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Prehistory of Native Americans on the Central American Land Bridge: Colonization, Dispersal, and Divergence

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The Central American land bridge has served as a passageway for animals and humans moving between North and South America. Nevertheless, after the first waves of human immigration at the end of the Pleistocene, contact between the native peoples who remained on this isthmus and other peoples living in continental areas where civilization ultimately developed, is characterized, according to the field record, by the transfer of crops, technologies, and goods, until ca.1400 BP when speakers of Mesoamerican languages occupied the northwestern edge (Gran Nicoya). The ancestors of modern-day speakers of Chibchan and Chocoan languages underwent social and cultural diversification mostly within the confines of the land bridge. Some Precolumbian residents altered vegetation immediately after first arrival at least 11,000 years ago, and began to add domesticated crops to their subsistence inventory between 9000 and 7000 BP. Maize and manioc (or cassava), domesticated outside the land bridge, were introduced in Preceramic times, early in the period between 7000 and 4500 BP, and gradually dominated regional agriculture as they became more productive, and as human populations increased and spread into virgin areas. Diversity in material culture is visible ca. 6000 BP, and becomes more apparent after the introduction of pottery ca. 4500 BP. By 2000 BP culture areas with distinctive artifact inventories are discernible. Between 2500 and 1300 BP hierarchies among regions, sites, social groups, and individuals point to the establishment of chiefdoms whose elite members came to demand large numbers of costume and sumptuary goods. A few special centers with stone sculptures and low-scale architecture served a social universe larger than the chiefdom, such as clusters of recently fissioned social groups with memories of a common heritage. Social interactions on the land bridge, endowed with

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productive bottomlands, highland valleys, and coastal habitats, appear always to have been strongest among neighboring groups.

KEY WORDS: Central American land bridge; continuity; Precolumbian agriculture; exchange; chiefdom.

INTRODUCTION

The Central American land bridge (between southernmost Nicaragua and the Atrato-San Juan axis in northernmost Colombia [Fig. 1]) united North and South America between 3.2 and 3.7 million years ago. It became an obstacle to marine organisms and a passageway for terrestrial ones including humans and their dogs during the Late Glacial Stage (LGS [14,000–10,000 B.P.]) and, subsequently, their crops (Bermingham and Lessios, 1993; Coates and Obando, 1996; Jackson and D'Croz, 1997; Piperno and Pearsall, 1998, pp. 209–226, 286–296; Ranere and Cooke, 2003; Webb, 1997). Less well advertised is the fact that the land bridge's position vis-à-vis tropical atmospheric circulation, and an orography influenced by the proximity of multiple plate junctions, have created a multitude of isthmian and insular landscapes, which have favored endemism *and* diversity—not only of terrestrial plants and animals but also of human societies (Anderson and Handley, 2002; Barrantes *et al.*, 1990; Constenla, 1991; Cropp and Boinski, 2000; Herlihy, 1997).

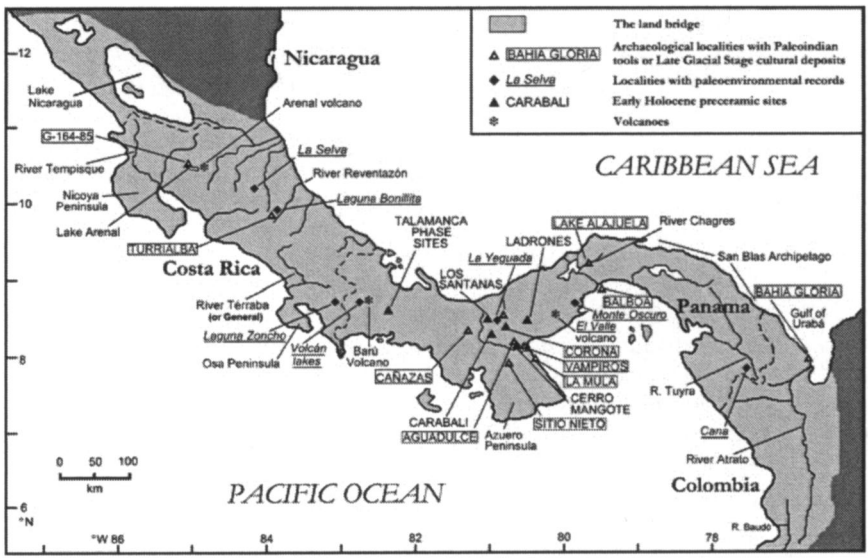

Fig. 1. The Central American land bridge, showing location of Paleoindian and Early Holocene preceramic sites.

The Spanish who settled the land bridge after A.D. 1502 observed many kinds of settlements ranging from small villages with houses scattered on hill tops amid forests to large towns in savannas and along rivers with gardens, closely packed houses, and small plazas. They attended the funerals of chiefs bedecked with finery, and honored with stone tablets and chants as befitted their prowess and position. They described fields of maize and manioc (or cassava), larders brimming with deer carcasses, and huge catches of fish hauled in with cotton and sisal nets. They fought against bands of warriors armed with spears and wooden sword-clubs. They were startled by the number of Native American languages that were spoken there (Columbus, 1988, pp. 101–103; Oviedo y Valdés, 1849, p. 235). Unbeknown to them, much—but not all—of this diversity derived from an ancient population, whose continual residence and in situ divergence on the land bridge spanned several millennia and is likely to have extended in some areas to the LGS.

Of course, many salient features of the pre-Columbian land bridge were patently *not* indigenous. Some social groups who settled at its northern edge during the last ~1400 years of the Precolumbian period brought with them languages and social behavior that had originated in Mesoamerica. Two crops that became the mainstays of regional subsistence—maize (*Zea mays*) and manioc (*Manihot esculenta*)—developed from their wild ancestors in continental foci, the former in southwestern Mexico and the latter in tropical South America before their ancient (ca. 7000 B.P.) dispersal across the land bridge (Iltis, 2000; Olsen and Schaal, 1999, 2001; Perry, 2002b; Piperno and Pearsall, 1998, pp. 120–126, 158–163). Archaeologists are at pains to explain not only when and how these and other domesticated plants arrived on and dispersed through the land bridge but also when and how pottery, metallurgy, lapidary work, and marine shell finery were transmitted since these technologies are demonstrably more ancient in Meso- and/or South America (Bray, 1992; Cooke and Sánchez, 2001; Garber *et al.*, 1993; Guerrero, 1988; Hoopes, 1994b; Oyuela, 1995; Pires-Ferreira, 1975; Snarskis, 1984, pp. 217–218). Although it has been claimed that some of these features were introduced by migratory people, who entered or crossed the isthmus by land or sea (Drolet, 1980, p. 331; Lathrap, 1977; Lundberg, 1977/1978; Willey, 1971, pp. 285–286), the "elusive" concept of diffusion (Sharer, 1984, p. 64) is more popularly seen as the principal mechanism for their dispersal and acceptance (Bray, 1984, pp. 324–327; Fonseca, 1997; Linné, 1929; Meggers, 1997).

The following summary assesses how the historical development of land-bridge Native American societies has responded to the dual modes of bridge and barrier. It looks at evidence for the continuity (or discontinuity) of social groups on the landscape, innovations in material culture, changes in subsistence, and shifting social interactions, inquiring whether the observed changes can most parsimoniously be explained in terms of local, regional, or continental peoples, events, and processes. It concentrates on three themes—*colonization*, *dispersal* and *divergence*. The third of these, particularly, is related to production and exchange (of food, everyday goods, valuables, and even people), as well as with conflict

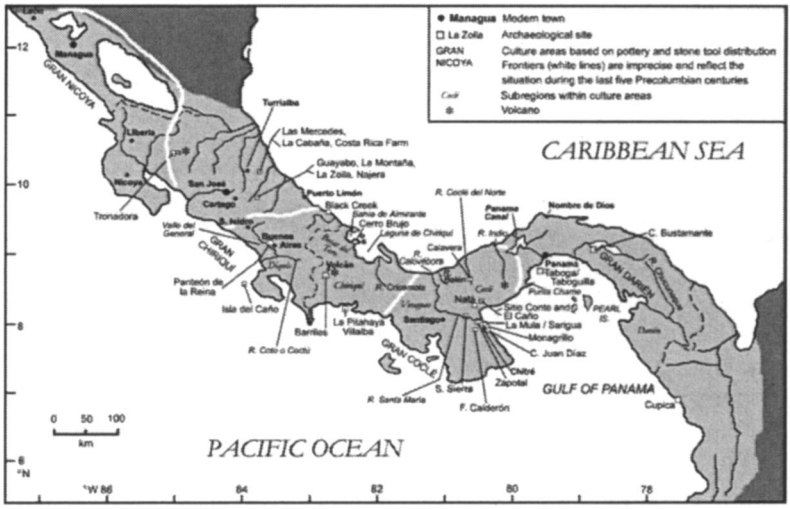

Fig. 2. The Central American land bridge, showing culture areas and archaeological sites.

and cooperation, another pervasive duality of land-bridge life that impressed the Spanish. "When they are not waging war," remarked Oviedo (1853, p. 140) "these natives [of Darién] spend their time making pacts with each other and bartering all their belongings."

Pre-Columbian dates are presented as radiocarbon years before present (B.P.). Specific ^{14}C dates are given in years B.P. followed by their B.C./A.D. calibrated 2σ range and intercept. (Calibrations were provided by Darden Hood [Beta Analytic].) I use brief names for sites (i.e., Aguadulce and Vampiros instead of 'the Aguadulce Shelter' and 'Cueva de los Vampiros') (Figs. 1 and 2).

MIGRATIONS, FOREIGN INFLUENCES, AND LOCAL DEVELOPMENT

Even respected archaeologists have proposed fanciful *Volkerwänderung* to explain culture change on the pre-Columbian land bridge. For example, Uhle (1924) attributed the Gran Coclé polychrome pottery tradition of central Panama (Sánchez, 2000) to the Maya, Lothrop (1942a, p. 258) to wanderers from South America, and Ichon (1980, pp. 314–325) to warriors from Colombia or Ecuador. Jijón y Caamaño (1943), Kidder (1940, p. 458), and Mason (1940, p. 76) popularized the idea among archaeologists that recent immigrants brought Chibchan languages from continental Colombia (*see also* Kirk and McDermid, 1974). Snarskis (1981, p. 84) related certain cultural changes in central Costa Rica to the

"apparent intromission ca. A.D. 500–700 of foreign (probably southern) *peoples* and tradition" (my emphasis). Less dramatic models envisage pre-Columbian culture history as a waxing and waning of influences from north and south as though the land bridge were solely an appendage to or derivation of continental cultures (Baudez, 1970; Baudez *et al.*, 1993, p. 1; Snarskis, 1984, pp. 204–206, 220; Stone, 1977, pp. 174–184; Willey, 1971, pp. 259–260).

In contrast, some of the earliest writings influenced by Boasian paradigms proposed that, in spite of the colonial experience, some present-day Native American peoples of the land bridge and those responsible for precontact cultures represented a historical continuum (Holmes, 1888; Joyce, 1916, pp. 90–152). This direct historical approach, which, simply put, means working back into prehistoric time from a documented historic culture (Willey and Sabloff, 1974, p. 114), was accepted by cultural ecologist Julian Steward (even though his example of deculturation between a pre-Columbian archaeological culture—Coclé—and a postcontact ethnia—the Kuna—was ill-chosen) (Linares, 1977b, pp. 78–79; Steward and Faron, 1959, pp. 224–300). It has been invigorated over the last 20 years by the growing—and much more effective—collaboration between archaeologists and the practitioners of other historical disciplines, i.e., paleoecologists, human population geneticists, and historical linguists.

Since World War II, the provision of settlement pattern data derived from systematic pedestrian surveys of particular regions or macrogeographical features and of long regional artifact sequences supported by ^{14}C dates has acted as a palliative to hypotheses that appeal to external populations, ideologies, and technologies as catalysts for culture change. For example, many researchers now propose that the gradual divergence in time and space of ceramics from more widely spread and more simple predecessors is a robust confirmation of autochthonous regional development's being a powerful conditioner of specific sociocultural trajectories on the land bridge (Corrales, 2000; Hoopes, 1992a, 1994b; Linares, 1980f; Sánchez and Cooke, 2000). Lithic studies, which in the Arenal region of Costa Rica and in central Panama cover materials that extend back into the LGS, have led to similar proposals (Ranere and Cooke, 1996; Sheets, 1994a, p. 252). The terms "conservative," "stable," "indigenous phenomena," "strong local traditions," and "resistant to change ... and external influences" are applied to the relevant artifact sequences (Bray, 1984, pp. 308–309; Hoopes, 1992a, pp. 70–73; Lange 1984b, p. 191; Lange *et al.*, 1992, p. 278; Sheets, 1992, p. 33, 1994b, p. 325).

Paleoecological studies, which have proliferated in the neotropics since the 1960s, have enabled researchers to reconstruct the impact of human settlement and agriculture on the vegetation of a growing number of watersheds along the land bridge. Some of these records can be compared with material culture, settlement patterns, and data about plant and animal usage obtained by archaeologists in the same areas, e.g., central Pacific Panama (Piperno and Pearsall,

1998), southeastern Costa Rica (Horn and Kennedy, 2000; Northrop and Horn, 1996), and highland Chiriquí (Behling, 2000). Other paleoecological records refer to areas whose archaeology has been poorly or never studied, e.g., the central Caribbean of Panama (Piperno, 1985, 1988, pp. 202–210), the narrow plateau that extends westwards from Panama City to Punta Chame (Piperno and Jones, 2003), the Colombian Chocó (Berrío *et al.*, 2000), and the eastern Darién (Bush and Colinvaux, 1994; Catat, 1889; Piperno, 1994). People lived in one Panamanian watershed (La Yeguada) continually from ~11,000 B.P. until the Spanish settlement of the central highlands around A.D. 1550 (Castillero, 1994; Cooke, 1993) after which forest regrowth over a millennially impacted landscape is paleoecologically striking (Piperno and Pearsall, 1998, Fig. 5.8).

The direct historical approach also has benefited from research projects that address the phylogeny of *surviving* Native American tribes on the land bridge. Ten modern Native American polities, as well as five whose postcontact language loss has been documented (Huétar, Dorasque, Chánguena, 'Muoi,' and 'Cueva') (Constenla, 1991, pp. 31, 47; Pinart, 1882, pp. 1–3; Romoli, 1987, pp. 69–91), speak (or spoke) languages that Constenla (1991, pp. 15–46) assigns to two groupings, themselves more historically related in deeper time to each other than to neighboring language families: the Chibchan stock of the Chibcha-Paya phylum (henceforth Chibchan) and the Chocoan family. Historical linguistics, human population genetics, ethnohistory, and ethnopharmacology concur that present-day Chibchan polities exemplify an ancient population stretched along a narrow, environmentally diverse corridor (Arias, 2003; Barrantes, 1993; Barrantes *et al.*, 1990; Batista *et al.*, 1995; Kolman *et al.*, 1995; Thompson *et al.*, 1992; Torroni *et al.*, 1993, 1994). Their fissioning and fusing is envisaged as having taken place in or near the regions they now occupy (southern Nicaragua to northwestern Colombia). Their low mtDNA diversity alludes to population bottlenecks that were conditioned not only by the effects of Spanish conquest but also by precontact processes related to earlier divergence, i.e., small founder population size, social and physical isolation, and genetic drift (Batista *et al.*, 1995; Kolman and Bermingham, 1997). Private polymorphisms among geographically contiguous groups that speak recently diverged languages (e.g., the Ngöbé and Buglé) show that fissioning could lead to effective social barriers between populations with a common ancestry—sufficiently long-lived, it seems, to have extended well into pre-Columbian time (Barrantes, 1993, pp. 111–176; Kolman and Bermingham, 1997; Layrisse *et al.*, 1995). This argues against the notion that Spanish conquest disrupted pre-Columbian societies so much that present-day tribes, i.e., the Kuna, are postcontact hybrids (Stier, 1979).

A recent study compared divergence in pottery styles in Costa Rica and Panama with the phylogeny of resident present-day Chibchans (Corrales, 2000). Another assessed a regional archaeological sequence in the context of the fissioning, dispersals, and adaptive radiations of the 'Guaymí' (Buglé and Ngöbé) of

western Panama and their purported prehistoric forebears (Linares, 1977a, 1980a; Linares *et al.*, 1975; c.f. Flannery and Marcus, 1983).

The Chocoan Emberá and Waunáan, residents today of eastern Panama and northwestern Colombia, were once thought to have trans-Andean affiliations with the 'Carib' and Kayapo (Kirk and McDermid, 1974; Rivet, 1943/1944). More recent studies indicate that they, too, represent an ancient population centered on the Atrato/San Juan trench and adjacent parts of the western cordillera of Colombia (Arias, 2003; Constenla and Margery, 1991; Jorge-Nebert *et al.*, 2002; Salzano and Callegari-Jacques, 1988). Like the Chibchan Kuna, they have moved westward across the Darién and San Blas in the wake of the extinction of the precontact Cuevan polity and of Spanish withdrawal in the face of native resistance (Herlihy, 1997; Romoli, 1987, pp. 23–24, 50–55; Wassén, 1963).

Although the Chocoans' divergence from Chibchans occurred longer ago than current estimates for major divergence within the former (Kaufman, 1990; Kolman and Bermingham, 1997), distinctions among polities that speak languages assigned to each of these groupings are weaker than formerly believed. For example, sampled modern Waunáan populations lack or have very low frequencies of the Diego (Di^a) antigen, considered a typical Chibchan genetic trait (Arias, 2003; Barrantes *et al.*, 1990; Layrisse *et al.*, 1995). People who spoke Chocoan languages probably resided in eastern Panama at contact. A short vocabulary of the Cueva "language" contains a few words cognate with modern Kuna, and more with parallels in contemporary Waunáan (Constenla, 1991, p. 45, 1995, p. 23; Loewen, 1963, p. 245; Romoli, 1987, Table 5).

At the northern edge of the land bridge (around the Nicaraguan lakes and in the Tempisque Valley) the situation was quite different. People who spoke languages belonging to three Mesoamerican families—Chorotega (Mangue), Subtiaba (Tlapanec), and Nicarao (Nahua) (Constenla, 1994)—settled here during the final pre-Columbian millennium. Their incursions—well documented ethnohistorically and historically, but difficult to date precisely—responded to complex demographic and political events in Mesoamerica and its periphery (Abel-Vidor, 1981; Fowler, 1989, pp. 34–70; Healy, 1980, pp. 19–34). Some specialists underline these immigrants' lack of important Mesoamerican cultural traits and play down their Mesoamericanization of local cultures (Lange, 1993; Lange *et al.*, 1992). Archaeology, ethnohistory, and linguistics, however, elucidate their history and social behavior with different emphases (Fowler, 1989, pp. 131–151, 227–248). Ideograms painted on the region's brightly colored polychromes are derived from Mesoamerican religion (Day, 1984, pp. 103–117, 144–152; Healy, 1980, p. 236), however diluted or meaningless they became through time (Lange, 1971, p. 231; Lange *et al.*, 1992, pp. 271–272).

Sixteenth century A.D. documents also refer to "Mexican" trading colonies located at or just after contact down the Caribbean coast of Costa Rica and Panama as far as Nombre de Dios (Jopling, 1994, p. 32; Lothrop, 1926, I, p. 10; Torquemada

1969, I, p. 333). Although their ethnic identification is debatable, postcontact folk memories suggest that some of them were involved with expanding Aztec and Maya trade interests in the area (Fernández, 1886, pp. 235–237; Healy, 1980, p. 23; Lothrop, 1942b; Pinart, 1900).

PASSAGE, SETTLEMENT, AND THE BEGINNINGS OF PLANT CULTIVATION (LGS—7000 B.P.)

Since it is unlikely that the first human immigrants into South America skipped the land bridge by making direct sea crossings (Dillehay, 2000, p. 61), the antiquity and paleogeography of the earliest human occupation is important for understanding the timing and nature of human dispersals into this continent. The narrowness of the isthmus enhances its appropriateness for addressing a fundamental question in current debates: coastal versus inland migrations and their accompanying subsistence orientations (Dillehay, 2000; Keefer *et al.*, 1998; Sandweiss *et al.*, 1998).

People probably first entered the land bridge early in the LGS. Two surface-collected Jobo-like projectile point fragments were found inland near the Continental Divide (La Yeguada [Pearson, 2002, Fig. 38c] and Lake Alajuela [Ranere and Cooke, 2003, Fig. 5d]). I predict from Venezuelan evidence (Cooke, 1998b; Jaimes, 1999) that future investigations will confirm this tenuous indication of a proto-Archaic and pre-Clovis presence (*sensu* Dillehay, 2000, pp. 8, 128–133).

Evidence is more widespread for Paleoindians—hunter-gatherers who lived approximately 11,500–10,000 B.P., made fluted projectile points, and hunted large extinct animals (Haynes, 1992; Politis, 1991; Ranere, 2000). Even so, few buried ^{14}C-dated deposits are known, and human-fauna associations have eluded archaeologists. At Vampiros (central Pacific Panama), there are no indications of a human presence in sediments deposited between 15, 190 ± 60 B.P. (16,640 [16,210] 15,820 cal B.C.) and a thin occupation floor with a bulk sediment date of 11, 550 ± 140 B.P. (12,080–11,980 [11,520] 11,950–11,200 cal B.C.). In soils deposited over this floor and beneath a charcoal date of 8970 ± 40 B.P. (8260 [8230] 8200 cal B.C.) Pearson and his team found overshoot flakes typical of Clovis reduction techniques (c.f. Ranere, 2000, Fig. 3c–f), a spurred end scraper, a thumbnail scraper, and a fluted bifacial point blade similar to South American fishtail fluted points (Pearson, 2002, pp. 67–71; Pearson and Cooke, 2002). Thinning flakes with technical details typical of Paleoindian bifacial point manufacture were found stratified in the basal deposits of Corona and Aguadulce (central Pacific Panama) dated at the former site to 10, 440 ± 650 B.P. (11,750 [10,400] 8090 cal B.C.) and at the latter to 10, 675 ± 95 B.P. (cal B.C. 10,869–10,408) and 10, 529 ± 284 B.P. (cal B.C. 10,700–10,263) (Cooke and Ranere, 1992b; Piperno *et al.*, 1991, 2000).

These archaeological finds overlap at 2σ with a *categoric* signal for sudden human activities in the oak-ilex forests around Lake La Yeguada ~11,000 B.P., where, as at Vampiros, there is no evidence for human activities during the previous 3000 years (Piperno and Pearsall, 1998, pp. 175–179). They also are coeval with North and Central American archaeological sites where stone tools of the Clovis tradition were used (Cooke, 1998b; Gruhn *et al.*, 1977; Ranere and Cooke, 2003). Pedestrian surveys around the La Yeguada lakeshore identified stone tools characteristic of Clovis and slightly later assemblages (i.e., a fluted Elvira point) (Cooke and Ranere, 1992c, pp. 252–262, Fig. 2; Gnecco and Mohammed, 1994; Pearson, 1999a,b). Evidence for the *production* of Clovis fluted points and other stone tools comes from three sites: La Mula-West and Sitio Nieto (central Pacific Panama), whose industries are uniquely Clovis, and Turrialba (Caribbean Costa Rica), which includes Clovis-like materials and later assemblages (Cooke and Ranere, 1992c, Figs. 4 and 5; Pearson, 1998, 2003; Ranere, 2000, pp. 114–119). Ranere and Pearson propose that technical details exhibited by tools and workshop debris at La Mula-West and Sitio Nieto point towards early Clovis. A date of 11, 300 ± 250 B.P. (11,910–10,880 [11,230] 10,770–10,710 cal B.C.) was obtained in the 1960s for a hearth, without tools, found on the high tidal flat where the La Mula-West site is located (Crusoe and Felton, 1974).

Lake and bog sediment analyses from the land bridge are consistent with paleonvironmental reconstructions from elsewhere in the neotropics, which point towards significantly diminished rainfall, sea and land temperatures, and atmospheric CO_2 (vis-à-vis present values), and a concomitant altitudinal depression of vegetation zones until the onset of warming conditions (10,000–8,500 B.P.). Worldwide LGS climatic oscillations (e.g., Younger Dryas) are detectable above 3000 m in the pollen record, but not at lower elevations (Bush and Colinvaux, 1990; Hooghiemstra *et al.*, 1992; Islebe and Hooghiemstra, 1997; Islebe *et al.*, 1995; Leyden, 1995; Piperno and Pearsall, 1998, pp. 104–105; Piperno and Jones, 2003). However, since paleoceanographic studies of the Cariaco Basin of Venezuela show a 3–4° reduction of sea surface temperatures and increasing trade wind velocity during the Younger Dryas, this chron presumably exerted some influence on lowland climate along the land bridge (Hughen *et al.*, 1996; Lea *et al.*, 2003). A reversal of sea level rise during at this time would be significant for the location of human activities in now submerged coastal areas.[2]

Paleoindian tools occur in Central America in several paleobiomes including *páramo* in Guatemala (Gruhn *et al.*, 1977; Piperno and Pearsall, 1998, Fig. 4.1; Ranere and Cooke, 2003). Paleoecological evidence for a late Pleistocene grassy savanna's replacement by a Holocene mesic forest has been acquired at a lowland

[2] A Paleoindian bifacial point blade was dredged in 1963 from marine sediments at '40–50 feet' near Balboa at the Pacific entrance to the Panama Canal (Bird and Cooke, 1978b, Fig. 2b).

Pacific-side lake in Panama (Monte Oscuro) (Piperno and Jones, 2003). It is harmonious with sediment core data for extensive open LGS habitats in Guatemala and Venezuela (Curtis *et al.*, 1999; Leyden, 1995; Leyden *et al.*, 1993). By extrapolation from these and other records Paleoindian sites in northwest Costa Rica and central Panama would have been located in xeric open or scrubby habitats conducive to rapid movements of hunter-gatherer bands (Lynch, 1983). Sites of Paleoindian age near Parita and Panama Bays would have been considerably farther from the coastline than they are today as sea levels had not yet covered the gently sloping marine platform. Other sites located in areas above 500–700 m or in lowlands with an annual precipitation >1500 mm would have been situated within forests (e.g., Turrialba, La Yeguada, Lake Alajuela, and Bahía Gloria) (Correal, 1983; Ranere and Cooke, 2003; Snarskis, 1979). These would have been floristically different from modern forests, however, not only because the LGS climate was cooler and drier, but also because megamammals foraged in them (Janzen and Martin, 1982; Owen-Smith, 1987; Piperno and Pearsall, 1998, p. 171). If trade-wind velocity increased during the Younger Dryas (Hughen *et al.*, 1996), Caribbean slopes would have been considerably more moist that Pacific-side ones. Gomphotheres, horse, and ground sloths were present on the late Pleistocene land bridge (Alvarado, 1994; Pearson, 2002, in press; Webb, 1997). Although they have not yet been found with human cultural remains, they were hunted in Colombia and Venezuela during Paleoindian times and before (Correal, 1981; Dillehay, 2000, pp. 157–160; Jaimes, 1999; Oschenius and Gruhn, 1979).

In sum, temporal control for initial human passage through and colonization of the land bridge is slowly improving but is still too imperfect to add supportive data for alternative hypotheses, i.e., (1) the *sequential development* of LGS lithic traditions (El Jobo → Clovis → fishtail points) versus (2) the total or partial *synchrony* of these and other traditions reflecting, perhaps, different subsistence strategies and bands with dissimilar cultural origins (Dillehay, 2000). Neither is it possible to distinguish at the Clovis time period between (1) a directional movement of a culturally homogeneous population (i.e., a Clovis people moving quickly from North into South America) and (2) constant exchange of technological information among widespread, culturally heterogeneous, but highly mobile bands (a Clovis technological horizon).

Continuity after Climate Change?

The hypothesis that people remained on the land bridge during and after Holocene climatic and geomorphological changes receives strongest support from the long paleoenvironmental record at La Yeguada where human disturbance intensified at a time when rainfall was increasing (Piperno and Pearsall, 1998, pp.

175–179). Archaeological data that support continuity between LGS and early Holocene populations are restricted to highland Costa Rica and central Panama. Stone tools that would be classified as Archaic (i.e., tanged and stemmed, unfluted projectile points, and *limace* scrapers) in other areas of the Americas are scarce but widespread where intensive foot surveys have been conducted (Acuña, 2000; Cooke and Ranere, 1992c, fig. 6; Pearson, 1999a,b; Ranere and Cooke, 1991, pp. 248–249, 1996, Figs. 3.4 and 3.5; Sheets, 1994a, pp. 233–234; Snarskis, 1984, p.197). These kinds of artifacts, as well as thinning flakes derived from bifacial point manufacture, are present in five central Panama rockshelters whose occupations date from 10,500 to 7000 B.P. (Figure 1; Pearson, 2002; Piperno *et al.*, 2000; Ranere and Cooke, 1996). The demise of the bifacial reduction of chalcedony alludes to the phasing out of hunting animals with stone-tipped spears and, presumably, spear-throwers. By ~7000 B.P., bifacial tools wrought in silica-rich stone vanished from the land-bridge record, to be reintroduced after ~2000 B.P. in the Costa Rican *cordillera* but not, as far as we know, farther south (Ranere and Cooke, 1996; Sheets, 1994a, p. 234).[3]

Currently, the antiquity, nature, and dispersal of domesticated plants in both Old and New World tropics and of the meaning and evolutionary and historical relevance of concepts such as cultivation, horticulture, and agriculture are being reassessed in the light of paleoecological research, improving techniques for identifying plant remains taxonomically *and* developmentally, and increasingly sophisticated studies of the genetic history of cultigens and their wild forebears (Harris, ed., 1996; Pringle, 1998; Piperno and Pearsall, 1998; Rindos, 1984; Smith, 1998, 2001b). It is clear that domesticated plants were incorporated into many tropical subsistence systems not long after Holocene climatic changes set in. In some areas cultivation led to genetic and ecological modifications of cultigens, and to levels of forest clearance that can best be described as agricultural, well before the introduction of aspects of material culture that traditionally have been considered *sine qua non* of farmers, such as polished stone axes and pottery (Denham *et al.*, 2003; Piperno and Flannery, 2001; Piperno and Pearsall, 1998, pp. 175–182; Pohl *et al.*, 1996; Pope *et al.*, 2001).

Since most (but not necessarily all) of the 100 or so pre-Columbian cultigens were domesticated in Middle and South America and since some of these can be traced to specific geographical areas on these continents (Harlan, 1992), data from the land bridge are important for understanding when and how they dispersed north and south. Multiproxy analyses of archaeological soils and stone tools

[3]Julia Mayo (2004) reports small bifacially chipped wedges from a workshop used to prepare shell beads at Cerro Juan Díaz (1400 B.P.). After ~1000 B.P., pointed tools with three faces were produced in central and western Panama. In illustrations (e.g., Einhaus, 1980, Fig. 15/4; Ranere and Cooke, 1996, Fig. 3.9) they *appear* bifacial, but they are not. The Talamanca tradition of western Panama (6800–4300 B.P.) produced bifacial wedges and axelike tools in *basalts* and *andesites* (Ranere, 1980c, Fig. 8/4). These may be prototypes for later *polished* axes made out of the same materials.

dated between 9000 and 7000 B.P. at three central Panamanian sites (Carabalí, Vampiros, and Aguadulce) indicate that bottle gourd (*Lagenaria siceraria*), arrowroot (*Maranta arundinacea*), *lerén* (*Calathea allouia*), and a squash (probably *Cucurbita moschata*) were cultivated during this period. The bottle gourd is of African origin, but it is not known whether its presumably seaborne dispersal to America occurred before humans arrived on this continent (Sauer, 1993, pp. 51–53). The botanical and ecological reasons for their being *domesticated* by 7000 B.P. have been amply discussed (Piperno, 1998, in press; Piperno *et al.*, 2000a; Piperno and Holst, 1998; Piperno and Pearsall, 1998, pp. 213–217; Piperno *et al.*, 2000b; Sanjur *et al.*, 2002). Since the three sites mentioned above are located in an area that today receives less than 1500 mm annually and has 4–5 month dry seasons, these paleobotanical data accord with substantial molecular, ecological, and hybridization evidence, which indicates that wild ancestors of many important lowland tropical crop plants are native to *seasonally dry* and never *humid* tropical forests (Piperno, in press). They also are consistent with the hypothesis that the scarcity, low productivity, and scattered distributions of wild carbohydrate resources in un- or minimally impacted Neotropical dry forests stimulated early food production (Piperno, 1989, in press; Piperno and Pearsall, 1998, pp. 55–61). Some carbonized remains of tree products also were recorded at Aguadulce and Carabalí: palm nuts (*Attalea*, *Elaeis*, *Acrocomia*), nance (*Byrsonima*), and zapote fruits (Sapotaceae) (Cooke and Ranere, 1992b). Ostensibly, this situation is consistent with "small-scale cultivation of gardens in which there are as many wild species as domesticated ones"—Harris's (1989, p. 20) definition for horticulture—and with Smith's (2001a) concept of low-level food production. Even so, the decline of tree cover and the corresponding increase in secondary tree taxa that can be inferred from the La Yeguada record between 11,000 and 7000 B.P. shows that, by the latter date, human activities in this watershed were of a sufficiently large scale to have effectively curtailed forest regrowth. The distinction between a wild and cultivated state in the aforementioned tree taxa is, besides, a subtle one. The rareness of *Acrocomia* in established Panamanian forests suggests that this widespread palm entered the land bridge as an allochthonous domesticate (Janzen, 1983; Piperno, 1989). C. E. Smith (1980) identified human selection for increasing fruit size through time at archaeological sites in Chiriquí (western Panama).

In sum, when paleoecological and archaeological data are assessed together, a good case can be made for the continual occupation of the seasonally arid central Pacific plains and foothills of Panama between the LGS and 7000 B.P. Certain details of the stone tool inventory allude to the cultural transformations of a resident population, which began to add cultivated plants to wild food resources after 9000 B.P. In northern and central Costa Rica, there also is evidence for continuity of populations although this area lacks the support of vegetation history.

AGRICULTURE, DISPERSALS, AND FARMER/FORAGER INTERFACES (7000–2500 B.P.)

If plant domestication and cultivation began in the neotropics in areas with a well-defined dry season, one would predict that farmers moved into moister environments later in time as a consequence of land shortage and declining soil fertility and in tandem with gradual adaptations of the plant foods to human manipulation and transport (Hansell and Ranere, 1997; Linares *et al.*, 1975). In the lower Chagres Valley—where today there is a short, sharp dry season—Caribbean forests began to be felled and burnt approximately 5000–4000 B.P. (Bartlett and Barghoorn, 1973; Bartlett *et al.*, 1969; Piperno, 1985, 1988, pp. 208–209). In the eastern Darién (Cana, upper Tuyra Valley), forest clearing with fire is apparent in sediment cores by the time the sampled lakes began to fill with water (~4000 B.P.). The high concentrations of maize pollen here suggest that, as at La Yeguada, this crop was intentionally planted at the lake edge at the beginning of the dry season (Bush and Colinvaux, 1994; Piperno, 1994; Piperno and Pearsall, 1998, p. 226). The paucity of archaeological data prevents an assessment of the cultural affiliations of the people who moved into these wetter forests.

Sediments from La Yeguada dated to 5860 B.P. contain pollen of a size (>90 microns in length) that unequivocally belong to maize. A single *Cucurbita* phytolith "probably from a cultivated species" dates to ~6000 B.P. (Piperno and Pearsall, 1998, p. 225). Maize, manioc, squash (*Cucurbita*), yam (*Dioscorea* sp.), and possibly bean (*Phaseolus*) occur as plant microfossils in late preceramic (7000–4500 B.P.) middens at nearby Aguadulce and on stone tools stratified within them. Maize and arrowroot were cultivated on the hillslopes near Ladrones and maize near Los Santanas during this period. In preceramic deposits dated to shortly before 7000 B.P. at Aguadulce, Piperno found phytoliths that originated from the cobs of a primitive maize race that probably possessed harder (more lignified) glumes than typically found in extant maize varieties. Phytoliths also suggest a change from harder- to softer-glumed maize varieties, and possibly smaller-glumed strains, shortly after 7000 B.P. Such changes would have made maize easier to process. Starch grain evidence indicates that maize was being *ground* at this site by ~7000 B.P. (Piperno, 1993, 2001; Piperno and Pearsall, 1998, pp. 209–227, 221–225, 286–297; Piperno *et al.*, 2000b; Piperno and Holst, 1998).

How maize, manioc, and *moschata* squash, which were domesticated outside the isthmus (Iltis, 2000; Nee, 1990; Olsen and Schaal, 1999; Sanjur *et al.*, 2002), were originally acquired is an unanswerable question: down-the-line contact among contiguous populations settled in savannas and dry forest edges, *and already accustomed to plant husbandry*, accords better with the available data than do human diasporae from continental areas by land or sea (Drolet, 1980; Lathrap, 1977; Ranere and Cooke, 1996, p. 73), although, in theory, these could have occurred.

In this part of central Panama, most sites that correspond to the late preceramic period (7000–4500 B.P.) are located on the Pacific slopes >15 km from the coast and generally on spurs near streams and rivers (Cooke and Ranere, 1992b,c; Weiland, 1984). (Holocene sedimentation skews site distributions in favor of hillslopes and against river bottoms.) The geography of this area, however, makes it easy for the same population to take advantage of the resources of rainfall farming (definitely a seasonal activity) with palm nut and (May–August) nance fruit collection, hunting (mostly deer), fishing in rivers and estuaries, and gathering shellfish and crabs. Frankly, current data cannot distinguish between (1) an annual subsistence round that contemplated the seasonal occupation of coastal sites like Cerro Mangote and hillslope ones like Aguadulce and Ladrones by the same social groups (cf. Voorhies *et al.*, 2002), and (2) the exchange of habitat-specific resources among a dispersed, relatively sedentary but socially integrated population (Cooke, 1984; McGimsey, 1956; McGimsey *et al.*, 1986/1987; Ranere and Hansell, 1978). Archaeozoological research has documented not only the variety and abundance of littoral vertebrates and invertebrates, which were available to the region's inhabitants after 7000 B.P. as postglacial sea-level rise dropped off (Clary *et al.*, 1984), but also the inland and transcordilleran transport of shellfish and—during the subsequent early ceramic period (4500–2500 B.P.)—small estuarine fish (Cooke, 1995; Cooke *et al.*, in press; Cooke and Ranere, 1992a,c, 1999; Hansell, 1979; Jiménez and Cooke, 2001; Ranere and Hansell, 1978). Long windy dry seasons around Parita Bay are ideal for salting and drying shrimp, fish, and meat (Zohar and Cooke, 1997). The distribution and sizes of fish species present in preceramic and early ceramic middens, as well as the total absence of fishing implements, are consistent with the use of barrier traps in intertidal zones, which capture large biomasses of aquatic organisms (Cooke, 2001b; Cooke and Tapia, 1994), even though field evidence for them has not been found. The narrowness of the isthmus, the productivity of its coasts, and the ease with which foods can be conserved and transported inland have obvious implications for the dietary well-being of land-bridge farming communities throughout prehistory (cf. Linares, 1980a, p. 246).

Pottery and Culture Change

By 4000 B.P. pottery had appeared in the land-bridge cultural record, represented by two geographically disjunct and, in my opinion, very different traditions: Monagrillo in central Panama (4500–3200 B.P.) (Cooke, 1995; Willey and McGimsey, 1954) and Early Tronadora in northwest Costa Rica (4000–2500 B.P.) (Hoopes, 1994a,c). It cannot be demonstrated that Monagrillo was derived from coeval pottery complexes in South America (*contra* Fonseca, 1997; Meggers,

1997; Willey, 1971). It has not been found east of the El Valle massif.[4] Neither has it been recorded along the western Azuero and Chiriquí coasts, which were quite intensively surveyed in the 1960s (Linares de Sapir, 1968; Ranere, 1968). It is *not* restricted to coastal habitats (*contra* Willey, 1971; Willey and McGimsey, 1954) having been found at sites in the *cordillera central* and in the very humid headwaters of the River Coclé del Norte where, at Calavera, Monagrillo sherds were associated with carbonized balsam (*Humiriastrum daguense*) seeds dated between 3450 ± 40 B.P. and 3150 ± 50 B.P. (four dates, 2σ range: cal B.C. 1770–1395) (Cooke, 1995; Griggs, 1998). The farmers responsible for cutting and burning the Chagres valley forests probably used this kind of pottery.

Hoopes (1995) and Pratt (1999) have argued that people adopted pottery in Central America and northern South America because they were changing the ways in which they prepared, shared, and stored foods and liquids. The increasing difficulty of providing sufficient plant containers, such as gourds (*Lagenaria*, *Crescentia*), at the right moment in an increasingly populated landscape may be relevant. Wherever it is found, Monagrillo pottery looks like a first attempt to make clay pots. Its scarce decorations are not ideographically impressive (cf. Pratt, 1999). Petrographic analyses suggest it was an expedient item made with locally available clays (Griggs, personal communication, 2003). Its appearance was not accompanied by notable changes in the stone tool inventory (Cooke and Ranere, 1992b; Ranere and Cooke, 1996).

Differences in human population size with respect to the late preceramic, which might reflect the demographic repercussions of more productive food plants, are difficult to assess away from the coast. Along the Parita Bay littoral, however, early ceramic sites are more frequent and also larger than late preceramic ones (Cooke and Ranere, 1992c). Debris at the Monagrillo coastal shellmound covers 14,000 m^2 (Willey and McGimsey, 1954), which, to use Curet's (1998) estimates, points to a maximum population of ~200 people. With a size of about 1750 m^2, preceramic Cerro Mangote (7000–5000 B.P.) would have been occupied by 30 odd people. The inhabitants of the Monagrillo shellmound (4400–3200 B.P.) consumed maize, manioc, and palm fruits, and, to judge from large numbers of grinding stones, in considerable quantities (Piperno and Holst, 1998; Willey and McGimsey, 1954). Whether they actually *grew* these crops in the coastal environment of the time or acquired them from other communities cannot be demonstrated. Occupation debris at another early ceramic coastal site, Zapotal (2345–1255 cal B.C.), covered 30,000 m^2, suggesting a maximum population of ~500. Edge-ground cobbles cached alongside an oval or circular structure here

[4]Food carbon residues from four sherds found at Cueva Bustamante (R. Majecito, east Panama) (Figure 2), formerly assigned to the *Monagrillo* style (Cooke and Ranere, 1992c, p. 270) returned dates between 690 ± 40 B.P. and 420 ± 40 B.P. [cal A.D. 1310–1620]) (*contra* Cooke and Ranere [1992c, p. 270]).

(Cooke and Ranere, 1992c, p. 273) recall a larger pile of grinding stones found at the village of Real Alto, Ecuador (Piperno and Pearsall, 1998, Plate 5.2). Only décapage excavations, however, will enable archaeologists to estimate how much of the living space in these apparent villages was actually occupied at a given time.

Hoopes' proposal (1987, p. 507, 1992a, p. 70) that Early Tronadora is the earliest variant of a northern pottery tradition (approximately 4500–2500 B.P.), which extended from the lake district of Nicaragua to the central Costa Rican highlands and adjacent Caribbean slopes, has been substantiated and typologically modified by Corrales (2000, pp. 159–160), who proposed the contemporaneity of this style with five others.[5] Early Tronadora pottery does not look like a first attempt but rather a development from earlier, as yet unidentified antecedents. Sheets' research team found evidence for round pole-and-thatch structures at Tronadora Vieja (G-163), which they interpret as a "small sedentary village." The earliest structure was stratified under tephra from an eruption of the Arenal volcano at ~3800 B.P. (Bradley, 1994; Sheets, 1994b, pp. 314–315). Maize was ground here on metates with legs (rather than crude milling bases). Kernels and cupule fragments recovered from three hearths represent the earliest *carbonized* maize fragments from the land bridge (3330–2930 cal B.C.) (Mahaney *et al.*, 1994, pp. 305–306).

In Panama west of the Santa María drainage where Monagrillo pottery was produced, either the chronology of the earliest ceramics has not been elucidated, or pottery entered this region from elsewhere (Costa Rica?). Ranere (1980a, p. 28) did not record pottery in Río Chiriquí rockshelters until 2450–2150 B.P. In the fertile valleys of Cerro Punta and El Hato, on the western slopes of the recently active Barú volcano, there is no sign of human occupation, either in the paleoecological or archaeological records, until after 3000 B.P. Three primary hypotheses for human dispersals into this cool and humid region and Caribbean forests beyond it derived from the Linares-Ranere project in western Panama: (1) maize farming, having originated in the seasonally dry Pacific foothills and plains of western Panama and/or adjacent Costa Rica, did not expand into montane forests above 1500 m until the end of the millennium 3000–2000 B.P. when its appearance appears to have been sudden; (2) the permanent settlement of the perennially humid Caribbean forests was not achieved until ~1500 B.P., when farmers from the cordillera moved down to the coast (partially in response to second of three eruptions of the Barú volcano) (*see also* Behling, 2000); and (3) Caribbean populations subsequently underwent an adaptive radiation distinct from that of coeval and ancestral populations on the Pacific side *although they maintained strong social ties with them* (Linares, 1977a, 1980a,c,e; Linares *et al.*, 1975).

Behling's (2000) pollen record from the Volcán lakes in the lower of the two basins studied by Linares' team is consistent with archaeological data. The fact

[5]Dinarte, La Pochota, Chaparrón, Barva, and Los Sueños.

that it identifies "strong human impacts on the landscape by clearance and the use of fire" after ~2860 B.P., however, vouches for an earlier immigration than the one proposed by Linares and also would explain some dates that formerly seemed anomalously early (Linares, 1980f, p. 109; Linares and Sheets, 1980; Linares *et al.*, 1975; Shelton, 1984). The fact that clear signs of extensive agriculture with maize are apparent after ~3240 B.P. at Laguna Zoncho, located 30 km southwest of Volcán (Clement and Horn, 2001), conforms with the hypothesis that slash-and-burn agriculture in the cordillera became possible only after maize races had acquired physiological adaptations to cool moist climates (Galinat, 1980; Linares, 1977a; Linares *et al.*, 1975). It also is harmonious with Corrales' (2000) proposal of an early nucleus of farmers located in the Valle del General and Térraba-Sierpe watersheds of Costa Rica, whose southern early pottery tradition is modally distinct from the coeval northern tradition.[6] Black Creek pottery from the southern Caribbean coastal plain of Costa Rica was in place between 3440 ± 40 B.P. and 2580 ± 40 B.P. (1880–590 cal B.C.) (Baldi, 2001), indicating that some stretches of the humid Atlantic Coast were settled long before the forests on the isolated Aguacate Peninsula (Bocas del Toro) where Linares (1980c,e,f) did not detect archaeological sites older than ~1400 B.P. Northrop and Horn (1996) propose that a disturbance horizon identifiable in sediments from Lake Bonillita ~2560 B.P. represents a first incursion of maize-using farmers into the upper (Caribbean) Reventazón Valley. Further north, in the coastal lowlands, a similar farming horizon is visible at La Selva ~2700 B.P. (Horn and Kennedy, 2000). These movements correlate with the distribution of the La Montaña ceramic style, which is coeval with Black Creek and is also a member of Corrales' southern pottery tradition.

Ovate grinding stones accompany the La Montaña pottery (Snarskis, 1984, Fig. 8.3 n–p). They seem more appropriate for preparing maize than root crops. Several researchers have proposed, however, that maize and manioc were dietarily and ecologically *dichotomous*. Stimulated originally by Harris's (1969, 1972) vegeculture and seed-culture complexes, this idea has been fueled in tropical America by two indemonstrable assumptions, namely, that small flakes of silica-rich stone were used for grating cyanogenic manioc and that flat ceramic plates with raised edges were griddles for baking bitter (toxic) manioc cakes (Acuña, 1983; Bird and Cooke, 1978a; Corrales, 2000, p. 39; Fonseca, 1992; Snarskis, 1992, p. 143; Stone, 1966, p. 27). There is no documentary evidence for cyanogenic varieties of manioc having been cultivated on the land bridge. Perry (2002a) has found maize starch on similar tools from Venezuela. Many other kinds of plants are grated (e.g., fibrous taxa and palm kernels). Manioc and maize are likely to have been dietarily *complementary* from the time their ancestral cultivars crossed paths many millennia ago. Their microremains are found together on early Panamanian grinding tools (Piperno and Holst, 1998). They remained complementary on the

[6]Curré, Darizara, Black Creek, La Montaña, and Sarigua (central Panama).

land bridge until after Spanish conquest. Both thrive in areas with seasonal drought. Manioc does well on poor soils where maize does not. It produces more calories per unit area than maize, which has considerably higher levels of protein than manioc tubers (Bray, 1984, pp. 315–319; Cooke, 1992; Linares, 1979).

In sum, available sediment core, paleobotanical, and archaeological data from central and eastern Panama invite the hypothesis that farmers, who opened plots for cultivation by felling and burning the vegetation and who cultivated maize, gradually dispersed from earlier population nuclei in drier areas on the Pacific slopes into more humid forests in the wake of the phytophysiological adaptations of this and accompanying cultigens between 7000 and 4000 B.P. (Hansell and Ranere, 1997; Piperno, 1985). This dispersal would doubtfully have been linear since the land bridge is today characterized by striking *local* variations in climate, drainage, and topography. Holocene drier periods, which would have facilitated tree felling and forest disturbance, may have influenced these patterns. To evaluate them vis-à-vis human behavior, however, it is necessary to factor in the local effects of the El Niño/Southern Oscillation, whose regularity seems to have increased in the mid-Holocene and whose present-day effects are often felt differentially on the Pacific and Altantic sides of the land bridge (Curtis *et al.*, 1996, 1999; Hodell *et al.*, 1995; Lachniet, personal communication, 2003; Leyden, 1997, Leyden *et al.*, 1993). Significantly, there is evidence that the period 7000–4000 B.P. was drier than today on the central Caribbean of Panama (Bartlett and Barghoorn, 1973; cf. Rull, 1996).

Farther north on the land bridge, data on the dispersal of early farmers is restricted to ceramic periods because very little research has addressed preceramic sites outside Panama (*but see* Lange, 1984b). There is, besides, little evidence for pre-3500 B.P. occupations in coastal Pacific lowlands (Hoopes, 1988, 1996), either because the corresponding sites have been missed by survey teams or because people were not living here. Stylistic and statistical analysis of pottery, however, suggests that there were two early nuclei of slash-and-burn farmers in Nicaragua and Costa Rica: one in the seasonally dry highlands of the northern half of Costa Rica and adjacent Nicaragua, the other in the southeast (Valle del General, Térraba-Sierpe, Coto, lowland Chiriquí). Dispersal out of these areas probably accounts for the pattern of forest clearance visible in the paleovegetational record just summarized. From a phylogenetic point of view, this observation is stimulating in light of discussions about relating the initial nodes of divergence of the Chibchan languages and gene pools to cultural diversification attendant on the spread of agriculture (Barrantes *et al.*, 1990; Constenla, 1991; Cooke and Ranere, 1992c; Corrales, 2000). It is premature, though, to confide overly in correlations between these artifact traditions and a *specific* cluster of people and their proto-languages: the time depth is simply too great, the ^{14}C chronology and survey coverage too incomplete, and the historical and geographical relationships among speakers of northern Chibchan languages and between these and speakers of Matagalpan languages too imprecisely defined.

Care also should be taken not to overstress the uniformity of cultural and subsistence geography during such early times when populations lived in small, dispersed settlements. Talamanca preceramic peoples who lived in the western highlands of Panama from approximately 6600 to 4300 B.P. used stone tool assemblages that retained features of Paleoindian assemblages and are quite unlike those of their coeval neighbors to the east (Ranere, 1980a,b,c,d). Ranere proposed, therefore, that foragers remained in more humid or inaccessible parts of the land bridge long after people in drier areas began to farm. Dickau (personal communication, 2004) reports isolating a small sample of starch grains that appear to be from a *Zamia* species at the Talamanca Phase Hornito-1 site. *Zamia* was an early food source in the West Indies and was cultivated by the Florida Seminole (Berman and Pearsall, 2000; Cardwell, 1987; Veloz-Maggiolo, 1992). It is possible that Dickau's research will identify other, more widespread cultigens on Talamanca tools and thus foster a re-assessment of Ranere's hypothesis (1980a, p. 43) that "not all early tropical forest people were farmers." Come what may, the Talamanca stone tool inventory's idiosyncrasies infer cultural differentiation from coeval peoples in central Panama (Ranere and Cooke, 1996). Sheets (1994b, p. 314) identified a temporal hiatus between a pre-5000 B.P. Archaic foraging population (Fortuna phase) and post-3800 B.P. Early Tronadora farming villages in the vicinity of modern Lake Arenal in northwest Costa Rica (Hoopes (1994a) offers an opposing view).

Temperance also is recommendable with regard to the nature and timing of a human presence along the Caribbean slopes of the land bridge. Paleoindians were active in Caribbean and montane LGS forests (Ranere and Cooke, 2003). Sites whose stone tools suggest occupations between 10,000 and 7000 B.P. have been reported in Caribbean Costa Rica (Acuña, 1983, 2000) and Panama (Griggs *et al.*, 2002; Ranere and Cooke, 1991). Indirect confirmation is provided by manatee ribs found in a 6000 B.P. midden at Cerro Mangote (central Panama, Pacific), which can have arrived there only across the cordillera from the Caribbean (Cooke and Ranere, 1992c). Later prehistoric and ethnohistorically recorded peoples engaged in constant commercial interactions across mountain ranges and between the Atlantic and Pacific Coasts. Small-scale economic enterprises may have been important enough to stimulate the penetration of even the remotest and wettest forests long before the agricultural expansion advocated in earlier pages. If true, this pattern is more likely to be elucidated in the future by archaeology than by paleoecology.

TERRITORIES, TRADE, AND SOCIAL RELATIONS

Most researchers are comfortable with Hoopes's (1992a) observation that the once-popular concept of a generalized developmental scheme, i.e., a Formative pantropical "mother-culture" (Ford, 1969), obscures important differences among

land-bridge polities that developed out of the simpler, smaller communities of the preceding period as (1) agriculture became more productive in response to genetic changes in cultivated taxa, (2) populations increased and nucleated, and (3) social tensions were aggravated. From a geographical point of view, accelerated divergence and complexity after ~2500 B.P. were conditioned not only by the intrinsic microenvironmental heterogeneity that I stressed on the opening page, but also by propinquity to technologies, goods, and people from Mesoamerica and northern South America (Hoopes, 1992b; Linares 1977a, 1979). Materially it is exemplified by widespread and interrelated features. Pottery progressed from being a mere receptacle to a medium for ideological expression as plastically executed and painted designs, including zoo- and anthropomorphic ones, appeared and diversified. Larger and functionally more complex vessels bear witness to innovative and intricate decorative techniques such as differential firing, negative painting, calcium carbonate filler, and the simultaneous use of several pigments (Baldi, 2001; Baudez *et al.*, 1993; Bonilla *et al.*, 1987; Cooke, 1995; Cooke *et al.*, 2000; Corrales, 2000; Fonseca, 1997; Hoopes, 1996; Sánchez, 1995; Shelton, 1984). Grinding tools attained sophisticated levels of crafting in response, not only to changes in the morphology and importance of foods, such as large-kernelled maize (now numerically dominant in most samples of carbonized plant macroremains), but also to the increasing symbolic importance of this cultigen, which is evident on the stone statuary of some culture areas (Bird, 1980; Einhaus, 1980, p. 466; Galinat, 1980; Graham, 1992; Linares, 1980a, p. 243; Linares *et al.*, 1975; Mahaney *et al.*, 1994; Snarskis, 1981). In Gran Nicoya the proliferation of obsidian tools reflects both improving technical skills and expanding trade networks. Polished stone tools (axes, chisels, etc.) were now made everywhere in large numbers, often fashioned or reworked at specific settlements (Linares, 1980a, p. 242; Sheets *et al.*, 1980). This burgeoning industry was surely related to the needs of farming settlements increasingly concentrated in riverine or lacustrine zones bordered with mature gallery and peripheral forests, which had to be removed to gain access to deep colluvial soils, and to the construction of large dugout canoes for the colonization of offshore islands (e.g., Taboga and Taboguilla [Panama] and Isla del Caño[7] [Costa Rica]) (Finch and Honetschlager, 1986; Stirling and Stirling, 1964b). In some areas the art of making prismatic blades (present during Paleoindian times but subsequently lost) reappeared, but with its own technical idiosyncrasies (Lange *et al.*, 1992, pp. 163–165; Ranere and Cooke, 1996). Lastly and most importantly, expertly crafted prestige and ritual items proliferated and stimulated new contacts, demands, ideologies, and social tensions, which by at least by 1300 B.P. had led to the formation of polities with many of the characteristics of chiefdoms.

[7] Badilla (personal communication, 2003) reports that settlements on Isla Caño go back to the Sinancrá period (1500–300 B.C.). Taboguilla was occupied by ~2000 B.P. to judge from a recently dated vessel from Butler Island (Lake Alajuela) (1990 ± 40 B.P. [cal B.C. 60–cal A.D. 90]), which is very similar to vessels reported by Stirling and Stirling (1964b) on this island.

Cultural Geography

Before ~2500 B.P. important differences in material culture allow archaeologists to identify regional artifact traditions with implications for ethnic and linguistic differentiation. But it was not until after this date that culture areas came to the fore. The predominant geographic concept since the dawn of archaeology in the region (Holmes, 1888; Joyce, 1916), culture areas are either political divisions to which the appendage Greater or *Gran* has been appended (i.e., Greater Nicoya, *Gran Chiriquí*, *Gran Coclé* etc.) or physiogeographic features (i.e., in Costa Rica, the central valley, central Atlantic watershed and central Pacific Coast) (Cooke, 1984; Corrales and Quintanilla, 1996; Lange, 1984a,b; Martín-Rincón, 2002b; Snarskis, 1981; Sánchez, 2000). Most published reports and maps intimate that the boundaries between them were rigidly fixed in time and space until contact. This is, of course, not true. Detailed geographical–historical studies of subregions within particular culture areas are increasingly drawing attention to (1) the importance of chance events (i.e., volcanic eruptions) in redirecting settlement history (Linares *et al.*, 1975; Sheets, 1994b, p. 318); (2) sociopolitical fragmentation, which resulted not only from population growth and nucleation attendant on agricultural intensification but also from growing competitiveness—the term balkanization is often used (Snarskis, 1981, p. 84); (3) the influence of changes in economic priorities and social interactions on the relationship between the location of raw material sources, craft centers, and artifact distribution, and between these and settlement geography and demography (e.g., Cooke *et al.*, 2003a; Creamer, 1983; Sheets, 1994b); (4) community-level specialization in the manufacture of certain goods that were important regional exchange commodities (e.g., small prestige and ritual items, polychrome pottery, metates, polished axes, and—north of Panama—obsidian tools) (Drolet, 1986, 1992; Lange *et al.*, 1992; Ranere and Rosenthal, 1980; Sheets *et al.*, 1980); and (5) fluctuating boundary zones, in which there was a greater mixing of cultural materials than at culture area epicenters (e.g., Cooke, 1980; Linares, 1980b; Linares de Sapir, 1968; Sánchez and Cooke, 2000). For example, archaeologists who work in Gran Chiriquí are documenting with improving precision the diversification of pottery into successively smaller spatial units characterized by stylistic categories whose posterior developments sometimes belie a common origin (Baldi, 2001; Baudez *et al.*, 1993; Corrales, 2000; Hoopes, 1996; Kudarauskas *et al.*, 1980; Linares, 1980f). At the same time, the sociopolitical cohesiveness of this culture area after the introduction of ceramics is confirmed by a common ideology, shared artistic traditions, and the exchange of everyday and prestige items. Changing cultural geography inferred from pottery distributions appears therefore to be harmonious with linguistic and genetic data, which point to recent (<1000 years) divisions of this area's Chibchans into geminate polities each with their own language, i.e., the Bribri and Cabécar, Chánguena and Dorasque, Buglé and Ngöbé, and, more arguably, Coto and Brunca (Barrantes *et al.*, 1990; Constenla, 1985; Corrales, 2000).

It is important, nonetheless, to be temperate about relating *specific* clusters of pottery to *specific* recent ethnias. Although the postcontact cultural geography of the Caribbean is difficult to unravel from existing written sources because of multiple external pressures on native polities, it can be argued on the basis of ethnohistoric data that the ancestors of the pre-Columbian people who lived around the Laguna de Chiriquí, at sites like Cerro Brujo, were Chánguena and *not* Guaymí (*contra* Linares and Ranere, 1971, 1980) who at contact were located farther east between the Cricamola and Calovébora Rivers (Castillero, 1994, pp. 188–200).

An additional stimulus to cultural diversification on the land bridge was provided by the arrival of migrant peoples from Mesoamerica to Gran Nicoya probably no earlier than 1400 B.P. The archaeological record demonstrates that each of these groups, whose genesis occurred in Mesoamerica, quickly slotted into local economic networks, underwent acculturation and ecological radiation, and followed different demographic trajectories (Benavides *et al.*, 1992; Bonilla *et al.*, 1987; Lange, 1984b; Vásquez, 1994). Even so, the Chorotega and Nicarao languages were thriving in the 1520s (Healy, 1980, pp. 21–22; Oviedo y Valdés, 1849, p. 390). Their speakers were still known as *naguatatos* in the late sixteenth century (e.g., Fernández, 1886, p. 205). This is why the Spanish who invaded this region from the north in the 1520s could pinpoint where the different groups they called "Mexicans" were living. In fact, their communities were scattered among those of indigenous peoples, some of whom, like the Huétar, spoke a Chibchan language and were not always peaceably disposed towards them (Constenla, 1984, 1991, pp. 30–45; Healy, 1980, p. 21; Santos *et al.*, 1994). Gran Nicoya at Spanish contact was more likely to have comprised communities belonging to several different ethnias (Ibarra, 1991, 2001) than multiethnic ones (Lange *et al.*, 1992, p. 13).

Chiefdoms

There is a general consensus (but *see* Roosevelt, 1979) that pre-Columbian polities on the land bridge did not surpass *chiefdoms* in complexity. These kin-based, moderately stratified societies, which lacked writing, did not live in cities, and were organized into small, sometimes populous but not politically expansive territories (Earle, 1991), are evident over much of the land bridge by contact (Helms, 1979; Ibarra, 1990; Romoli, 1987). It is doubtful whether the requisite population densities and degrees of settlement nucleation, economic integration, and social differentiation were attained anywhere in this study area before 2500 B.P. Most scholars, in fact, postpone the genesis of chiefdoms in their regional chronological schemes until 2000 or 1500 B.P., by which dates archaeological evidence for categoric wealth differences, craft specialization, and meaningful variability in archaeological site size, complexity and function are apparent in several culture areas (Briggs, 1989; Drolet, 1984, 1992; Fonseca, 1992; Haller,

2004; Hoopes, 1991; Linares 1977b, 1980a, pp. 241–244; Quilter and Blanco, 1995). Reassessments of the dates of the polychrome pottery produced at Sitio Conte push the evidence for indisputable wealth differentials based on rank or status in Gran Coclé even closer to contact (after 1300 B.P.) (Cooke *et al.*, 2000). Forcing these data into a progressive developmental scheme, i.e., from some kind of tribe into some kind of chiefdom (Fonseca, 1992; Hoopes, 1991) or into a lateral dichotomization along the same lines ("tribes" coeval with "chiefdoms" [Creamer and Haas, 1985]), obscures the coeval existence until Spanish contact of many types of communities, many levels of population density and nucleation, and different subsistence emphases, often in the same culture area or economic interaction sphere (Linares, 1977a, 1979).

Oberg (1955) is often credited with having been the inventor of the term chiefdom whose theoretical formalization occurred after World War II (Sahlins, 1958; Service, 1962). Even so, Lothrop's excavation of the Sitio Conte in Coclé (Panama) between 1930 and 1933 (Lothrop, 1937, 1942a) first opened New World archaeologists' eyes to the opulence of a few adult males who held sway over small territories noticeably un- or underendowed with public works. Relying as much on contact period Spanish documents as modern scholars, Lothrop underlined many behavioral traits considered archetypical of chiefdoms even though he did not use this term himself (Briggs, 1989; Lothrop, 1937, pp. 9–29; c.f. Helms, 1979; Linares, 1977b; Roosevelt, 1979).[8]

Researchers now prefer multi- to unicausal (prime mover) explanations for the formation and maintenance of chiefdoms (Drennan, 1995; Flannery, 1972). Worldwide, the greatest degree of variability among these "autonomous political units" (Carneiro, 1981, p. 45) concerns the articulation of birthright, achievement, authority, prestige, and power, and the relationship between grades of sanctity and social hierarchy. These features characterize the hierarchical typologies of chiefdoms that several scholars have proposed (Goldman, 1970, pp. 20–24; Sahlins, 1958, pp. 11–12; Steward and Faron, 1959, pp. 241–245). They have been the focus, too, of disagreements about the nature of land-bridge chiefdoms (Briggs, 1989; Helms, 1979, 1982; Hoopes, 1991, 1992a; Linares, 1977b; Roosevelt, 1979; Snarskis, 1981, 1987). They are easier to glean from the documentary than from the archaeological record. Even so, one detects consilience with regard to the commonality of the following features: (1) chiefly power was deeply rooted in genealogical hierarchy and monopolized by males; (2) the transference of power within high-rank social units in each chiefdom was based as much (or more) on achievement as on ascription and was often accompanied by internecine tension;

[8]Thus, on *social groups*: "the Indians who lived (in Coclé) were divided into many groups each ruled by a chief and various sub-chiefs"...; on *insignia*: "each chief had his own device with which his followers blazoned themselves"...; on *warfare:* "war was waged by the natives of Panama frequently and for many reasons, of which the chief (ones) were to acquire more lands and acquire prestige"... on *social classes*: "although the communities in which the natives lived were not large, their society was divided into several distinct ranks."

(3) chiefs advertised their success by accumulative behavior akin to potlatching (involving a certain degree of control over food production in order to finance social gatherings); (4) chiefs and their entourages lived at special settlements, often moving back and forth among various sites (according to Spanish chroniclers they lived in special houses, which may have been confused for meeting houses); (5) at sites whose special features allude to their being centers of power, there is a correlation between simple architecture and monolithic sculpture, and symbols of both aggressive behavior and fecundity (expressed by images of human females and maize); (6) frequent warfare focused on raids and skirmishes among rival chiefs in nearby territories and was accompanied by the mistreatment of prisoners, including forced labor, branding, mutilation, and loss of burial privileges; (7) a degree of resource redundancy among the most populous or richest chiefdoms prevented the long-term political dominance of any one of them; and (8) to acquire special sumptuary or ideologically significant badges of offices, which were often exhibited at special places and during burials, chiefs controlled trade routes, especially those that led to distant lands or towards prestige items (Drennan, 1991, 1995, 1996; Fitzgerald, 1996; Haller, 2004; Helms, 1976, 1979, 1994; Ibarra, 1990; Lange, 1992a; Linares, 1977b; Linares *et al.*, 1975; Snarskis, 1987).

Prestige Goods, Esoteric Ideas, and the Relevance of Distance to Exchange Relations and Elite Formation

The relevance of long-distance contacts to the relationship between ideology, wealth, and power on the land bridge has been at the forefront of discussions ever since anthropologist Mary Helms developed the hypothesis, originally formulated by geographer Carl Sauer (1966), that most metal ornaments found in pre-Columbian Panama—and *all* the most exquisitely crafted ones—were produced in continental Colombia. She argued that Panamanian elites either obtained them via traders or itinerant crafters or by traveling themselves to Colombian centers. Such contacts and exchanges with distant lands and elites consolidated the influence and power of Panamanian chiefs by allowing them to use valuable prestige goods as rewards and to enhance their sanctity and that of their entourages through the acquisition of *esoteric* knowledge (Helms, 1979, pp. 36–70, 140; 1992, 1994).

In Mesoamerica, scholars associate early elite interaction, which can be traced back to 3500–2500 B.P., to an increasing demand for fine ceramics decorated with certain ideologically charged motifs, and objects crafted from greenstone, shiny iron minerals, and marine shells (e.g., thorny and pearl oysters [*Spondylus* and *Pinctada*]) (Clark, 1991; Clark and Blake, 1989; Love, 1991; Pires-Ferreira, 1975, 1976). In northern Costa Rica, jadeite, serpentine, and chalcedonies were primary commodities for skilled crafting between approximately 2500 and 1300 B.P. and are considered to be the earliest manifestation of elite exchange and display on the land bridge (Bishop *et al.*, 1993; Chenault, 1988; Guerrero, 1988; Sharer, 1984;

Snarskis, 1984). Opinions about how and by whom this jadeite was obtained and who actually used it have swung from a bias towards Mesoamerica as their *fons et origo* (Balser, 1980; Easby, 1968, 1981; Stone, 1973) to a more balanced proposition that both local and imported materials were used for the manufacture of three kinds of elite-centered paraphernalia: (1) amulets, (2) stone maceheads or ceremonial digging sticks, and (3) ceremonial stone stools and grinding stones (or metates) (Bishop and Lange, 1993, p. 129; Lange, 1993, p. 288, Lange *et al.*, 1992; Snarskis, 1984, pp. 176–178, 215–219). Costa Rican lapidaries used mostly local jadelike stones and (probably) an unidentified local jadeite source (Bishop and Lange, 1993, p. 129). Imported items were invariably made of jadeite from the Motagua Valley source in Guatemala (Lange *et al.*, 1981).

These ritual or prestige artifact classes share zoomorphic icons, e.g., crocodiles, eared and hook-beaked raptors, parrotlike birds, humming birds, bats, and felids (Fonseca and Scaglion, 1978; Snarskis, 1986). Because these taxa are symbols of standard cosmological spaces throughout tropical America, e.g., forests, earth, and sky, it is perhaps a hyperbole to attribute a Mesoamerican origin to them (Snarskis, 1985, p. 26). Even so, Costa Rican lapidary work harks back to older Mesoamerican artistic traditions, in the same way that early land-bridge goldwork advertises iconographically its antecedents in continental Colombia (Bray, 1981, 1992). Rare Olmec, Izapan, and Classic Maya jadeite amulets and slate mirror backs found in Costa Rica (some with legible glyphs) were not made there (Graham, 1993; Lange, 1993, p. 284; Parsons, 1993; Stone and Balser, 1965). They were recycled and (probably) heirloomed (Graham, 1992, p. 191; Lange, 1984b, p. 171; Snarskis, 1984, p. 219). This hints that the raw material was more valuable to the recipients than the finished artifacts and their foreign ideology. South of central Costa Rica, where no jadeite source is known, lapidaries working approximately between 2000 B.P. and before 1000 B.P. preferred agate, quartzite, sericite, and serpentine. Some large bars and bar pendants are beautifully crafted and must have been especially esteemed as both prestige and ritual objects (Cooke *et al.*, 2000, Fig. 8.7 v and w; Hearne and Sharer, 1992, plates 38–40; Lothrop, 1937, plate 3; cf. Helms, 1993).

Metal objects are first recorded on the land bridge ~1800 B.P.[9] In Bray's opinion (1992, 1997) metallurgy spread here from the Sinú, Tairona, and Quimbaya centers of continental Colombia. Whether they were moved by land or by sea or transmitted by diffusion or itinerant craftsmen is archaeologically unfathomable. Since canoe-borne trade from the north is well documented in the ethnohistoric

[9]The earliest contextualized metal pieces were found in feature 16 at Cerro Juan Díaz – a copper ring and fragments of ornaments from a disturbed tomb, which were associated with a human tooth dentin date of 1780 ± 40 B.P. (cal A.D. 130–370). Isaza, working under the direction of Heather Lechtman, found traces of platinum in a fragment of a spread-eagled bird in this feature as well as evidence for the welding of thin plates with different quantities of copper. Although these traits are characteristic of the La Tolita-Esmeraldas region between Colombia and Ecuador, platinum is present in some Panamanian ores, and it is premature to attribute these objects' origin to the former region (Cooke *et al.*, 2003a; Cooke and Sánchez, 1998; Ichon, 1980, pp. 197, 321).

record, however, similar exchanges with traders from the south are likely and would explain the clustering of Initial Group ornaments in Caribbean Costa Rica before 1500 B.P. (Bray, 1981, p. 154; Cooke and Sánchez, 2001; Graham, 1996; Stone and Balser, 1965). The earliest metal artifacts found in land-bridge graves may have been made in continental Colombia. Even so, local goldworking styles developed rapidly, resorted to their own technical idiosyncrasies (Fleming, 1992; Howe, 1986), and, most importantly, shared many iconographic details with other locally produced media (i.e., shell jewelry and painted and modeled pottery) (Bray, 1992; Cooke and Bray, 1985; Sánchez and Cooke, 1998; Snarskis, 1986). The production of cast gold figurines and hammered plaques is documented archaeologically and historically in Costa Rica and Panama and continued into the 17th century A.D. (Bray, 1981, p. 156; Lange, 1992a, p. 129, Fig. 14; Snarskis, 1985, p. 26). Metal ornaments dated between 1800 and 1300 B.P. at Cerro Juan Díaz were found associated with ritual paraphernalia, i.e., *Spondylus* bead and felid teeth aprons and/or necklaces, polished stone bars, and incense burners. It is possible, then, that gold ornaments at first slotted into ritual activities such as shamanism and curing (Cooke, 2003b; Cooke *et al.*, 2000; Quilter, 2000; Saunders, 2003). Only later did they acquire the exoteric role necessitated by the self-aggrandizing behavior of wealthy adult males, which is clearly evident after 1300 B.P. at some mortuary sites such as Sitio Conte (Briggs, 1989; Lothrop, 1937), in stone statuary (Fernández and Qunitanilla, 2003; Graham, 1992, 1996), and also in Spanish descriptions of warriors going to battle bedecked with shining gold finery (Cooke *et al.*, 2003a).

The coeval use of gold and jadeite has been documented in Costa Rica (e.g., Herrera, 1998; Snarskis, 2003). But after ~1500 B.P. jadeite's importance in Nicaragua and Costa Rica diminished as cast and hammered *tumbaga* ornaments became more widely distributed. Along the coast of Panama Bay, a similar change in priorities appears to have affected the production of beads and pendants made of thorny and pearl oysters (*Spondylus* and *Pinctada*), whose apogee occurred between 1800 and 1200 B.P. (Cooke, 1998a; Cooke *et al.*, 2000; Ichon, 1980).[10] It is possible that its decline was related to human overexploitation of local populations of these shells. Or perhaps *Spondylus* artifacts were worn only in certain ritual contexts or by young people (Briggs, 1989). Whichever the case, polychrome pottery painted in the distinctive style of Gran Coclé (Labbé, 1995; Lothrop, 1942a; Sánchez, 2000) became considerably less abundant at sites located east of the El Valle massif after 1200 B.P. than it was before that date, as though the new demands and ideologies stimulated novel exchange relationships related to the growing ideological and political importance of metal ores and artifacts, which hypothetically would have led to the growing importance of exchange centers such as Cupica (Colombia) (Bray, 1984) and even changes in the social or ethnic composition

[10]Ornaments fashioned out of inshore estuarine shells, such as *Anadara grandis*, were manufactured until after Spanish contact (Cooke *et al.*, 2000).

of coastal settlements around the Gulf of Panama and its islands (Cooke, 1998a; Cooke *et al.*, 2000; Sánchez and Cooke, 2000). Copper and gold ores are particularly abundant in outwash and alluvial gravels along the central Caribbean and cordillera of Panama and in the Darién (Cooke *et al.*, 2003a), whereas in the Pacific, *Spondylus* and *Pinctada* are concentrated around rocky and coral-fringed islands. Recent research in the Belén, Coclé del Norte, and Indio Rivers in Panama has identified especially large prehistoric sites—some with extensive stone-walled terraces—in proximity to localities where the Spanish extracted alluvial gold (Cooke *et al.*, 2003a). Similar sites with more impressive architecture are well known from the Caribbean watershed in Costa Rica (e.g., Guayabo, Las Mercedes, and La Cabaña) (Fonseca, 1981, 1992; Hartman, 1991; Snarskis, 1984). Chiefs whose territories included gold and copper deposits, basalts, tuffs and lavas, fine clays, and scarce pigments would have been able to exchange these materials for the agricultural produce of neighboring polities situated in areas better suited to the production of foodstuffs.

In 1502, Columbus' son Ferdinand referred to the coast between Almirante Bay and the River Coclé del Norte as "active trading country" (Cooke *et al.*, 2003a). Later documentary sources state that the "Mexican" traders present on the Caribbean coast at and after contact went there specifically to obtain gold and cacao (Lothrop, 1942b). It is unclear which goods would have been offered to local people in exchange for these products. I know of only five published artifacts from Panama that can be objectively attributed to Mesoamerican manufacture, and only one whose origin beyond the southern edge of the land bridge is indisputable (Cooke *et al.*, 2003a; Lothrop, 1942a, fig. 440). All are small portable objects, and none was found in a professional excavation. Exactly where on the land bridge articles that reached Mayan and Mexican sites were manufactured is a difficult question to answer. Current knowledge does not admit attributing their provenience to a particular region such as "Veraguas" or "Coclé." Metal figurines cast in Bray's Initial and International Styles exhibit far less regional stylistic differentiation than do pottery and stone tools. Large gaps exist in the distribution of archaeologically contexualized goldwork, especially in eastern Panama and the Atrato Basin, where there is documentary evidence for important metalworking centers. Finished ornaments were composed of variable quantities of generally water-borne auriferous ores, which, when intentionally alloyed, are notoriously difficult to attribute to specific mineral sources (Bray, 1977, 1992, 1997; Fleming, 1992; Graham, 1996; *contra* Lothrop, 1950, 1952).

Trade and exchange, of course, were not exclusively elite activities. Contact period ethnohistoric accounts abound with references to the movement of a wide variety of goods among polities that dwelled in the same, contiguous, or nearby chiefly territories or spheres of influence (Helms, 1979) but in different habitats with distinct product inventories. Oviedo y Valdés's reference to the Cuevans' bartering everything they owned (p. 132) underlines the preeminence of this behavior. Humid forest products, i.e., incense, medicinal plants, resins (for embalming the

dead), cacao, vegetable dyes, pet peccaries, birds and tapirs, feathers, and felid teeth, claws, and pelts, figure in lists of traded items that were exchanged for non-forest items, e.g., human captives, cotton textiles, marine shells, and salt fish (e.g., Andagoya, 1994 [1519], p. 29; Núñez de Balboa, 1994 [1513], pp. 23–24; Ibarra, 1990; Oviedo y Valdés, 1853, p. 140). It is clear that people captured during skirmishes were coerced into becoming porters for this trade, which the rugged terrain of much of the isthmus would have made quite onerous (Oviedo y Valdés, 1853, p. 140). Some Panamanian chiefs, who lived inland, controlled "ports" on one or both coasts where marine products were obtained. Markets in Gran Nicoya were vibrant places of exchange. They were called *tianguez* by the Nicarao, cognate with Aztec *tianquiztli* (Fowler, 1989, p. 187). At markets in the chief village of Natá in Gran Coclé (Panama), people exchanged coastal produce such as crabs for maize (Espinosa, 1994b[1516], p. 49). The relative abundance of several species of marine fish at Sitio Sierra, located 12.5 km up the Santa María River from the coast, suggests market-type exchange (Cooke and Ranere, 1999). A Panamanian chiefdom—Escoria (River Santa María)—made "arms" (presumably stone and/or wooden weapons) for the surrounding territories (Espinosa, 1994b[1516], p. 54). In highland Chiriquí, chipped stone tools were produced at most households while polished axes appear to have been the work of specialists (Linares and Sheets, 1980). Axe quarries found by Griggs (1998) in the very humid Caribbean foothills of central Panama produced blanks, which were presumably exchanged with people who lived at larger villages on the Pacific side (Cooke, 1977). Although there was some reciprocal exchange of fine polychromes between Gran Nicoya and central and coastal Pacific Costa Rica, this was sporadic (Guerrero *et al.*, 1994; Lange, 1992a, p. 127; Snarskis, 1984, p. 222); compositional analysis has shown that the movement of clay vessels (even beautifully crafted ones) was strongly intraregional in Gran Nicoya where a sample of a ware formerly believed to be Mesoamerican—Usulután—proved to have been locally made (Bishop, 1992; Bishop *et al.*, 1992, pp. 160–162; Lange, 1992b, pp. 435–436). On the other hand, elemental analyses show that obsidian was brought in from Honduran and Guatemalan quarries up to 450 km from their points of use (Healy *et al.*, 1996, p. 21; Salgado and Zambrana, 1992/1993; Sheets *et al.*, 1990; Stross *et al.*, 1992). In western Panama, obsidian is restricted to poor-quality local materials (Ranere, 1980c, pp. 319–320).

Accurately identifying the location of producers and recipients of artifacts is a prerequisite for understanding another important aspect of exchange relations in land-bridge chiefdoms: the development of specialized crafting alongside older patterns of household production. Drolet (1992) proposed that in the Diquís subregion of Gran Chiriquí fancy ceramic wares, polished stone jewelry, and round stone balls were made at special centers subsidized by the leadership (*see also*, Fernández and Qunitanilla, 2003). The transition from household to specialized production of obsidian tools is evident in Gran Nicoya (Valerio and Salgado, 2000).

Contact-period documents indicate that metal ornaments were an important component of local and regional exchange networks linking the acquisition of ores in alluvial and hill outwash deposits to specialized crafting. Artisans at the villages of two Panamanian chiefs, Comogre (lower Chucunaque) and Cori (near modern Panama City) crafted made-to-order ornaments, which were exchanged for raw gold obtained in outlying districts (Cooke *et al.*, 2003). Chief Couto o Coctu in southeastern Costa Rica was renowned as a goldsmith (Snarskis, 1985, p. 26). When Fernández de Oviedo was living at Hispanicized Natá (central Panama) in 1527 he would send his native slaves out to barter cotton blankets and hammocks for "good quality gold" with people living in the unconquered regions of Veragua (Cooke and Ranere, 1992c, p. 285; Oviedo y Valdés, 1853, p. 499).

Territories, Special sites, Gatherings, and Genealogies

On the land bridge, as elsewhere in tropical America, estimating the size of native populations is curtailed by drastic demographic decline during the first few decades between initial Spanish contact (arguably *preceded* by old world diseases) and the first royal census figures obtained during the establishment of the *encomienda* system (Castillero, 1994, pp. 36–64). Since mortality rates during this period are generally assumed to have been catastrophic—perhaps up to 90–95% (e.g., Abel-Vidor, 1981)—the numbers of people present at contact must have been considerably more elevated than those recorded by the first *encomienda* figures.

The Spanish term *provincia* is generally considered by scholars to equate with the territory of a single chiefdom, which itself comprised several villages (e.g., Helms, 1979, Figs. 6, 8, 9; Lothrop, 1937, Fig. 2; Romoli, 1987, p. 33, map). Using documentary data, Romoli (1987, pp. 29–31) calculated that at Spanish contact (1501–1519) there were 89 chiefdoms in Cuevan territory (eastern Panama and northern Colombia), which covered 25,000 km^2. If we accept her estimate for the Cuevan population as 230,000, chiefdoms averaged 2854 people (density: 10 persons/km^2). Ibarra (1984, pp. 58–59) estimated the population of the largest of ten chiefdoms in the central Atlantic watershed and central valley of Costa Rica, Guarco, as 5550 people in 1569, surely an underestimation vis-à-vis the situation in 1502. On the basis of archaeological survey data, Linares and Sheets (1980, p. 54) estimated the population of the Volcán area of highland Chiriquí ~1350 B.P. at 2430 people (density: 39/km^2), by which time there is evidence for site and social hierarchies. Basing their less reliable estimates on an average of 600 people per village located about every 3 km up the Santa María River (Weiland, 1984), Cooke *et al.* (2003b) propose that the population of the chiefdom of Escoria, with an estimated area of 176 km^2, was ~7800 (density: 44/km^2). Chief Comogre is said by Oviedo y Valdés (1853, p. 9) to have been able to recruit 3000 warriors and to have ruled over 10,000 people. Spanish captain Gaspar de

Espinosa guessed the population of the village where chief Natá lived at ~1500 people (Espinosa, 1994b[1516], p. 44). The village of Turrialba, the largest in the chiefdom of Guarco, had 2100 people (Ibarra, 1984).

That the above figures are disproportionately eclectic and dangerously approximate was recently underlined by Haller's (2004) foot survey of 104 sq. km. in the Parita valley in central Panama. Basing his population estimates on the relationship between the area and density of occupation of sites, rather than site area alone, Haller proposed a maximum pre-Columbian population of just over 1000 for his survey area. Notwithstanding Haller's cautionary approach, however, it seems likely to me that the largest *provincias* described by the Spanish on the land bridge would have had populations in the range of 2000–10,000 people, with villages of more than 1000 people in the most densely populated territories. In areas of very high subsistence potential, such as the lake region of Nicaragua and large fluvio-estuarine systems, the figure may have been considerably higher. If the lower end of this estimation seems overly small for the population of a chiefdom, archaeologists have derived a population of 2000 people from field data obtained in the Valley of Oaxaca (Mexico) between 3100 and 2450 B.P. (Drennan, 1991, p. 268) - a period during which status differences and public architecture are comparable to those of many of the land-bridge chiefdoms in the last few centuries of the pre-Columbian period and at contact.

Exactly how these chiefdoms were related to linguistic and ethnic diversity is a difficult question to answer because documentary evidence south of Gran Nicoya is difficult to interpret. In the western Chiriquí cordillera and in central Panama, each chiefdom is recorded as having its own language, sufficiently differentiated for interpreters to have been needed in social encounters among native polities (Andagoya, 1994 [1519], pp. 33–34; Oviedo y Valdés, 1849, p. 235, 1855, p. 117). In central Costa Rica, several chiefdoms spoke the same language (Huetar) (Ibarra, 1984). Although a single Cuevan "language" is reported as having been spoken over a territory in which Romoli identified nearly 90 chiefdoms, Oviedo y Valdés refers to "many differences of vocabulary" across this region. It is possible, therefore, that there was considerable dialectal variation (as would be expected) or that, conversely, "Cuevan" was a *lingua franca* or *koine* used for communication in exchange relations, like the *lingua geral* of Amazonia. On the one hand, Oviedo y Valdés (1853, pp. 132–133) says that Cuevan chiefs did not marry women from people who spoke "foreign" languages; on the other hand, it is clear that chiefs in central Panama took wives from neighboring territories *even though they were in conflict with them.* Other linguistic features that anthropologists have recorded for neotropical peoples, such as linguistic exogamy (Jackson, 1983) and the use of ritual speech modes alongside demotic ones, are difficult to decipher from documents.

After ~2500 B.P. considerable regional differences developed on the land bridge with regard to residential structures and funerary sites. Many of these can be explained by cultural diversity, conditioned, of course, by local environmental

conditions (e.g., topography and rainfall). In the north, from Gran Chiriquí into Gran Nicoya, houses had stone foundations or walls (Corrales and Quintanilla, 1996, figs. 5–9, 5–10; Drolet, 1992; Quilter, 2004; Snarskis, 1981, figs. 16, 20, 32). Graves often used stone walls, floors, and lids (Snarskis, 1981, fig. 13; 1992, figs. 9 and 10). South of Gran Chiriquí, on the Pacific side, the extensive use of stone has not been reported for archaeological dwellings, which had clay floors, sometimes cane walls, and roofs made of palm or grass thatch (Carvajal *et al.*, in press; Cooke, 1998d; Isaza, 1993).[11] Even the most lavish tombs here were simple excavations made in the underlying soil or cut through bedrock. They were not embellished with stone although many were covered by perishable structures in the manner of recent Kuna mortuary enclosures. Often burials were made underneath structures, including dwellings (Briggs, 1989; Cooke *et al.*, 2000; Díaz, 1999; Isaza, 1993; Linné, 1929, pp. 247–252; Lothrop, 1937; Sánchez, 1995). Spanish chroniclers describe mortuary houses in which the embalmed or desiccated bodies of elite personages were laid out with all their finery (Espinosa, 1994a[1519] pp. 63–64; Martyr, 1912, p. 218). A round structure recently found at Cerro Juan Díaz has been interpreted as a mortuary house (Carvajal *et al.*, in press). On the Caribbean slopes between Bocas del Toro and the Panama Canal, it has not been determined whether some sites with stone-faced terraces and stone floors served a residential or ceremonial function (Cooke *et al.*, 2003a; Cooke *et al.*, 2003b, p. 6).

All over the land bridge, areas reserved only for burials also are known, established at some distance from residential areas, often on the tops of high hills. Some of these are of an early ceramic date (3000–2000 B.P.) (Biese, 1967; Cooke, 1995; Harte, 1966; Stirling and Stirling, 1964a). Others, such as Panteón de la Reina (Rivas, Costa Rica) (Quilter, 2000), were the resting places of wealthy elites.

A small number of sites also exhibit nonresidential features that are either entirely earthen or employ cobbles and flagstones for pavements, plazas, terraces, drains, and for facing earthen structures. These are often accompanied by special burials, stone statuary, and, in the Diquís subregion of Gran Chiriquí, stone balls. An interesting aspect of their distribution is that they are far fewer in number than the *provincias* described by the Spanish. In western Panama, for example, Barriles—endowed with a ceremonial platform, huge ceremonial metates and double sculptures of human figures—seems to have served at least *two* territories, each one of which, it can be argued, has features coincident with those of an autonomous chiefdom (Haberland, 1973; Linares *et al.*, 1975; Linares and Sheets, 1980). La Pitahaya and Villalba are the only sites with mounds and columns known along the Gulf of Chiriquí (Linares, 1980b,d). The Sitio Conte/El Caño ceremonial precinct in Gran Coclé is endowed with lines of sculpted and unsculpted columns, animal figures in the round, and stone pavements, which together appear to have

[11] There are two documentary references to stone's being used for building in Panama: 'Cateba' (Bocas del Toro) (Columbus, 1959, p. 243) and Comogre (Darién) where the "chief's house" (perhaps a congress house) measured 1150 × 80 yards and was made out of wood reinforced with stone walls (Martyr, 1912, p. 219).

formed a special precinct. Burial remains at the Sitio Conte sector suggest that this was the resting place of adult males, including a few very rich and successful ones. Few women and no children were buried there (Briggs, 1989; Cooke *et al.*, 2000; Cooke *et al.*, 2003a; Lothrop, 1937; Torres de Araúz and Velarde, 1978). Although other cemeteries where very wealthy people were buried have been reported in this culture area (e.g., Finca Calderón on the Azuero Peninsula) (Cooke *et al.*, 2003a; Haller, 2004; Ladd, 1964), no similar site with statuary and pavements has been identified. On the central Atlantic watershed of Costa Rica, there are two large clusters of ceremonial sites, each of which covers an area of about 10 km^2 (Guayabo, La Zoila, Najera and Las Mercedes, La Cabaña, Costa Rica Farm) (Hartman, 1991; Snarskis, 1992, p. 157).

The distribution of these special sites raises interesting questions about their function and about the social universes they would have served. Some surviving ethnias on the land bridge still play ritual games whose preparation requires the provision of large amounts of food for lots of people. The Ngöbé *balsería* is a well-documented example (Young, 1971, 1976). Others—ball games and spear-throwing contests—were observed by the Spanish in Panama (Cooke and Ranere, 1992c). These ceremonies not only enhance the political aspirations of the organizers but also reaffirm group solidarity and history. Oviedo y Valdés (1853, p. 138) had an anthropologist's understanding of the real meaning of the social gatherings called *areytos*, which accompanied Cuevan funerary rites: "these *areytos*," he remarked, "are their literature (*letras*) or remembrances (*memoriales*)." It is reasonable to suppose that a historical-cum-genealogical relationship existed between archaeological ceremonial centers and *several* surrounding territories. Some surviving ethnias, such as the Bribri and Cabécar, retain memories of hereditary rights of certain clans to particular territories and to leadership (Stone, 1961). All over the land bridge, mortuary behavior inferred from archaeological and ethnohistoric data draws our attention to an overriding concern with looking after the ancestors (c.f. Helms, 1998a): (1) multistage burial rituals for rich and poor alike, (2) the reburial of skulls kept for long periods of time, (3) mortuary houses where the embalmed remains of prominent ancestors were displayed, (4) the reuse of tombs over several generations, (5) the removal of earlier funerary arts, and (6) specially designated pantheons or necropolises for important people (e.g., Briggs, 1989; Cooke, 2001a; Díaz, 1999).

Iconographic studies suggest that many features of land-bridge art refer the beholder to the relationship between special people and special animals, which are sometimes depicted realistically, and sometimes humanized. This relationship recalls the Talamancans' memories of ranked named clans and other land-bridge people's origin and hero myths (Helms, 1995, 2000; Stone, 1961). In Gran Coclé, a humanized crocodile (my preference) or iguana (Helms' preference) is a widespread icon. Through time, it appears to have become more dominant. An admittedly speculative inference is that a social group that traced its ancestry back to a crocodile achieved political ascendancy. Although this image is frequent in

rich graves at Sitio Conte after ~1300 B.P., in which it is depicted with high-status human attire and weapons (Cooke, 1998c, 2003a; Cooke *et al.*, 2003a; Helms, 1977), it also was used by people of modest means. A historical and genealogical relationship among ideologically linked territories, which through time became politically antagonistic because of rivalries among groups or individuals, is consistent with the residence of members of ranked descent groups in several *provincias*.

Ethnohistory tells us that warfare was endemic among land-bridge chiefdoms. The iconography of statuary and the postcontact situation draws our attention constantly to relevant behaviors, such as the display of human heads. Physical anthropology, however, is not informative about the physical damage caused by skirmishes. An earlier description of mutilation (Lothrop, 1954) should be reevaluated with caution in the light of more recent mortuary data, whereas the generalized instances of skulls as offerings can be explained as *ritual* rather than *belligerent* behavior (Díaz, 1999; Martín-Rincón, 2002a). At Spanish contact, conflict was most frequent among the most closely related (or most recently fissioned) groups. This baffled Oviedo y Valdés (1853, p. 129) who thought that skirmishes among Cuevan factions in the Darién "seemed to have no purpose." Antagonistic polities, however, banded together under a war leader in the face of foreign incursions (e.g., Andagoya, 1994 [1519], p. 35). Probably, warfare was symbolically meaningful only among people who shared a common ancestry being involved with rivalry, stealing food, prestige goods and women, and exhibiting skills and bravado.

CONCLUSION

During the last 20 years or so, a consensus opinion has formed among archaeologists and specialists in other realms of historical inquiry that surviving sectors of the Native American population of the Central American land bridge—assigned by linguists to Chibchan and Chocoan language groups—are most closely related historically to each other and are more likely to descend from a pre-Columbian population, which resided on or adjacent to the land bridge for a very long time, than from recent long-distance migrants from continental areas. Native Americans have been present in some well-studied regions (e.g., central Panama and northwest Costa Rica) continually since humans first arrived in the Late Glacial Stage. In central Panama populations were substantial enough to have considerably modified the landscape approximately between 11,000 and 7000 B.P., initially as hunters and gatherers, and after 9000 B.P. as cultivators who exponentially burnt and cleared hillslope forests. Only at the northern edge of the land bridge has the arrival of peoples whose ethnogenesis can be attributed to Mesoamerica during the pre-Columbian period been adequately documented, and these incursions postdate ~1400 B.P. The fact that their Mesoamerican languages survived until conquest here is evidence either for considerable cultural resilience or for a large immigrant

population in spite of the effects of acculturation and subsistence adaptation that the archaeological record has documented quite well.

After initial human movements during the LGS, the land bridge's role as *passageway* in prehistory is clearest in relation to the transference of crops and technologies, some of which had important consequences for local and regional cultural and social trajectories. Jadeite and obsidian used for making everyday tools were sometimes obtained from distant Mesoamerican sources. The stimulus for making pottery may have filtered down from Mesoamerica into Nicaragua and Costa Rica. Metallurgy was indisputably introduced from continental northern South America soon after the beginning of the Christian era. Even so, land-bridge peoples quickly adapted these foreign materials and technologies to the demands of their own local and regional markets and ideological universes. Greenstone, agate, marine shell, and gold-copper artifacts ended up being made in considerable numbers by local production centers whose raw materials were not necessarily obtained from distances longer than a valley-to-valley, mountain-to-coast, or coast-to-island journey. In fact, finished objects that can be unequivocally attributed to distant cultures are scarce in the north, and very rare in the south. They were frequently defaced and mended, suggesting that foreignness was not their principal value. To claim that exotic prestige goods brought from afar were irrelevant to land-bridge societies and their leaders is to fly in the face of copious and well-researched anthropological data for a causal link between crafting, ideology, trade, and power. Nevertheless, these relationships are less well elucidated from the current archaeological record for the land bridge than many recent monographs and articles propose. This caveat applies equally to identifications of strange animals, such as the spectacled bear (*Tremarctos ornatus*), whose depiction on Gran Coclé polychrome pottery can be objectively attributed to animal species that were *locally* abundant, such as raccoons (Cooke, 2003a; *contra* Helms, 1998b).

More tangible in the archaeological record is the social relevance of a constant demand for everyday and sumptuary materials and objects obtained or manufactured in two ecologically contrasting marine littorals, in regions with very different basal geologies and in vastly different habitats. If cooperation was most intense among nearest neighbors, so was conflict: contact-period documents are replete with descriptions of raids by local leaders on the *nearest* territory, a pattern that is typical of the ethnographic situation in tropical regions the world over. Spanish documents repeatedly relate such bellicose behavior to the desire of leaders for revenge, to take captives (especially women), and to steal high-status regalia.

At Spanish contact in the early 1500s there was considerable variation in the size of local populations, their settlement types, and their permanence on the landscape, facts that were not lost on observant Spanish commentators. If the cultural-geographic units that anthropologists once derived from the most striking environmental differences on the land bridge—i.e., simple "tropical forest cultures" mostly on the Caribbean and complex "chiefdoms" mostly on the Pacific,

divided by high mountain barriers (Steward, 1948; Steward and Faron, 1959)—now appear overly simplistic, it behooves archaeologists to identify how different categories of communities in this multitude of habitats were integrated into larger social units at different points in time. This is a more difficult task than it seems because archaeology has focused on drier, more accessible areas to the detriment of more humid and more inaccessible ones even when there is sound documentary evidence that the latter were in places densely settled before Spanish contact. If giving the name "chiefdom" to clusters of archaeological sites in a territory that equates with a Spanish *provincia* seems a justifiable procedure in the light of anthropological knowledge, determining the limits of a chief's territory and how the role of smaller, dispersed communities participated in or interacted with it requires continuing survey projects and funding for analyses of material culture that address *physical* as well as stylistic and typological attributes. The relative scarcity and spatial clustering of special sites with features that underline their ritual and or political importance suggests that, above the chiefdom, there were larger, equally important social units—to judge from the ethnographic record, some kind of descent group or groupings of ethnias with closely related languages and memories of common origins, shared songs and praises, and conflicts between real and mythical personalities and social groups.

Relating specific groups of artifacts to tribes, language families, language clusters, proto-languages, or other groupings of Chibchans and Chocoans and their ancestors is methodologically tempting because language and genetic history are eloquent about the gradual and prolonged in situ diversification of populations resident on the land bridge. But it is fraught with difficulties, firstly, because it is not necessarily true that the measures archaeologists most regularly use for identifying cultures—types and styles—were coterminous with specific languages or gene pools; secondly, because we know from the historic record that recent ethnias have adjusted their territories in response to political and social factors of the last 500 years of European occupation; and, thirdly, because it is very difficult to gauge the effects of extinctions of languages and peoples (documented or otherwise) on phylogenetic relationships among present-day groups. The most striking of these extinctions is that of the problematical Cuevan polity.

Using the linguistic terms Chibchan or Chocoan to describe a historical area of interaction of which the land bridge is part—as has become the custom in recent decades (Cooke, 1992; Fonseca, 1992, 1997; Fonseca and Cooke, 1994)—makes sense as long as the construct is used heuristically. Perhaps its most useful function has been to alert researchers that there is a historical, cultural, and geographical continuum between "lower Central America" and "northern South America" across the misnamed Darién Gap (Bray, 1984). This is one reason why I chose the "land bridge" as my geographical universe in this essay. The other was to stress that the variegated landscape, marine and terrestrial productivity, and ease of movement of people, products, and objects among ecozones and habitats

along this narrow strip of land promoted continual interactions among closely related peoples in many areas surprisingly buffered from events and processes in continental areas.

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