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NEW EVIDENCE OF ANTIQUITY OF TEPEXPAN AND OTHER HUMAN REMAINS FROM THE VALLEY OF MEXICO

ROBERT F. HEIZER AND SHERBURNE F. COOK

IN JANUARY, 1957 Dr Luis Avelleyra Arroyo de Anda, Director of the Museo Nacional de Antropología in Mexico, and Dr Arturo Romano, Director of the Department of Prehistory of the Instituto Nacional de Antropología e Historia, Mexico, provided us with a series of bone samples of humans and extinct animals which have been recovered under conditions strongly suggestive of contemporaneity and high antiquity. In each case some obscurity and uncertainty over contemporaneity, and therefore antiquity, exists, and it was the hope that tests for nitrogen content and fluoride level of the bones would indicate some solution to the problem of whether the human remains were younger (presumably by reason of intrusion into older deposits) than the animals, or whether the human and animal remains were deposited at approximately the same time and are therefore coeval.¹

As one control we determined the nitrogen and fluorine content of the femur from a human skeleton excavated by us at Tlatilco, a Preclassic site near Los Remedios on the outskirts of Mexico City.² This burial was accompanied by a number of stone and ceramic offerings which indicate that the grave refers to the final stage of the Middle Preclassic with an estimated dating of 700 to 500 BC. Wood charcoal collected from soil surrounding the burial has been radiocarbon dated³ at 2525 ± 250 years old (568 BC).

The much discussed human skeleton from Tepexpan was represented in our tests by a rib fragment. No animal remains are associated directly with the Tepexpan skeleton,⁴ but at a distance of about 2.6 km have been recovered two skeletons of mammoths, each of which was associated with flaked projectile points and other

1 A grant from the Wenner-Gren Foundation for Anthropological Research supported this investigation. The bone samples were secured incidental to a research trip financed by the National Geographic Society. A list of published papers dealing with the chronological significance of bone constituents is contained in an article by the present authors in this journal, Vol. 12, pp. 229-248, 1956.

2 On the Tlatilco site see Porter, 1953; Piña Chan, 1958.

3 Sample M-660 (reported in Science, vol. 128, p. 1120, 1958).

4 On the discovery, geology, and physical anthropology of the Tepexpan skeleton see De Terra, 1947; De Terra, Romero and Stewart, 1949; De Terra, 1957, pp. 160-171; Avelleyra, 1950, chap. 3.

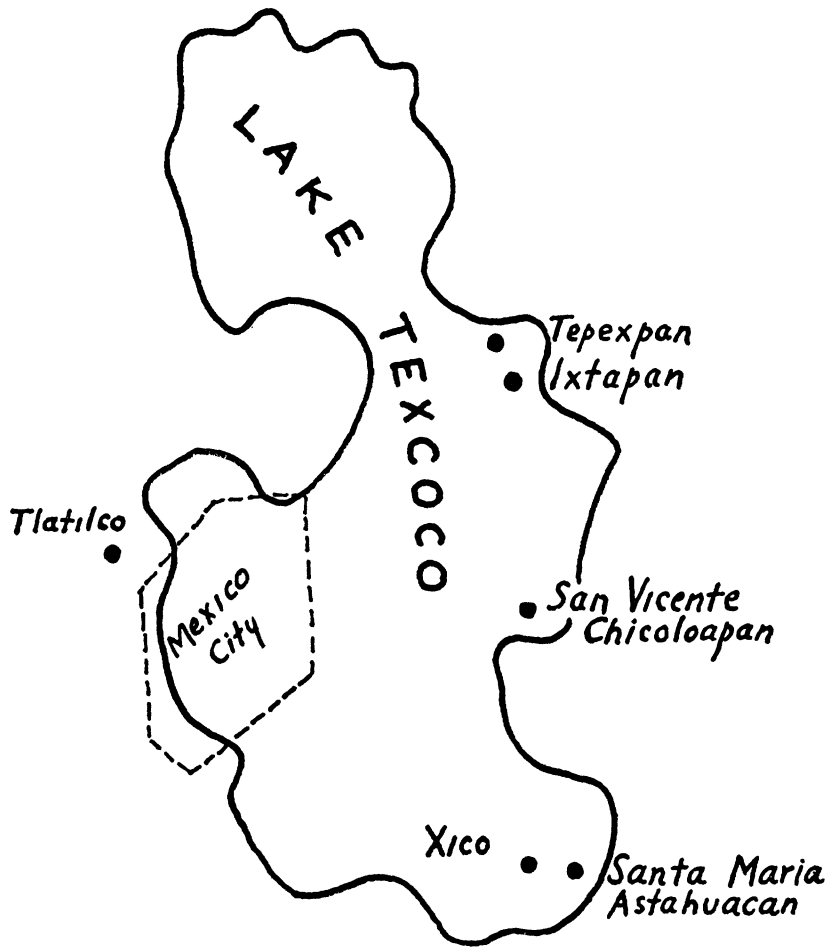


FIG. 1. Location of find-sites. Approximate highest lake level after Lorenzo, 1956. (Scale approx. 1/100,000.)

chipped implements.⁵ The two mammoth skeletons, which are clearly the remains of animals killed by man, lie in deposits identified as the Upper Becerra formation. Stratigraphic placement of the Tepexpan human skeleton is less certain since, although it lay in the Upper Becerra formation, some have claimed that the skeleton may be intrusive from overlying deposits of post-Becerra date.⁶

A third find, apparently from the Totolzingo formation which follows the Upper Becerra, consists of a mineralized skull encountered during well-digging operations near the village of San Vicente Chicoloapan at Km 29 on the highway between Mexico City and Texcoco.⁷ At a distance of about 2 km from the find-site of the skull, in a sandpit, fossil remains of *Bison*, *Elephas*, and *Camelops* have been recovered from deposits which are assignable to the Becerra formation according to H. De Terra. The animal bone analyzed by us is from a *Camelops* skull.

The find of two human skeletons at Santa Maria Astahuacan by George O'Neill of Columbia University led to their recovery and study of the site by the Department of Prehistory of the Instituto Nacional de Antropología e Historia.⁸ The skeletons were found in the side wall of a long-used open well or pond and the stratigraphic situation of the remains could not be, or at any rate have not yet been, satisfactorily determined. De Terra, who has studied the site recently, tells us that the soil layers in which the skeletons lay clearly lie on top of the El Risco sands which is a lacustrine beach deposit roughly of the same age as the Becerra formation.

A final analysis in Table 1 refers to the Xico human mandible found about 1890 in a sand quarry on the border of Lake Chalco near Astahuacan in the Valley of Mexico. The figures for percent of fluorine in the human mandible and the *Equus* radius found close by in the same stratum have been taken from an article published by Alfonso Herrera in 1893.⁹ Aveleyra¹⁰ discusses this earlier find, and concludes that we know too little about it to say definitely whether the *Equus* and human bone are of equal age. The close comparability of the fluorine content of the Xico horse and human with that of other human and animal bones which have been found more recently and for which we have some geological context makes it seem likely that the Xico mandible is in fact, as argued by Herrera, that of an ancient inhabitant of the Valley of Mexico. We would be in a better

5 Aveleyra and Maldonado-Koerdell, 1953; Aveleyra, 1956.

6 Black, 1949; Krieger, 1950; Arellano, 1951. For recent reviews of the late Pleistocene and Recent geology of the Valley of Mexico see Moser, White, and Lorenzo, 1956; Krieger, 1957.

7 A report of this find has not been published. We have been provided information by A. Romano, P. Martinez del Rio, L. Aveleyra A. de Anda, and H. De Terra.

8 Romano, 1955.

9 Herrera, 1893.

10 Aveleyra, 1950, pp. 32-33.

position to support this judgment if the find site could be relocated and a geological study made, though this would be difficult and perhaps impossible after a lapse of nearly three-quarters of a century.

Any final evaluation of the significance of the chemical data as these relate to absolute age must await additional bone analyses and radiocarbon check-dates from the Valley of Mexico.¹¹ At this time we feel justified in making the following assessment.

TABLE 1
Nitrogen and fluorine quantities (shown as percent by weight)
of human and animal bones from the Valley of Mexico

<i>Site</i>	<i>Type of bone</i>	<i>Nitrogen</i>	<i>Fluorine</i>	<i>Geological horizon</i>
Tlatilco	Human	0.72	0.046	Recent
Chicoloapan	Human	2.14	1.150	Totalzingo
Tepexpan	Human	0.06	1.540	Becerra
Ixtapan	Mammoth	0.02	1.822	Becerra
Chicoloapan	Camel	0.08	1.860	Becerra
Astahuacan	Human	0.08	1.988	post-Becerra (Totalzingo?)
Xico	Human	—	1.94	?
Xico	Horse	—	1.34	?

The Tlatilco results are roughly comparable to those already on record from the Sacramento Valley of California. In both places one can argue that the general environmental conditions and specific conditions of burial are similar, and it is of interest that the nitrogen and fluorine levels of human bones of about the same age from both areas are similar.¹² The Tlatilco site occupies a position near the foot of the hill of Los Remedios; all other sites considered here lie in the immediate lake basin areas and have been subject to greater influence of ground water.

The Chicoloapan figures for nitrogen we consider to be of doubtful reliability on account of the type of bone (a cancellous or spongy mandible fragment) available for test. It has been shown¹² that great variation of nitrogen level occurs within a single skeleton and that spongy bone tends to run higher in nitrogen than dense bone. The fluorine content does not appear to be subject to such wide varia-

¹¹ Other possibly ancient remains are described in Avelleyra, 1950.

¹² Cook and Heizer, 1952, p. 20.

tion according to the type of bone and we therefore view the high fluorine content of the Chicoloapan bone as a more reliable indication of its relative age.

The Tepexpan human, Ixtapan mammoth, and Chicoloapan camel bones all have been geologically associated with the Becerra formation and may therefore be considered as a group. The differences in nitrogen content of these three samples are considered as without significance—with such small quantities present differences of this magnitude are not important. The important point is that the nitrogen is essentially gone and in general terms this may be taken as clear indication of a long passage of time since the bones were buried. The rate of disappearance of nitrogen is unknown but the direction of the process (i.e. decrease through time) is clear.¹³

With reference to fluorine, we know that the process involves gradual uptake through time.¹⁴ In this light Tepexpan man looks to be a bit younger than the Ixtapan mammoth and Chicoloapan camel. We are definitely of the opinion that Tepexpan man is ancient, and recent intrusion seems clearly to be ruled out. Whether Tepexpan man might be five hundred, or one thousand, or three thousand years younger than the Ixtapan mammoth we cannot say. The accuracy of the fluorine method is such that it is not possible to invest small percentage differences with precise time intervals. Since the Upper Becerra formation was deposited over a period of time believed to be four to five thousand years, interment of the Ixtapan mammoths and Tepexpan man may have taken place at different times and their remains still lie within the same geological stratum.

With reference to the Astahuacan skeleton, there exists a problem of correlating the post-Becerra deposits, in which De Terra says the bones lie, with low nitrogen and high fluorine levels which make it appear as ancient as, for example, the Ixtapan mammoths which lie in Upper Becerra deposits. Several alternatives may be proposed to account for the apparent discrepancy. Possibly the spring waters at Astahuacan are charged with fluorine, or the geological dating is incorrect. We are simply not in a position to say why the discrepancy exists and trust that further examination may lead to the solution of this problem. We are, however, of the opinion that the Astahuacan human remains are as old as the nitrogen and fluorine levels seem to indicate.

Finally, the Xico human mandible and extinct horse bones, whose fluorine contents were determined nearly three-quarters of a century ago in Mexico, may be taken as roughly equal in age to the Tepexpan-Chicoloapan-Ixtapan finds. Our interest in these finds is largely historical, since the chemical tests are not likely to be precisely comparable to our more recent ones. If, however, they are taken as

¹³ Cook and Heizer, 1947.

¹⁴ Oakley, 1951.

generally accurate, the remains would be assigned to a geological age equivalent to the Upper Becerra formation of the terminal Pleistocene.

Our results, while far from being conclusive, do seem to support the view of high antiquity for the Tepexpan, Chicoloapan, Astahuacan, and Xico human remains from the Valley of Mexico. Fluorine and nitrogen analyses will not provide absolute dates, but may be expected to indicate general magnitude of age if ancillary paleontological and geological data can be referred to.

More determinations of nitrogen and fluorine content of fossil bones from the Valley of Mexico are needed before the method can be said to yield unequivocal results. The fluorine levels seem relatively high for the age of the bones, and this indicates high fluorine content in the local ground water or soils. By combining chemical results with dates derived by the radiocarbon method we may look forward to further progress in this matter. The results presented here are an initial attempt and should be considered as tentative and subject to more precise evaluation in future.

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