Reports

A Successor of Tepexpan Man in the Valley of Mexico

Abstract. A preceramic site at San Vicente Chicoloapan, in the Valley of Mexico, disclosed a human burial associated with stone-lined hearths and artifacts. The prevalence of primitive grinding stones suggests a collecting economy of the "Chalco culture," now for the first time recognized as such, and belonging to a long-headed people that succeeded Tepexpan Man some 8000 to 6000 years ago.

Ever since the discovery of Tepexpan Man (*1*) and of the corroborative evidence for early man in the adjoining site of Santa Isabel Iztapan (*2*), the Valley of Mexico has held out promise for bridging the hiatus between the mammoth hunters and the earliest farming cultures. The radiocarbon dates available for the two periods (9000 ± 100 and 3407 ± 250 years before the present) (*3*) suggested an approximate time span of some 5600 years for which no certain archeologic records were available. Scattered finds of basalt artifacts of distinctive typologic character indicated to me, as early as 1946, the presence of a preceramic culture provisionally named after the town of Chalco, where such artifacts were found in a calcareous evaporite of an ancient lake (*1*). Other finds were subsequently made in charcoal-bearing gravels which underlie the famous burial site of Tlatilco. In view of the ambiguous nature of the Chalco culture, it is therefore of interest to report on a new preceramic site in that region which clarifies the issue.

The circumstances which led to this new find were occasioned by an invitation which the Dirección de Prehistoria in Mexico extended to me last June to prospect for sites of early man and investigate related geologic features. The cordial assistance given me provided some welcome opportunities for studying various localities, among which is the new preceramic site here reported.

In 1955 a farmer had encountered human bones in his well excavation, close to the village of San Vicente Chicoloapan and adjacent to the highway which leads from Mexico City to Texcoco. The landowner intended to accord a Christian burial to these bones and consulted his priest, a Protestant minister, who had the good sense to deliver the cranium with an explanatory note to the Museo Nacional de Antropología e Historia. Since the museum authorities were not notified, the incident remained unknown until last year, when the cranium was noticed in the osteologic collection. When it was shown to me in the museum, I noticed how mineralized it was.

Upon my return from an excursion to Puebla, on 19 July, with Arturo Romano P., I visited the site of the find, a square pit measuring 3 m on each side and 3.60 m deep. The upper two meters had been protected by masonry. From one of the walls, close to the floor, projected a boulder. Next to it another, larger boulder had been found, which the owner put to use as a cover for the open well casing. We were told by the owner that both stones had lain on top of the skeletal remains at a depth of 3.42 m, a level indicated by the boulder still *in situ*. When we examined the soil layers at that level, we found a fragment of a human rib and next to it an obsidian flake. Sporadic bits of charcoal appeared at the same level. In the deepest portion, at 3.76 m, the pit disclosed a contact between the dark artifact-bearing soil and a plastic grey clay reminiscent of the swamp deposit in which the Tepexpan Man had been found. This contact between the lake deposit of late Pleistocene age and the old soil indicates that the burial had lain but 0.35 m above the lake clay which I took to represent the closing phase of a period in which mammoths roamed around the lake. One of these mammoths had in fact been found previously in such a stratum near the highway to Texcoco.

These observations prompted me to recommend an excavation, and, although the rainy season and other circumstances were anything but favorable, work was begun almost immediately. By the beginning of September, the time of my departure from Mexico, the original pit had been enlarged and the new area had been excavated to a depth of 3.50 m. The results of this first excavation may be summarized as follows.

Two meters distant from the burial, a fireplace was found, constructed of some 25 stones laid out in an elliptical heap measuring 0.84 by 0.53 m and containing small bits of charcoal. A few of the stones had been reddened by fire. A second, smaller hearth lay closer to the burial. In the same level, between 3.02 and 3.35 m, a number of basalt artifacts were encountered: crudely shaped grinding stones, metates and manos, two round stones a little larger than a baseball, flaked rocks, and a fair number of small obsidian chips, flakes, scrapers, and blades. One of the blades has a finely serrated edge. In the same level lay the broken basal portion of a large stemmed projectile point of chert. All the artifacts lay within a distance of 0.60 to 3 m from the original burial site. No sherds were encountered in this level; pottery fragments reached only to a depth of 2.55 m, at which level a laminated clay appeared lying on top of a thin layer of fine brown sand. Below this lay the compact sandy clay of dark color that contained the artifacts, fireplaces, and the burial.

A comparison of this soil sequence with others exposed in adjoining irrigation wells disclosed that the laminated clay layer is localized to the excavation site, indicative of sporadic ponding of meadows surrounding the Texcoco lake shore, which is at present some 2 miles distant from the site. The stratigraphic position of this ancient meadow soil is comparable to that of similar soils and stream deposits to which I had previously given the name Totolzingo phase (*1*). It was preceded by the lacustrine and delta deposits of the late glacial Becerra formation as represented by the plastic lake clay and by cross-bedded sands and clays which are exposed in a large sandpit 1 mile or so distant from the new site. The Becerra fauna is here represented by a skull of *Camelops,* a molar of an immature mammoth, and vertebrae of an extinct bison. Samples of the sediments encountered in the excavation were obtained by Monica Bopp, who intends to analyze their pollen content at Yale University.

In 1955 no other parts of the human skeleton from San Vicente Chicoloapan were preserved but the cranium. Its index (73.13), as determined by Arturo Romano P., indicates a long-headed type, different from that of Tepexpan Man, who was rather round-headed.

A tentative dating of the site may be

Instructions for preparing reports. Begin the report with an abstract of from 45 to 55 words. The abstract should *not* repeat phrases employed in the title. It should work with the title to give the reader a summary of the results presented in the report proper. (Since this requirement has only recently gone into effect, not all reports that are now being published as yet observe it.)

Type manuscripts double-spaced and submit one ribbon copy and one carbon copy.

Limit the report proper to the equivalent of 1200 words. This space includes that occupied by illustrative material as well as by the references and notes.

Limit illustrative material to *one* 2-column figure (that is, a figure whose width equals two columns of text) or to *one* 2-column table or to *two* 1-column illustrations, which may consist of two figures or two tables or one of each.

For further details see "Suggestions to Contributors" [*Science* **125**, 16 (1957)].

inferred from certain radiocarbon dates previously obtained from the Valley of Mexico (*4*). The charcoal from the Rio Hondo gravel at Tlatilco gave an average date of 6390 ± 300 years before the present for the Totolzingo phase. The date for the mammoth site at Santa Isabel Iztapan, near Tepexpan, as previously cited, is identical with one furnished last year by the Division of Geochemistry of the U.S. Geological Survey for the matrix of a giant fossil armadillo from the Upper Becerra formation (*5*). Its fauna may therefore have become extinct between 9000 and 8000 years ago. In view of the stratigraphic position of the burial at San Vicente Chicoloapan, its age may be 8000 to 6000 years.

The artifacts found so far have been deposited in the Direccíon de Prehistoria, which will continue the excavation (*6*).

HELMUT DE TERRA
Department of Geology,
Columbia University, New York

References and Notes

1. H. de Terra, J. Romero, T. D. Stewart, *Tepexpan Man* (Viking Fund Publ. Anthropol., No. 11, 1949).
2. L. Aveleyra A. de Anda, *El segundo mamut fósil de Santa Isabel Iztapan, Mexico, y artefactos associados* (*Instituto Nacional de Antropologia e Historia*, Mexico D.F., 1955).
3. The latter date was supplied by J. L. Kulp of the Lamont Geological Observatory of Columbia University.
4. H. de Terra, "Comments on radiocarbon dates from Mexico," in F. Johnson, "Radiocarbon dating," *Am. Antiquity* 12, No. 1 (1951).
5. Information supplied by Ing. A. R. V. Arelleno of the Instituto Nacional de Geología in Mexico City.
6. Previous to my summer visit in Mexico I had the pleasure to attend, at the end of February, the opening of the Museo de Prehistoria at Tepexpan. Its simple but very attractive modern design provides a large hall, in the center of which is the original site of Tepexpan Man, surrounded by exhibition show cases, wall charts, and photographs. Situated on the road to the pyramids of Teotihuacan, a site frequented by thousands of visitors, it symbolizes the start of prehistoric studies in Mexico and the progress of public education in that country. The opening was among others attended by those Mexican colleagues to whom I feel deeply obliged for their generous aid and cooperation, notably Dr. Eusebio Davalos, professors P. Martinez del Rio and Arturo Romano P., and Luis Aveleyra A. de Anda.

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Antigenicity of Steroid-Protein Conjugates

Abstract. Testosterone, cortisone, deoxycorticosterone, estrone, and progesterone act as haptens when they are conjugated with bovine serum albumin. Antibodies with steroid specificity are formed in rabbits immunized with each of the five steroid hormone–protein conjugates.

Five steroid hormones, testosterone (T), cortisone (C), deoxycorticosterone (D), estrone (E), and progesterone (P), were coupled to bovine serum albumin (BSA) (Armour, fraction V). Six conjugates were formed, two containing testosterone, and one containing each of the other steroids. The conjugates are referred to as T-3-BSA, T-17-BSA, C-21-BSA, and so forth, the number indicating the carbon atom through which the steroid moiety was linked to the protein. The synthesis and chemical properties of T-3-BSA, T-17-BSA, and C-21-BSA have been described in detail (*1*). E-17-BSA, P-20-BSA, and T-3-BSA were prepared by use of the O-(carboxymethyl)-oxime. D-21-BSA was synthesized by use of succinate in a manner analogous to that used in the preparation of C-21-BSA.

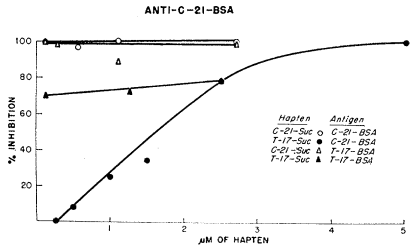

Fig. 1. The inhibition by cortisone-21-succinate and testosterone-17-succinate of precipitation of anti-C-21-BSA with C-21-BSA and T-17-BSA.

Antisera were obtained from rabbits immunized with alum-precipitates of each of the steroid-protein conjugates (*2*). All antisera precipitated with BSA as well as with the conjugate used for immunization. The antisera therefore were absorbed with BSA before use to eliminate that portion of the reactions between the conjugates and the antisera dependent on residual BSA specificity of the conjugates. Quantitative antibody determinations followed the procedure described by Kabat and Mayer (*2*), in which the Folin-Ciocalteu method (*3*) for analysis of the specific precipitates is used.

After absorption with BSA, it was found not only that the antisera react with the steroid-protein conjugate used for immunization, but also that cross-reactions among the steroid-protein conjugates also occurred. For example, at the respective points of maximal precipitation, D-21-BSA and P-20-BSA precipitated 67 percent, and T-3-BSA precipitated 50 percent, of the antibody from an anti-T-17-BSA serum precipitable by T-17-BSA.

The hapten-inhibition technique (*4*) has been used to demonstrate the steroid specificity of the antisera. In these studies, the steroid itself, as the hemisuccinate or the O-(carboxymethyl)oxime, was incubated with the antiserum prior to the addition of the homologous antigen. The effectiveness of each hapten in inhibiting precipitation could be calculated by comparing the precipitate formed in the presence of the hapten with the precipitate formed without the hapten. The results shown in Table 1 indicate that each antigen-antibody system was inhibited by the homologous hapten and so demonstrate the steroid-specificity of the antisera.

The specificity of the reaction between antigen and antibody is also indicated from a comparison of the inhibiting effectiveness of T-17-hemisuccinate with the homologous hapten. As is shown in Table 1, for each system where this has been done, the homologous hapten is a better inhibitor than T-17-hemisuccinate.

The hapten-inhibition technique may also be used to elucidate the chemical basis for the specificity of the antisteroid sera by determination of the inhibitory effectiveness of a large number of haptens. The results of some experiments designed to determine the specificity of anti-T-17-BSA are recorded in Table 2. As with the other antisera, the homologous hapten, in this case T-17-hemisuccinate, was a better inhibitor than any of the other haptens studied. Compound S-21-succinate, which differs from T-17-succinate by possessing a dihydroxy side

Table 1. Inhibition of the reactions between the steroid-protein conjugates and their homologous antisera by the homologous hapten and testosterone-17-succinate. Suc, succinate, OCMO, O-(carboxymethyl)oxime.

Anti-serum	Hapten	Amt. (mg)	Inhibition (%)
T-17-BSA	T-17-Suc	0.1	74
T- 3-BSA	T-3-OCMO	0.1	58
T- 3-BSA	T-17-Suc	0.5	25
C-21-BSA	C-21-Suc	0.05	93
C-21-BSA	T-17-Suc	0.5	55
D-21-BSA	D-21-Suc	0.01	90
D-21-BSA	T-17-Suc	0.1	80
P-20-BSA	P-20-BSA	0.005	80
E-17-BSA	E-17-OCMO	0.1	96
E-17-BSA	T-17-Suc	0.5	77

Table 2. Inhibition of the reaction between T-17-BSA and anti-T-17-BSA by various soluble steroid derivatives. Suc, succinate; OCMO, O-(carboxymethyl) oxime.

Hapten	Amt. (mg)	Inhibition (%)
T-17-Suc	0.1	74
Compd. S-21-Suc	0.1	66
C-21-Suc	0.2	63
Hydrocortisone-21-Suc	0.1	36
T-3-OCMO	0.1	12
E-17-OCMO	0.2	4
Estradiol-17-Suc	0.2	0