

Human Habitation of the Americas

Eliot Marshall's 17 August Research News article "Clovis counterrevolution" (p. 738) focused my 56-year consideration of the problem of who the makers of fluted blades were and how they came to range over the two American continents. I was E. B. Howard's chief of party in 1936–1937 at the Clovis type site in New Mexico, working as a graduate student in anthropology at the University of Pennsylvania. At that time I had already studied more than a thousand collected blades of types associated with extinct post-Pleistocene megafauna, classifying them as fluted or distinctively parallel precision flaked and all characterized by grinding of basal edges to protect lashing (1). The fluted blades were traced from the western to the eastern United States, no distinction then being made between the more delicate Folsom type site blades and the larger and somewhat less precisely fashioned Clovis type.

At Clovis, besides the distinctive fluted blades, another diagnostic artifact type was discovered associated with mammoth bones: a bone foreshaft with the base end bevelled (2). Since 1936 such bone foreshafts have been found from Alaska to Oregon and ultimately eastward to Florida (3). Another diagnostic bone artifact found with Clovis points in the Southwest is the bone shaft wrench—a bone shaped like a doughnut with a handle. These shafts and wrenches are familiar Upper Paleolithic artifacts in Europe. So are bone needles such as those found at the Folsom site on the Lindenmeier Ranch in northern Colorado, where I also worked in the mid-1930s.

Here are some key facts in the Clovis puzzle.

1) No fluted blade tradition occurs in all Eurasia from the Atlantic to the Pacific oceans.

2) The northernmost sighting in the Americas of the Clovis fluted blade is in Alaska, where it may not necessarily be the oldest of this type.

3) Clovis fluted blades occur in the Rocky Mountain Southwest that date to around 11,000 to 12,500 years ago.

4) About 1000 to 2000 years later a more refined and technically improved fluted blade (Folsom) developed in the Rocky Mountain–high plains area, spreading from there over the prairie plains to the Mississippi River, but hardly beyond.

5) The Clovis fluted type migrated relatively quickly to the East Coast, where sa-

vannahs and woods harbored other types of megafauna; but in the Southeast it assumed a slightly constricted base that is distinctive. The more delicate Folsom type did not leave its plains-prairie ecological niche, where tall grass supported the bison megafauna associated with it.

6) The fluted Clovis-like blade is also found in Central and South America, but with a subtle change in outline.

All this appears to fit into a frame of 13,000 to 8,000 years ago. Then the fluted blade abruptly terminates with the end of the late Pleistocene megafauna. So do the bone shafts and wrenches in North America.

The question now is, Was this highly mobile hunter of big game with his distinctive weapons and tools able to innovate a unique lithic point in addition to a kit of ostensibly Eurasian Upper Paleolithic bone tools and occupy two American continents in 2000 years or less?

If these people did not invade the Americas as the first humans, what evidence did their predecessors leave? For all the possibility that at least four sites in North and South America do range from 16,000 to perhaps 30,000 years ago, there simply is no site yet found that has produced clear evidence of precedent unfluted bifaced leaf-shaped flaked blades in clear context with late Pleistocene megafauna or in any other ecological or cultural association that is absolutely unequivocal. And there is no established tradition of any other tools or other manufactured objects that can be said to characterize the pre-Clovis pioneers, although they may have had much cordage, basketry, wood, and bone artifacts that did not survive.

Over half a century ago I had no doubt that humans were present in at least North America before the makers of Clovis artifacts. I should have been incredulous to hear that in 1990 there should be a Clovis "controversy." In my eighth decade I am witnessing this strange difficulty in finding and providing evidence of pre-Clovis antiquity for Amerindians, when we know there were Upper Paleolithic peoples in northeast Asia west of the Bering Strait at least 30,000 years ago. The greatest improbability of all is that mankind lingered there for 17,000 years before deciding to make the trip as the land bridge was disappearing, when it had beckoned many thousands of years before and megafauna had crossed it.

JOHN L. COTTER
Curator Emeritus,
American Historical Archaeology,
University Museum of Archaeology
and Anthropology,
University of Pennsylvania,
Philadelphia, PA 19104

REFERENCES

1. J. L. Cotter, thesis, University of Denver (1935).
2. ———, *Proc. Acad. Nat. Sci. Philadelphia* **89**, 1 (1937).
3. ———, *Curr. Anthropol.* **3**, 250 (1962).

One may observe two aspects of the present stage of development of the problem of who initially settled the Americas that signal the demise of the "Clovis-first" model: (i) the actual reported field evidence from Late Pleistocene archeological sites; and (ii) the general character of negative arguments by defenders of the Clovis-first model, who offer appeals to authority, ad hoc explanations, and outright misrepresentations of these sites. The description of specific South American archeological sites by Thomas Lynch in his recent article (1) is laced with factual errors and significant omissions that we will detail in a forthcoming response. In his article, Marshall also makes mistakes in site descriptions: most important, the second stone artifact recovered by us at Taima-taima in 1976 was a utilized jasper flake found not on the edge of the waterhole but directly adjacent to the left ulna of a butchered juvenile mastodon that also had an El Jobo projectile point fragment in the pelvic cavity (2). The stratigraphic sections documented in our primary reports (2, 3) testify that all younger strata overlying the sealed basal sand deposit from which all stone artifacts, mastodont remains, and early-dated radiocarbon samples were recovered at Taima-taima are culturally sterile. It is ludicrous to propose that the direct association of a projectile point and a flake cutting tool with remains of a particular mastodont individual that clearly was butchered is due to fortuitous mixture of older bones with younger, derived artifacts; yet that suggestion has been repeated in the literature time and time again in attempts to discredit the site. Small wonder that the excavators of Late Pleistocene archeological sites openly express annoyance at criticism based on undocumented speculation, and the issue has become emotional. We expect to see an end to the controversy with the publication of the detailed final reports on sites like Monte Verde and Toca do Boqueirão da Pedra Furada. It is time to move on, to develop new positive and productive models of the peopling of the Americas.

RUTH GRUHN
ALAN L. BRYAN
Department of Anthropology,
University of Alberta,
Edmonton, AB T6G 2H4, Canada

REFERENCES

1. T. Lynch, *Am. Antiq.* **55**, 12 (1990).
2. A. Bryan, R. Casamiquela, J. Cruxent, R. Gruhn, O. Ochsenius, *Science* **200**, 1275 (1978).

3. C. Ochsenius and R. Gruhn, Eds., *Taima-taima: A Late Pleistocene Paleo-Indian Kill Site in Northernmost South America—Final Reports of 1976 Excavations* (Mongrafías Científicas, Programa del Centre de Investigaciones del Paleolítico y Cuaternario Sudamericano, Universidad Francisco de Miranda, Coro, Venezuela, 1979); R. Gruhn and A. L. Bryan, in *Quaternary Extinctions: A Prehistoric Revolution*, P. S. Martin and R. G. Klein, Eds. (Univ. of Arizona Press, Tucson, AZ 1984), pp. 128–137.

Computer-Guided Fertilizer Application

Philip H. Abelson's editorial "Dialog on the future of agriculture" (3 Aug., p. 457) alludes to the potential of computer-guided fertilizer application. While theoretically an excellent idea, an accurate soil quality data base is presupposed. My parents sent four different labs soil samples from their California farm and received four statistically different values for *each* of the minerals analyzed. Until these labs provide reliable data, farmers will have to rely on the tried and true method of visually appraising their crops and fertilizing by memory.

JOHN T. BAKOS

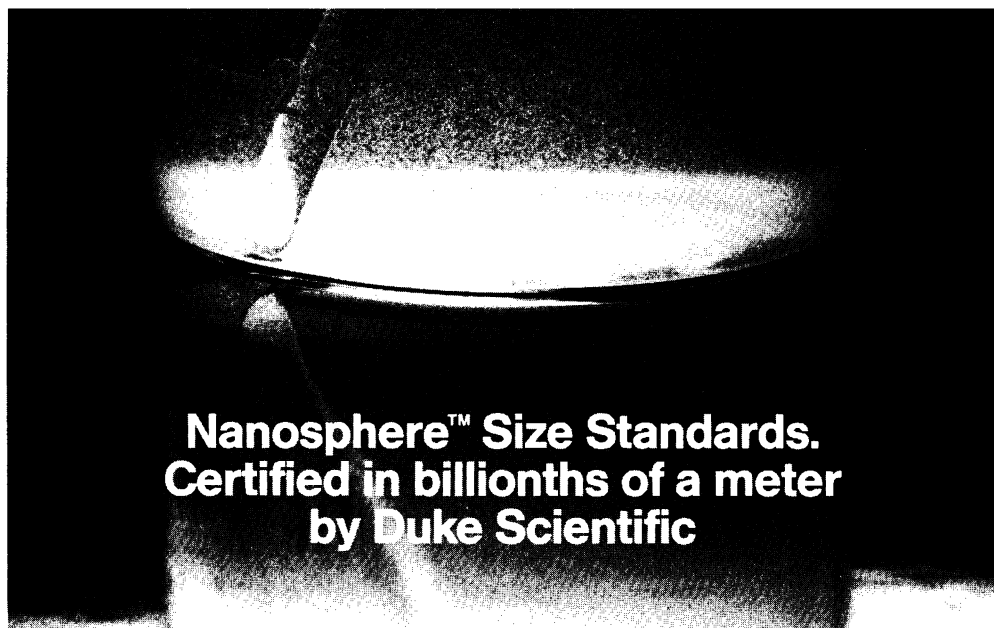
Department of Human Biological Chemistry
and Genetics,
University of Texas Medical Branch,
Galveston, TX 77550

EPA Scientific Advisory Panels

I believe it is important that the Environmental Protection Agency (EPA) confirm its support for the public service performed by the scientists serving on the agency's many science advisory committees. All of us, both inside and outside of EPA, benefit from the fact that these scientists, representing some of the country's foremost authorities, are willing to serve despite the sacrifices that public service often entails.

I personally am very appreciative of the contribution that EPA's independent science advisors make to the agency. In the Senate hearings on my confirmation as EPA Administrator, the first criterion that I mentioned for an effective environmental policy was "respect for science." I remain convinced that if EPA's decisions are to be accepted as credible by the public, Congress, environmentalists, and the regulated community, they must also be perceived as being based on sound scientific principles. Our science advisory committees play a crucial role in ensuring that EPA's actions are scientifically reasonable.

Unfortunately, a number of questions have been raised about financial relationships between members of EPA science ad-



Nanosphere™ Size Standards. Certified in billionths of a meter by Duke Scientific

Nanosphere Size Standards are calibrated in billionths of a meter (nanometers) and are available in 22 sizes from 21 to 900nm—all traceable to the National Bureau of Standards. Nanospheres are part of our complete line of spherical particles from 0.02 to 2000 micrometers in diameter. They are used as standards for instrument calibration, quality control, filter checking, and in numerous biotechnology applications. At Duke Scientific—established in 1971—we have the expertise and resources to meet any of your requirements for microspheres and particles. Call us today for information.



**Duke Scientific
Corporation**

1135D San Antonio Road, Palo Alto, CA 94303, Toll Free
(800) 334-3883, in CA (415) 962-1100, Fax (415) 962-0718



Circle No. 24 on Readers' Service Card

visory committees and the institutions that the Agency regulates. Such questions must be dealt with promptly and decisively; otherwise public confidence in our work is jeopardized.

Science was one of the first publications to raise questions about conflicts of interest on the part of certain members of EPA's Scientific Advisory Panel (SAP) who reviewed the agency's scientific assessment of the decision on the controversial pesticide Alar (daminozide) (News & Comment, 7 July 1989, p. 23). It is therefore vital that the facts concerning the Inspector General's investigation of these allegations be made public.

In his initial response to the Senate Subcommittee on Toxic Substances, Environmental Oversight, Research and Development, the Inspector General provided the results of a Preliminary Inquiry (16 August 1989) which indicated that no conflict of interest violation had occurred for six of the eight panel members who reviewed Alar in 1985. He stated that there were separate investigations involving possible violation of postemployment restrictions by Christo-

pher Wilkinson and Wendell Kilgore, whose cases were referred to the Public Integrity Section of the Department of Justice. The Department of Justice concluded that the "facts do not merit prosecution" for either scientist. In response to further inquiry from the Senate Subcommittee, the Inspector General clarified in detail the findings of the Department of Justice. The following relevant paragraphs are excerpted from that 26 February 1990 letter.

The statement of Dan Schiese, attorney, Public Integrity Section (Department of Justice), included in our Report of Investigation, indicated that his office declined to prosecute Wilkinson because the issues and matter concerning Alar handled by the SAP, while Wilkinson was a member, were different than the issue Wilkinson handled while he was a consultant to Uniroyal. In addition, Schiese advised that the matter Wilkinson handled for Uniroyal was one with which he had no involvement while serving on the Panel. Thus, Schiese advised that no violation of the conflict of interest statutes occurred.

Regarding the Kilgore case, Schiese advised that no violation by Kilgore was indicated.