# Technical Papers

## A Strange Pleistocene Fossil Locality in Mexico

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In the course of further explorations in the Basin of Mexico, carried out in the summer of 1952, an unusual deposit of fossil bones was encountered that deserves special attention by those interested in the antiquity of man. The circumstances found in this excavation are so extraordinary that a brief account of them, if only to call attention to certain criteria which are apt to furnish indirect evidence for the occurrence of ancient prehistoric sites, is justified.

The locality was reported to staff members of the Dirección de Prehistoria, Instituto Nacionál de Antropología e Historia, Mexico City, by the owner of a pumice sand quarry. An excavation was carried out by Luis Aveleyra, M. Maldonado-Koerdell, and Arturo Romano, the same group of investigators who excavated mammoth and associated artifacts near Iztápan in the Tepexpan region. The site is situated a little over 5 miles west of the town of Tlalnepantla, on a dirt road leading to the pueblo of San Mateo. It is one of several pumice sand quarries scattered at the foot of a steep hill known locally as Huachichil.

The geologic situation shows dacite rock in faulted contact with pumice sand and agglomerate, against which rests a bone-bearing boulder deposit overlain by laminated brown clay and caliche. These strata can be identified with formations already known in the basin stratigraphy, such as the Tarrango pyroclastics, the Tacubaya, a fossil pedalfer type of soil, the older Becerra alluvium, and the Barrilaco caliche, a pedocal type of soil which caps the youngest Pleistocene sediments in the region. Their interpretation, as previously stated by the late Kirk Bryan and myself, is such as to suggest for the Tacubaya and older Becerra units ages that are roughly equivalent with the Wisconsin 1 and 2 stadials, whereas the caliche marks the close of the Pleistocene and the beginning of the geologic Recent. On this basis, the bone-bearing boulder deposit of the section would be of pre-Mankato age, representing the oldest known Pleistocene fossil bed in this region. This assumption is supported by the strong fossilization of the bones and more so by their association with sediments typical for the older unit of the Becerra formation.

The most puzzlesome array of features is presented by the bone-bearing boulder deposit; its origin cannot very well be explained by geologic agencies.

In the first place, the bones occur where the boulders are more numerous than at any other place on the hill slope. Approximately 70 boulders were found associated with the fossils in an exposure measuring 60 sq ft, whereas fewer than 10 boulders were seen at the same level in adjoining outcrops extending over 500 ft. The boulder layer is 2 ft thick and consists of dacite rocks of remarkably uniform size, each measuring $15 \times 20$ in. and having slightly worn edges. Practically fresh in appearance, they rest on a thin layer of sand, which marks a depositional contact with the weathered and ochre-stained pumice sand. A brown sandy clay provides a loose matrix in the boulder deposit containing local bone pockets. In excavating this layer two pairs of elephant tusks were found, each consisting of matching tusks of a mature and younger animal, perfectly preserved, and with boulders lying on top and under them. The undamaged condition of these tusks suggests that the boulders came to rest on top of unweathered ivory. Embedded between the boulders were found a perfect skull of giant camel, bones and teeth of *Equus crenidens*, edantates, bison (*Bison ? chaneyi*), carnivors, insectivors, birds, and rodents. The bone pockets were charged with rodent bones in unarticulated condition. The limb bones of other animals were broken up. This bone deposit was found covered by brown sandy clay, 6 ft thick, and laminated in the upper 2 ft.

A search on the hill slope yielded no other fossil locality and none was known to the quarry operators in that vicinity, so that one must assume a strictly localized association of bones with boulders. On first sight, such an association might well have resulted from an ancient waterhole, by the banks of a stream or in a lake lagoon, were it not for the fact that the boulders coincide singularly with the bone pocket and that they are of uniform size. In the absence of a stream deposit it is very unlikely that such a curious association could have originated from stream or lake waters. A shore feature, on the other hand, is suggested by the steeply curved contact between the sediments and the weathered pumice sand, especially since the level of the boulder deposit appears to correspond with one of the higher lake beaches designated as El Risco I. The boulders were obviously derived from the hilltop above, where dacite rock is exposed. An alternate mode of origin would be a landslide deposit, except that such an explanation would neither account for the bone pockets nor for the uniform size of the boulders, and most assuredly not for the position of the elephant tusks placed crosswise in two pairs.

The puzzle presented by this association challenges the imagination to the point where one is obliged, if somewhat reluctantly, to assume a purposeful slaying of the larger animals at a spot where selected boulders of medium weight were catapulted from the higher slope on top of elephants bogged on a lake shore. Almost equally suggestive for a human agency is the accumulation of broken bones of smaller animals in the boulder deposit. Unhappily, no artifacts were found in the excavation to verify the impression of an occupation site of prehistoric man. This locality may

retain its enigmatic character until similar conditions may possibly be encountered at the foot of a hill where a lakeshore environment favored better preservation of a prehistoric hunting skill which, to my knowledge, has not been recognized so far at a prehistoric site in North America.

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## Iodinated Protein in Milk[1]

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Iodide has been demonstrated in the milk of women (*1, 2*) and of animals (*3*). We have reported that rats on a synthetic low iodine diet containing purified casein[3] do not develop goiter (*4*). This suggested the possibility of a substance in casein which prevented goiter. We found purified casein to contain 0.11 μg of iodide/g. This iodide was not removed by 6-hr soxhlet extraction with butanol or ethanol. The following experiment was performed to test for the production of protein bound iodine in milk.

Two lactating dogs were injected with 2.5 and 8 millicuries, respectively, of $I^{131}$. After 4 and 24 hr milk was collected. The milk was dialyzed against running water for 2–4 days and the dialyzate subjected to paper electrophoresis in a barbital buffer at pH 8.6 for 3 hr. Human serum and the dog serum were used as controls. An autoradiograph was prepared from the electrophoresis paper. The area containing radioactivity was then cut out and counted in an internal gas counter. Figure 1 shows the nondialyzable radioactivity of milk to move with a slow moving protein under these conditions.

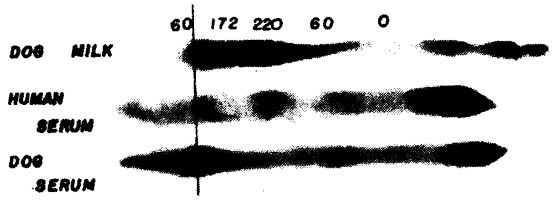


FIG. 1. Paper electrophoresis patterns. The nondialyzable $I^{131}$ was found with the slow moving protein of the dog milk. Counts/minute of the various areas of the dog milk patterns are indicated above.

The dialyzed milk was hydrolyzed in 2 *N* NaOH for 12 hr at 100° C, then acidified and extracted with butyl alcohol. This extract was subjected to paper chromatography by the method of Gross *et al.* (*5*). Two radioactive substances were demonstrated using butyl alcohol, dioxane, and ammonia. Their Rf values were 0.25 and 0.35. Using butyl alcohol and formic acid, a radioactive compound with Rf = 0.58 was shown. The acid-butanol extract from less severe hydrolysis (0.5 *N* NaOH for 4 hr at 100° C) was chromatographed using *n*-butanol and acetic acid. One dominant radioactive compound was separated with Ff = 0.87.

These data are interpreted to indicate that milk contains an iodinated protein and purified casein possesses a thyroid-like property of goiter prevention.

*Added in proof.* Further experiments have demonstrated detectable quantities of $I^{131}$ in all protein fractions of the electrophoretic separation of milk.

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[2] John and Mary R. Markle Foundation scholar in medical science.

[3] Nutritional Biochemicals Corporation.

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## Changes in Concentration of Hydrogen Ion During Precipitation Reactions Between Neutral Salt Solutions

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In discussing changes of hydrogen-ion concentration in chemical and biological systems all writers appear to assume without question that when two dilute neutral solutions of normal salts of strong or moderately strong acids and bases are mixed the resulting solution is also neutral, and that when two such solutions differ in hydrogen-ion concentration and from exact neutrality the hydrogen-ion concentration of the resulting solution will be between that of the two solutions. Neither appears to be generally true, however, when a precipitate is formed as a result of a chemical reaction between the two solutions.

As a good illustrative example, changes observed on mixing solutions of barium chloride and potassium sulfate may be cited. In the experiment in which 0.1 *M* barium chloride of pH 6.6 was slowly added to 0.1 *M* potassium sulfate of pH 6.4, the pH of the mixture or supernatant liquid as measured with a glass electrode rose steadily to a maximum of 9.5 just before the equivalence point and then dropped more rapidly through the equivalence point to about 7.2. When the solutions were mixed in the reverse order, the pH fell to a level of 5.7 before the equivalence point and rose to a maximum of 8.9 just after. The graphs of the changes in pH during the two titrations were

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