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GEOLOGIC OBSERVATIONS AT HUEYATLACO, A LATE MID-PLEISTOCENE ARCHAEOLOGICAL SITE, VALSEQUILLO AREA, PUEBLA, MEXICO

by
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INTRODUCTION

The Hueyatlaco archaeologic site is one of four EARLY Early Man sites discovered by Dr. Cynthia Irwin-Williams and Prof. Juan Armenta Camacho in 1962 on the north shore of the Valsequillo Reservoir, State of Puebla, Mexico, and excavated by them 1962 - 1966 (Irwin-Williams, 1967, 1978 and cited references). It has been dated at roughly 250,000 - 275,000 years or older by ten radiometric dates on fossil butchered bone associated with bifacial stone tools and on overlying (younger) primary tephra layers (Szabo et al., 1969, Steen-McIntyre et al., 1981, Donelick et al., in prep.). Two uranium-series dates on a butchered mastodon tooth fragment from the nearby El Horno site, a few metres lower in the section, agree with this great age (Szabo et al., 1969). The stone artifacts at Hueyatlaco were recovered from diatom-rich beds containing taxa extinct before the end of the Sangamon Interglacial 80,000 years ago (VanLandingham, 2000, 2002, in press a,b).

Two distinct stone tool types occur at Hueyatlaco separated by a sterile layer: an upper level with well made bifacial tools and a lower one with unifacial tools. The nearby El Horno site, lower in elevation, contains only unifacial tools (Irwin-Williams, 1967, 1978; Szabo et al., 1969).

Two primitive looking human skulls have been found in the area. The Dorenberg skull was collected over 100 years ago south of the City of Puebla. (Reichelt 1899 (1900) as reported in VanLandingham, 2000). It was put on display in a museum in Leipzig and destroyed during the bombings of WW II. A sample of diatomite from within the skull cavity, preserved as a reference

slide at the California Academy of Sciences, San Francisco, shows the same extinct taxa and diatom suite that occurs in the sedimentary beds with bifacial tools at Hueyatlaco, dating both by biostratigraphy at greater than 80,000 years (Van Landingham, 2000, 2002).

The second skull, the Ostrander skull, was reported to have been collected by someone (illegally) at Hueyatlaco some time in the late 60's or early 70's. It has been preserved at a small college in California until very recently (Steen-McIntyre, submitted). It may now have been re-buried by a local Native American tribe without an attempt to date it. A photo supplied to me by the late Professor Ostrander in the mid -70's shows a partial skull with thick brow ridges and low cranium (Figure 1.)

Because of the great significance of the Hueyatlaco site and the Valsequillo region in general for the study of Early Man in the New World, I list here briefly the geological observations I made and the radiometric dating methods we used on materials from the site. Hopefully it will help others others to recognize sediments of similar age when they encounter them in the area and to date them. The weathering characteristics of the primary tephra layers have been discussed in detail elsewhere (Steen-McIntyre, 1975, 1977, 1981a,b, 1985, submitted).

A LATE MID-PLEISTOCENE SITE: WHAT TO LOOK FOR

If a new excavation in the area exhibits the following characteristics, consider the site "old" (Late Mid-Pleistocene, around a quarter-million years):

1. Lack of charcoal or shell.

2. Bone material

   a. completely lacking in collagen (no possibility of 14C dates)
   b. dark stained (manganese)
   c. heavy (organic matter replaced by mineral matter)

3. Overlying, primary tephra layers (under the microscope)

   a. hypersthene phenocrysts deeply etched (they form "picket fence" or "saw tooth structures")

b. silicic glass shards completely hydrated with at least 5 per cent water of superhydration in all enclosed spindle-shaped vesicles (bubble cavities) 10-50 micrometers in length

4. Sediment layers

a. indurated when dry (trench walls remain vertical for years)
b. color tends to light tan or pink (unless the clasts them selves are dark in color, such as basalt fragments)
c. clay adhering to mineral grains, especially the feldspars
d. difficult to disaggregate with finger pressure
e. clay skins and/or manganese stain and/or Mexican-onyx-like deposits (translucent banded pink carbonate) in sediment voids
f. pink Mexican-onyx-like veinlets

5. Carbonate deposits

a. occur as casts in ancient krotovinas (root molds and old animal burrows)
b. occur as veinlets along planes of weakness in the sediment
c. does not occur as caliche (I believe them to be a former soil caliche that was later dissolved in a wet, humid cli mate, then still later redeposited as calcium carbonate in clay-rich sediment voids as the climate became semi-arid once again.)

USEFUL DATING METHODS

To date radiometrically the Late Mid-Pleistocene Early Man sites in south central Mexico, one must turn to Africa and the dating methods used there in early hominid research. The uranium-series methods on fossil bone seem to work well for sites as young as Late Pleistocene (see below). Fission track dates on zircon phenocrysts from within pumice clasts collected from overlying, primary tephra layers can give an approximate, broad-brush date for older sites (for Hueyatlaco: Hueyatlaco ash, 600,000 ± 340,000 yrs; Tetela brown mud pumice; 370,000 ± 200,000 yrs, Steen-McIntyre et al., 1981). Potassium-argon dates have not been possible for the area because of lack of suitable mineral phenocrysts and the extent of weathering of the tephra clasts.

While the sediment layers and fossils at Hueyatlaco could not be dated directly by the 14C method (no carbon preserved at the site), butchered bone associated with bifacial tools was directly dated by the uranium-series method (245,000 ± 40,000 yrs,230Th; >180,000 yrs, 230Pa, Szabo, et al., 1969). In the area, the U-series methods
appear to be reliable for material as young as 22,000 years (Szabo et al., 1969).

For rough dating methods, microscopic examination of selected tephra components (hypersthene phenocrysts, silicic volcanic glass shards) from overlying primary layers of pumice and volcanic ash can suggest whether a new excavation is Holocene, Late Pleistocene, or Late Mid-Pleistocene in age (Steen-McIntyre, submitted, and cited references). Diatom stratigraphy can give a minimum age for sediments that contain extinct forms, as well as a clear picture of the local paleoenvironment (VanLandingham 2000, 2002 and cited references.)

CAULAPAN, A MUCH YOUNGER SITE

Dates of 20,000 ± 1,500 yrs (230Th) and 22,000 ± 2,000 yrs (231Pa) on a proboscidean vertebra associated with a stone flake tool at the nearby Caulapan site agreed well with a 14C date on associated shell of 21,850 ± 750 yrs (Szabo, et al., 1969). Caulapan is a barranca (steep-walled valley) located roughly 4 km to the northeast of Hueyatlaco and carved into the same sediments as those exposed at the base of the Hueyatlaco site The Caulapan site itself occurs in a remnant deposit of (younger) barranca fill 10 metres above its base. A 14C date on molluscan fossils of >35,000 yrs was obtained for the base of the barranca fill (Szabo et al., 1969). Diatom stratigraphy by VanLandingham places the base of the barranca fill at Caulapan equivalent in time to the dated (Donelick et al, in prep.) Buena Vista lapilli, which occurs above the dated Tetela brown mud unit near the Hueyatlaco site.(VanLandingham, in press a,b). Extinct taxa in the diatom suite at both collecting localities date the base of the barranca fill at Caulapan and the Buena Vista lapilli overlying Hueyatlaco sediments at >80,000 yrs or older (Sangamon Interglacial).

CONCLUSION

A whole new era is opening up in the study of Early Man in the New World. Gone are the days when the radiocarbon method can be called upon to answer the important question of age: it can't reach back far enough into time! Other dating methods are waiting in the wings, proven methods used for decades in Africa and Asia, and still other, newer ones offering their services. It's a new ball game out there for all of us, and we've just begun to play!

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