ARTICLES

The Late Pleistocene Cultures of South America

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Important to an understanding of the first peopling of any continent is an understanding of human dispersion and adaptation and their archeological signatures. Until recently, the earliest archeological record of South America was viewed uncritically as a uniform and unilinear development involving the intrusion of North American people who brought a founding cultural heritage, the fluted Clovis stone tool technology, and a big-game hunting tradition to the southern hemisphere between 11,000 and 10,000 years ago.[1–3] Biases in the history of research and the agendas pursued in the archeology of the first Americans have played a major part in forming this perspective.[4–6]

Despite enthusiastic acceptance of the Clovis model by a vast majority of archeologists, several South American specialists have rejected it.[6–11] They contend that the presence of archeological sites in Tierra del Fuego and other regions by at least 11,000 to 10,500 years ago was simply insufficient time for even the fastest migration of North Americans to reach within only a few hundred years. Despite this concern, and despite the discovery of several pre-Clovis sites in South America,[6,10–12] some specialists[2,3] keep the Clovis model alive. Proponents of the model claim that the pre-Clovis sites are unreliable due to questionable radiocarbon dates, artifacts, and stratigraphy. Solid evidence at the Monte Verde site in Chile[14–16] and other localities[6,8,10–12] now indicates that South America was discovered by humans at least 12,500 years ago. How much earlier than 12,500 years ago is still a matter of conjecture.[6,10,12,15] Some proponents prefer a long chronology of 20,000 to 45,000 years ago,[8] while others advocate a short chronology of 15,000 to 20,000 years ago[10–12] or only 11,000 years ago.[1–3]

All these views can be accomodated by emphasizing different archeological records in different geographical areas. That is, prior to the outset of deglaciation between 15,000 and 13,000 years ago, the first South Americans may have been confined to productive, open terrain or patchy forests in lowland environments where they may have moved quickly and adapted readily. Movement into the high altitudes of the Central Andes and the high latitudes of southern Patagonia may not have occurred until 11,000 to 10,000 years ago, after deglaciation. Whatever the entry date may be, late Pleistocene cultural developments in South America show a steady shift away from broad uniformity and toward the establishment of distinct regional traditions.[6,8,9–11,13,17] It is clear that several regions were moving toward different social and economic patterns by terminal Pleistocene times: Most groups moved rapidly from simple to complex proto-Archaic systems. This is indicated by widely diverse technologies, loose territoriality, generalized foraging economies, and demographic change. Some groups ultimately manipulated plants and animals in favorable environments and developed the beginnings of social differentiation.[10,11,17]

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Key words: Pleistocene culture; extinction of animals; early technologies; migration

Between 11,000 and 10,000 years ago, South America also witnessed many of the changes seen as being typical of the Pleistocene period in other parts of the world.[5,9–11] These changes include the use of coastal resources and related developments in marine technology, demographic concentration in major river basins, and the practice of modifying plant and animal distributions. Others occur later, between 10,000 and 9,000 years ago, and include most of the changes commonly regarded as typifying early Archaic (or Neolithic) economies: Increases in site density and abandonment, increased use of high-cost plant foods, plant manipulation, intensive exploitation of coastal resources, greater technological diversification, and the appearance of ritual practices.[6,9,11,18,19] From a global perspective, what makes South America interesting is that cultural complexity developed early, possibly within only a few millenia after the initial arrival of humans. Being the last continent occupied by humans but one of the earliest where domestication occurred, South America offers an important study of rapid cultural change and regional adaptation. This change accelerated quickly between 11,000 and 10,000 years ago, as indicated by the increased number of diagnostic tool types, site types, and exploited resources associated with the movement of humans into the interior river corridors and coastal fringes of the continent. The triggering mechanisms of these changes are not well understood, but may be related to climatic shifts, internal developments within regional populations, the imitation of neighbors, the arrival of new people on the scene, and the procurement of food and other resources in highly productive environments, as well as

the growing cultural experience and constantly changing lifestyle of *Homo sapiens sapiens* resulting from having traversed the entire span of the Western Hemisphere.

Early cultural diversity may most readily be traced in the archeological record by the study of stone-tool typology. But it is also important, wherever possible, to examine the internal characteristics of sites and local-level subsistence practices. The current record is geographically uneven due to sampling bias, with most attention having been given to the central Andes, southern Argentina, southern Chile, and central Brazil (Fig. 1). As a result, some cultural differences may appear greater now than they will when more archeological information has come to hand. Nonetheless, where the record is best understood, it shows obvious and consistent cultural differences in stone tool technologies and subsistence practices between one millenium and the next and between North America and South America. Because the South American record historically has been perceived as a cultural outgrowth or clone of early North American culture,[1–3] I will discuss the major differences between the two continents. I also will stress the broad technological and economic developments in South America. The general course of these developments has been outlined in recent reviews by Bryan,[8] Dillehay and colleagues,[11] Ardila and Politis,[10] and Lynch,[3,17] and will be summarized briefly here. Because the archeological evidence of a human entry to South America before about 15,000 years ago is weak and only presumed at this time, I will focus on the paleoclimatic and archeological evidence from the period between approximately 13,000 and 10,000 years ago. Given the presence of humans in South America at least a few centuries before 12,000 years ago, we must presume an entry date at least 15,000 to 14,000 years ago.

APPLES AND ORANGES: NORTH AMERICA AND SOUTH AMERICA

To date, the most persistent explanatory models of the peopling of both North and South America are those that attribute the growth, spread, and change of the earliest cultures to the movement of human populations and broad-scale climatic change. I am referring to studies that envision the long-distance movements and settlements of populations[20–24] and the later diffusion of ideas and circulation of items across extant populations. Most models have it that Clovis and later Paleoindian big-game hunters, after successfully passing through the high-latitude glaciers or along the Pacific coastline of North America, adapted to a plentiful, dense, but seasonally and geographically unpredictable resource base, the gregarious megafauna of the late Pleistocene.[21,22] Hunting these large animals probably required high mobility in some areas, opportunistic camping, and periodic movement over long distances. These patterns are reflected in the artifact assemblages at North American sites, which often are comprised of exotic raw materials carried from long distances.[23,24] The uniformity of stone tool types over large areas like the eastern two-thirds of North America is important. It suggests expansive, overlapping territories and, along with exotic raw material patterns, and generally standardized information and material culture.

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The late Pleistocene period of South America stands in contrast to that in North America.[6,8–11,13] The first difference is the absence of a continent-wide stone tool style like Clovis and the long-distance movement of exotic raw lithic material. Another distinction is that the glacial effect in South America was confined to patchy high-altitude or high-latitude areas of the Andes and had less effect on human populations after 13,000 years ago, when deglaciation had already occurred in most regions. In North America, the extensive ice sheets covering high latitudes limited the initial movement of people. On the other hand, in lower Central America and the eastern and western flanks and lowlands of the Andes, as well as the southeastern United States, less glaciation provided an environment of mature forests and savanna grasslands. This mixed forest environment, especially in parts of Colombia, the land-bridge gateway into South America, and in eastern Brazil, possibly provided a more predictable, dense, and uniform resource structure that offered a wide variety of economic opportunities. Current archeological evidence suggests that these areas probably witnessed the early rise of generalized foraging economies, a greater reliance on local lithic raw materials, and more microregional differentiation of material culture between 11,000 and 10,000 years ago. These patterns probably reflect decreased movement, increased population density, and the appearance of loose territoriality, if not colonization (settling into a particular habitat) near the outset of human entry into some areas. Within this scheme, the classic Paleoindian strategy of specialized big-game hunting was simply one of many different subsistence practices. More common are sites reflecting a diet typical of the early Archaic period. The finds at Monte Verde in southern Chile,[6] several highland cave sites in the central Andes,[10,11,18,19,25,26] the Grande Abrigo de Santana do Riacho,[27] Lapa do Boquete,[28] Lapa dos Bichos,[29] and other sites[13,29,30] in central Brazil have yielded seeds and other plant foods along with game animals, some extinct. Also entering into the equation is plant manipulation, which might have begun in some areas by 11,000 years ago, given the presence of domesticates possibly as early as 10,000 to 8,000 years ago.[25,31–33]

Another difference between North and South America is in projectile point developments, unifacial stone tools, and bola stones, which are modified spheres probably used as sling

Figure 1. Map showing major early archeological sites in South America: 1. Taima-Taima; 2. Rio Pedregal, Cucuruchu; 3. El Abra, Tequendama, Tibito; 4. Popayan; 5. El Inga; 6. Las Vegas; 7. Siches, Amotope, Talara; 8. Paijan; 9. Guitarrero Cave; 10. Lauricocha; 11. Telarmachay, Pachamachay, Uchumachay, Panalauca; 12. Pikimachay; 13. Ring Site, Quebrada Las Conchas and Quebrada Jaguay; 14. Intihuasi Cave; 15. Gruta del Indio; 16. Agua de la Cueva; 17. Inca Cueva IV; 18. Huachichoana III; 19. Quebrada Seca; 20. Toca do Sitio do Meio, Toca do Boqueirao da Pedra Furada; 21. various site in Minas Gerais state; 22. Lapa Vermelha IV; 23. various Goias sites; 24. Itaborai sites; 25. Alice Boer; 26. Catalaense and Tangurupa complexes; 27. Cerro la China, Cerro El Sombrero, La Moderna, Arroyo Seco 2; 28. Los Toldos; 29. Fells Cave, Palli Aike, Cerro Sota; 30. Mylodon Cave, Cueva del Medio; 31. Tres Arroyos; 32, 33. various sites in northern Chile; 34. Quereo; 35. Tagua-Tagua; 36. Monte Verde; 37. El Ceibo; 38. Chobshi Cave; 39. Cubilan; 40. Asana; 41. Ubicui and Uruguai Phase sites. (Modified from Dillehay[6])

stones or hand missles. If we know anything about early projectile point types in North America, it is that stylistic and technological continuity can generally be traced on a regional level at the beginning of the Paleoindian period, from one type to another (e.g., Clovis, Folsom, Plainview, Dalton, Cumberland). Elongated projectile points with flutes and stemmed points often appear in stratigraphic sequence.[5,12,22] The most widely published cultural trait linking North and South America is the fluted point tradition and there is considerable debate about its origin. Some archeologists[8] believe that the flute was invented in South America and diffused to the north. Others see the flute as nothing more than a longitudinal thinning flake removed by a different technique than that used to make the classic channel flakes of Clovis and Folsom.[11,34] In South America, on the other hand, there are few, if any, linking traits to indicate technological evolution, even where diagnostic stone tools (primarily projectile points) are in stratigraphic order. When these tools occur in the archeological record, they generally are regionalized types and appear with low frequency. Widespread unifacial stone tool assemblages such as those at Tequendama and Tibito in Colombia, Monte Verde, and Itaparica Phase sites in eastern Brazil (Fig. 1) appear by the 11th and 12th millennia. This unifacial industry makes South America inherently different from the Northern Hemisphere. It should be noted that the bifacial and unifacial industries in South America are not considered to be competing or opposing technologies but complementary ones, most likely derived from the same technological source. Depending on regional environmental and cultural circumstances, they may co-exist in different frequencies at sites or be entirely absent in some areas during some periods. Another distinguishing trait is the bola stone, which appears in South America about 12,500 years ago at Monte Verde and between 11,500 years ago at others sites in eastern Brazil and the southern half of the continent. Taken together, the distribution of points, unifaces, and bola stones suggests complicated mosaics of technological and subsistence practices in which bifacial or unifacial types occur regionally and independently, and are often intermixed with hybrid local types (Fig. 2).[8,9,11,13,17] As I indicated earlier, these diverse types seem to represent greater time depth and rapid in situ cultural change, probably resulting from rapid colonization after initial entry, as well as highly effective local adaptations.

The almost ubiquitous unifacial technologies in South America were truly innovative. They have been documented in many different environments and at many sites throughout the continent. This industry involved far more economical use of raw mate-

rial and the ability to repair or modify tools without totally replacing them. This technology is best and conventionally seen as a development from pebble tool industries in which techniques for making all-purpose tools were frequently practiced. Examples of this industry are the Amotope, Siches, Honda, and Nanchoc traditions on the north coast of Peru,[11] the Itaparica and Paranaiba industries in central Brazil,[29,35] and the Tequendamiense and Abriense industries in Colombia.[10,11] It has been argued that several of these industries were used for plant processing and woodworking, and that the development of these industries was a response to a wetter climate and the resulting spread of vegetation. Although plausible, that argument rests on slender foundations, for we have little direct evidence about the uses to which these individual artifacts were put.[6] Furthermore, archeologists are still far from being able to explain why the parallel developments of bifacial and unifacial technologies took place in South America. Simple diffusion from a common source, particularly one in North America, is unlikely. The co-existence of early unifacial and bifacial technologies in South America is more reminescent of late Pleistocene adaptive technologies in Australia and parts of Asia than of North America.

In summary, there is a sufficient amount of South American data to warrant rejection of the received North American intrusive-Clovis culture model and even the notion of a homogeneous dispersing population. Although the Clovis model possibly accounts for the presence of one trait, fluting, in some areas of South America, it fails to account fully for the diversity of contemporaneous material cultures and economies that existed by 11,000 years ago. To better understand the context of this diversity, we need to view the archeological evidence from the perspective of different regional populations culturally adapting to different environments.

REGIONAL DIVERSITY IN SOUTH AMERICA

A primary cause of cultural diversity must be sought in the environmental transitions at the end of the Pleistocene period. That is not to say that simple environmental determinism and isolationism directed human cultural and biological diversity; it is simply to assert that changing climate and resource structures must have influenced patterns of human distribution and subsistence practices across the continent. A wide range of studies have been carried out to reconstruct the late Pleistocene environments, with varying degrees of success, accuracy, and geographical and temporal coverage. In general, at about 30,000 years ago, the climate was warmer and moister than it is today.[36–39] Between 28,000 and 18,000 years ago, the climate was drier and cooler.[36–40] From 18,000 to 14,000 years ago, it was drier and colder.[36,38,41–43] Closer to the primary time period under study here, there is evidence of a significant temperature rise between 15,000 and 14,000 years ago.[36,38,41–43] As a result, continental ice sheets started melting and the sea level began to rise. In southern South America, the effects of this rise, which occurred between 13,000 and 10,000 years ago, were particularly dramatic: The Atlantic shelf and many areas in present-day Tierra del Fuego were flooded as were any sites dating to this period or earlier. After 12,000 years ago, there was a moister and cooler climate until 11,000 to 10,000, when it became warmer and drier again. The early Holocene reflects a return to a cool, moist climate.

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Coastlines, deltas and wetlands, and major rivers leading into the interior were undoubtedly important to the initial dispersion of humans and their exploitation of predictable resources. If humans first traveled along the Pacific[44] or Atlantic coastlines, they could have moved quickly into the southern portions of the continent, occasionally migrating laterally into the interior. Various wetland habitats in deltas and along major coastal rivers may have served as primary areas of initial adaptation and movement into the interior.[6,45] Whether they initially moved along the coasts or immediately into higher river valleys (e.g., Magdalena) of the Andean mountains and adjacent plains of Colombia between 15,000 and 12,000 years ago, any human population was probably thinly spread, with the majority living closer to major waterways. After 13,000 years ago, when more arid conditions existed, it is likely that human settlement was focused in wetland habitats and especially the major river valleys. The further development of rivers in terminal Pleistocene times, when they were more stabilized after deglaciation, was probably central to the early cultural history of South America, especially in the Amazon Basin and surrounding regions, because they favored human population concentration, growth, and contact, and reduced foraging ranges. Extensive wetland and lake systems were also present in many areas, but probably not to the degree seen in the early Holocene.

There is a rash of early sites all over the continent that are associated with wetland, riverine, and other enviroments. These include, for example, Monte Verde, Taima-Taima, Tequendama, Tíbito (Fig. 3), Pedra Furada II, Itaparica Phase sites, Grande Abrigo de Santana do Riacho, Monte Alegre, Papa do Boquete, and Lapa dos Bichos. As a whole, these sites present a highly heterogenous archeological record that negates many of our previous assumptions about entry dates, human dispersion, and early technologies and economies. Although some of these sites are beset with problems such as dubious human artifacts, questionable radiocarbon dates, or unreliable geological contexts,[3–6] several cannot be dismissed. Most questionable are the deeper layers of the Monte Verde I site in Chile[3,6] and of the Pedra Furada site in Brazil,[46,47] where modified stones

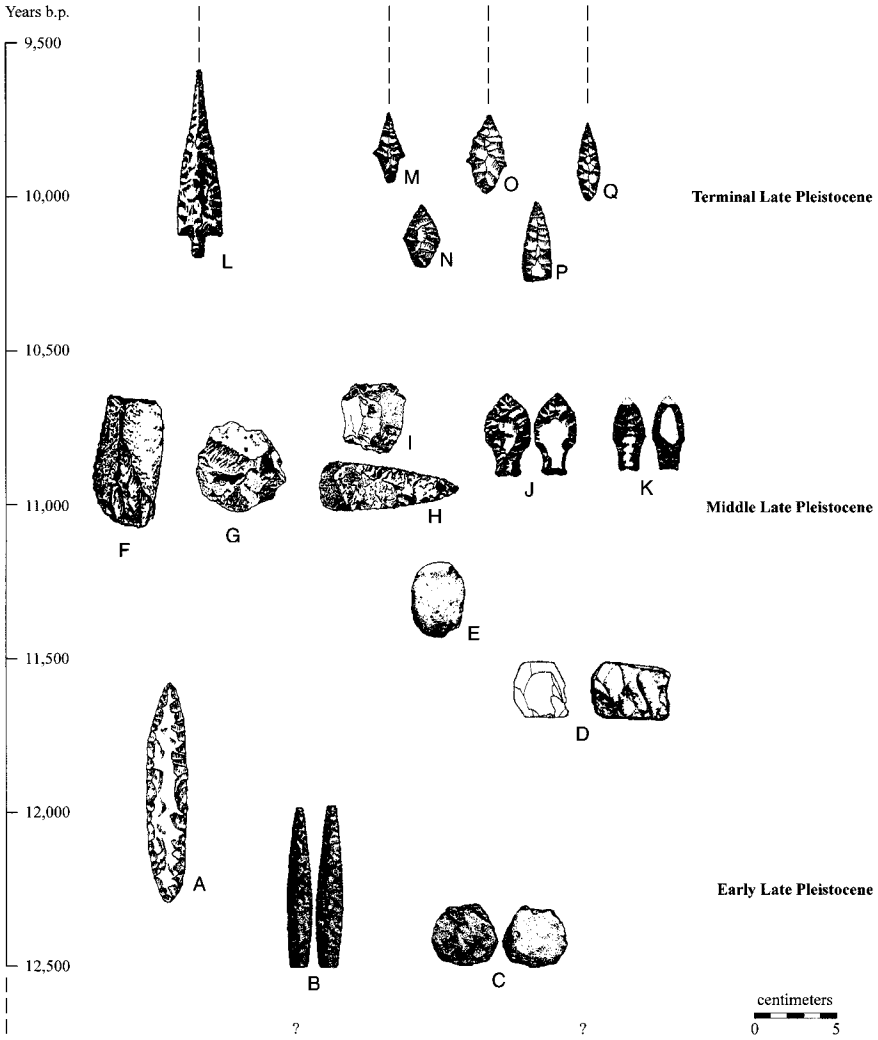

Figure 2. Sample of the variety of bifacial and unifacial stone tools typical of Late Pleistocene sites in South America: A. El Jobo projectile point from Venezuela; B. Monte Verde projectile point from Chile; C. unifacial tools from Monte Verde; D,E. edge-trimmed flakes of the Tequendamiense and Abriense complexes in highland Colombia; F–I. Various unifacial stone tools from Itaparica sites in Brazil; J,K. fishtail projectile points from Fell's Cave in southern Chile; L. Paijan projectile point from coastal Peru; M–Q. various stemmed and unstemmed projectile points from cave and rockshelter sites in highland Peru.

and features hint at a possible human presence earlier than 20,000 years ago. Much more reliable is the Monte Verde II site, which has been securely dated to about 12,500 years ago. There are a handful of other sites that contain evidence of reliable cultural materials from before 11,000 years ago. These are Taima-Taima in Venezuela[48] and a few caves and rockshelters in Brazil[27–30,35,49,50] and Tierra del Fuego.[51] There also are the various unifacial and bifacial lithic complexes in the forested areas of Colombia, Venezuela, Brazil, and Chile. These include the Tequendamiense and Abriense complexes of Colombia[10] and the Itaparica Phase of Brazil[35] for the period from 11,800 to 10,500 years ago. In addition, there are the stemmed fishtail points of various areas, the Paijan points of Ecuador and Peru, and a myriad of projectile point types from the central Andean highlands,[10,11,25,26] all of which appeared between 11,000 and 10,000 years ago. Other less known or less diagnostic unifacial and bifacial assemblages dating between approximately 11,500 and 10,000 years ago have also been recognized throughout the continent. Although the discontinuites and continuities between many of these sites and their tool technologies are presently vague on a continental level, they are important, reflecting different patterns of subsistence in different environments, including big-game hunting and generalized foraging, between at least 12,500 and 10,000 years ago.

One example of a generalized foraging life-way is seen at the site of Monte Verde II,[6] dated to about 12,500 years ago and located on a tributary of a major river midway between the Pacific coast and the Andean highlands of southern Chile (Figs. 4 and 5). The site contains a wide array of well-preserved perishable materials such as wood, plant, and bone and unifacial, bifacial, and bola stone technologies. Included in the recovered material inventory are the wood and hide remains of a long tent-like structure and a nearby isolated hut. Individual living spaces inside the tent were associated with small clay-lined firepits, food stains, plant remains, stone tools, and other debris. Outside the tent were two large cooking pits, several wooden mortars and grinding stones, numerous modified stones and pieces of wood, and other miscellaneous features indicative of multiple domestic tasks. Recovered from inside the isolated hut were the remains of plants that possibly were medicinal. Scattered around the outside of the hut were wooden artifacts, stone tools, and bones of seven mastodons, suggesting the area may have been used to process animal hides and meat, manufacture tools, and, perhaps, tend the sick. The wide range of organic and inorganic remains in the site were brought from several distant highland and coastal habitats within the river basin, indicating maximum exploitation of resources and a highly effective

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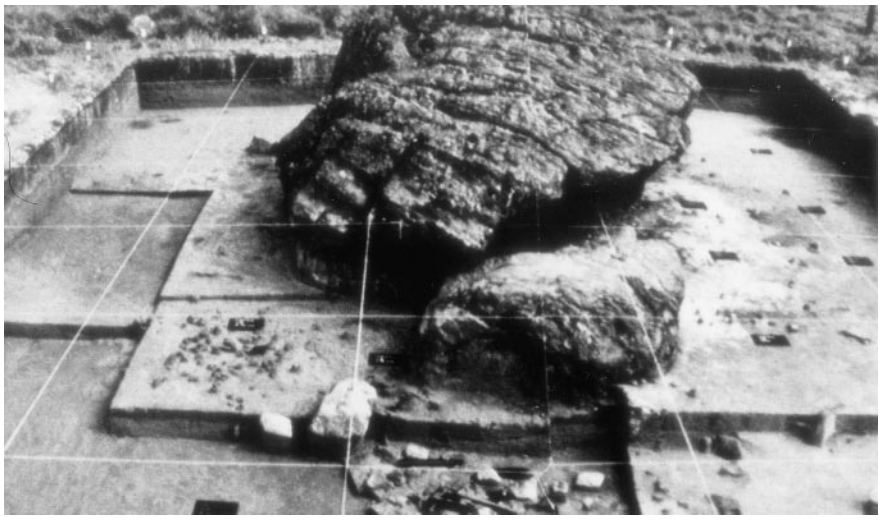

Figure 3. View of concentrations of flakes and burned bones of mastodon and native horse at the Tíbito site in the savanna plains north of Bogotá, Colombia, dated to approximately 11,740 years ago.

foraging economy, especially in the wetlands. The excellent preservation of organic material at Monte Verde also reminds us of what may be missing in poorly preserved sites and how narrow our interpretations of the past may be when they are based almost exclusively on patterns observed in stone tool and, occasionally, bone assemblages.

Unlike the people at Monte Verde, who were probably territorial and resided in the river basin for most of the year, some later groups were highly mobile, using a classic bifacial projectile point technology in various open environments characterized by extinct big-game animals such as mastodon and giant ground sloths. The primary examples are populations associated with El Jobo points (Venezuela), fishtail or Magallanes points (various parts of the continent, but mainly the southern half), and Paijan points (Peru and Ecuador) at sites in grasslands, savanna plains, and patchy forests.[8,11,13,25,26,52–56] Although not well-documented, the diversity of faunal and, when preserved, floral resources at these sites seems to be generally low, comprising mainly large, nomadic prey. The stone tool technology includes a very low proportion of bifacial tools. With the exception of the Taima-Taima locality in Venezuela, dated to between 13,000 and 11,000 years ago, these sites usually range in age between approximately 11,000 and 10,000 years ago.

A wide variety of regional projectile point types primarily associated with the hunting of guanaco, a wild camelid, or other game appear between 11,000 to 10,000 years ago. These types also occur in low frequencies and are sometimes associated with different unifacial tool types.[11,25,26] The clearest record occurs at numerous rockshelters and caves in the highlands of Peru, Chile, Argentina, Bolivia, and occasionally Ecuador. These sites, dating to 10,500 years ago and later, are typified by subtriangular, triangular, and stemmed points akin to, but generally cruder than those of the subsequent early Holocene period. Many of the groups possessing these points hunted game and gathered other resources in specific habitats, such as high-altitude deserts and grasslands (puna), and probably practiced a loose form of territoriality within those habitats.[57] The descendants of these high-altitude groups eventually domesticated the Andean camelids.

We know more about the abundant, widely distributed rockshelter and cave sites that have been investigated in the high Andes than we do about regions further to the east in Brazil, Uruguay, and Argentina. Sites in the savanna and forested areas of central and eastern Brazil primarily contain generalized or all-purpose unifacial stone tools; bifacial technologies are rare.[9–11,30,35] Groups in this area were adapted to a wide variety of floral and faunal resources and environments. They may have occupied a large territory and moved little within it. Such groups include the inhabitants of several sites of the Itaparica and Paranaiba phases, dated between at least 11,500 and 10,000 years ago. Early sites in Uruguay and Argentina are associated primarily with projectile point assemblages, including the fishtail point, and with both specialized big-game hunting and generalized foraging. The same pattern exists at several localities farther south in the cold, moist Patagonian grasslands of Chile and Argentina. These sites include, for example, Fell's Cave, Mylodon Cave, Palli Aike, and Cueva del Medio.

As a whole, vagueness surrounds the wide variety of bifacial and unifacial industries spread across the continent because so much of our information is based on a few well-dated sites and many poorly dated collections from disturbed contexts or surface exposures. Further, no sequence has yet been established that shows the source industry of these varied types. Nevertheless, it is obvious from the relative diversity of projectile point types and unifacial industries that between 11,000 and 10,500 years ago a generally heterogenous culture was distributed over vast areas, and that, probably within a few hundred years, it began to develop into small regional

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Figure 4. View of wishbone-shaped foundation of hut at Monte Verde, Chile, dated to approximately 12,500 years ago. The sand and gravel making up the foundation was imported from a nearby stream bed. In and around the hut were found numerous fragments of animal skins, bones of mastodon and paleo-llama, quids of various imported plant species (today consumed by local native people for medicinal purposes), and stone tools. Vertical stubs of burned and cut wood were embedded in the two arms of the foundation, suggesting the remains of a pole frame.

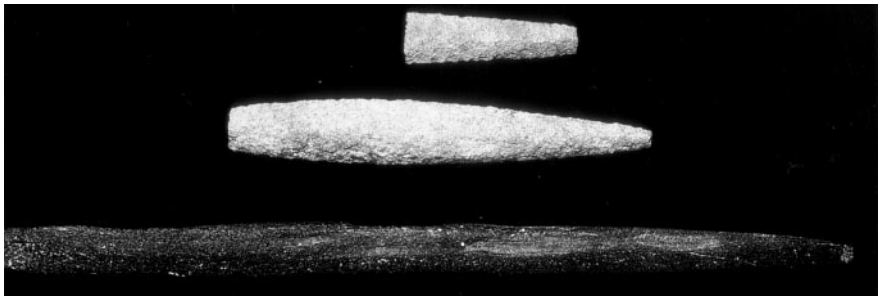

Figure 5. Two fragments (top and center) of the bipointed and rhomboidal points made of andesite and basalt found at Monte Verde. The top fragment was recovered near the hut; the middle fragment was associated with the nearby remains of a long tent-like structure. The bottom specimen is slate imported from the coast about 60 km east of Monte Verde. The piece has been pecked and ground into a perforating-type tool.

cultures. The majority of these industries are made of local raw material. Around or slightly before 11,000 years ago, a period of widespread movement of populations or diffusion of ideas in parts of South America is suggested by the widespread distribution of the fishtail point and its variants in the southern cone. As mentioned earlier, this point type is the only one with nearly continent-wide distribution currently known in the late Quaternary archeological record. This style and the other bifacial or unifacial industries co-existing at the same time, and often close together, suggest that we are dealing not merely with functional variants, but probably with the presence of distinct and partially isolated populations.

No discussion of the continent is complete without consideration of human occupation of the coastlines. Although the Atlantic coast is generally devoid of early well-dated cultural deposits,[30,35,58] possibly because such sites may be under water, the Pacific coastlines of Peru and Chile contain evidence of occupations that may date to as early as 10,500 years ago.[57,59,60–66] Most of the coastal sites are shell middens comprised of estuarine or rocky intertidal mollusk species, or both, as well as some intertidal and estuarine fish fauna, varying quantities of sea mammal and terrestrial mammal remains, and a few plant species. The artifact assemblages tend to lack diversity, primarily consisting of simple flake and core tools and, in terminal Pleistocene and early Holocene times, subtriangular, triangular, and leaf-shaped bifaces and harpoon points. Ornaments of shell, bone, or stone are rare. There is little archeological evidence of specialized big-game hunting along the coast. Rather, the coastal populations are interpreted as having been generalized hunter-gatherers who harvested the resources of coastal habitats, interior pluvial lakes, where present, and riparian fauna and flora. These same coastal populations eventually laid the foundations for the rise of early Andean civilization along the coastal plain of Peru and northern Chile sometime in the early to middle Holocene period.[57,63]

Coastal sequences of the same order of antiquity as sites located within the interior of the continent are less forthcoming, although a few earlier sites are beginning to appear. The most detailed archeological evidence comes from the site of Huentelafquen on the north-central Chilean coastline[60,64] and the Ring Site in southern Peru,[63] where relict Pleistocene land surfaces have been discovered proximal to the sea. These sites have been radiocarbons dated to between 10,800 and 9,700 BP. Marine fauna and unifacial lithic industries are present in the earliest deposits. There also is good evidence of the exchange or direct procurement of cultural items and food resources from the interior portions of the coast. Recent work at two other Peruvian south coastal sites, provides further support for a human presence there by at least 10,200 years ago.[65,66] Some investigators believe that these sites represent the first migration of humans into the continent along the Pacific coastline.[65] These sites, however, are not the earliest on the continent and thus represent only a late Pleistocene human exploitation of selected littoral and adjacent interior environments. Because of the unusually steep declination of the continental shelf and high cliffs in southern Peru and northern Chile, rising sea

levels in late Pleistocene times did not submerge sites. More early coastal sites will surely be found in this region in the future.

Between 10,000 and 7,000 years ago, human diets along the Pacific coastal plain and in many other parts of South America changed dramatically.[31–33,57] Wild plant and animal foods previously available but not much exploited suddenly became important and sometimes dominant elements of local diets. Other changes in human behavior also occurred, marked by the appearance of new technologies such as seed-grinding stones, composite fishhooks, harpoon points, more formal bifaces, and basketry. There were larger and more stable settlements and higher regional population densities, especially in the major river valleys descending the Andean mountains to the east and west; increased reliance on food storage; the appearance of broad exchange networks; the emergence of complex social differentiation, indicated by mortuary patterns and house structures; and, in some areas, the development of horticulture.[31,32,57] Perhaps, in some closely circumscribed and highly productive habitats such as those on the Peruvian and Chilean coastal plains, in some river basins in the Andean highlands, and in the tropical lowlands east of the Andes, the pressure of human numbers was already stimulating changes in this direction between 11,000 and 9,000 years ago as part of the competition for control of, or access to, these favored habitats. The late Pleistocene period was probably characterized by very low population densities in most habitats. However, when groups encountered favored habitats they may have opted to stay in close contact rather than to migrate long distance, not only for the purpose of accessing key resources but for biological reproduction. In this regard, I suspect that mating and loose territorial fission-fusion were as important as raw stone material and certain food types. This same process may have stimulated social aggregation on a local level and reinforced group differentiation, identity, and possibly even occasional rivalry. This situation was probably intensified in the early and middle Holocene period, especially in more productive environments such as open forests, parklands, and large forming deltas.

Although the preceeding configurations present environmental, subsistence, and technological speculation about the varied early archeological record of South America, that record is still too vague and too spotty to depict underlying units and rates of culture change. At this time it is possible to identify a sequential process that can accomodate and specify the different subsistence and technological patterns that were present by at least 11,500 to 10,500 years ago, each of which is probably associated with different dispersing or colonizing populations. Moreover, not a single site in South America suggests a clear chronological trend between these environmental, technological, and subsistence changes. The present evidence does suggest, however, that since at least 11,000 years ago, these changes have not been unidirectional in South America. Furthermore, the time lag between the appearance of people and the later beginnings of social and cultural complexity in parts of South America was probably on the order of 4,000 to 7,000 years in some areas, if we presume the presence of people no earlier than 15,000 to 18,000 years ago. From the perspective of cultural evolution, this makes South America unique, given that other continents were occupied by humans many millenia prior to the earliest development of social and cultural complexity. On the other hand, if people were in South America before 20,000 years ago, then the South American record falls into an evolutionary line of development similar to that throughout the rest of the world, whereby complexity occurred many thousands of years after the initial arrival of *Homo sapiens sapiens*. I believe that when a more complete archeological record is available, the latter scenario will prevail.

Around or slightly before 11,000 years ago, a period of widespread movement of populations or diffusion of ideas in parts of South America is suggested by the widespread distribution of the fishtail point and its variants in the southern cone.

GENERAL TRENDS IN HUMAN OSTEOLOGY AND GENETICS

The trends I have described in the archeological record have obvious implications for patterns of gene flow and the type of biological *Homo sapiens sapiens* that colonized South America.[67–70] Direct evidence regarding the physical and genetic make-up of the first people entering the continent is missing.[67] In fact, not a single reliable human skeleton from the late Pleistocene age (i.e., before 10,000 years ago) has been excavated, making South America the only continent on the planet where we know of an early human presence almost exclusively through traces of artifacts and not skeletal remains. The earliest known skeletal evidence is from the sites of Las Vegas in southwest Ecuador,[61] Lauricocha and Paijan in northern Peru,[10,11,53] La Moderna in Argentina,[10,11,34] Lapa Vermelha IV in Brazil,[68] and a handful of other localities, all dating to between approximately 10,000 and 8,500 years ago. There are claims of earlier skeletal remains, but the their stratigraphic contexts or radiocarbon dates are highly suspect.

In studying the cranial morphology of skeletons from these and other localities dating to the early and middle Archaic period (10,000–6,000 years ago), some physical anthropologists believe that two distinct human populations, one Mongoloid and the other possibly non-Mongoloid, existed in late Pleistocene times,[68–71] and that the latter arrived first.[68] They attribute this difference to at least two different waves of human migration rather than to the entry of a single population that split into two different directions and adapted to distinct habitats and dietary customs. At present, the sample of human skeletal material is too incomplete to determine whether these differences are related to sampling biases,

methodological biases, migrations, local adaptations, or gene-flow barriers.[72]

So far, the genetic evidence has not been very helpful in shedding new light on this and other problems, though it has provided new insights into the genetic diversity of contemporary indigenous South Americans.[73–83] Unlike physical anthropologists studying cranial morphology and other skeletal traits, geneticists vary in their opinions of the meaning of genetic diversity. For instance, some studies favor an entry before 15,000 years ago.[75–77,81] These studies are not at odds with the archeological evidence supporting an entry date before 11,000 years ago. Others admit to considerable diversity in the genetic evidence but accomodate their findings to the Clovis model of late entry.[70] It is not known whether diversity occurred rapidly in intermixed populations, slowly in longstanding small populations, or slowly in other populations that were undergoing changes in size but that had not had enough time together to recreate diversity through mutations. It is also possible that small, isolated populations lost some genetic diversity, further complicating our understanding of these records. Lastly, to accomodate the biological diversity identified in both the skeletal and genetic records, several physical anthropologists and geneticists have advocated an early entry date as far back as 20,000 to 40,000 years ago. Some linguists also have proposed great time depth to explain language diversity.[84] Calibration of these records must depend, however, on archeological dates taken from reliable contexts.

In summary, I believe that the current sample size of human skeletal material in South America is too small and that the patterning observed in the remains of the Archaic period is too late in time to extrapolate back to the late Pleistocene period. Until we understand the mortuary practices of the first Americans and recover a larger sample of earlier human skeletons, I am reluctant to believe that the current biological evidence reliably reflects historic events in the late Pleistocene. This is not to say that this evidence has not helped our understanding of the peopling of the Americas. On the contrary, this information has established the probability of two distinct human populations in late Pleistocene times and has suggested different models of human dispersion.

CONCLUSION

Given the current archeological record, I believe that the peopling of South America was in some ways culturally and socially different from that in North America. Although early populations in both continents were surely derived from the same Asian biological stock, the first people entering South America were somewhat different behaviorally and culturally due to previous multiple generations of technological and organizational adaptations in North America and Central America. In this regard, I see the early cultural diversity and complexity in South America as being related not just to regional isolationism but to the degree and history of transgenerational contacts between different populations and various local types of technological, economic, and social practices. In order to account for the early technological continuity such as that of Clovis and subsequent Clovis derivatives such as Folsom, Dalton, and Cumberland, which has been documented in the North American archeological record, I believe that in North America there was more initial contact across broad regions and less local-level adaptation than there was in South America. Such contact would partially explain the rapid, widespread dispersion of the Clovis tradition, probably across an extant population, in North America. Early local adaptations, less mobility, new strategies for dealing with seasonal and unpredictable environmental variations, and probably circumscribed territories would also help to explain the widespread diversity of stone tool technologies and other cultural traits in South America.

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The most plausible scenario to explain the current archeological evidence, regardless of an early or late entry date, is a founding migration of people moving rapidly from North America to South America along the Pacific coastline sometime shortly before (ca. 14,000–12,000 b.p.) the invention and spread of the Clovis culture. Once the pre-Clovis population reached South America, it probably dispersed quickly into several widely spaced and isolated regional groups. Each regional group was initially highly mobile within certain broad environmental zones (e.g., savanna plains, patchy woodlands) and was large enough in size to biologically sustain itself. Although it is probable that a second wave of immigrants bearing a Clovis-like culture reached the continent sometime around or after 11,000 b.p., South America apparently did not experience the continuous flow of immigrants presumed for North America. This pattern would explain the early cultural and biological diversity identified across South America, as well as the presence of a few North American technological traits. Human dispersion across South America was probably greatly facilitated by the numerous east to west oriented rivers on both flanks of the Andes, especially between 14,000 and 12,500 b.p., when deglaciation had occurred in most areas and when many river valleys had become stabilized. These valleys would have provided an adundant and diverse resource base and an ease of movement between the coast and highlands and into the eastern lowlands, especially in areas such as southern Ecuador (present-day Guayaquil River basin) and northern Peru, where the Andean mountains are relatively low and narrow. From an Atlantic or Caribbean perspective, the Orinoco River system was important as an avenue into the heartland of the Amazonian basin.

To extend the contrast between the two continents even further, the cultural diversity and broad-spectrum economies documented across South America by 11,000 BP did not take

place in North America until approximately 10,000 BP, or roughly a thousand years later. The rapid, efficient adaptation of regional populations to diverse environments may partially explain why some forms of early civilization emerged earlier in parts of South America. For instance, cultigens may have appeared as early as 10,000 to 8,000 BP, while pottery production is established by at least 6,000 BP.[85] Monumental architecture existed in parts of Peru by 5,000 BP.[18,31–33] What triggered these changes is not well understood. I suspect that much of the answer lies in a further understanding of advanced hunter-gatherer societies intensifying broad-spectrum diets in lush, circumscribed areas such as wetlands along the coasts of Colombia, Ecuador, and Peru, ecotones along the western and eastern flanks of the Andes from Colombia to northern hile and Argentina, and confluences of large river systems in the eastern lowlands from Venezuela to Paraguay and Uruguay.

It is not known when and where the first humans migrated to the Americas. Given the presence of valid archeological sites dated to between 12,500 and 11,000 years ago, it is likely that people arrived in the Southern Hemisphere no later than 15,000 to 14,000 years ago. Further, we are a long way from being able to specify all of the conditions under which these first human adaptations occurred in the Southern Hemisphere. As a starting point, we must recognize that the key issue is not rapid, blitzkreig movement but efficient adaptation of technological, socioeconomic, and ideational practices over several generations within different local and regional populations. We must also develop research questions and strategies to study these practices on a comparative local and hemispherical basis that may lead us to significant insights into the plasticity of late Pleistocene human populations. With more research, we should see that these populations were far more subculturally and temporally variable than has previously been envisioned. From an archeological perspective, this variability should be reflected as gradations in changing populations types, artifact types, and site features. These gradations in the archeological complexes should correlate with the direction, rate, and timing of late Pleistocene environmental change and related cultural changes, not only across South America but throughout the Western Hemisphere and Pacific Rim in general. However, identifying these processes in the archeological record is not easy, particularly in marginally productive areas such as the high puna grasslands of the Andes, where human entry may have fluctuated over a long period in accordance with changing climatic patterns. In more productive areas, such as the temperate climates of southern Chile where the Monte Verde site is located and of the forested environments of the Amazon Basin, people may have entered and then colonized within a very short period of time. What we need most now are specific research questions and field strategies to study these gradations and what they tell us about the first peopling of the Americas.

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