Humanities Press, Atlantic Highlands, New Jersey.
- 1984c El CIZA: 10 años de investigación. *Boletín de Lima* 31:7-16.
- *1985 Del Mediterráneo al Cuzco: Difusionismo o evolucionismo multilineal? *Boletín de Lima* 41:57-69.
- *1986 *España: Del Oriente hacia el Occidente*. Lima: Editorial El Virrey.
- 1987a *De las begonias al maíz: vida y producción en el Perú antiguo*. Lima: Centro de Investigaciones de Zonas Áridas, Universidad Nacional Agraria, La Molina.
- 1987b *Prehistoric Andean Ecology: Man, Settlement and Environment in the Andes*, Volume 5: Lomas. I. The Chilca Monograph, Chapter B: The Fog Oases or "Lomas", Chapter C: Other Areas. Atlantic Highlands, New Jersey: Humanities Press.
- *1987c *Ecología prehistórica andina: El hombre, su establecimiento y el ambiente de los Andes (Chilca Valley Lomas Sites and Other Chilca Valley Sites)*. Volume 6. Lima: Centro de Zonas Áridas (CIZA) de la Universidad Nacional Agraria, la Molina, Perú.
- 1988a *Ecología prehistórica andina: El hombre, su establecimiento y el ambiente de los Andes*. Volume 7: Chilca, Pueblo I: Implements de Hueso. Lima: Editorial El Virrey.
- 1988b *Ecología prehistórica andina: El hombre, su establecimiento y el ambiente de los Andes*. Volume 8: Otras Lomas del sur medio: Cuevas de Chilca. Lima: Centro de Zonas Áridas (CIZA) de la Universidad Nacional Agraria, la Molina, Perú.
- 1988c *Ecología prehistórica andina: El hombre, su establecimiento y el Ambiente de los Andes*: Volume 9: Implementos líticos tallados sin forma definida o amorfos. Lima, Peru: CIZA. Distributed by the Instituto Nacional de Cultura, Perú.
- *1989 Oasis de neblina más napas freáticas: Un desierto dominado. *Zonas Áridas* 6:7-14.
- 1992 *Ecología prehistórica andina: El hombre, su establecimiento y el ambiente de los Andes*: Volume 10: Un desierto en tiempos prehispanicos, Río Pisco, Paracas, Río Ica. Lima: Editorial El Virrey.
- Fairbridge, R.W.
- 1976a Shellfish-eating Preceramic Indians in Coastal Peru. *Science* 191:353-359.
- 1976b Holocene Climate Change on Some Tropical Geomorphic Processes. *Quaternary Research* 6:529-536.

- Fung Pineda, Rosa
1972 El temprano surgimiento en el Perú de los sistemas socio-políticos complejos: Planteamiento de una hipótesis de desarrollo original. *Apuntes Arqueológicos* 2:10-32.
- 1976 Curayacu: Un retorno arqueológico y la formulación de una metodología. *San Marcos: Revista de Artes, Ciencias y Humanidades* (New Series) 17:3-21.
- Grieder, Terrence, Alberto Bueno Mendoza, C. Earle Smith, Jr., and Robert M. Malina
1988 *La Galgada, Peru: A Preceramic Culture in Transition*. Austin: University of Texas Press.
- Kosok, Paul
1965 *Life, Land and Water in Ancient Peru*. New York: Long Island University Press.
- Lanning, Edward P.
1963 A Pre-Agricultural Occupation on the Coast of Peru. *American Antiquity* 28(3):360-371.
- 1967 *Peru Before the Incas*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.
- Llagostera, M. A.
1979 9,700 Years of Maritime Subsistence on the Pacific: An Analysis by Means of Bioindicators in the North of Chile. *American Antiquity* 44:309-324.
- Ludeña R., Hugo
n.d. Recordando al Dr. Frédéric Engel. Manuscript on file in the archives of *Andean Past*.
- Miró Quesada Cantuarias, Francisco
2002 Frédéric Engel: amor por el Perú. *Expreso* (Martes 22 de Enero), Lima.
- Moseley, Michael E.
1968 *Changing Subsistence Patterns: Late Preceramic Archaeology of the Central Peruvian Coast*. Ph.D. dissertation, Harvard University, Cambridge, Massachusetts.
- 1975 *The Maritime Foundations of Andean Civilization*. Menlo Park California: Cummings Publishing Co.
- 1992a Maritime Foundations and Multilinear Evolution. *Andean Past* 3:5-42.
- 1992b *The Incas and Their Ancestors*. London, Thames and Hudson.
- Ojeda, Bernardino
1978 Agricultura precolombina en las hoyas de Chilca. *Zonas Áridas* 1:48-57.
- Osborne, A. J.
1977 Strandloopers, Mermaids and Other Fairy Tales: Ecological Determinants of Marine Resource Utilization, the Peruvian Case. In *For Theory Building in Archaeology*, edited by L. R. Binford, pp. 157-206. New York: Academic Press.
- Patterson, Thomas Carl
1966 Pattern and Process in the Early Intermediate Period Pottery of the Central Coast of Peru. *California University Publications in Anthropology* 3.
- Patterson, Thomas Carl and Edward P. Lanning
1964 Changing Settlement Patterns on the Central Peruvian Coast. *Nawpa Pacha* 2:113-123.
- Paulsen, Allison
1976 Environment and Empire: Climatic Factors in Prehistoric Andean Culture Change. *World Archaeology* 8:121-132.
- Quilter, Jeffery
1991 Late Preceramic Peru. *Journal of World Prehistory* 5:387-438.
- Ravines, Rogger
1988 Review of *De las Begonias al maíz: Una historia del Perú antiguo*. *Boletín de Lima* 56:3-4.
- Raymond, J. Scott
1981 The Maritime Foundation of Andean Civilization: A Reconsideration of the Evidence. *American Antiquity* 46(1):806-821.
- Reitz, Elizabeth J.
1986 Faunal Remains from Paloma, an Archaic Site in Peru. *American Anthropologist* 90:310-322.
- 1988 Preceramic Animal Use on the Central Coast. *BAR International Series* 427:31-55.
- 2003 Resource Use through Time at Paloma, Peru. *Bulletin of the Florida Museum of Natural History* 44(1):65-80.
- Rick, John
1987 Dates as Data: An Examination of the Peruvian Preceramic Radiocarbon Record. *American Antiquity* 52:55-73.
- Richardson, James B. III
1969 *The Preceramic Sequence and the Pleistocene and Post-Pleistocene Climate of Northwest Peru*. Ph.D. Dissertation, University of Illinois.
- 1973 The Preceramic Sequence of the Pleistocene and post-Pleistocene Climate of Northwest Peru. In *Variation in Anthropology: Essays in Honor of John C. McGregor* edited by Donald Lathrop and Jody Davis, pp. 199-211. Urbana, Illinois Archaeological Survey.
- Sánchez, Edgar, and Dora Velásquez O.
1982 Estudio bioecológico de la Loma Paloma: II. Fauna Vertebrados. *Zonas Áridas* 1:68-74.
- Sandweiss, Daniel H.
1996a Environmental Change and Its Consequences for Human Society on the Central Andean Coast: A Malacological Perspective. In *Case Studies in Environmental Archaeology*, edited by Elizabeth J. Reitz, Lee A. Newsom, and Sylvia J. Scudder, pp. 127-146. New York: Plenum Press.
- 1996b The Development of Fishing Specialization on the Central Andean Coast. In *Prehistoric Hunter-Gatherer Fishing Strategies*, edited by Mark G. Plew, pp. 41-63. Boise, Idaho: Department of Anthropology, Boise State University.
- Sandweiss, Daniel H., Asunción Cano, Bernardino Ojeda and José Roque
1999a Pescadores paleoíndios del Perú. *Investigación y Ciencia* 277:55-61.
- Sandweiss, Daniel H., Kirk A. Maasch, and David G. Anderson
1999b Transitions in the Mid-Holocene. *Science* 283:499-500.

- Sandweiss, Daniel H., Kirk A. Maasch, Fei Chai, C. Fred T. Andrus, and Elizabeth J. Reitz
 2004 Geoarchaeological Evidence for Multidecadal Natural Climatic Variability and Ancient Peruvian Fisheries. *Quaternary Research* 61:330-334.
- Sandweiss, Daniel H., Michael Moseley, Jonathan Haas, and Winifred Creamer
 2001 Amplifying Importance of New Research in Peru. *Science* 234:1651-1653.
- Sandweiss, Daniel H., James B. richardson III, Elizabeth J. Reitz, Jeffrey T. Hsu, and Robert A. Feldman
 1989 Early Maritime Adaptations in the Andes: Preliminary Studies at the Ring Site, Peru. In *Ecology, Settlement and History in the Osmore Drainage, Peru*, edited by Don S. Rice, Charles Stanish, and Phillip R. Scarr. *BAR International Series* 545(1):35-84.
- Sandweiss, Daniel H., Harold B. Rollins, and James B. Richardson III
 1983 Landscape Alteration and Prehistoric Human Occupation on the North Coast of Peru. *Annals of Carnegie Museum*. 52:277-298
- Shady Solis, Ruth, Jonathan Haas, and Winifred Creamer
 2001 Dating Carál, a Preceramic Site in the Supé Valley on the Central Coast of Peru. *Science* 292:723-726.
- Torres G., Juan, and C. López Ocaña
 1981 Productividad primaria en las lomas de la costa central del Perú. *Boletín de Lima* 14:2-11.
- 1982 Estudio bioecológico de la Loma Paloma: I. Flora y vegetación. *Zonas Áridas* 2:61-66.
- Vradsburg, Joseph A., Robert A. Benfer, and Lisa Sattenspiel
 1997 Evaluating Archaeological Hypotheses of Population Growth and Decline on the Central Coast of Peru. In *Integrating Archaeological Demography: Multidisciplinary Approaches to Prehistoric Population*, edited by Richard R. Paine, pp. 150-174. Occasional Paper No. 24, Center for Archaeological Investigations, Southern Illinois University at Carbondale, Carbondale, Illinois.
- Weir, Glendon and J. Philip Dering
 1986 The Lomas of Paloma: Human-Environment Relations in a Central Peruvian Fog Oasis: Archaeobotany and Palynology. In *Andean Archaeology: Papers in honor of Clifford Evans*, edited by Ramiro Matos, Solveig Turpin, and Herbert H. Eling, Jr., pp. 18-44. Monograph 27, University of California, Los Angeles.
- Wilson, David
 1981 Maize and Men: A Critique of the Maritime Hypothesis of State Origins on the Coast of Peru. *American Anthropologist* 83:93-120.