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RESEARCH ARTICLE

Pre-Columbian Transoceanic Influences: Far-Out Fantasy, Unproven Possibility, or Undeniable Reality?[1]

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Abstract—The standard view has been that once the Americas were settled via Beringia, the human denizens of the Western Hemisphere were essentially cut off from interaction with peoples of the Old World. Here, I present multidisciplinary evidence that the hemispheres were, instead, interconnected by repeated voyages over millennia, resulting in profound influences on both sides of the oceans. I first examine arbitrary cultural traits (cosmology, calendrics, and art) and complex technologies (barkcloth/papermaking, the blowgun, metallurgy, weaving and dyeing, ceramics), then comment on likely relationships between certain Old and New World languages. A large number of cultivated plants and one or two species of domestic fowl, which could not have crossed oceans without human carriage, were shared between the hemispheres before—in most cases, long before—1492. Several tropical Old World human intestinal parasites that could not have entered the Americas via Beringia were also shared, some remarkably early. The geographical distributions of certain distinct human genetic markers imply important inputs to Mesoamerican and Andean populations from more than one overseas source. Studies of climatology, oceanography, and traditional watercraft and navigation show that early vessels were capable of ocean crossings via certain routes. These converging, essentially independent lines of evidence imply that we can no longer assume that the cultures of the two hemispheres evolved in parallel fashion in isolation from one another and according to "laws" discoverable through comparative studies.

Keywords: culture—cultural diffusion—culture change—comparative studies—technology—cultivated plants—intestinal parasites—human genetics—ocean crossings—traditional watercraft—traditional navigation

Of course, America had often been discovered before Columbus, but it had always been hushed up.

— Oscar Wilde

Introduction

The standard view of the human history of the pre-1492 Americas has long included the idea that when sea levels were lower during the last Pleistocene ice age and the present Bering Strait was dry land, one or a few migrations of pedestrian Asian hunters, following herds of game animals, walked from Asia into the unpopulated North American continent and quickly spread to virtually every inhabitable part of the hemisphere. According to this view, when the ice sheets melted and the seas rose and created a water barrier between Siberia and Alaska, owing to a lack of capable watercraft, New World peoples were essentially cut off from communication with those of the Old World, and the multifarious Native American cultures encountered by Leif Eiríksson and his Norse cohorts and by Christopher Columbus and his successors had all evolved in the Western Hemisphere from their Upper Paleolithic predecessors, without significant further input from elsewhere. Recently, agreed-upon dates of initial human entry have been pushed back a bit and the likelihood that at least some of these earlier arrivals traveled coastwise in boats rather than only overland on foot has gained numerous supporters (e.g., Dillehay 1997, 2000, Dixon 1999, Nichols 1992, 2002, see also Jett 2007a, Erlandson & Braje 2011)—although in the absence of watercraft remnants, some scholars remain reluctant to reject exclusively pedestrian movements (e.g., Meltzer 2009:130). However, aside from acceptance of a short-lived and inconsequential eleventh-century A.D. Norse presence in and around Newfoundland, the notion of pre-Columbian transoceanic contacts—to say nothing of multiple and important interinfluences, beginning in the distant past—remains almost universally, and often derisively, dismissed by archaeologists, historians, and—to a lesser degree—geographers, especially in academic America (see, e.g., Jett 2006, Kehoe 2003, 2010). Thus, the native societies of the New World are widely perceived as 1) having developed in complete or virtual seclusion and, therefore, 2) when compared with the societies of the Old World, conveniently provide a minimum of two independent cases of development from which one may generalize about universal processes of cultural evolution (cf. Trigger 2003). This isolationist stance is often labeled "independent-inventionism." Inventionists perceive multiple, historically unconnected duplicate innovations as being the principal source of cultural similarities around the world (see, e.g., Trigger 2003).

A minority contrary opinion was actively espoused during their lifetimes by, among a certain number of other professionals, eminent University of California, Berkeley, geographer Carl O. Sauer (1889–1975), by Sauer students George F. Carter (1912–2004) and Carl L. Johannessen, and by Stephen C. Jett, a Carter student (Gade 2003/2004; Jett 2000b, 2007b), as

well as anthropologists/archaeologists such as Gordon F. Ekholm (1909–1987), David H. Kelley (1924–2011), Paul Tolstoy, Wolfgang Marschall, and Alice Beck Kehoe, by the art historians Robert Heine-Geldern (1885–1968), Douglas Fraser (1929–1982), Terence Grieder, and Paul Shao, and by linguists Mary Ritchie Key (1924–2003), Mary LeCron Foster (1914–2001), Cyrus H. Gordon (1908–2001; see Gordon 2000), Bede Fahey, and Brian Stubbs. That alternative view is that not only did pre-1492, pre-1000 contacts across or around the oceans take place, they began millennia ago and were numerous and highly influential; therefore, any general theory concerning universal processes of cultural evolution that rests on the supposition that the civilizations of the Western hemisphere emerged and evolved in splendid isolation is based on a fundamental misapprehension. This point of view is a form of what is commonly termed "diffusionism." Diffusionism posits that almost all cultural change—and cultural content—is a result of interaction and cultural exchange among societies, not of repeated autochthonous innovations (see, e.g., Jett 2000a). Thus, inventionists see humans as relatively creative, diffusionists as more imitative.

The differences between these two viewpoints have generated some of the most prolonged and acrimonious debates in scholarship, particularly among archaeologists (see Fingerhut 1994, also Davies 1986).

The Critics

There are many reasons for the prevalent resistance to this idea of early and important transoceanic influences; some are fact-based, some subjective. I do not propose to detail these reasons here but, rather, will concentrate on assessing whether contacts in fact took place, which would have provided opportunities for cultural exchanges between the hemispheres.

Still, one does need to begin by gaining some idea as to what the concept of influential early ocean crossings engenders in the way of negative academic opinion. Major impediments to entertaining the notion of meaningful interconnections include beliefs that 1) owing to inadequacies of watercraft and of navigation, pre-medieval crossings of oceans were impossible except, perhaps, under extraordinary circumstances, and would have been too rare to have been influential; 2) if we accept diffusionism, we lose the pair of independent emergences of civilization that permit generalizing about cultural evolution (see above); and 3) diffusionism is racist and culturally insulting because it robs peoples of credit for inventive creativity and because it was used to justify colonialism by alleging that there was but one font of civilization and that that font's exclusive heirs were Western Europeans, who had a right and a duty to manage and civilize the Natives (e.g., Blaut 1993; see Jett 2006). Note that beliefs 2 and 3 say

nothing about the *reality* of interinfluences, only about the *palatability* of the concept, and they will therefore not be addressed here. Belief 1 is treated below.

Many scholars consider the idea of influences on pre-Columbian American cultures from across the Atlantic or the Pacific to be so implausible and/or unacceptable that they perceive it as the "far-out fantasy" of this article's title, and lump such a notion with those of sunken continents, creationism, and certain other religious/mystical beliefs (cf. Wauchope 1962), and with UFOs and space aliens' having sparked human civilization. The characterizations "cult archaeology" and "pseudoarchaeology" are employed (e.g., Cole 1980). Extremist critics speak of "off-the-wall," "pseudoscientific," "rogue professors"; these are defined as academics who may look like professors and write like professors and in fact hold the title of Professor, but who in fact play fast and loose with the evidence and are dangerous because they do so with all the trappings of scholarship (Williams 1991, p. 270, referring to George Carter and his ilk; see also Feder 2005, Wilson 2012).

Critical commentators who purvey these kinds of characterizations typically write entertainingly but with anger and/or irony and sarcasm rather than with the neutral language that is supposed to distinguish scholarly discourse. They ask, 'If there were contacts, then where are the artifacts?' but tend to dismiss every pre-Norse piece of positive artifactual evidence for contact as being some sort of fake or fraud or, at the very least, the object of misinterpretation.[2] Some of these detractors are distinguished scholars, so one must necessarily consider whether they ought not, therefore, to be taken very seriously concerning this issue. The only way to assess that question is to look at the evidence itself—something that hostile critics seldom do in depth, because they perceive such an effort as being a ridiculous waste of their time and a distraction from "fruitful" scholarship such as comparative evolutionary studies (e.g., Rowe 1966; see response by Jett & Carter 1966).

It is true that meaningful assessment of the issue requires time and effort. It also requires a broad approach: The evidence of archaeology alone is insufficient, and one must also look closely at aspects of climatology, oceanography, watercraft and navigation, linguistics and epigraphy, ethnography, ethnobotany, ethnogeography, human genetics, medicine, and so forth. Here, I take a close (if necessarily brief) glance at what the combined evidence of culture and biology may tell us concerning the reality of the postulated contacts and influences, with particular attention to relatively recent findings (cf. Jett 2003). The examination commences with a summary of some of the classically cited cultural evidence. It then proceeds to consider relatively recently forwarded relevant linguistic data,

and ends with a review of the rapidly developing biological evidence for contacts, which has been dramatically raising the debate to a new level.

The Evidence of Arbitrary Cultural Traits

"Diffusionists" may be defined as those who have concluded that humans are more "plagiarizers" than inventors, and that in most cases the contents of individual cultures are primarily the product of foreign influences rather than a consequence of independent in-situ internal innovative processes (see Linton 1936, 1971 for classic statements). Diffusionists tend to look to culture itself for evidence of cultural exchanges. In the context of transoceanic-contacts studies, diffusionist scholars have long been impressed by a variety of specific cultural traits and complexes shared by certain societies on the two sides of the oceans but absent in the northern areas over which ice-age humans are supposed to have migrated from Eurasia to America. There follow herein some explicit examples of such cultural phenomena, on which cultural historians focus, and which have generated diametrically opposed interpretations. I begin with those traits that are particularly arbitrary—what could be termed cultural oddities, not being called for, elicited by, or even favored by nature, by the medium employed, or by universal psychological characteristics or social relations, and which, therefore, seem particularly unlikely to have been "invented" more than once, especially in combination with each other. The case for diffusion is strengthened 1) when the traits concerned are complex rather than simple and easily arrived at; 2) when the traits display limited geographical distributions and thus must not be "obvious" inventions potentially universally thought up; 3) when multiple commonalities are shared between the potential donor and recipient regions—geographic clustering—the probability of the combination's being independently arrived at being significantly lower than the combined probabilities of independent invention of the individual traits; and 4) by temporal overlap of the traits concerned between the two areas, ensuring the chronological possibility of influence from proposed donor area to postulated recipient area. The presence of a developmental sequence over time in one of the regions and the abrupt appearance of the fully developed trait in the other region can suggest which area is the donor and which the recipient. (On these matters, see Jett 1971.)

Cosmology, Religion, and the Calendar

The world's many societies manifest a number of different concepts regarding the origins and layout of the cosmos and how to worship in the context of those concepts. Despite this diversity, striking similarities have

been recognized between the belief systems of ancient southern and eastern Asia, especially pre-Buddhist China, on the one hand, and pre-Columbian Mesoamerica on the other. Both realms saw the cosmos in terms of a multilayered universe with division of the earth's surface (or the domain) into four cardinal–directional quarters (plus, sometimes, a center, a zenith, and a nadir), each of which was assigned a color, a season, a deity, an animal, a wind, an element (as in air, water, fire, wood, and earth or metal), and so forth. Although the specifics of the color-directional systems varied from group to group, in certain cases the identical colors were assigned to the identical directions on the two sides of the Pacific (Nowotny 1969, Jett 1983:379–380). Independent inventionists perceive even these specific and arbitrary commonalities as emerging entirely separately owing to humans' psychological universals and limited perceptual possibilities, while diffusionists view them as strong evidence of historical connections. A third alternative is to see the similarities as being a result of parallel development from common ancient Paleolithic roots (e.g., Chang 1992).

An elaborate timekeeping system is a part of this complex. The Université de Montréal archaeologist Paul Tolstoy provided a thoughtful statement in this connection:

> . . . the series of 20 day-names on which the Mesoamerican calendar is based . . . shows multiple and elaborate correspondences with the Eurasian lunar zodiac and its associated deities as identified in China, India, and the Near East. . . . This system's mere presence in Mesoamerica, in view of its arbitrary features, would seem persuasive evidence of contacts between the higher civilizations of both hemispheres. Moreover, it is but one element of an elaborately networked set of correspondences that includes mathematics (e.g., position numerals, the zero), calendrics (e.g., permutation time counts), communication devices (e.g., writing, books, papermaking), and conceptions of the world (former and present mythological worlds, world quarters and their colors, the latter with such diverse ramifications as the patolli/parchise game and state administration). To these may be added ritual practices (various forms of sacrifice, the use of water and incense, the *volador* [pole-swinging] ceremony); symbolism based on felines, snakes, and trees; and insignia of rank such as fans, parasols, and litters. (Tolstoy 1974:132–133)

The University of Calgary Mayanist David H. Kelley (1960, 1972, 1974, 2008, 2011–2014), Showa Women's University East Asian linguist David B. Kelley (1995, 2008, 2011–2014), and others who have studied calendar systems have pointed out commonalities involving a combination of deities and their attributes, associated animals and concepts, and order of occurrence in sequence. For example, D. H. Kelley identified seven in-order primary correspondences between the gods of the 28 Hindu lunar mansions

and the deities of the 20 Aztec days, and nine in-sequence correspondences between the Mesoamerican day names and Asian lunar animals.

Regarding rain worship specifically, Dennis Wing-sou Lou (1957; cf. Shao 1998) pointed out that China and Mesoamerica had the following, often arbitrary, beliefs and practices in common: 1) serpent deities (dragon/feathered serpent) associated with sky and water, the cardinal directions, and the latter's colors and winds; 2) twin-snake rain deities who are also gods of Heaven and Earth and are the precursors to humans; 3) two forms of torch-bearing Chinese thunder gods and Mayan rain gods (*chac*s), one with a human head and the other with a long-nosed head (of an elephant, in China), who ride serpents, are associated with the directions and with the S or reverse-S sign, which in turn is associated with a + sign; 4) the association of frogs with rain; 5) the concept of the raven of the sun and the rabbit/hare in the moon, along with a woman in the moon associated with medicine and childbirth; 6) four-directional rain-worship altars, with a directional rain god and its element worshiped according to the season, coupled with the gathering of snakes and the performance of a serpent dance; 7) large bonfires whose smoke elicits rainclouds; 8) mountains as rain deities; 9) the plaiting of mats in connection with rain ritual; 10) human sacrifice, including by heart excision, drowning, burial alive, and immolation; and 11) dog sacrifice.

In a summary statement, D. H. Kelley (1974:136) gave the following as the principal Asian cosmological/religious trait constellations for which there were corresponding ones in the Mesoamerican system:

(a) the Eurasian animal cycle
(b) the Hindu deity cycle
(c) the system of world ages and their associations with colors
(d) Hindu and Greek four-element theory and relationship to the world ages
(e) the use of an astronomical and cosmological era base
(f) the association of cataclysmic catastrophes with the era base, with planetary revolutions, and with eclipse calculations
(g) the use of zero in calculating the era base
(h) the use of the nine-day planetary week
(i) iconographic items such as the *makara*/*cipactli* [composite-monster] parallel and the *makara* tree.

It takes a confirmed skeptic indeed concerning contact to see this kind of complex, detailed, and arbitrary correspondence as something naturally and independently arising here and there. Although in light of the multitude

of co-occurring arbitrary concepts involved, historical transpacific—or circumpacific—connection seems to me to be the only plausible explanation, such skeptics are nevertheless numerous. Some see mere coincidence in these commonalities, others the manifestations of universal human psychological characteristics dealing with similar materials, questions, and challenges. Harvard's late K. C. Chang (1992), the pre-eminent American interpreter of Chinese archaeology, felt that Chinese/Mayan resemblances reflected the common ancient Asian background of the two cultures, both of which, over time, built similar conceptual edifices on this assumedly shared pre–Bering-migration Paleolithic foundation. "[W]e can empirically establish a Maya–China cultural continuum based on real and powerful archaeological and textual data," he observed. All that notwithstanding, his mind was made up: "no amount of illustration can convince us that these similarities were the result of cultural contact . . ." (p. 218).

Art Styles

Artistic style is another area of culture that often involves arbitrary traits. One pair of comparable decorative styles is the Eastern Zhou/Chin style of Bronze Age China and the Tajín style of late pre-Columbian Veracruz, Mexico (Figure 1), whose close resemblances have long been recognized. The following observation comes from the pen of the prominent architectural and art historian of pre-Columbian Mesoamerica and talented artist Tatiana Proskouriokoff:

> Many observers have noted striking parallels between some of the Veracruz designs and those that were used on early Chinese bronzes. Not only are the two arts very similar in general conception, with their dragon forms almost lost amid intricate tracery, but there are [also] specific and complex forms in the two styles so nearly alike that it is hard to believe that they were independently invented. (1971:571)

Having said this, Proskouriokoff then explicitly backed off from selecting an explanation for the similarities. A major difficulty concerning these two styles is that they are separated by half a millennium of time, and no temporally intermediate similar examples have been discovered. This, say isolationists, shows that similar styles can and do emerge independently. Yet diffusionists contend that these styles' detailed correspondences cannot conceivably be independent, so an ancestral Tajín-like style must have endured the time gap concerned, perhaps in perishable materials that did not survive (e.g., Heine-Geldern 1959).

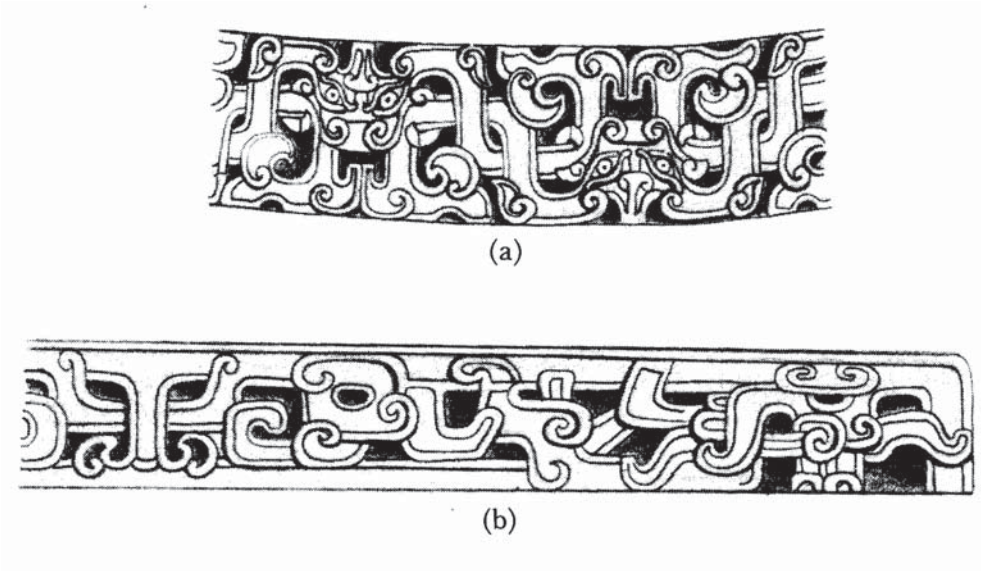

Figure 1. Drawing (by Rulon Nielson) of Chinese and Mexican interlaced, outlined-band designs: (**a**) from a Zhou Dynasty bronze vessel, first millennium B.C.; (**b**) from a stone frieze, El Tajín, Vera Cruz, circa A.D. 900. Note the semi-camouflaged monster masks (from Jett 1983:357).

Technological Systems as Evidence of Contacts

Whereas the emergences of technological systems are constrained by those systems' purposes and by physical law and are therefore far less arbitrary than are cosmological concepts and iconography, nevertheless some technologies that are shared between the two hemispheres are so complicated and/or peculiar that it is surprising that they were *ever* devised, anywhere; it would be more than doubly surprising to discover that they arose twice, independently, since particular complex enabling sets of environmental, economic, cultural, and historical circumstances are never closely duplicated. Furthermore, geographically these technologies appear in coherent distributions, not randomly here and there, suggesting that historical diffusion has been at work rather than disparate invention; an outward expansion of the complexes over time can often be demonstrated archaeologically, as would be expected from dispersal outward from a hearth of innovation. Therefore, diffusionists tend to think in terms of there having to be a historical relationship among the geographically separated occurrences of any such technology. I next describe five such technological complexes that have been studied thoroughly.

Bark-cloth and Primitive Paper Manufacture

Certainly the best-known example developed by a student of possible transoceanic transfers is the Université de Montréal Mesoamericanist archaeologist Paul Tolstoy's analysis of the making of bark-cloth—known as *tapa* in the Pacific islands—a paper-like material produced by felting the inner-bark fibers from certain kinds of trees, particularly those of the mulberry family; in its advanced form, a primitive paper is the product. Bark-cloth is used for clothing and, in its refined form, for writing on. In the opinion of the late American Museum of Natural History Mesoamericanist archaeologist Gordon F. Ekholm (1955:104) and a number of others, "bark cloth manufacture has, in general, the appearance of something that is not a very obvious thing; it is not a discovery which would be likely to be made more than once . . ."

Manufacture of bark-cloth involves the following steps: 1) stripping bark from an appropriate tree; 2) usually soaking or retting the bark to remove the sap; 3) separation of the outer bark from the inner to obtain the bast (phloem) of the inner; 3) beating the bast to felt its fibers; 4) optionally, boiling in an alkaline solution to facilitate firmer felting by 5) a second beating; 6) drying; plus, optionally, 7) polishing and 8) sizing (Needham & Lu 1985:51–53). Tolstoy (1963, 1966, 1972) ascertained that of the 121 analyzable traits found within the world's bark-cloth and primitive papermaking industries, 92, or 76%, were shared between Southeast Asia and Mesoamerica. Forty-four of these shared traits are

> not required by any of the other steps in the procedure of which they are part or by the goal itself of making bark-cloth . . . Even when essential, many of these traits are still but one of several known alternatives . . . [37 of the traits] are redundant, i.e., they co-occur with their alternatives, thus casting doubt on their comparative advantage or determination by function. (Tolstoy 1972: 385)

Bark-cloth–beating implements of the Indonesian island of Sulawesi, which derive from a type originating in Guangdong, China (Cameron 2008:206–07), and those of pre-Columbian Mexico are essentially identical (Figure 2). In addition to these bark-cloth manufacturing commonalities is the making of screen-fold books from the material produced by both the Maya of Mesoamerica and certain peoples of Thailand and Burma in Southeast Asia (Grieder 1982:173, 175–77).

The Blowgun

In the context of examining possible early Indonesian influences in tropical America (Jett 1968), the University of California, Davis, cultural

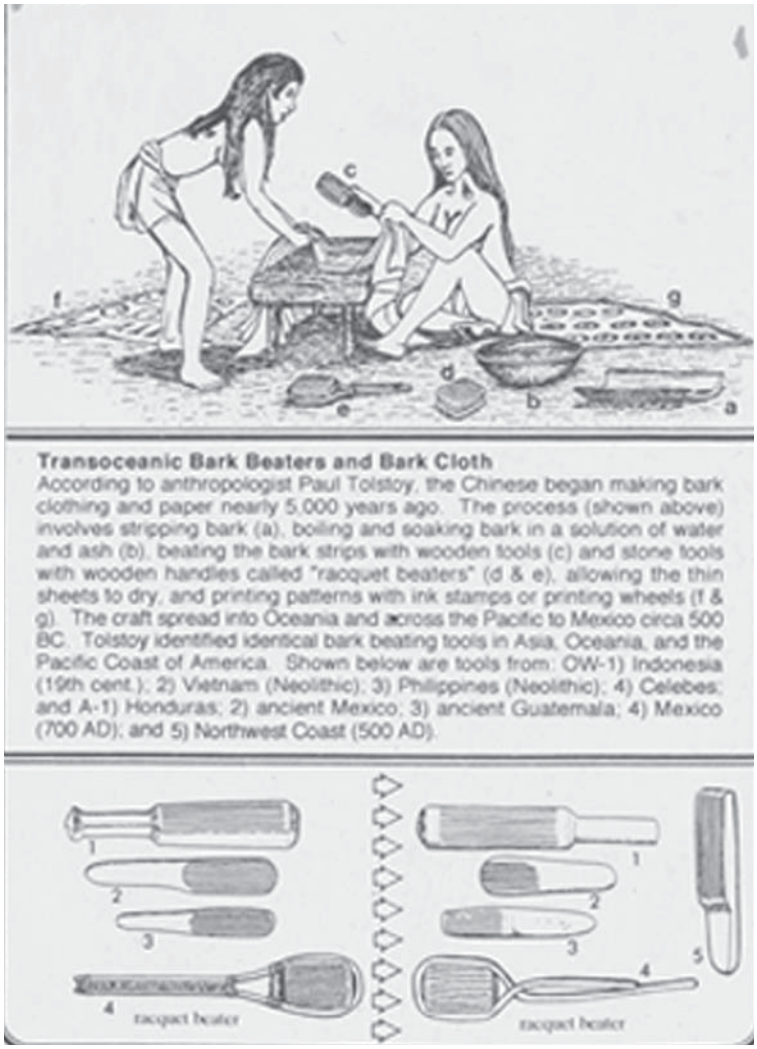

Figure 2. Drawing of Southeast Asian and American bark-cloth beaters (by Gunnar Thompson 1992:224).

geographer Stephen Jett conducted a global review of blowguns—those tubular weapons with which hunters shoot darts or pellets at small game (Jett 1970, 1991)—which archaeology shows to be pre-Columbian in both hemispheres. The developed blowgun is closely associated with Indonesian speakers in the Old World but is also widely distributed within the tropical

and subtropical Americas, where its greatest elaboration centers on the region where Ecuador, Colombia, and Peru conjoin.

Jett concluded that there is compelling evidence of a historical relationship between these two blowgun complexes. His global analysis identified 55 traits for comparison. Of these, 32, or 58%, were shared between Island Southeast Asia and tropical South America. But whereas 82% of the 39 elements described for the Americas also appear in Asia, the Old World complex is more evolved and only 67% of its traits also occur in the Western Hemisphere—which implies an Asia-to-America direction of transfer, prior to later elaboration in Indonesia.

Here are some of the more notable characteristics held in common: 1) single-tube weapons using a naturally hollow plant stem or one whose pith has been pushed out; 2) single-tube blowguns created by splitting a length of wood, incising half of the bore into one of the split halves and half into the other, then gluing and binding the two halves together; 3) double-tube blowguns, with one tube inside the other; 4) sights, mouthpieces, and muzzle rings; 5) projectiles in the form of clay pellets and darts, with fiber wadding for the latter carried in a gourd; 6) bamboo dart quivers tied to the waist by a cord; and 7) preparation and use of a cardiac tree-sap dart poison and of a poison made from lianas of genus *Strychnos*, for which salt is a supposed (but not real) antidote.

Metallurgy

In elaborated form, the technology of metal-making is exceedingly complex. Even in fairly basic form, the *chaîne opératoire* of metal-artifact production involves the following: 1) prospecting, by inspection of minerals, plant growth, and water color and taste; 2) the collecting or mining of ore, mining requiring manufacture and the use of hammers and picks, excavation of pits, shafts, drift tunnels, etc.; 3) ore-processing or benefaction, which involves crushing with tools and then sorting; 4) acquiring materials for, and building, drying, and preheating a crucible or furnace of the correct dimensions and providing the crucible/furnace with draft, as either wind or as breath blown through properly placed and employed blowpipes or as air-flow generated with bellows, which require previous construction; 5) finding and selecting the appropriate type and size of fuel (usually, charcoal from certain woods, which requires its own long and elaborate preparation and even woodland-management), placing the fuel in correct position and proportion to the ore, and timing the addition of more ore (additionally, in the case of sulfide ores, roasting to replace the sulfide radical with oxygen prior to smelting); 6) reduction to free metal by smelting with the carbonaceous fuel for the proper length

of time at the proper temperature; 7) refining (re-melting and removing remaining impurities, preferably in the presence of charcoal to prevent re-oxidization); 8) alloying (if required), with control of the proportions of two or more ores or metals; 9) annealing (cold-hammering, perhaps alternated with heating); 10) construction of a mold and then casting, if required; and 11) smithing, including hammering, grinding, polishing, and decorating (optional) to produce the finished artifact. Considerable organization and overall guidance are needed to achieve success, and most of the individual operations require experienced specialists (de Barros 1997, Ottaway 2001, Roberts et al. 2009). This complicated set of physicochemical procedures is surely not something that would naturally be stumbled upon again and again, even incrementally (Forbes 1950:12).

Beyond the fundamental technology just described is the sophisticated elaboration of it, as well as the forms of the objects produced. The Austrian art historian Robert Heine-Geldern (1972) addressed these matters with regard to two adjacent metallurgical areas of pre-Columbian northwestern South America. Technological commonalities with Southeast Asia included copper-ore smelting, the wind furnace, the blowpipe, granulation, solid and lost-wax casting, the manufacture of a copper–gold alloy (*tumbaga*), tin-bronzemaking, surface-coloring of gold–alloy objects by chemical processes (*mise-en-couleur* and wash gilding), and soldering. Heine-Geldern compared the forms of metal objects from these areas with those of the Dong Son (Đông Sơn) culture of northern Vietnam. Regarding the Colombian–Ecuadorian region, he found in common with Southeast Asia: small globular bells, openwork scenes framed with simple or plaited rope designs with spiral appendages plus dangles, frogs decorated with the plait motif, and a stress on double spirals (Figure 3). In Peru, he noted other traits shared with Dong Son: socketed axes and spades, tweezers, bracelets or rings whose open ends form spirals, and S scrolls. His conclusion was that, somehow, Dong Son metallurgists had sailed to South America two millennia ago. West Mexico, which had connections by sea with Ecuador, participated in this metallurgical complex as well (Heil 1998).

Weaving and Dyeing

Although we take loom-woven textiles very much for granted today, they are, as one archaeologist observed, "one of the strangest inventions ever produced by man" (Rubín de Bobolla 1964:3), an invention that seems unlikely to have arisen in multiple times and places.

Cloth-weaving on hand looms is a technological complex that involves a number of stages, devices, and procedures: 1) domesticating and raising fiber plants or animals; 2) harvesting, cleaning, and carding the fibers;

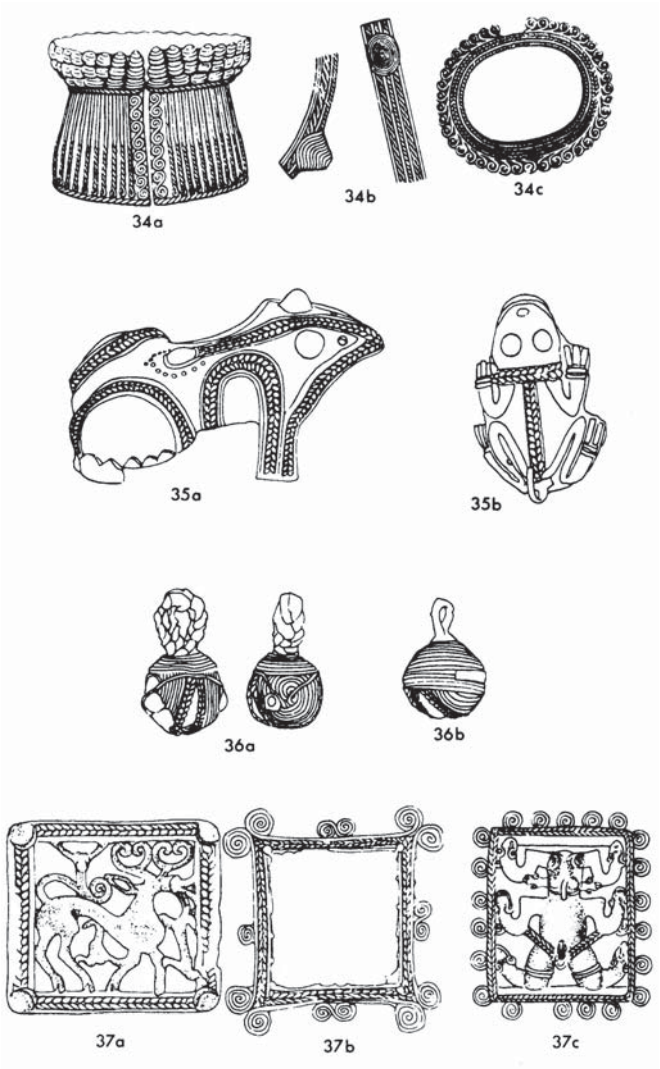

Figure 3. Drawing comparing metal objects from the Dong Song culture of Indochina (second half, first millennium B.C.) and from pre-Columbian Colombia and Panama:
(34a, b) bronze amulets, Cambodia; **(34c)** gold ornament, Colombia;
(**35a**) bronze frog effigy, Indochina; (**35b**) *tumbaga* (copper–gold–alloy) frog effigy, Colombia;
(**36a**) bronze bells, Laos; (**36b**) *tumbaga* bell, Colombia;
(**37a**) bronze belt buckle, Caucasus Mountains; (**37b**) bronze ornament, Indochina; (**37c**) gold ornament, Panama (from Heine-Geldern 1972:804).

3) using the principle of the flywheel to spin the fibers into thread, and perhaps plying threads into yarn; 4) assembling and setting up the loom frame; 5) stringing the warp threads/yarns under tension; 6) separating the warp leaves using heddle rod and heddles and inserting the wefts through the resulting shed and then the countershed; and 7) beating the warps into place. A host of woven structures—some ingeniously complex—were devised to produce patterns. Weaving may be followed by making the cloth into tailored garments, which requires cutting to shape and assembling by sewing. If one adds to all this the chemical technology of dyeing with colors, often highly technical and complicated and involving not only laboriously produced dyestuffs but also fiber-roughening and chemically binding mordants, one has an extraordinarily elaborate physical and chemical system of production—in fact one of humankind's most amazing pre-modern achievements. Regarding dyeing alone, whose recipes were often kept secret, one writer asserted, "Making dyes was once a treasured craft, something akin to sorcery, and the recipes were often so complicated and obscure that most tribes chose certain people to do nothing but gather the necessary roots, nuts, leaves, fruits, and insects" (Specter 2000:49).

At least four important genres of dyestuffs were shared between the hemispheres before 1492. Madder-root reds were produced in southern Asia and in early Peru. Indigo was a specialty of northwestern India and of the high cultures of the Americas. Red dyes from various species of tiny coccid insects were also made in Southwest and South Asia (kermes and lac) and in Mexico and, later, Peru (cochineal). The labor-intensive use of shellfish-purple dyes was centered in the eastern Mediterranean but also included the Red Sea and Atlantic Morocco in the Old World, and (in less laborious form) Middle America and Peru in the New (Jett 1998b).

But that is not the totality of potential complexity. In addition to manipulating structure to create pattern, including with yarns of different colors, in both hemispheres non-structural means were utilized as well, including embroidery, freehand painting, and printing—the last two employing either direct painting/printing or the application of mordants to cause the dye to be absorbed only in the mordant-painted areas. As if this weren't enough, methods of resist dyeing were also developed to create design: preventing the dye from reaching certain parts of the thread/yarn or cloth during the bath. These hugely laborious shared resist methods included 1) *ikat*, the pre-dyeing tying off, with impermeable cord, of some areas of the as-yet unwoven warps, wefts, or both; 2) *tie-dye* or *plangi* and *tritik*, the tying or sewing off of some areas of the woven cloth prior to dyeing; and 3) *batik*, the coating of parts of the cloth with starch, resin, wax, or the like before dyeing to repel the dye from those areas. Then there is the question

of color palettes and design styles, in themselves often complex and quite diagnostic, even emblematic, of particular cultures (Jett 1999).

There are three ancient loom types with distinct regional associations in the Old World that also occur in the New: 1) the horizontal staked ground loom of North Africa and Southwest and Central Asia is also found in the Lake Titicaca basin of Bolivia and Peru and in Northwest Mexico; 2) the vertical two-bar (tapestry) loom of southwestern Asia is widely distributed in the Americas as well; and 3) the backstrap loom of Southeast Asia is also common in the Western Hemisphere, especially in the tropics (Heyerdahl 1978:76, Broudy 1979, Teague 1998:106–24). With regard to the heddle complex (a rod-and-multiple-string device for separating the warp leaves), *the* historian of ancient textiles (and a weaver herself), Occidental College's Elizabeth Wayland Barber (1994:41) wrote that from its region of Neolithic origin in northern Iraq or Turkey, "the idea must have spread slowly to Europe, to the Orient, and eventually by boat to South America [circa 2000 B.C.]. It is such a difficult concept that it may have been invented only once."

Needless to say, these several elaborate cloth-related technologies did not arise spontaneously in many places here and there but only in a few areas where a permissive combination of factors happened to co-occur. From these centers of innovation, the technologies spread outward until they became widely distributed in both the Old and the New Worlds but with coherent patterns of geographical distribution as well as some archaeological support for spread over time from areas of invention. I am inclined to conclude that the textile traditions of the two hemispheres are historically as well as technologically closely related to each other and a consequence of multiple overseas contacts between peoples of southern Asia and tropical America.

Ceramics

The making of even simple, non-wheel–turned, non-molded ceramics is not an uncomplicated matter. Suitable clay must be identified, dug out, transported home, and worked to remove inclusions. It must be mixed with the proper proportion of water and tempering material such as sand, crushed potsherds, or organic material, to limit shrinkage and prevent cracking. The vessel must be hand-formed (usually by coiling and scraping) to a uniform degree of thinness. Optionally, the surface may be decorated by beating with a cord-wrapped paddle, incising, punctating, appliquéing, or some other method while still damp, and/or be slipped and painted when dry. Fuel must be gathered and the "green" pot fired with the right amount of cover to create either a reducing or an oxidizing atmosphere at the proper temperature. Altogether, it is not a technological complex that would naturally and easily have arisen in multiple locations.

Furthermore, certain New World pottery vessel forms are strikingly similar to certain forms in the Old World, e.g., ceramics of the American Formative and those of Neolithic southeastern China (Tolstoy 1974:133,134).

There are many other areas of material and nonmaterial culture in which close correspondences may be seen (see Sorenson and Raish 1996). The abundance, arbitrariness, complexity, and geographical and temporal clustering of many such correspondences are enough to cause diffusionist scholars to have few doubts about the existence of historical relationships (see, e.g., Fraser 1965, Tolstoy 1972, Jett 1971). However, such commonalities are not sufficient to persuade everyone; in fact, the majority of scholars remain convinced that, because humans all have the same kinds of brains and must deal with the same kinds of physical and social challenges, such similarities demonstrate not contact but the potential of completely separated societies to independently invent the same solutions anywhere that they are faced with the same general circumstances: If people could devise some trait or another in one place, other people could do the same thing somewhere else. This belief is particularly strong in the transoceanic context, since it is widely assumed that the Atlantic and the Pacific were essentially uncrossable before the European development of adequate ships and navigation in the 1400s (see below). The data that diffusionists perceive as demonstrating contact strike independent-inventionists as proving that unconnected societies can and do create very similar innovations. Clearly, then, cultural indications and theoretical arguments alone are unlikely to resolve these differences of viewpoint; we must search for confirmatory or refutatory evidence in non-cultural realms. More particularly, we must ask whether there exists *objective* and *non-cultural* proof of significant contacts. If such can be identified, then the *opportunity* for cultural exchange will have been demonstrated and the burden of proof will definitively shift from the diffusionist to the independent-inventionist.

Linguistic Evidence of Contacts

Languages and Writing

Among all the different categories of cultural phenomena, language and written inscriptions provide the most potentially useful indicators of contact, and American inscriptions in Old World alphabets and languages were of much interest to the Texas A&M geographer George Carter, who sparked the sometimes wild "American epigraphy" movement as led by the marine invertebrate zoologist H. Barraclough "Barry" Fell, a brilliant but methodologically flawed researcher and popularizer (e.g., Fell 1976).[3] Although much of Fell's work is unreliable, some of his identifications have

been accepted by Mayanist epigrapher David H. Kelley (1998a, 1998b, 1998c) and certain others (e.g., McGlone, Leonard, Guthrie, Gillespie, & Whittall 1993, but see Vastokas 2004).

Regarding comparisons between Old and New World languages, although these have long been viewed as not demonstrably related to one another, in 1967 the linguist Aert H. Kuipers did point out striking lexical and grammatical resemblances to Indo-European on the part of the Squamish language of northwestern North America's Coast Salish stock; but, as far as I am aware, this has never been followed up on. In more recent years, a few maverick professional and avocational linguists have forwarded some intriguing additional indications of certain other American Indian languages being closely related to particular Old World tongues—for example, the Andes' Quechumaran and Mexico's Uto-Aztecan, Tarascan, and Mixe-Zoquean languages being allied to or creolized with Afro–Asiatic idioms (Foster 1998, Stubbs 1998), of many tropical South American languages containing Austonesian elements (Key with Richards 1984, Key 1998, Stubbs 2014), and of Mayan being a Sinitic language (Fahey 2004, 2005/2006/2007). Two other proposed Asian/American language connections may also be mentioned: North America's Na-Denean and Siberia's Yeniseian (Ruhlen 1998, Kari & Potter 2010) on the one hand and Cal-Ugrian (Siberia's Ob-Ugrian and western North America's Penutian; von Sadovszky 1996); however, these two transfers would not have involved long open-sea voyaging.

In addition to some notable grammatical correspondences, these scholars have presented impressive lists of seeming lexical cognates that display systematic phonetic shifts. However, the linguistic and epigraphic evidence and arguments are too technical to present briefly and cogently, so I will move on to a distinct category of clues, that of biological evidence. The beauty of biology is that it is based on genetics rather than on cultural invention interpretable as coming from the universally shared human psyche interacting with people's common experiences and concerns.

Biological Evidence of Contacts

Cultivated Plants and Domesticated Fowl

More than a century ago, U.S. Government botanist O. F. Cook recognized that every cultivated plant could have been taken into domestication only where its wild ancestor(s) existed, and, that said, ancestors were confined to one hemisphere or the other. Therefore, such plants—most of which were incapable of diffusing via the Arctic, of leaping oceans on their own, or even of surviving without human intervention—could be used as objective

tracers of human movements, including movements across oceans. He also pointed to the names of these plants as having often traveled with the species (Carter 2002). Although botanists generally ignored Cook's notions, the cultural geographer Carl Sauer took up these ideas, and one of his students, Johns Hopkins University geographer George Carter, carried them farther than Cook or Sauer ever did (Gade 2003/2004, Jett 2007b).

Beginning in the 1930s, but especially in the decade after World War II, an increasing number of indications began to crop up that several cultivated plants had been shared between the hemispheres and between the Americas and Polynesia before 1492. Carter (1950, 1953) became the first to assemble all of the then-available information and present it as a whole (see also Heine-Geldern 1958). Until recently, however, the evidence of pre-Columbian transfer of these species was mostly circumstantial and therefore subject to dispute. But in recent years, the data have mushroomed. Another Sauer student, University of Oregon cultural-plant geographer Carl L. Johannessen (Gade 2003/2004), has been at the forefront in gathering and presenting the new findings (e.g., Johannessen & Parker 1989, Johannessen 1998, Johannessen with Wang 1998). The Brigham Young University anthropologist John L. Sorenson and Carl Johannessen have together compiled copiously documented information, which the authors characterize as providing

> . . . conclusive evidence that nearly 100 species of plants, a majority of them cultivars, . . . were present in both the Eastern and Western Hemispheres prior to Columbus' first voyage to the Americas. The evidence comes from archaeological, historical and linguistic sources, ancient art, and conventional natural science studies. Additionally, 19 species of micro-predators and seven other species of fauna were shared by the Old and New Worlds. The evidence further suggests the desirability of additional study of at least 75 other organisms as probably or possibly bi-hemispheric in pre-Columbian times. (Sorenson & Johannessen 2009:1)

That, it must be acknowledged, is a breathtaking statement. Because it is so very far from the general consciousness concerning pre-Columbian plant distributions and exchanges, we are bound to ask: Are Sorenson and Johannessen's assertions really supportable? I have sampled their original sources and studied all the archaeological reports in detail and have found that the short answer is: Yes, they are abundantly supportable. Johannessen's work has stressed pre-Columbian temple carvings in India that clearly show maize ears (Figure 4) and, somewhat less obviously and abundantly, the sugar-apple, sunflower, and certain other American plants. The Indian art historian Shakti M. Gupta (1996) has independently

confirmed many of these identifications. For those not convinced by carvings, literary references (e.g., to tobacco; Ashraf 1985), and the like, but only by truly "hard" evidence in the form of actual pre-Columbian plant remains, one may mention a number of reports of Eurasian–Pacific archaeological specimens—some of great antiquity—of the following American crop plants: the sweet-potato widely in Polynesia (Hather & Kirch 1991, Pearthree 2003, Ladefoged, Graves, & Coil 2005, Horrocks & Rechtman 2009, Barber 2010); the peanut in Neolithic China (Johannessen with Wang 1998, Sorenson & Johannessen 2009, citing Wenhua 1994); the common bean, the lima bean, the phasey bean, amaranth, the sugar-apple, and *Datura* at early levels in India (Johannessen with Wang 1998:22–25, Saraswat, Sharma, & Saini 1994, Pokharia & Saraswat 1999, Pokharia 2008); third millennium B.C. peanut, sugar-apple, maize, and chili pepper on the East Indies' island of Timor (Glover 1977:43,46, 1986:55, 102, 132, 229–230, Oliveira 2008:218,178,182); and agave in Cyprus (Steffy 1985:84, 1994:56).

In the New World, the Asian variety of the bottle gourd is archaeologically ancient in many regions (Erickson, Smith, Clarke, Sandweiss, & Tuross 2005), and the Indian Ocean coconut has been reported archaeologically in Guatemala (ca. A.D. 700), in Honduras (ca. A.D., 400; Robinson et al. 2000:843), and in Peru (Heyerdahl 1953:458). Half of the chromosomes of pre-Columbian American domesticated cottons are from an African species (Hutchison, Silow, & Stevens 1947, Johnson 1975), although likely a result of natural dispersal (Wendel & Cronn 2003), and there is more equivocal archaeological evidence for plantain and certain other Old World crops. Small culinary dogs in China and the Americas share the same gene for hairlessness (Drögemüller et al. 2008, Jett 2008–2010); although the animal is ancient in America, its age in Asia is unknown.

Molecular genetics has, in recent times, been applied to questions of the geographic sources of certain of these "out-of-place" crop species. Genetics indicates that the aboriginal Polynesian sweet potato most likely came from the Ecuador/Peru region (Roullier Benoit, McKey, & Lebot et al. 2013). The bottle gourd is more problematic; morphologically, the New World ones are like African gourds, while some geneticists feel that the affinity is with Asiatic ones (Erickson et al. 2005, Clarke 2009:199).

George Carter (1971, 1998) and Carl Johannessen (Johannessen & Fogg 1982, Johannessen, Fogg, & Fogg 1984) also presented much circumstantial biological and cultural evidence of Asiatic chickens having been introduced to pre-Columbian America, but they were unable to verify any pre-1492 chicken remains. However, in 2007 an international archaeological team

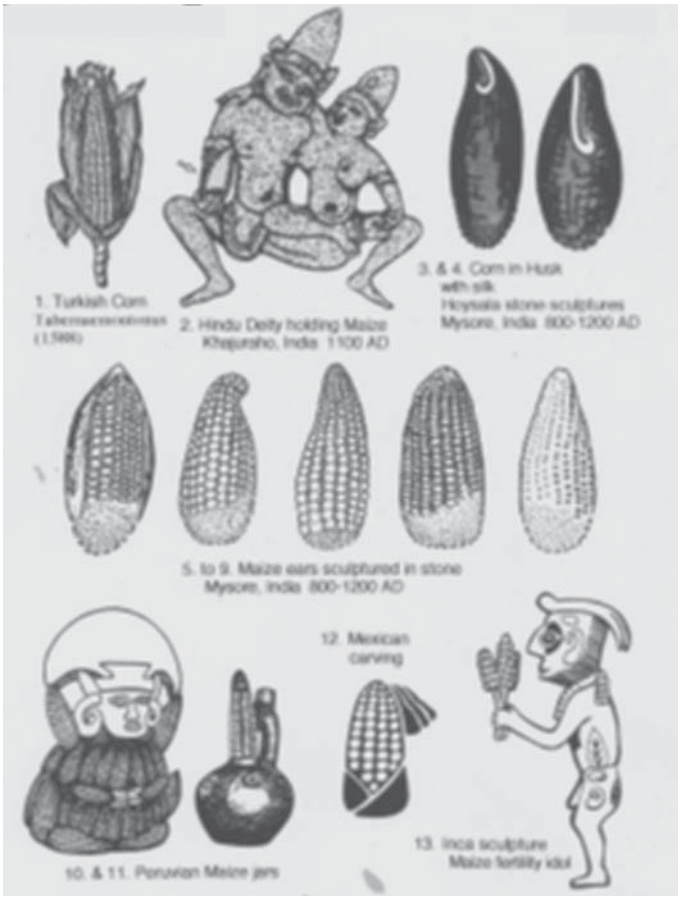

Figure 4. Drawings of pre-Columbian sculpted maize representations in the Old World, notably from Hindu temples in Karnataka (formerly, Mysore) state, India, and in Mexico and Peru (by Gunnar Thompson 1992:240).

led by Alice A. Storey announced the discovery of late pre-Columbian West Polynesian–type chicken bones in coastal south–central Chile, representing a minimum of five birds; additional bones were obtained later (Storey, Quiróz, & Matisoo-Smith 2011; for demurrers, see Gongora et al. 2008, refuted in Storey et al. 2007, 2011, Thompson et al. 2014). Medieval-period bones of the American turkey have been reported from Europe as well (Bökönyi & Jánossy 1959), although they have been disputed as being from peacocks (Schorger 1966:472).

One fascinating matter, which Jett has investigated in depth, is

reports, mainly by a German team of forensic pathologists led by Svetlana Balabanova (beginning with Balabanova, Parsche, & Pirsig 1992), that residues of nicotine and cocaine occurred in the bones, hair, and tissues of a multitude of ancient Egyptian mummies, and nicotine alone in numbers of other pre-1492 Old World burials. Since tobacco and coca—major ritual, medicinal, and indulgent plants of the Americas—are the only plausible sources for these alkaloids, we are obliged to conclude that transoceanic drug-trafficking occurred. This conclusion is reinforced by the discovery of the occurrence of residues of THC from Asian-origin hashish in a number of pre-Columbian Peruvian mummies (Parsche, Balabanova, & Pirsig 1994; for comprehensive coverage, see Jett 2002, 2003/2004; see also Görlitz 2002, 2011).

Although this fact has not yet been widely absorbed in the scholarly community, the quantity and quality of the evidence for inter-hemispheric transfer of domesticates is now such that it is hardly disputable that multiple roundtrip pre-Columbian contacts and plant transfers took place; the "undeniable reality" of this article's title must be accepted.

Human Parasites

The human louse (*Pediculus humanus*), known archaeologically from Europe and Africa, has been identified on pre-Columbian Peruvian mummies dating to circa A.D. 1225, in the form of clade B (one of its three clades), which may have originated in Africa but which is now global (Raoult et al. 2008).

There are certain tropical/subtropical intestinally parasitic worms that had always been thought of as being confined to the Eastern Hemisphere before 1492, most having evolved along with domestication and urbanization there and consequently being too late to have entered the pre-Columbian Americas with the founding migrants (Reinhard 1990:159). Most of the few human intestinal parasites of earlier vintage were thought to have been filtered out by cold, as paleolithic hunters entered via arctic Beringia. Except for pinworms, said archaeopathologist Karl T. Reinhard, "So late as 1981, parasitologists in general believed that the [pre-Columbian] New World was essentially free of human parasite disease" (Pringle 1998:1776). In the intervening years, that impression has changed dramatically.

In 1974, the first American archaeological find of the hookworm *Ancylostoma duodenale*, from a Tiahuanaco mummy of circa A.D. 900, was reported from Bolivia. Sixteen years later, many more such finds had been made, in both South and North America, not only of *A. duodenale* but also of another hookworm in Brazil, *Necator americanus*, and the whipworm (*Trichuris trichura*) in various parts of South America (at approximately

6670 B.C. in Brazil). Similarly, the hookworm (*Ancylostoma duodanale*) was found circa 5250 B.C. in eastern Brazil. Other parasites unearthed include the hairworm (*Strongyloides*) and the giant roundworm (*Ascaris lumbricoides*), the last being attested in Peru at about 2300 B.C. (Fernando Ferreira, Araújo, & Confalonieri 1988:65–67, Verano 1998:221, Horne 1985:300–303).

Brazilians have been active in this research, citing *A. duodanale* from two places in Brazil, at circa 800 and 5250 B.C., respectively. These Brazilians concluded that transoceanic contacts were necessary to account for these occurrences and that the presence of various helminths among "Paleoindians" placed the oldest of such contacts much earlier than even most diffusionists have proposed (Fernando Ferreira, Araújo, & Confalonieri 1988:20–23, Confalonieri, Fernando Ferreira, & Araújo 1991:864–865). The pre-Columbian New World presences of these Old World warm-region intestinal parasites are among the stronger evidence of actual seaborne contacts across the oceans in early times. The only alternative explanation to transoceanic—or, at least, rapid boat-borne littoral transfer—that comes to mind is of carriage via the Bering Strait area during an interglacial, when conditions would have been warmer—although whether or not they would have been warm *enough*, I am uncertain;[4] in any case, that would require both an early initial entry of humans into the hemisphere—the possibility of which is debatable—and emergence of the parasites before the rise of agriculture, which is contrary to present understanding.

Human Genetics

The study of human genetics, especially biochemical and molecular genetics, is technical and fast-developing. Sampling has so far not been anything like geographically universal; thus, many conclusions remain tentative. And because genetics is so complex a subject, I cannot present a clear and comprehensive picture in the space available. Nevertheless, the field seems certain to provide critical evidence relevant to transoceanic investigations. The biologist Austin L. Hughes (2002) has written, "Molecular-biology data offer the promise of at last unlocking the prehistories of our . . . species." The anthropologist Kenneth Tankersley was of the same mind:

> Genome variation is rapidly becoming a powerful tool that is leading toward a quantum leap in our knowledge of human migrations and origins. . . . It is becoming increasingly evident that genetics in the twenty-first century will have as a profound effect on American archaeology as radiocarbon dating did during the twentieth century. (Tankersley 2000:75)

What gives such genetic studies the advantage over traditional physical

anthropological ones is the specificity, numerousness, variability, and high degree of mutual independence of the items involved, resulting—as long as sampling is done properly—in statistically unassailable matches. For purposes of reconstructing contacts, distinctive and uncommon genetic markers that involve polymorphisms with no apparent phenotypic functional or adaptive advantage may be most revealing, just as in the cultural realm minor but distinctive and highly arbitrary cultural traits may indicate contact and introduction. It is the presence and limited geographic distributions of such distinctive polymorphisms, not pooled averages that show the degree of overall genetic distance among populations, that count in this context. These polymorphisms are the "trace elements" of biological anthropology, and can signal contact and gene flow even when small numbers of migrants or visitors were involved.

Although the ABO blood groups are the best-known single-gene–controlled factors, they are of limited use for our purposes because the different blood groups provide differing degrees of resistance to various diseases and therefore can be selected for or against relatively rapidly. However, other blood factors are far more useful, in that the numbers of genotypic variants are much greater and have no demonstrated adaptive differences among variants. As far back as the 1960s, the Diego factor was found to be abundant among South American Indians and common in southern and eastern Asia but absent in the Bering Strait region (Garn 1965:45–46). Certain haplotypes of the Rhesus and Kell systems also display such suggestive distributions among living Amerinds. Transferrins have variants with similar distributions as well. All of this suggests contacts between the hemispheres via the oceans, separate from any via the Arctic. (The absence of the Asian mitochondrial–DNA haplogroup B in the north may reflect the Late Pleistocene littoral movements into the hemisphere's bypassing the then-frozen north or scarce early northerners later being genetically swamped, as well as later, Holocene, transoceanic inputs directly to more southerly areas (Jett 2007a).)

The American organic chemist James L. Guthrie (2000/2001) made an extensive study of the present-day distributions of the above factors, particularly of human leukocyte (lymphocyte) antigens (HLAs), which are components of the histocompatibility system. Although no HLA data are available for pre-Columbian times, these contemporary data are nevertheless particularly useful owing to the great number of variants and the rarity and geographical restriction of certain of them, and the low likelihood of their presence reflecting post-Columbian admixtures.

I can only summarize Guthrie's findings. Many of the "foreign" HLAs and other factors do not occur in the northern regions of Asia or America but

do occur in America's lower-latitude zones of high culture. Mesoamerica and the Andean region share many of these factors with each other but not with Central America, while a number of those present in Central America fade out to the north and to the south, implying related outside inputs to Mexico and Peru and a separate input or inputs to the intermediate area. A number of "Afro–Asiatic" HLAs—characteristic of the Mediterranean/southwestern Asian realm—show up, many together, in South America, especially in the Andean region, as well as among Uto-Aztecan speakers of Mexico and adjacent countries; these distributions fit nicely with the aforementioned fairly recent proposals that Uto-Aztecan and the Andes' Quechumaran languages are in some way related to the Afro–Asiatic linguistic stock. In addition, there are southern Asian HLAs in parts of aboriginal America, suggesting Southeast Asian/Oceanian input. Certain European HLAs also appear among Uto-Aztecans and Andeans. The patterns of "foreign" HLAs found among living indigenous American peoples are not, in most regions, what would have prevailed if their source had been the post-1492 European colonizers. Nor are independent mutations a plausible explanation for these patterns. I cannot credit that the co-occurrence of these and other "foreign" genes in the Andean and greater Mesoamerican regions—exactly where multifarious foreign influences are most suggested by cultural and linguistic evidence—does not reflect pre-Columbian human intrusions from the Eastern Hemisphere; if anyone can suggest another encompassing explanation, I would be most interested to hear it.

One relevant genetic system is that of the genetically stable but highly diverse polymorphic *Alu* sequences of short interspersed repetitive elements (SINEs). Heterozygosity (an index of multiple contributors to a population) is maximal in Peru, high in North America including Mexico, and minimal in Central America. The study of *Alu*s shows that a notable correlation exists between the Chinese and the Mayans and their neighbors (Novick et al. 1998)—dovetailing with Bede Fahey's case that the Mayan and Chinese languages derive from a common ancestor as well as D. B. Kelley's concerning some of the calendrical data (see above).

Supremely useful though they are in tracing past human movements, with the exception of the finding that Asian mitochondrial-DNA haplogroup B is absent in the north of Native North America (Cann 1994), uniparental DNA studies have contributed little to the Holocene transoceanic-contacts question. Geneticists studying Native American origins typically look only at "Native American" DNA (haplogroups A, B, C, D, and X) and eliminate from consideration "foreign" DNA, which they reflexively attribute to post-Columbian admixture. Thus, these studies normally fail to report the very data we need for the question we are asking (future advances in ancient-

DNA studies may eventually come to our aid). In addition, most ancient contacts from overseas are highly likely to have involved only men and not women, so we would not anticipate mtDNA (female-inherited) to be useful in this context (male-inherited MSR DNA has significantly fewer polymorphisms, and there are many fewer Y-DNA than mtDNA studies).

A partial exception to the limited utility of recent DNA studies in identifying transoceanic inputs is the Near Eastern/European mitochondrial-DNA haplogroup X, of which variant X2a occurs, sometimes at fairly high frequencies, among a number of northerly North American Indian groups (Smith et al. 1998, Brown et al. 1998). The European and American haplogroup-X variants appear to have split from each between 17,000 and 13,000 years ago, giving some additional credibility to theories of Pleistocene ice-edge transatlantic migrations from France and Spain: the "Iberia, not Siberia" hypothesis for the ancestors of carriers of the early North American Clovis culture, ancestors who are hypothesized to have been Solutrean Europeans (Stanford & Bradley 2012; for an early contrary view, see Straus, Meltzer, & Goebel 2005; too, X may not have been in Western Europe this early).

Interestingly, a sample from the Cherokee included not only notable frequencies of mtDNA X but also six additional non-Native American haplogroups of Levantine/European origin, most in significantly higher percentages than among the non-Indian populations of the Southeast and including haplotypes unique to the Cherokee, suggesting considerable age; these patterns seem to essentially preclude attribution to post-Columbian European/African admixture (Yates 2012).

Watercraft and Navigation

Transoceanic diffusionists have always thought that the detailed and arbitrary cultural commonalities shared between the two hemispheres were sufficient to show that contacts had taken place and that influences had occurred. All this was reinforced by the circumstantial evidence for the pre-Columbian sharing of certain cultivated plants and the chicken. Therefore, so diffusionist thinking went, despite a lack of direct evidence of adequate watercraft with which to effect crossings, such craft *must* have existed—contrary to historians' assertions that Old World "discovery" of the open oceans and the Americas awaited European Medieval/Renaissance developments such as adoption of the magnetic compass, capacious multi-masted ships, and the stern rudder (Jett 1998a, 2008). Isolationists simply said, "We don't think contacts could or did occur; *show* us the boats, and then *show* us Old World artifacts professionally excavated from pre-Columbian New World sites, and then perhaps we'll consider the possibility

of influences. Meantime, we will assume independence."

Littoral adaptations, including the use of watercraft, are now thought to have been important in the spread of modern humans for at least 150,000 years (Erlandson 2001). Archaeology has proven humans to have made significantly long ocean voyages to settle the islands of Near Oceania beginning more than 40,000 years ago, showing that well-developed seagoing watercrafts, presumably sail-powered, as well as celestial navigation were in use far earlier than previously suspected (e.g., Gamble 1994, Irwin 1992). Okinawa, in the Ryukyu Islands and never connected to the mainland, has yielded human skeletons dated back to 30,150 B.C. In Japan proper, obsidian was being obtained from Kozushima in the Izu Islands 34 miles off Honshu as long ago as 28,000 years B.C., showing that Paleolithic voyaging was occurring in East Asia as well (Ikawa-Smith 1986:204); by 1000 B.C. or earlier, long-distance seaborne trade was taking obsidian some 2,175 miles westward from New Britain and the Admiralty Islands to Borneo (Fredericksen 1997:376–377). In the West, the Mediterranean islands were populated even earlier: Sardinia as much as 300,000 years ago and Crete 170,000 years ago (Bednarik 1997, Broodbank 2006).

In the late twentieth century, the study of traditional watercraft and their performances—including, importantly, by the geographers Edwin Doran (e.g., 1971) of Texas A&M University and Clinton Edwards (e.g., 1972) of the University of Wisconsin-Milwaukee—plus maritime archaeology, led by the Texas A&M University nautical archaeologist George Bass—vastly expanded our knowledge of ancient watercraft, and a number of specialists now feel that many kinds were quite capable of crossing oceans; in fact, history and archaeology tell us that traverses of the Indian Ocean greater in length than the width of the Atlantic were routinely undertaken in Antiquity.

The building of reproductions of ancient craft and the submission of them to rigorous sea trials has increased our respect for early vessels' durability, seaworthiness, and handiness. Experimental voyaging in replica watercraft has repeatedly demonstrated the transoceanic capabilities of everything from reed bundle craft and log rafts to skin boats, sailing canoes, and Chinese junks (e.g., Crumlin-Pedersen & Vinner 1986, Capelotti 2001). Multiple solo crossings in minute modern boats have reinforced the conclusion that almost any craft is capable of crossing an ocean, even by simply drifting (many post-1492 transoceanic drifts have been recorded; Jett 1971:13–15; Kehoe 1971, 1990). Rainwater and wild foods obtainable at sea were usually more than adequate for survival (Jett 2005/2006/2007).

Also, indigenous navigational methods have been studied (e.g., Gladwin 1970, Thomas 1987, Lewis 1994) and tested, particularly by University of Hawaii anthropologist Ben Finney's (e.g., 1979, 1994) team, and found to

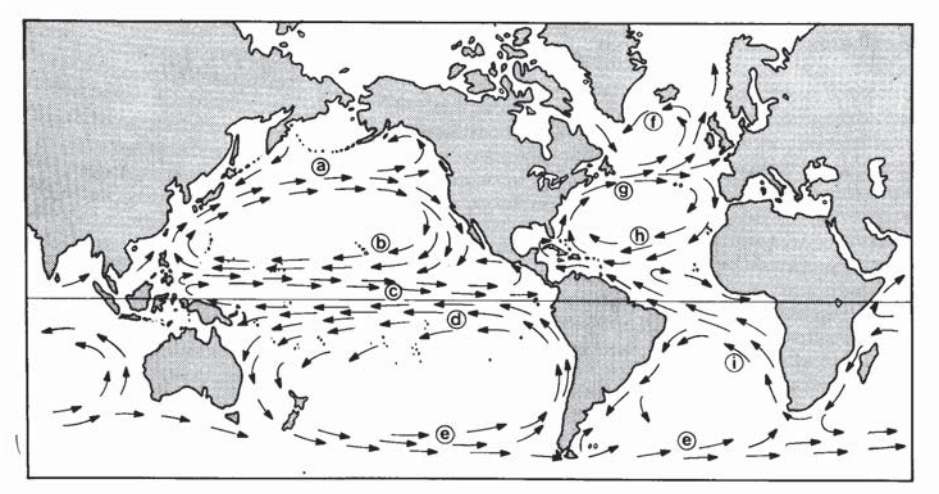

Figure 5. Generalized map of the principal surface ocean currents:
(a) Japan/North Pacific currents; (**b**) California/North Equatorial currents;
(**c**) Equatorial Countercurrent; (**d**) Peru/South Equatorial currents;
(**e**) Antarctic Drift; (**f**) Irminger Current;
(**g**) Gulf Stream/North Atlantic Current;
(**h**) Canaries/North Equatorial currents;
(**i**) Benguela/South Equatorial currents.
Note: The map projection distortion exaggerates area and distance in northerly regions.

be serviceable (Jett 1998a, 2008). In addition, our growing understanding of the world's winds and surface ocean currents, including, importantly, the El Niño–Southern Oscillation, has revealed more about plausible avenues and timings of travel (Figure 5; for drift simulations, see Callaghan 2003, 2005, Montenegro, Hetherington, Eby, & Weaver 2006). The view of a necessarily hermetically sealed-off New World can no longer be sustained. With what we now know of early watercraft and navigation and of climatology and oceanography, it would not only be unsurprising if many overseas contacts turn out to have happened, it would be astonishing if such contacts did *not* occur.

Summing Up

If significant contacts between the hemispheres did take place, then there existed the opportunity for biological and cultural inter-influences. Because it is easier to emulate than to invent, diffusion rather than independent invention is the more economical hypothesis to explain the multitude of specific cultural similarities between the Old World and the New World,

and may also plausibly account for many more general resemblances.

Research into the possibilities of pre-Columbian transoceanic travels has rapidly advanced in recent years, and signs of more widespread acceptance have appeared (note, for example, Huyghe 1992, Schoch & McNally 2003, Jones, Storey, Matisoo-Smith, & Ramírez-Aliaga 2011, Stanford & Bradley 2012). Access to relevant information has been greatly facilitated by the publication of a massive annotated bibliography on the subject (Sorenson & Raish 1996, see also Fingerhut 1994) and by initiation in 1998 of *PreColumbiana: A Journal of Long-Distance Contacts*.

A variety of independent lines of evidence now converge on the conclusion that these facts can, separately and especially jointly, be explained only by a long sequence of influential pre-Columbian transoceanic contacts, between and among several Old and New World areas. For decades, a plethora of cultural evidence has existed. The now-massive biological evidence shows clearly that repeated and significant encounters, involving at least notable plant and human-genetic exchanges, did happen. In fact, even many of those researchers not fully acquainted with this evidence have seen enough to acknowledge that a few contacts must have taken place—while usually still denying that the interactions had much impact or importance, remaining reluctant to give up the notion that the New World represents an independent "laboratory" of cultural evolution, and/or remaining committed to an optimistic and "egalitarian" humanist view of mankind's great inventiveness (see Jett 2006).

To the diffusionist, on a culture-by-culture basis the role of inter-influences has been far more significant to human cultural history than has local innovation. The inter-hemispheric exchange of economic plants and of culture seems so massive as to have played a fundamental (if so-far largely unrecognized) part in the histories of the Eastern and Western hemispheres, especially the Western. It is not that the various cultures of these continents lacked their own distinctiveness and styles or were mere passively uninventive receptive vessels. But the civilizations of the two hemispheres may have evolved, to a considerable degree, in tandem, involving significant and continuing inter-influences from early times onward, mostly unrecorded in written history but no less real for that. In fact, the inter-influences may have been critical in stimulating cultural innovation and elaboration—in both the New World and the Old, but especially in the New.

Unquestionably, Late Pleistocene/Early Holocene human migrants from the Old World to the Americas brought with them basic Paleolithic technologies and non-material culture that formed the basis for later developments within the New World. Certainly, too, there was some innovation among descendants of these founders as they applied universal

human abilities and mental characteristics in adapting to a variety of New World environments, as well as to environmental change. However, as long as these peoples remained out of touch with the larger world, their cultures remained more static than innovative. I conclude that although a terminal Pleistocene transatlantic input of European Solutrean Paleolithic technology may well have occurred in otherwise isolation, relatively little altered culturally in earlier-Holocene America. Because archaeology and history have increasingly made clear that the peoples of the ancient Old World were linked in networks of travel, trade, and cultural exchange from at least Neolithic times onward and that major innovations tended to develop in only a few hearths at cultural crossroads (e.g., Southwest Asia, between three continents and several seas) and subsequently to diffuse from those centers like ripples on a pond, it would, in my opinion, be erroneous to omit the New World from this overall picture. When inter-hemispheric contacts did (as I see it) become established, not only did cultural and biotic imports take place, but spurts of stimulus to innovate locally occurred, sparked by the possibilities of combining novel traits with pre-existing ones as well as opening minds to the possibility of true invention rather than simply taking the status quo as a given. This is analogous to the principle, in organic evolution, of punctuated equilibrium (see Gould 2002), punctuations in this instance arising from overseas interactions. However, these postulated cultural and proven biological imports did not create clones of Old World societies in the New World; American cultures developed in often highly distinctive ways and created their own unmistakable styles—although making only a handful of exclusively American technological breakthroughs and, despite postulated major interaction, failing to adopt or invent many Old World ones.

The ancient Greeks spoke of the Ecumene—the known inhabited, particularly civilized world. We may increasingly be obliged to think in terms of a global Ecumene, enmeshing the more elaborate pre-Columbian cultures on both sides of the seas (Jett 2000a, see also Gordon 1971), and to think of the ancient oceans less as barriers and more as highways for watercraft-users, linking distant shores and peoples (Jett 2008).

Notes

[1] This is an adaptation, expansion, and updating of a paper read as the inaugural George F. Carter Lecture, Emeriti Professor Colloquium Series, Department of Geography, Texas A&M University, 19 November 2004 (Schilling 2004). I acknowledge with gratitude the efficient collegiality of the TAMU Geography graduate students, especially Wendy W. Patzewitsch. Early versions of certain parts of this article appeared in

Jett (2003, see also Jett 1993). Some of this material is also treated in a forthcoming book (Jett 2014). Many colleagues have contributed to my knowledge and to the gestation of my ideas. Thomas D. Dillehay has made suggestions specific to this article.

[2] An excellent case has been made for a circa A.D. 220 Roman terracotta head found in-situ in a late-pre-Cortesian pyramid at Cholula, Mexico (Hristov & Genovés 1999).

[3] Fell established the *Epigraphic Society Occasional Papers*, which continues to be published long after its founder's death.

[4] Uniquely, Hawdon and Johnston (1996) have suggested the possibility that the warmer microclimates of dwellings and a hypothesized dormant stage of the parasite could have allowed the passage of hookworms through the Arctic. But this begs the question of why the organisms are absent in the North today. Again, apparently uniquely, Fuller (1997) opined that the hookworm was misidentified in South America.

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