THE MASTODON AND EARLY MAN IN AMERICA

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IN the light of American discoveries of the last few decades, it has become rather generally accepted that most of the now extinct Pleistocene fauna perished during the closing phases of the retreat of the Wisconsin ice. That this final disappearance was exactly synchronous in every instance is unlikely. The eyes of the geologist and paleontologist must inevitably fail to note the minutia of centuries or even millennia in the vast time expanses over which they range. To accept the survival of many Pleistocene forms into the period of ice retreat, then, is not to define completely the date of their extinction, nor to deny that in some few instances they may, in an attenuated fashion, have reached across the border of Recent time. In our present state of knowledge, arguments as to whether a particular discovery is very late Pleistocene or very early Recent are quite academic, particularly when the geological circumstances can not be related to the ice borders. These facts, would, I believe, be generously admitted by most objective workers in American paleontology and archeology, and, in the long run, they do not greatly affect the question of the time of man's first intrusion into the New World.

There does exist, however, another point of view which may, I believe, be characterized as a minority interpretation. In accordance with it, the life span of certain of these animals, notably the American mastodon, would be brought down into recent centuries. Never thoroughly investigated, so far as the premises upon which it is founded are concerned, this view has been appealed to and reiterated by archeologists committed to theories involving very recent human migration from Asia. As a conception of faunal transitions in the New World, it is worthy of closer examination.

In order to make such an examination, we shall have to engage in a brief survey of the earlier history of paleontology in Europe and America. Before doing so, however, let us set forth the argument for recency as expressed by the eminent paleontologist, William B. Scott. He says: "It was long taken for granted that, when stone weapons were found in association with the bones of Pleistocene mammals, the presence of Pleistocene Man in America was thereby proved. The reasoning was fallacious, for many Pleistocene mammals were in existence *only a few centuries ago, in what is called "historic time in the Old World."* Scott then points out that "Several skeletons of the American Mastodon have been found in bogs, covered by only a few inches of peat with more or less of the hair and recognizable contents of the stomach preserved.[1] Such fossils can be of no great antiquity, and they all occur in Post-Pleistocene deposits, *laid down after the complete disappearance of the Glacial Ice*"[2] (Italics mine. L. E.).

A few decades ago, to have asserted the existence of the mastodon within recent centuries would have occasioned no surprise. Similar ideas were entertained by many eighteenth and early nineteenth century writers who were locked in a religious ideology which demanded such survival.[3] Even as late as the eighteen eighties there were suggestions that the Mound Builders had achieved their constructions through the domestication of the mammoth and his utilization as a draft animal. Statements of this sort could pass well-nigh unchallenged, because American archeology was almost completely undeveloped, and no carefully documented sites, no confirmed cultural sequences with accompanying fauna were available.

To-day over large areas of the United States such sequences are known. Whatever the exact date of the disappearance of the American elephants, there exists no single iota of reliable information to show that the American mastodon or, for that matter, any of the other vanished Pleistocene forms, survived recently enough to have been hunted by those peoples who we now know inhabited the Eastern woodlands "a few centuries ago."[4] This devastating evidence is ignored by those unacquainted with the extensive defining of archeological horizons and their accompanying faunas,

[1] Since the animal's food consisted largely of twigs, their survival in bog waters, which preserve vegetable substance for millennia, is in no wise remarkable. As for the hair, this has become an item of paleontological folklore which the writer proposes to examine elsewhere. Its documentation is old, scanty and untrustworthy.

[2] W. B. Scott, "*A History of Land Mammals in the Western Hemisphere,*" Macmillan, N. Y., 2nd ed., revised, 1937, p. 260.

[3] L. C. Eiseley, *American Anthropologist,* 47: 318–320, 1945. See also "Myth and Mammoth in Archeology," *American Antiquity* (in press).

[4] The writer would indicate his awareness of the problem presented by the discovery of ceramic remains reported in association with a South American species of mastodon, *Cuvieronius postremus,* in Ecuador. Considering the fact that *Neohippus andium* and *Mylodon robustus* were also reported from this site, its archeological neglect has been scandalous. If the site had been claimed as "Pleistocene" many experts would undoubtedly have journeyed even to this out-of-the-way location. The claim for genuine association under conditions suggesting marked recency has satisfied many, but in actuality a really thorough investigation of this find has never been made, at least in terms of what would be demanded in connection with Folsom investigations in North America. The plain truth is that a certain unpleasant suggestion of neglect has not contributed to the prestige of this particular discovery. In any case, however, the faunal extinctions in South America present a special problem

which has been carried out in the last few decades. Lest I be misinterpreted, let me reiterate: This evidence is not sufficient, at present, to determine the exact time of disappearance of the American elephants. It is sufficient, however, to remove that extinction to a period preceding the rise of the known Amerindian cultures. Work in the Plains area and in the Southwest has yielded nothing to contradict this position.

Still to be considered, however, are Scott's comments upon the mastodon remains buried in American peat bogs. Hair and the existence of fatty tissue have been made much of as demanding the utmost recency, and as quite distinct from the situation in which mammoth finds have been recovered in Europe. It was not long after the colonization of the New World commenced before travelers began to comment upon the huge bones found in the New World. They seemed strewn in greater profusion, to be, in short, more suggestive of recency. Sir Charles Lyell makes note of such occurrences in several of his writings, one such instance being recorded in his "Travels in North America,"[5] where he remarks on the finding of mastodon in bogs which in England almost never yield elephant remains. Nevertheless, Lyell is quick to comment, in connection with a more northerly bog site[6] which he himself helped to excavate, that mastodon remains which he had been told lay in superficial earth were really buried in shell-marl below the peat. Irrespective of this observation, however, several points can be made in connection with these bog deposits.

First of all, the apparent number of visible remains of mammoth and mastodon as chronicled by earlier writers in the New World is not so remarkable when we consider the unpeopled character of the American wilderness and the cultural status of the American aborigines. Europe, by contrast, had destroyed countless thousands of its fossil bones before it had learned to value them. Digby comments that there is evidence that mammoth ivory was a fairly familiar article of trade in early Greek civilization.[7] Alfred Haddon has noted the destruction of fossil remains occasioned in the sixteenth and seventeenth centuries by the search for the unicorn's horn, regarded as a specific for many diseases.[8] In addition it is known that fossil bones were sometimes utilized as fertilizer.

It must furthermore be remembered that the last great ice advance in North America extended much farther southward than in Europe. The bogs and the bog fossils of Indiana and New York, even though Post-Glacial, need not be as young in point of time as bogs in Europe lying in more northerly latitudes. It is here that Dr. Scott's assertion about the "complete disappearance of the Glacial Ice" becomes ambiguous. Not all these bogs are of the same degree of antiquity[9] nor, even if they were, would this prove that the ice had completely disappeared at the time the bogs began to be laid down on the drift of the old ice borders. All that such evidence actually proves is the survival of the mastodon into the period of ice *recession,* where the glaciers were in retreat from their areas of maximum advance. It would be of service if we had pollen spectra from the exact location in the bogs of these mastodon remains, but so far none have been forthcoming.

In Europe it is known that the mammoth, already rare, lingered close to the border of recent time[10] and that in Spain *Elephas antiquus* may have survived almost as long. No one, however, in the long cultural range of the Mesolithic and Neolithic, has brought them farther forward into time. Yet there is reported an instance of a mammoth skull with "the bones fresh-looking and *full of undecomposed gelatine*"[11] (Italics mine. L. E.). And this not from bog waters but the Rhineland loess! Nowhere, when mastodon remains from the drift borders of the American ice are discussed, have the following facts been dwelt upon: (1) The preservative effects of bog waters and insulating muck: It is not surprising, under such circumstances, where delicate pollens and the membranous tissues of plants are preserved for thousands of years, that insect wings and the chemically transformed marrow of the long bones may be similarly insulated from bacteria, and hence survive. (2) It has never been adequately pointed out that the eastern mastodon, a browser of forest habitat, was far more apt to leave his remains in bogs than the European mammoth—a steppe and tundra feeder—which preferred the open. The latter did not frequent those European areas which have left us the most extensive remains from the peat beds—a fact which was not realized by Lyell. Hence, the rarity of mammoth remains in the peat deposits of Europe is not, upon ecological reasons alone, a fair basis for comparison between the Old World and the New. The American mastodon was an animal of seemingly quite different habits—ones

which will have to be surveyed on its own merits. Survivals there do not necessarily demonstrate North America lingerings any more than the existence of the African elephant proves the late survival of the mammoth in Europe.

[5] Vol. I, p. 54, London, 1845.

[6] *Ibid.*, p. 45.

[7] Basset Digby, "The Mammoth and Mammoth Hunting in Northeast Siberia," pp. 19–20. London, 1926.

[8] "History of Anthropology," p. 81. London, 1934.

[9] L. C. Eiseley, *American Antiquity,* 5: 115–140, 1939.

[10] J. G. D. Clark, "The Mesolithic Settlement of Northern Europe," Cambridge, 1936. H. F. Osborn, "Proboscidea," Vols. I and II, N. Y., 1936–1942.

[11] H. H. Howorth, "The Mammoth and the Flood," p. 161. London, 1887. The find, it should be noted, is reported by the distinguished naturalist, Falconer.

which made him peculiarly vulnerable to entrapment in the muck and peat deposits so common to the eastern woodlands of immediately post-glacial time. Whether he found that habitat endurable for a somewhat longer period than the European mammoth was able to survive in Europe, we do not know at present. But we do know that his life span did not extend into the time of the archeologically known horizons, and, in addition, we must confess that his presence in bogs on the southward drifts is not sufficient to clarify his age accurately enough that we may assert his survival into recent centuries.

These bogs can not be correlated with those of Scandinavia and the North German plain with anything like the necessary degree of exactitude which would validate Scott's assertion of extreme recency. We merely know that both are Post-Glacial in their particular latitudes, and that is all. There exists no evidence, at present, which seems to demand in the New World a lingering extinction of the American elephants in a way much different from the course of events in Europe. But it would be well to bear in mind, in future studies, that the eastern mastodon was a creature whose way of life was by no means entirely comparable to that of the mammoths. When this is realized, his more numerous presence in bogs on the early drift may be better understood. Moreover, it will reduce the tendency to make casual and ill-aimed comparisons between the sparsity of such remains in Europe and their frequency in the New World. The problem of mastodon antiquity will eventually be solved on other evidence. This writer is quite willing to admit that the solution is not evident at the present time, but he does not feel that the above facts can be made to fit into an easy and superficial dogmatism about the recency of survival of the American elephants within the last few centuries.

OBITUARY

JOSEPH CHRISTIE WHITNEY FRAZER

JOSEPH CHRISTIE WHITNEY FRAZER died in Baltimore on July 28, 1944. His death marks the loss of the last direct link with the Remsen influence. He is mourned with sadness at Johns Hopkins, and the activities and creative accomplishments of this great Hopkins chemist are hereby inadequately recorded by one of his friends.

An English Jesuit once said, "It is surprising how much good a man may do in the world if he allows others to take credit for it." The intense devotion of Frazer's students and associates is partly explained by his unselfishness, but the strength of the bond between him and his inner circle was largely the result of his kindly penetrating judgment. It was wisdom enriched by a voracious appetite for scientific literature and finely tempered with a sympathetic feeling for the vagaries of the human soul. The affectionate title "the Boss" was a feeble attempt by his students to express their belief in his wisdom and their faith in the gentleness of his rule.

J. C. W. Frazer was born on a farm in Kentucky on October 30, 1875. He attended Kentucky State College (later the University of Kentucky) in Lexington, from which he received the B.A. and M.A. degrees. It was here that his enthusiasm for chemistry was kindled by a great teacher, Joseph H. Kastle. It was this latter man who aroused in young Frazer a love for the robust form and vivid coloring of physical experiment. It was he who distilled into Frazer's thinking a strong tincture of scepticism, without which no modern man of science may guide himself through the welter of data and ideas.

Frazer then came to the Johns Hopkins where he worked under the direction of Ira Remsen and H. N. Morse. It is indicative of his mental processes that he did not follow the brilliant, highly articulate, encyclopedic Remsen, but rather the careful, precise technician Morse. The latter would lecture for months on the analytical balance, and for weeks on the Bunsen burner. After Frazer obtained his degree in 1901 he became assistant to Morse and proceeded to the task of the exact measurement of osmotic pressure. This painstaking work is recorded in numerous papers, but never can enough be said of the endless difficulties that beset the path of these two investigators. It was a struggle, with a most critical margin, against selective porosity. They succeeded brilliantly with some measurements, but finally, as the work progressed, it became evident that instead of being a fundamental clarifying concept in the theory of solutions, osmotic pressure was a complicated manifestation that could be simply characterized only in idealized cases. With his penetrating, uncanny knack of getting at the bottom of things Frazer clearly saw that the theory of solutions, especially electrolytes, demanded stronger tools of investigation than utopian semipermeable membranes, and accordingly turned to measurement of vapor pressure of true solutions and osmotic pressure of colloidal or high polymer solutions.

Here follows the only interruption of his Hopkins association—a four-year position as research chemist in the Bureau of Mines. It was here that the work of Frazer laid the foundation of exactness and experi-