English translation of the monograph

VESTIGIOS DE LABOR HUMANA EN HUESOS DE ANIMALES EXTINTOS DE VALSEQUILLO, PUEBLA MEXICO

by

Juan Armenta Camacho

-1978 -

Translated by Virginia Steen-McIntyre
September, 1996 — February, 1997

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Editorial Board of the State Government

Pages 1 and 2

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Title page

Autograph: “For Virginia, with gratitude and love” [?], February 27, 1978

TRACES OF HUMAN WORKMANSHIP ON EXTINCT ANIMAL BONES FROM VALSEQUILLO, PUEBLA, MEXICO

Work supported by the AMERICAN PHILOSOPHICAL SOCIETY and
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The Government of the State intends to encourage the scientific research of the people and presents to the public the study of Professor Juan Armenta Camacho, who wishes to go deeply into the investigation of the remote past.

DR. ALFREDO TOXQUI FERNANDEZ DE LARA
Governor

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Summary page

From the Spanish: Traces are described of the workmanship of prehistoric hunters on bones of extinct animals of the Quaternary Period, discovered in Valsequillo, Puebla, (Mexico).

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"The adventure of the Prehistoric [period] is a long succession of disputes and controversies. At each [new] discovery, it is necessary to eat away at the incredulity of the skeptics, to confront the scoffers, to convince the authorities" Henri Breuil

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INTRODUCTION

The Valsequillo Prehistoric Zone

The materials described here originate in the Valsequillo Prehistoric Zone, which is located some 10 km south of the city of Puebla; it does not have precise boundaries and embraces the catchment basin of the reservoir, "Manuel Avila Camacho" and the towns of San Francisco Totimehuacan, San Pedro Zacachimalpa, and San Baltasar Tetela (on the north) and Santa Maria Tecola, Los Angeles and La Cantera (on the south) (Fig. 1).

The zone occupies a valley of low, irregular relief that slopes generally to the south, where it rests upon the spurs of the Tentzo Mountain Range. Mean elevation is 2,100 metres s/N/M[?].

The area's drainage system is formed by the Atoyac River and the arroyos Alseseca and Atepitzingo, which run from north to south and drain into the catchment basin for the "Manual Avila Camacho" Reservoir (commonly called the "Valsequillo Reservoir") which at maximum water level (2,059 mt. above sea level) covers a surface area of 3,134 hectares [*1 hectare equals about 2.5 acres*], with a length of 21 km and width at its widest of 8 km.

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The area has suffered from severe erosion which has uncovered very old terrain in which outcrops of the calcareous marine basement rock (Cretaceous) stand out, and upon which rests a calcareous conglomerate, tuff layers, and alluvial and lacustrine sediments of undetermined age, and higher [in the section] consolidated stratified tuff layers called "xalnene", which underlie a thick sedimentary section of lacustrine deposits called "Tetela Formation", which has lenses of gravel ("Valsequillo Gravels"), and is rich in the remains of Quaternary mammals and which is the object of this study. The "Tetela Formation" is covered, in some parts, by travertines and, in others, by indurated mud flows (with detritus and [faceted? angular?] rocks of the "Malinche Formation", being usually covered by volcanic tuffs and ashes [proceeding from as far away as?] the near-by resplendent volcanoes that encircle the zone (Fig 2)*.

Page 10 (cont'd.)

*This general geology was established by the author in empirical form and only with the intent of locating the fossils. The stratigraphy has been studied by M. Maldonado-Koerdell, H.E. Malde, J. Brunet and F. Mooser. The ash petrography was studied by V. Steen-McIntyre.

The Valsequillo fossiliferous deposits, from whence come the materials described here, form part of a biostratigraphic unit of wide distribution in the Puebla-Tlaxcala valley, according to the discoveries that the author has made in the city of Puebla, in the quarries of San Felipe Hueyotlipan, and in the channel of the Zahapan River (where it intersects with the road to Tres Reyes) in the north, and in the east in the Barranca del Aguila (at an elevation of San Hipólito Xochiltenango), in the barrancas of Gorozpe, La Cantera de la Curva (near Tepeaca), in Pardiñez and in Tecali, to mention only the most abundant [discoveries].

Quaternary Fossils

The remains of large Pleistocene mammals have been well known to the inhabitants of the region for a long time, to judge by the popular legends about the "Xantilómetl" (giants' bones) which in the Spanish changed itself to "[heathens'?] bones".

Relating to those remains, in the indigenous literature (Mendocino Codex), there are references to the "Qinametli" or "Quinametzin" (the highly respected, vanished giants).

In the old chronicles we find that of Bernal Diaz del Castillo (l), who narrates that when the Spanish reached Tlaxcala on September 25, 1519, "during a conversation between Cortéz and Xicotonga (Xicoténcatl), the Indians said that their ancestors told them that a long time ago there were settlements of men and women who were very tall and with huge bones; that because they were very evil and of bad behavior, they killed them fighting with them, and those that remained died. And in order that we could see what enormous sized bodies they had, they brought a bone or leg bone of one of them, and it was very heavy and very large in height [compared to?] a man of average stature. And that leg bone was from the knee to the hip. I measured myself with it and it was as tall as I, although I am of average build. And they brought other pieces of bone like the first. Most were already [eaten? bare?] and hardened from the earth, and all of us marveled at seeing those leg bones, and we were certain that there had been giants in this country. And our Captain Cortez told us that he would be sending that great bone to Castile in order that His Majesty could see it, and so thus we sent it with the first products that went out.

Page 10 (cont'd.)

Years later, at the time Puebla de los Angeles was founded, the [*Papal?*] Inspector Fray Antonio Vázquez de Espinosa refers to ... “when the foundation was dug for building this renowned and saintly church (cathedral), they came across giants' graves, whose bones were of notable size.”

That this type of find was a reason for interest during the vice-royalty we know from globe-trotter Juan F. Gemelli Carreri (3), who visited the city of Puebla at the end of the 17th century and related in his travel diary that ...”D. Nicholas Alvarez, master of ceremonies at the cathedral, caused me to see a giant's rib as thick as a human arm and of ten palms in length. There is a tradition there that those giants lived in the hills around Tlaxcala”.

All these “giant's bones” to which the chronicles and popular legends refer seems to be only remains of large Quaternary mammals (mammoth, mastodon, and megatherium),

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according to what is deduced from the research of very respectable scientists such as Félix and Link (4), Osborn (5), Aveleyra (6), Freudenberg (7), Romer (8), Maldonado-Koerdell (9), and Hibbard (10), who describe forms of Pleistocene Mexican [mastofauna: *megafauna?*] that concurs well with what the chronicles and legends say; whereas, on the other hand, in all the literature examined, there is not found even the slightest inkling or presumption that in Mexico there may have been some human [seres] of a stature as extraordinary as that of the “Quinametzin”.

The Valsequillo Materials

The first formal collection of Quaternary fossils from the Valsequillo region was that which Jose Manzo assembled at the end of the last century in the Natural History Room of the old State College, presently the Autonomous University of Puebla. Among their materials, remains of mammoth and mastodon originating from the localities of Totimehuacan and Tetela stand out.

At the beginning of this century, H.F. Osborn (11) extracted a fine collection of fossils from a locality that he indicates is near to the large town of Totimehuacan. These fossils must have been known to the prominent Mexican geologist Jose C. Aguilera inasmuch as it was he who led Osborn to that site, and they worked together, but the author has not found anything on his report regarding this.

Page 11 (cont'd.)

The first contact that the author had with the prehistoric materials of the area was an accidental find that he made in June 1933, in the riverbed of the Alseseca arroyo, where a small landslide caused by the rain brought to light the [asamente] of a mammoth. Two years later, in that same area, he found a femur of a proboscidian in which was solidly driven a flint artifact* (12).

* In order to profit from future explorations, it is fitting to point out here that the fossil remains are located within the gravel lenses ("Valsequillo Gravels") which are easily identified by their black tabular flint fragments, coming from the marine limestone of the region. These gravels served as a sign to the author in order to trace other fossiliferous deposits, from the barrancas of Manzanilla (8 km to the north of Puebla) for 25 km to the south, where the rich Valsequillo deposits are located.

That first testimony of the presence of hunters of extinct animals was not to be confirmed with new finds of associated artifacts, notwithstanding the increased number of fossils that were collected during the following years. It became evident that this area's paleontologic wealth required more extensive and formal studies, and for that reason, and at the initiative of the author, in 1956 the Department of Archaeology and Prehistory (subsequently the Department of Anthropology) of the Autonomous University of Puebla was founded; and in 1958, the [Puebla? Peoples?] Institute of Anthropology and History (subsequently Central Region Puebla-Tlaxcala), a branch of the National Institute of Anthropology and History [*INAH*] (S.E.P.) [*?*].

Thanks to those new organizations, the systematic exploration of the area was enlarged, and they were able to better study the fossiliferous deposits of Valsequillo (Fig. I), which contain abundant remains of mammoth, mastodon, camel, various types of horse, glyptodon, peccary, [*bear?*] "dog-wolf [*dire wolf?*], various types of deer-like animals, weasel-like animals, felines, rodents, and other animals of the Pleistocene Period.**

** The taxonomy has been studied by M. Maldonado-Koerdell and by C.E. Ray. M. Pichardo del Barrio has made a special study of the proboscidians.

Page ll (cont'd.)

The materials, collected exclusively during salvage operations , would shortly enrich the osteological collection of the Department of Anthropology of the University of Puebla (CODAUP) by more than three thousand pieces of diagnostic value. To that was added some rare material salvaged from the foundation work carried out within the urban perimeter, such as the mastodon remains located in Río Yaque Street in the [Fraccionamento] Gardens of San Manuel; the horse remains encountered at the corner of 2 North and Portal Hidalgo (Calderón Building); the remains of a mammoth that were found at 4 Poniente Street 306 (Matanzo Building); proboscidian bones located at the corner of 3 Poniente and 5 Sur streets (Barranco Building); the proboscidian femur drawn from the bed of the San Francisco Arroyo, near 4 Oriente Street; the remains of camel, horse, peccary, glyptodon, and mammoth that were removed from the building [*sites?*] in the Arroyo San

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Francisco, near 48 Poniente St.; the horse remains that were found right at the Zocalo in Puebla at the construction site of a utility bill office; and the mammoth remains associated with charcoal lenses, found at the corner of 5 de Mayo Avenue and 2 Poniente Street (Alles Building).

Prehistoric Works at Valsequillo

From the first explorations at Valsequillo, crudely manufactured flint artifacts were encountered (Fig. 4.) [*Fig. 3*], which, logically, were given the uncertain significance of surface finds. Nevertheless, the presumed presence of prehistoric hunters gradually gained strength as fragments of bone with multiple fractures, modified bone splinters, and pieces with signs of usage (Fig. 5) [*Figs. 4,5*] began to show up, which the authorities consulted deigned to consider — without discussion — simply the result of transport.

Not satisfied with that explanation, the author devoted himself to the task of reproducing experimentally those pieces, using various techniques (V. Experimental Control); which at the end of two years, gave reasonable surety that they were remains of the hunt and primitive tools.

To the preliminary results of the experimental control, in short, were added other testimony of the presence of hunters, such as an artifact associated with mammoth remains (13), a [ramus] of a mammoth mandible with a flint artifact stuck in the [parasinfisial] edge (Fig. 9), and a fragment of mastodon pelvis with the interior surface covered with engraving (Fig. 64).

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With that basic judgment reached, and thanks to the intervention of Dr. Pablo Martinez del Rio, Technical Advisor for the National Institute of Anthropology and History [*INAH*]; Dr. Alex D. Krieger, Research Professor at the University of Washington; Dr. Hanna Marie Wormington, Curator of the Denver Museum of Natural History; and Dr. Manuel Maldonado-Koerdell, Technical Advisor for the Pan American Institute of Geography and History (OEA), funds were obtained from The American Philosophical Society to restudy the discovery zone; and as a result, three other engraved bones (Figs. 75 and 77), a carved bone (Fig. 50), an "ornament" (?) with perforations (Fig. 62), and other pieces with signs of human workmanship were discovered, which are described in this work (14).

Seeing that interdisciplinary investigation was justified, the Doctors Wormington, Krieger, Maldonado Koerdell and Martinez del Rio interceded once again in favor of the author in order to organize the "Valsequillo Project", which undertook to make archaeological excavations and complementary field and laboratory studies.

The "Valsequillo Project" investigated the area of its namesake from 1962 until 1973, with funds furnished by The American Philosophical Society, Harvard University, The National Science Foundation, The Smithsonian Institution, the U.S. Geological Survey, and the Autonomous University of Puebla.

The work covered the following disciplines:

Specialty	Investigator
Archaeology	Dr. Cynthia Irwin-Williams Peabody Museum of Archaeology and Ethnology, Harvard University
Geology	Dr. Harold E. Malde U.S. Geological Survey
Field Stratigraphy and Geochemistry	Dr. Virginia Steen-McIntyre Branch Field Geochemistry and Petrology U.S. Geological Survey

Vertebrate Paleontology	Dr. Clayton E. Ray Vertebrate Paleontology Division Smithsonian Institution

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<u>Specialty</u> (cont'd.)	<u>Investigator</u> (cont'd.)
Molluscan Paleontology	Dr. Dwight Taylor U.S. Geological Survey
Palynology	Dr. Paul S. Martin University of Arizona Geochronology Laboratories

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14-C Method	Dr. Meyer Rubin U.S. Geological Survey Radiocarbon Laboratories
	Dr. R.M. Chatters Radioisotopes and Radiation Laboratory Washington State University
U-Series Method	Dr. Barney Szabo U.S. Geological Survey Laboratories
Zircon Fission-Track Method	Dr. Charles Naeser U.S. Geological Survey Laboratories
Remnant Paleomagnetism	Dr. Roald Fryxell Washington State University R. and R. Laboratory, Pullman, Washington
	Dr. Joseph Liddicoat University of California Santa Cruz Laboratory

With the intention of making known the official information from each of the investigators, the following results are given:

1) Archaeological investigations proved the existence of prehistoric hunters and discovered numerous flint artifacts in clear association with remains of extinct fauna.

2) The paleontology stated precisely that the fauna is of [*early? ancient?*] Pleistocene.

Page 13 (cont'd.)

3) Geology and stratigraphy affirmed that the cultural remains were found "*in situ".*

4) Laboratory experiments determined that the oldest fossiliferous deposits (where the cultural remains described here were found) have a mean age of 200,000 years.

Along with these investigations, the author continued the special study of the bony material, this being the first report of the work that was done.

Long before the "Valsequillo Project" was created, outstanding specialists repeatedly came to Puebla, who examined the field and laboratory work, verified the authenticity of the finds, and evaluated their cultural characteristics, including: Drs. D. Pablo Martinez del Rio, Hanna Marie Wormington, Alex D. Krieger, [*and*] Manuel Maldonado-Koerdell, who all supervised many aspects of the investigation; Luis Aveleyra Arroyo de Anda [*and*] Arturo Romano Pacheco of INAH; Douglas S. Byers and Richard S. McNeish of the Peabody Archaeological Foundation; Hans Jürgen Müller-Beck of the Berne Museum; Michael D. Coe of Yale University; Helmut de Terra of Columbia University; Jean Brunet of the University of Paris; J. Cruxent of the Institute for Scientific Investigations (Venezuela); Ruth DeEtte Simpson of the University of California; Alberto Rex Gonzalez of the University of Cordoba (Argentina); D. Pedro Bosh Guimpera, Frederick Peterson, Kent V. Flannery, Carl Schuster, Charles E. Rosaire, Ian Cornwall, and delegates of the Congress of Internationalists which was held in Mexico during this time period — to whom the author here makes evident his profound gratitude.

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Figure 1. Topographic diagram of the Valsequillo Prehistoric Zone, Puebla.
J. Armenta, 1960.
Localities

[***Note: Compare the fossil/artifact locations here with Steen-McIntyre*** **et. al.** ***198l, Fig. 2, which shows the outcrops of the dated Tetela brown mud (600,000 ± 340,000 years, Table 2*** **),** ***especially in the collecting areas around Santa Maria to***

the south of the reservoir, and the south extent of Location 3 (Arenillas) and all of Location 4 (Tetela) to the north. The beds are relatively flat-lying here, and the outcrops closest to the water line of the reservoir are older than higher, back-lying beds, which include the dated brown mud unit. That means the artifact-bearing beds are older than at least 260,000 years. It also means that any new

reconnaissance field work should concentrate first in these areas.]

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Figure 2. Generalized Geology of Valsequillo
J. Armenta, 1958

calcareous tufa
basalt
Malinche formation
travertine
Xalnene tuff
Tejaluca formation
limestone conglomerate
marine limestone

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METHODS AND MATERIALS

Preliminary Studies

The first studies of the remains of human workmanship on bones of extinct animals were begun in the selfsame Valsequillo deposits, where the author observed the following:

1) The animal remains were incomplete and, in spite of the abundance of materials and the determination to collect specimens for museum display, never was a complete large mammal skeleton encountered but [*on the contrary*] lacked the ribs, vertebra, pelvis, and legs. This was an intriguing result, especially in regards to proboscidians (mammoth and mastodon). seeing it was absurd to suppose that the enormous bones should have been carried away by predators, and also illogical to suppose that natural agents should have selectively detached them, reworking [*?*] them until they disappeared; [*while*]

respecting at the same time small pieces and light-weight fragments which remained in large number.

2) In contrast with the number of large pieces that were missing (and that, curiously, corresponded to parts of the anatomy rich in meat), hundreds of tooth pieces, loose or still implanted in fragments of mandibles were encountered,*

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* In numerical order, the following types of fragments were found: horse, bison, camel, mammoth, mastodon, peccary, cervids, canids, felids, glyptodon, ursids, and megatherium.

as well as a large number of skull fragments, horns/tusks, antlers, glyptodon carapaces, articulated remains, shattered vertebrae, and bones cut from the extremities, as well as other diagnostically-important fragments.

3) Many of the fractures, especially on bones of the extremities, had classic shapes, which in medicine are called "a flute [*?*] point", "a green twig", a butterfly wing", "spiroidal", etc., which **only is produced in life or very soon after death** [*Armenta's emphasis*] when the bone is still very fresh; which is well known in trauma study, and in forensic medicine.

These classic fractures have a well defined etiology which, in their case, could have been [*caused by?*] twisting, flexure, the most numerous of which show action by damaging agents of precise mechanism; which have been studied for many years, and of which there is a very extensive literature (15-27).

Now, because those classic fractures were produced, it is indispensable that a series of precise, well define factors coincided; because their repetition — in the quantity that was observed in the deposits —cannot be attributed to

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simple natural agents, which have diverse mechanisms very capricious in intensity, point of application, direction, duration, and frequency.

On the other hand, the type of fragmentation, the way in which the materials were dispersed, and the regular absence of certain pieces correctly tallies with certain dismemberment practices, butchering, extraction of bone marrow, and other handiwork fitting for hunters.

4) Besides those indications, gradually by degrees there were discovered in the Valsequillo deposits bones with score-marks, incised marks, cut-marks; with

margins rounded by abrasion; with tips modified to a point, smoothed or spatulate; with sections burnished, [*and? or?*] engraved; culminating with the discovery of an “ornament” (?) with perforations, and six bones with engraving, all of them of unquestionable human workmanship. And, if there still remained some doubt of the presence of hunters, part of a mammoth mandible was encountered which still had a flint artifact sticking out of it. (All these materials are described in this report.)

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Evaluating all of the indications, the author arrived at the conclusion that the fossiliferous deposits of Valsequillo were hunting camps (kill sites), and that the materials found were proof of hunting: remains of dismemberment, primitive tools, and artistic manifestations of prehistoric hunters.

That thesis was not accepted by the authorities, who said that medical experiences are not applicable to Quaternary animals, and that these [*animals*] owe their death to floods (seeing that the zone was lacustrine), and that the lack of [*certain*] pieces, and fragments with all their [*diverse*] forms and repeated modifications, including the supposed engravings, are owed to the transport action of the arroyos, to earth compaction, and to other natural causes. Respecting the perforations of the “ornament” (?) and of the artifact embedded in the mammoth mandible, they said that they were simply accidents occasioned also by transport.

The problem appeared to have been checked at the purely speculative level of thought when, fortunately, various vertebrate [*skeletal fragments*] were found together: a megatherium pelvis and a horse leg, each of them correctly articulated (Figs. 6 & 7); and in addition, a small rodent skeleton, complete and in [*correct*] anatomical position notwithstanding its extreme fragility (Fig. 7). This proved that the Valsequillo deposits had suffered neither reworking nor compression of the magnitude that had been supposed.

However, in order to better illustrate the problem, the author proceeded to make a series of experiments, which are discussed below.

Experimental Control

Transport Experiments

Technique: Fresh beef and pork bones were thrown into the Alseseca and San Francisco arroyos at the points where the current is violent (Totimehuacan and Molino de Enmedio).

Results: After three months, the bones that were recovered were complete and, except for a general polishing, suffered no modification.

These results were not considered conclusive because of the short duration of the experiment. However, [*at the time?*] of these experiments, there was opportunity to compare a large number of bones, originating from the city's garbage, having suffered current action for various years without fracturing; notwithstanding that some were bones of domestic fowl with a very delicate structure (Fig. 8).

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In order to simulate more severe transport conditions, the following mechanical experiments were made.

Revolving Drum Experiments

Technique: For these experiments, a concrete mixer of medium size (90 litres capacity) was used (Klein-G-C), run by a 2 hp motor at 30 revolutions per minute. For experimental materials, fresh beef and pork bones were used. To begin with, the mixer was filled with sand, medium-sized gravel, and water.

Results: a) After one hour, all the bones were recovered whole, with the surface polished, but with neither abrasions, scratches, nor cuts.

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b) After three hours, all the bones remained whole, very burnished, and only one pork bone underwent abrasion, confined to an epiphysis.

c) With the mixer filled only with coarse gravel and water, after three hours the pork bones underwent an irregular form of crushing, with detachment of thin splinters, none looking like lanceolate or helicoidal splinters or the other forms found in the Valsequillo deposits. The beef bones were not fractured, and only underwent small notching and abrasion, confined to the condyles.

With these experiments, it is assured that fresh bone, even when subjected to severe mistreatment, does not fragment in the classic forms or comminutions well known in traumatology, and such as appear in the fossiliferous deposits of Valsequillo.

Compression Experiments

The experiments took place in the Materials Resistance Laboratory of the School of Engineering, Autonomous University of Puebla, under the direction of the head of the laboratory, Eng. Delfino Castellanos S.

For the experiments, a universal hydraulic press (Riehle Testing Machine, Mod. MA-60) was used.

General Compression Experiment

Technique: A beef bone was placed in a strong wooden box without a lid, well packed in clayey-sand (obtained from the "Tetela Formation") in order to reproduce as closely as possible the natural conditions of the Valsequillo deposits.

For a lid, a steel plate connected to the compressing piston was used.

Results: Under a compression of 1,000 kg p/cm^2, the bone sustained no visible change. From 3,000 to 5,000 kg p/cm^2, no deformation was observed.

At 6,200 [kg p/cm2] compression, the wooden box burst. The bone was preserved complete and only sustained a small crack or fissure in the middle of the diaphysis, which Eng. Castellanos interpreted as the result of the sudden decompression.

Flexo-Compression Experiments

(Girder/Beam Work)

Technique: On the flat surface of the hydraulic press, a beef femur was placed in a horizontal position, with its articulated condyles serving as a resting prop, with [*a length?*] of 32 cm. At the middle of the diaphysis, a concentrated load was applied by means of a large blade of 45 ° angle attached to the piston of the press.

Results: At 210 kg pressure, the condylar periosteum yielded, enduring a localized crushing.

At 840 kg, the bone began to crack according as the condylar crushing was affecting the spongy texture

At a load of 2,100 kg and without appreciable [*chaining?*], the bone broke suddenly into various large fragments, very irregular in form, with splintered edges, but which in no case were similar to the finds in the Valsequillo deposits.*

* H. Martin (28) says that for the experimental fracture of a horse ilium (which has a form and resistance very different from the femur of a steer), it was necessary to use a pressure of 1,310 kg.

Manual Experiments

Fracture of Fresh, Dry, and Fossil Bones

In order to resolve the frequent and basic problem of knowing if a bone was broken in the fresh, dry, or mineralized state, the author performed experiments using as a [*striker?*] a flint artifact (archaeologic) of some 300 gr weight and with a dull edge, having obtained the following results.

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In fresh bone, the fractures and fissures are identical to the various clinical types well known in traumatology. Often only the large parts are disarticulated. The edges of the fracture are clean, and only in some sections demonstrate the roughness typical of trabeculas. The size and form of the splinters depend on the intensity and direction of the blow, and also on the point where it was applied. Other characteristics of the fresh bone splinters can be seen in the [*display?*] of specimens.

In dry bone, the fractures are predominantly comminutive [crushed in pieces], with the form called “old wood”, that gives off thin, sharp splinters. The forms of fracture are extremely variable, depending on the degree of loss of ostein [ossein: the organic substance of bones] and the consequent loss of elasticity.

In fossil bones (very mineralized ones, like those of Valsequillo), the fractures are comminutive, with generally prismatic pieces and clean edges. The fracture planes agree with those of other mineralized materials.

Besides these manual experiments, experiments were made in order to reproduce signs of human labor that were observed in the Valsequillo fossils. The selfsame that are exhibited in the [*display?*] of specimens.

Comparison [*Studies?*] In addition to the laboratory work, at the invitation of the Smithsonian Institute, and with the economic support of the Mary Street Jenkens Foundation, the author compared selected Valsequillo specimens with material in the Washington Natural History Museum that the Institute had collected : a comparison that resulted in great profit for the evaluation of the [*local?*] materials.

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Fig. 3. Surface artifacts. 1. flint burin; 2. rose quartz point; chalcedony point; 4. flint point. The lithic materials are not native to the region.

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Fig. 4. Remains of extinct Valsequillo fauna with breakage and splintering of the same style, with modifications, perforations, and other signs of human workmanship.

Fig. 5. Scapulas fractured in a very similar way.

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Fig. 6, 1. & 2. Articulated fragments that demonstrate that the fossils of the Tetela Formation underwent very little or no transport. 1. articulated vertebrate of a bison; 2. *Megatherium* pelvis.

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Fig. 7, 1. & 2. Articulated pieces extracted from the Tetela Formation. 1. skeleton of a small rodent; 2. horse leg, dismembered by fracture.

Fig. 8. 1. 2. & 3. Bones from the city's garbage which were subjected to prolonged transport in the Arroyo San Francisco: 1. & 2. bones of domestic fowl with minimal abrasion; 3. condyle [knuckle bone] cut with a butcher saw, whose spongy fabric has not deteriorated because of transport, in spite of its low resistance.

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SPECIMENS

Hunting Injuries

The specimen that best demonstrates this type of injury is a ramus of a mammoth mandible, found at the Arenillas locality, which preserved a flint artifact embedded in the [parasinfisial] edge (Figs. 9 & 10).

The artifact (Fig. 13) was driven into the animal in life, and was preserved in place for a long time, during which the bone developed scarring osteosis (or callosity) massive enough to cover part of the injury. Some osteologists point out the possibility that the scarring process had infectious complications, which left as its mark the corrugations which can be observed on the [parasinfisial] edge (Fig. 11).

In addition to the penetrating injury, the projectile caused fissure fractures, which radiated vertically from the point of maximum penetration to the internal face of the [parasinfisial] edge (Fig. 11), which reveals the tremendous force of the impact.

The mandible also shows a traumatic frontal crushing at the alveolus [*tooth socket*] of the front molar (Fig. 12), and fissure fractures from the lingual face of the same alveolus which run vertically to the mandibular body, with detachment of small fragments that, at scarring, knitted themselves to the mandible (Fig. 12).

In order to reconstruct the circumstances in which those injuries were produced, by way of a working hypothesis and as only one [*possible*] explanation, the author postulates that the men were hunting a mammoth (possibly trapped in a mudhole) and

struck it with force in the snout, to the point of breaking the alveolus, in order to force open the fauces [*throat*], and give opportunity for their projectiles to penetrate down to the back of the neck in order to produce a fatal hemorrhage. But, to the misfortune of the hunters — and to the great fortune of the prehistorians — their aim missed, and the projectile was driven into the edge of the mandible, detaching the artifact from its support; and the animal carried it in its escape, keeping it for the rest of its life.

By confirming this hypothesis, the mystery of how they were able to bring down these Quaternary colossi would become a little clearer; some of which reached a height of 4.5 m and whose enormous mass appeared invulnerable to the weak thrusts with rock points of the gallant little men who hunted them many, many times. (At Valsequillo, remains of 93 mammoths and 26 mastodons have been found, hunted by man.)

Other specimens with hunting injuries are various bone fragments from the extremities of horses.

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whose harpoon-like form (Fig. 14), according to medical studies (24), was produced as a consequence of a blow when the bones supported the weight of the body. In other words, they were produced when the animals were alive and standing on their feet.

In order to confirm this etiology, the author made the following experiment.

Under the hydraulic press, a [canon] bone of a horse was placed vertically, and 200 kg of pressure was applied to it, in order to simulate the weight that would have been supported if the animal were standing. Then, a blow was applied with a club in the middle of the diaphysis, with the result that the bone broke into three parts: two large pieces, each one with an epiphysis, and an intermediate-size splinter of harpoon shape, identical to some which were collected at Valsequillo, and of the form [*caused by*] trauma (Fig. 14).

Another specimen of this group is a distal bone of an artiodactyle, which shows “green stick” fracture, the consequence of a lateral blow of intermediate intensity when the bone did not support all of the animals’ weight (Fig. 15).

All bones with harpoon form, “butterfly wing”, and “green-stick” fractures have been classified as hunting injuries because of the very specific conditions which produced them. It is inferred from these conditions, by way of a working hypothesis, that the hunters were accustomed to wait for the animals to pass by and, with a blow from a club or with throwing sticks, to break their legs in order to bring them down.

Page 27

Fig. 9. View of the occlusal surface of the right ramus of a mammoth mandible, with a flint artifact embedded in the [parasinfisial] edge, [*collected at*] the Arenillas locality.

Page 28

Fig. 10 1&2. Arenillas mammoth. 1. Frontal view of the mandible, showing at top the traumatic crushing with fracture in front of the molar, and fissure fracture of the lingual face. At center, the embedded artifact and fissure fractures produced by the impact. At bottom, remains of the matrix of “Valsequillo Gravels”, deliberately left [*in place*] in order to identify its geological provenience. 2. Detail of the “Valsequillo Gravels” showing its characteristic fragments of tabular black flint.

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Fig. 11 1&2. Arenillas mammoth. 1. Detail of the embedded artifact with fissure fractures produced by the impact and with small areas knitted together in the interior of the scar. 2. Detail of the penetration injury the artifact produced, around which one can see the scarring osteosis or callosity and the ruggedness/corrugation probably produced by infection of the wound.

Page 30

Fig. 12 1&2. Arenillas mammoth. 1. External view of the traumatic crushing. 2. Internal view of the same injury, with fissure fractures and small parts knitted together in the back of the same scar.

Page 31

Fig. 13. Flint artifact that was found embedded in the Arenillas mammoth.

Page 32

Fig. 14 1,2,3,4. Harpoon-shaped splinters produced by a blow given when the extremity supported the weight of the body. 1&3. Fossil splinters; 2. radiograph of a fractured human femur with harpoon-shaped splinters at the center (After Rienau, 24); 4. fossil splinter modified in order to give it a sharp point.

Page 33

Fig. 15. Bone from the distal end of an artiodactyle with “green-stick” fracture, caused by a lateral blow.

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Disarticulation

In addition to other traces of dismemberment cited here, coxae bones [hip joints] of bovids and equus have been found with signs of complete dismemberment by violent disarticulation.

The reconstructive tests showed that, in order to extract the head of the femur from the cotyloid cavity, much effort was required, to overcome the great resistance of the [*capsular? annular?*] ligaments (which unite the head of the femur with the back of the acetabulum). To bring this about, it was necessary to flex the leg of the animal in a direction contrary to its natural movement, and to force the shaft intensely, until one succeeded in pulling it from its articulation. (In the tests, in order to disarticulate the leg of a steer, it was necessary to use four men.)

This form of violent disarticulation produced fractures in the flange of the acetabulum and, occasionally, detachment of parts of the external floor of the cotyloid cavity, similar to many fossil fragments from Valsequillo (Figs. 16 & 17).

Page 36

Fig. 16, 1. Cotyloid cavity from a bovid and, 2. cotyloid cavity from an equus, both with fracture in the flange produced by violent disarticulation of the femur.

Page 37

Fig. 17. Cotyloid cavity from a bovid, with fractured flange and detachment of part of the external floor, caused by violent disarticulation.

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Helical or Spiroidal Splinters

These are large bone splinters from the extremities (principally of horse, bison, and camel), generally [*elongate?*] and whose helix or spiral form follows the curve of the bone (Fig. 18). They have been classified as indisputable products of human workmanship because of the [series of manual] operations that were required in order to obtain them. After many tests, the author was able to obtain them only in the following manner:

1. First he submitted the bone to twisting (Fig. 19). This indispensable condition, as subsequently seen (in dismemberment practices) facilitates the detaching of the extremities considerably.

2. Then, with striking blows, the proximal epiphysis was cut off, care being taken that the blows were of medium intensity — hardly enough to break the bone — and allowing the force of the torsion to complete the cut.

Under these conditions, the fracture of a bone yields edges with the classic “flute[*d?*] point” form (Fig. 19). In Traumatology, it has been verified many times that a violent twisting is sufficient to produce a spiral fracture without the need of an intervening damaging agent (Fig. 21).

3. Finally, with striking blows given vertically and lightly toward the outside, splinters were detached from the edge of the previous fracture (Fig. 19).

The splinters obtained in this manner are helicoidal or spiroidal and identical to

those discovered in the Valsequillo deposits (Fig. 20); and, at the same time expose the marrow, free from [bone] chips.

To analyze this reconstructive technique, [*it looks like?*] the helicoidal splinters are related to the practice of dismemberment and to the obtaining of marrow; handiwork that also the hunters carried out using a fairly similar technique, testimony of which is shown below.

Page 40

Fig. 18. Helicoidal splinter, found at the Tecacaxco locality, obtained by splintering a bone previously truncated under torsion.

Page 41

Fig. 19, 1 & 2. Reconstructive technique used to obtain helicoidal splinters: I. Bone subjected to twisting to prepare it for truncation with striking blows; 2. The bone, now truncated (with a "flute point" fracture edge) in preparation for being splintered with vertical blows.

Page 42

Fig. 20, 1 & 2. Almost identical helicoidal or spiroidal splinters, obtained from bones submitted to twisting. I. Splinter obtained by means of the reconstructive technique previously illustrated. 2. Fossil splinter from Atepitzingo, which was modified to make it sharper.

Page 43

Fig. 21. Helicoidal fracture of a human tibia, caused by violent twisting (after Rienau, 24).

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Simple Truncation and Lanceolate Splinters

These two works of hunters are intimately related: to obtain lanceolate splinters, it is prerequisite to have a simple truncation, such as was proved in the reconstructive tests. For this reason, they have been studied together.

Simple Truncation

This type of break can be observed in large bones of the extremities of camel, horse, and bison which, without twisting, can be separated (only the proximal epiphysis) with striking blows; traces of which at times can be noted on the edges of the fracture (Fig. 22.)

In some cases, truncation was accompanied by flexion, which resulted in small [*tearings*] in the diaphysis (Fig. 23).

Both types of truncation have been reproduced experimentally.

Page 45 (cont'd.)

Whatever the purpose of these fractures (which could well have been for dismemberment, marrow extraction, or for other reasons), it shows the care with which they were made, avoiding crushing and splintering of the bone.

Lanceolate or Foliate Splinters

As the name implies, these splinters have a form similar to the point of a lance or the leaf of a tree (Fig. 26). To reproduce them, the author used a previously truncated beef bone placed vertically, and with gentle striking blows, splinters from the edge of the fracture were broken off. He obtained three types of fragments, identical to the fossil fragments from Valsequillo, with the following characteristics:

1. Lanceolate or foliate splinters with a [*planar? flat? smooth? level?*] base, with a smooth and lightly undulating edge (similar to the "concentric waves" [conchoidal fracture?] of a flake of flint) while the other edge is rough and [*grooved? corrugated?*] Fig. 28).

2. When the striking blow is made in a direction a little to the outside of the bone, one obtains the same type of lanceolate splinter, but with a peduncled [stemmed, stalked] base (Fig. 26, 3.).

3. At the end of the handiwork, the marrow remains to be exposed, and the remaining bone (distal epiphysis) shows sharp edges and characteristic fissures identical to fossil fragments from Valsequillo (Fig. 29).

Page 46

Fig. 22. Extremity bone of a bovid with simple truncation, found at the Arenillas locality.

Page 47

Fig. 23, 1 & 2. Extremity bones of equus, with truncation completed by flexure (Tecacaxco locality).

Page 48

Fig. 24. Equus bones, exposed in the Hueyatlaco excavations, between which were found a truncated bison femur.

Fig. 25. Extremity bone of an equus with truncation completed by twisting.

Page 49

Fig. 26, 1, 2 & 3. Fossil lanceolate splinters collected in different localities, all of them with a grooved edge characteristic of intentional splintering. 3. Stalked splinter obtained by striking blows given towards the outside.

Page 50

Fig. 27. Extremity bone from a steer after being truncated and splintered in reconstructive tests.

Page 51

Fig. 28. Detail of the result of experimental splintering of a beef bone, with its sharp projections and fissures radiating to the epiphysis. 2. Lanceolate splinter obtained in these tests, with a planar base, a smooth and lightly undulating side [edge] and with the other side [edge] with a characteristic groove.

Page 52

Fig. 29, 1 & 2. Fossil bones that were splintered and that preserve sharp edges and fissures similar to the bones splintered experimentally.

Page 53

Trepanation

Even though rather rare, at Valsequillo trepanned bones also have been found, mostly of proboscidians (Fig. 30). In this piece, one can observed that the striking blows [made] in order to enlarge the opening split the bone down its whole length.

Similar trepanations have been observed in paleolithic materials from the Crimea, studied by S.A. Semenov (31).

Page 54

Fig. 30. Proboscidian bone, trepanned on two sides, found at Santa Maria Tecola (Valsequillo).

Page 55

Surgical Cuts

These remains are superficial cuts, incisions, or simple score marks — either individual or in groups — which are observed in many types of bones with planar surfaces (Figs. 31-40). Their name was given to them by H. Martin (28 & 29), and they have been identified with those described by S.A. Semenov (31), who studied the prehistoric bones of Kostenki.

The surgical incisions, in agreement with their etymology (from the Greek *creourgía*: to tear meat to pieces), are related to the manual work of cutting up meat or to the work of a butcher.

Experimental Control

In order to experimentally reproduce these types of traces, the author used ilia [large pelvis bones] and scapulae [shoulder blades] from a steer, and [*on? above? from?*] them cut thick pieces of raw meat and fresh hide from the same animal, using flint tools as sharp as a steel knife; similar to [the type of tests?] archaeologists have recently made.

To cut with flint tools, the author found that the testing materials (both flesh and hide) offered a resistance that was truly unexpected, as much for the structure as for the additional interior slipping of the fiber; and, to overcome it, it was necessary to exert strong pressure and make energetic to-and-fro movements   This ended, almost always, with the inevitable sinking of the implement into the bone, producing in it incision marks identical to the types observed in the fossils from Valsequillo:

a. Fine cuts of shallow depth, made when the bone was very fresh (Fig 38, l).

b. Very wide, deep cuts, when dry bone was used (animal dead more than 90 days) (Fig. 39).

It was not possible to reproduce some very deep cuts that was found on a compacted rib (Fig. 40), and that, it is supposed, was owed to the little resistance of the scarring osteosis.

When one worked with a steel knife, the flesh and hide cuts were made with much greater ease, without needing to exercise pressure. As a consequence, marks on the bones were rare and almost imperceptible. Even when intentionally made, they were perceptibly thinner and more shallow than those left by the sawing edges of the flint tools.

Page 56

Fig. 31. Horse iliac fragment: 1. Ventral face of the iliacal region, with numerous incisions and cuts.

Page 57

Fig. 32,1 & 2. Spinal apophyses [off-shoot, projection] with surgical cuts (only on one of the faces).

Page 58

Fig. 33. External face of a horse iliac, with cuts near to the attachment of the median gluteal muscle.

Page 59

Fig. 34. Proboscidian rib, with numerous short cuts.

Page 60

Fig. 37. Scapula fragment with surgical cuts and faint remains of engraving (at left).

Page 61

Fig. 36, 1 & 2. Bones with cut marks: 1. Camel mandible; 2. Horse mandible.

Page 62

Fig. 37. Internal face of the ischiopubic opening of a horse ilium, with radiating cuts (some retouched with pencil).

Page 63

Fig. 38, 1 & 2. Horse iliac bones, with cuts.

Page 64

Fig. 39. l. Labial face of a horse mandible with two deep cuts, probably made when the bone was dry; 2. Horse palate, with fine cuts, made when the bone was fresh.

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Fig. 40, 1, 2 & 3. Compacted bison rib, with cuts: 1. ventral face; 2. dorsal face; 3. detail of the cuts from the ventral face, among which appears to be an attempt at engraving.

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Use of Fire

The use of fire, which is the proud prerogative of the human vertebrate, can be observed in numerous fossil fragments, found principally in the localities of Atepitzingo, Hueyatlaco, and Tecacaxco. M. Pichardo del Barrio (30), upon checking the osteological collection of the Department of Anthropology, University of Puebla (CODAUP), found more than 20 pieces that were partially burned (Fig. 41). This particularity rules out the possibility that one is dealing with a natural accident, such as a fire in place.

A fine specimen with fire marks is a fragment of mandible from a young mammoth that has an embedded molar (M2?), which suffered burning on all its [*exposed surfaces?*], with loosening of the dentin near the crown, deep carbonization, and much cracking in the area of the radicle [root] (Fig. 43).

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Fig. 41, 1 & 2. Proboscidian vertebrae, partially burned.

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Fig. 42, 1 & 2. Bits of carbonized proboscidian bone.

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Fig. 43, 1,2 & 3. Mandible fragment from a young mammoth, partially burned. 1 & 2: Rear views of the piece; 3. Detail of the carbonization and much cracking of the root of the molar.

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Modified Fragments

A goodly number of fossil fragments collected in the Valsequillo area show signs of having been modified using diverse techniques; in order to plane the ends, bevel the edges, smooth certain sections, give them the form of a spatula, chisel, projectile point, sharp point (prismatic and rounded), and many other modifications (Figs. 44 to 60).

By their appearance, some pieces bring to mind the skin smoothers, perforators, and other types of prehistoric tools of the Old World (29, 30, 32), but the traces that the work leaves on them have not yet been studied; therefore one is not able to safely judge their destined use.

Page 72

Fig. 44, 1, 2, & 3. Modified fragments. 1. Piece with general smoothing and a burnished [escotura]; 2. piece with a beveled and polished end (x0.5); [3?] remains of a piece cut and polished in the form of a wedge or chisel (part of the matrix has been left in order to identify its stratigraphic origin).

Page 73

Fig. 45. Fragment with an end reduced to the form of a spatula, and with signs of use.

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Fig. 46, 1 & 2. Fragments with an end reduced to the form of an inclined chisel (x0.5). (Both retain part of the matrix in order to identify the stratigraphic provenience.)

Page 75

Fig. 47, 1 & 2. Splinters, each with a spatulate end. 3. Epiphysis fragment with two planed faces and the point reduced to the form of a chisel.

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Fig. 48, 1 & 2. Fragments with an end modified to the form of a chisel.

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Fig. 49, 1, 2, & 3. Fragments with generalized smoothing and a truncated and burnished end.

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Fig. 50. Fragment with the external surface burnished, and whose edge was cut and polished in order to give it a sigmoid [s-shaped] and beveled contour..

Page 79

Fig. 51, 1. Lanceolate splinter with end reduced to form a chisel; 2. helicoidal splinter with both ends worn away.

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Fig. 52, 1 & 2. Helicoidal splinters with general smoothing, and with point sharpened.

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Fig. 53, 1 & 2. “Butterfly wing” splinters, with edges rounded off and with an end sharpened: 3 [*4?*] splinter with both faces planed; 4 [*3?*] “harpoon” splinter with general smoothing and retouching in the medular canal to accentuate two grooves.

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Fig. 54, 1. Epiphysis fragment, with its end made more acute; 2. fragment with an end reduced to a point.

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Fig. 55, 1. Lanceolate splinter, with generalized smoothing, with its edges rounded and its point sharpened; 2. fragment with generalized smoothing, [with a piece knocked off], and its largest side reduced by sharpening the point.

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Fig. 56, 1 & 2. Fragments in the form of a point, which retain a very well made incision; 2. moreover, this piece has a cylindrical notch near the base.

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Fig. 57, 1,2,3,4,5,6, & 7. Bone points.

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Fig. 58, 1,2,3, & 4. Fragments in the form of points; 1. this piece has incisions and a generalized smoothing; 4. cranial fragment, reduced to the form of a point.

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Fig. 59, 1. Fragment of a proboscidian long bone, with the point sharpened, marks of blows, and general smoothing (x0.25); 2. fragment of proboscidian rib modified in the form of a punch (x0.50); 3 [*?*] fragment reduced to the form of a needle (x1).

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Fig. 60, 1 & 2. Cervid antlers with the points cut off and partially hollowed out; 3. tip of an antler separated by truncation.

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Cut Bones

The marks with which the bones were cut are not always clearly seen, since some examples, after being cut, were smoothed and polished, erasing the traces of the implement. Nevertheless, the forms of some pieces and the skill with which they were sectioned signal the use of this technique.

In the El Horno archaeologic excavations, a phalange of a mastodon was discovered that was in process of being cut, and shows a deep V incision (Fig. 61, 1), which appears to have been made with converging cuts which left individual grooves in the depths of the incision. The motive for cutting the bone in this way is not known, but

Semenov (31) relates that in some prehistoric cultures of the Old World, bones were found cut in this manner to serve as a handle or hilt for flint implements.

Another interesting piece is a fragment of proboscidian long bone which was carefully cut to the form of a curved planisher, on whose smoothing face remains of the [*cutting edge?*] can still be seen (Fig. 61, 2).

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Fig. 61, 1 & 2. Cut bones. 1. Mastodon phalange in process of being cut, discovered in the El Horno excavations. The piece preserves a very clear cut in the planar region; 2 fragment of long bone from a proboscidian, cut and smoothed into the form of a planisher or chisel (x0.5).

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Perforation

An excellent work of perforation can be observed in a small bone flake found in the Atepitzingo locality (Figs. 62 and 63). The piece has a modified contour. In its external face it shows the remains of a relief — whether artificial [or not] one is not able to say. Its internal face, occupied by the spongy tissue, is abraded and polished. In the upper part, the piece retains the perforations, slanted, and at different levels.

Because of its general appearance, size, and principally because of its two perforations, this piece was probably an [*adornment?*], such as those that one is accustomed to hang from the neck.

As a curious aside, this example was found under the cranium of a mastodon, exactly at the site where the samples W-1899 and M-B4 were [later?] taken for geochemical tests (see Chronology).

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Fig. 62. Small flake of bone, with the contour and the internal face abraded, and with two perforations, found at the Atepitzingo locality.

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Fig. 63, 1 & 2. Other views of the small, perforated bone plate from Atepitzingo.

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Engraved Bones

Specimen: CODAUP-HG-T.I

Origin: Tetela (Hueyatlaco)

Date Found: May 2, 1959

Collector: Juan Armenta Camacho

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Description: [The specimen] is a fragment of a mastodon pelvis, triangular in outline, whose rounded base corresponds to an anatomical edge. The other two sides of the triangle are sections of old fractures. Its two parallel faces are anatomical surfaces of which one only, the internal face, which is smoother than the external one, was engraved (Fig. 64).

Dimensions: Height	15	cm
Base	19	cm
Thickness	6	cm

Because this was the first time that an engraved piece of Quaternary age had been discovered in the New World, and owing to the large amount of publicity and international importance that has been given to it, the author considers himself obligated to supply the following [*research information*].

Location of the Find: The piece was discovered by the author during a routine salvage trip, in a place 50 mt to the north of what was later to be the principle center of the Hueyatlaco archaeological excavations ("Valsequillo Project"). The find was situated at the foot of a small rise, where the Valsequillo Gravels crop out (elevation: 2,056 m).

Stratigraphically, the piece was situated in the lower-middle Tetela Formation, where it was firmly embedded, showing only the anatomical edge.

At the time it was found, the engravings were not observed. Not having any antecedent that would suggest their existence, the piece was not carefully examined.

The work was recognized when the bone was being cleaned in the laboratory; thanks to the fact that the author accidentally used a tangential light, the engravings were thrown into relief.

Study of the Piece: Having no precedent in America for prehistoric engravings to serve for comparison (The only ones on record were some examples on view in museums in England, France, and Czechoslovakia, pertaining to other cultures and with other characteristics of workmanship.), and given the lack of experience of the author in this specialty, he thought extreme caution necessary before making a public announcement.

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For one whole year, the author kept the find secret so that qualified specialists could examine it and make pertinent studies.

Page 96 (cont'd.)

In the course of that year, investigators from official institutions studied the piece — for the most part foreign scientists mentioned previously, who had maintained direct contact with all the work carried out at Valsequillo.

The studies ranged from the identification of the bone material and the technique of workmanship to the interpretation of the engravings.

The bone was identified as part of a mastodon pelvis, thanks to finding, a few days before, an almost complete pelvis of this animal together with two molars and other diagnostic bones. (Later, when the "Valsequillo Project" made archaeological excavations at the El Horno locality, this identification was checked against another mastodon pelvis that was found there, associated with flint artifacts.)

Regarding the age of the bone: because it was found embedded in the Tetela Formation, belonged to an extinct Quaternary Period animal and, moreover, had the same degree of mineralization as the fossil material found in this stratum, it was considered contemporaneous with them and of the same Quaternary age.

The engravings preserved on the piece are a superposition of elements — truly enticement for imaginative reconstruction — with very shallow but sufficiently precise burin grooves.

Doubtless the work only could be made by man; but it remained to clarify if they were truly engravings, intentionally made, or if one was only dealing with accidental lines, such as surgical cut marks. With this view in mind, a comparative study was made that showed the following:

All the surgical cuts and accidental lines, even in cases in which they appear in groups and superposed, always <u>are individual and not continuous</u>. On the other hand, in the piece being studied, <u>the engraved lines are systematically continued</u>, strengthened by means of rectifications and connections (Figs. 71, 72, 73, and 74).

What's more, in the surgical cuts and accidental lines, <u>pronounced curves and closed elements have never been observed</u> (as one can see in the demonstration of surgical cuts); <u>the engraved bone is a totally different thing, where there are abundant, precise, dominant curves and closed elements</u> (Figs. 71,72,73, and 74).

Page 96 (cont'd.)

Not agreeing with these remarks, the author tried to reproduce the work preserved on the piece, cutting raw meat and hide over fresh bones. In spite of the fact that the experiments were deliberately and carefully made, the results were completely negative. He was not able to reproduce a single one of the engraved figures.

Certain that the bone was of Quaternary age, and convinced that the work was truly engraving, still pending was the problem of knowing if the piece had been engraved "fresh", that is to say shortly after the mastodon was killed and in the midst of the Quaternary epoch, or many centuries later, when the bone had been mineralized.

Tests made to determine this gave very objective results:

In fresh bone, the burin (both flint and steel) gave a groove bordered by minute facets and microscopic resilient filaments of organic material that the burin was not able to extract. Meanwhile, in a fossil bone from Valsequillo, the scoring by a burin was clean, and only altered by microscopic conchoidal chips, fitting for its mineral composition (which, according to chemical analysis, is apatite and calcite (36).)

The best testimony that the bone Tetela I was engraved "fresh" is the microscopic filaments encroaching upon the engraved grooves that were fossilized at the same time as the rest of the piece, and that have the same degree of mineralization as the rest of the bone (Fig. 65).

The studies with the microscope were made in the Histology Laboratory of the School of Medicine and in the Biology Institute, Autonomous University of Puebla, under the direction of Dr. Andrés Anaya and Dr. Julio Glockner, respectively, with the assistance of biologist Prof. Wolfgang Boege.

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Engraver's Opinion: In order to obtain an opinion that is exclusively technical regarding the workmanship, the piece was examined by D. Senén Sánchez Tostado, professional engraver and Professor of Engraving at the Belles Artes Academy. He noted at first that in order to engrave fresh bone with a hard surface, such as that of the piece [being described], one needs definite execution and knowledge in order to control the burin, things that are only acquired with long practice. This initial qualification made, Professor Sánchez Tostado expressed the opinion that, in the specimen under study...

"It is appraised that it was worked with heavy lines and fine lines, both continuous, having twice-scored points and small hollows. Parallel with some

Page 97 (cont'd.)

lines, a fine dotted line was observed that possibly was part of the sketch, just as some engravers still make. The figures are a fine piece of miniaturization, bearing an evident degree of stylization, as can be deduced by the cleanness of the line and the sure execution of the curves. Whoever engraved it was a craftsman, knowing his material, and well mastering the burin."

Interpretation of the Engravings: To try to interpret superimposed sketches like those found on this piece is a very subjective matter and of a personal criteria as well, that at times borders on clinical psychology. Precisely for this reason, the piece was submitted to the judgment of clinical psychologist Dr. Francisco Ciófalo Zúñiga (32), who stated:

"On the surface of the piece, one can see traces of artistic work of primitive style. In the upper central part, two figures stand out that represent [two] animals: the lower one resembles a proboscidian, and the upper one, according to my understanding, is a fierce carnivore, perhaps a large cat. The figures are schematic, and the upper one is highly dynamic.

"I judge that the lines are intentional and of human production. The lines of the engravings are precise and definite where the figures superpose. I reject the

> possibility of several chance cuts, as it would need millions in order to produce the two tidy figures of the piece.
>
> "These engravings are notably like those of the Paleolithic and, supposing that an adult or child of our culture might have sketched them, his psychological maturity would be slightly under the mental age of twelve years."

According to Michael D. Coe (33), of the Department of Anthropology, Yale University, this engraved bone...

> "is the only specimen of art representative of the Pleistocene Period that we have for all the New World. It reminds one of the magnificent incised art of the Upper Paleolithic of Europe, although infinitely more crude than any of them, and reflects the obsession of both hemispheres for the hunting of animals: 'art for meat' as it has been irreverently called."

The reference to the piece made in *The American Heritage Book of Indians* (38) deserves to be quoted, because it is a volume which numerous scientific institutions and distinguished authorities supervised:

> "And in the previously mentioned Puebla find: In the spring of 1959, at a site known as Tetela, to the southeast of Puebla, Mexico, four bone fragments were

> discovered, on one of which [*either of mammoth or mastodon bone*] was engraved heads of a feline, serpent, mastodon, and hunting scenes, all executed with an extraordinarily artistic capability, considering its probable age.

The find was kept secret for more than a year while Dr. Juan Armenta Camacho, in charge of the excavations, invited pre-eminent specialists to study that which is perhaps a discovery that will mark a new epoch, which will likely be locked in the books of prehistory. The belief at present, based on geology and on fossils found in association with the engravings, is that they can be actually dated [*to the beginning of*] the long ice-free period previous to the main Wisconsin glaciation. If it is true, they will prove to be of first importance, not only for the ancient history of America, but for the entire world."

The Engraved Figures: Intending to separate out some elements of the superposed engravings the author, recognizing his lack of experience in this work, used Breuil's technique [*ref?*]. With aid of a low-powered microscope, following the trace of each element which clearly demonstrated continuity, he achieved in this manner a tentative separation of the figures (Fig. 70); one that, obviously, is capable of all sorts of corrections.

Addenda

No sooner had the investigation begun than he tried to identify completely every animal represented in the engraved bone "Tetela I". [*?*] However, the author could not skip over a figure of a proboscidian which clearly had engraved horns (or "tusks") both on the upper and lower part of the snout (Fig. AD-l).

Exactly this type of double [tusks] characterizes *Ryncotherium tlascalae*, a very old mastodon whose remains have been discovered in different Valsequillo localities (Fig. AD-2).

The identification of *Ryncotherium* was achieved thanks to numerous molars which have as a peculiarity three-globed [prétritos], and the characteristic enamel banding of its [tusks] (Fig. AD-3). This mastodon has been studied by various investigators, among whom are H.F. Osborn (5), W.Freudenberg (7), and M. Pichardo del [B]arrio (30).

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Fig. 64. Engraved bones: Specimen "Tetela I".

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Fig. 65, 1 & 2. Photomicrograph of the engraving found on the "Tetela I" bone. l. Surface view, seen under medium power; 2. With high-power magnification, one can observe the retraction of the [*cut-up surfaces ?*] of the edges and the crackling caused by the disappearance of the ostein during fossilization. In the bottom of the groove, some microscopic chips loosened when the bone was engraved while fresh were fossilized at the same time as the rest of the piece.

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Fig. 66. "Tetela I" specimen. Photomicrograph of one of the engraved grooves, in which one can see the small hollows produced by the burin as it tore away small fibers of bone fabric, and the "little seats" or stair-step cuts left by the burin.

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Fig. 67. Photograph of the "Tetela I" specimen, taken with monochromatic light.

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Fig. 68. Tracing of the engravings found on the bone “Tetela I”.

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Fig. 69. Distribution of the principal elements of specimen “Tetela I”.

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Fig. 70. Tentative separation of the engraved figures on the bone “Tetela I”, using the method of Breuil.

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Fig. 71. Detail, Tetela I specimen.

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Fig. 72. Detail, Tetela l specimen.

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Fig. 73. Detail, Tetela l specimen.

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Fig. 74. Detail, Tetela l specimen.

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AD-l, l. Detail of the engraving and 2. free-hand copy of Figure D, which can be found in the central part of engraved bone Tetela I and which clearly represents a proboscidian with double [tusks].

AD-2. View that shows *Ryncotherium tlascalae*, a very ancient mastodon from the valley of Puebla, whose principal characteristic was to posses double [tusks]. (From the reconstructive work of H.F. Osborn (5).)

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AD-3. Remains of *Ryncotherium tlascalae*, discovered in the Arenillas locality: 1. molar with the characteristic three-globed [prétritos] and 2. end of the lower [tusk] with its peculiar banded enamel.

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Fig. 75. Engraved bones: specimen “Atepitzingo I”. This example is a fragment of proboscidian long bone, whose engravings have remained covered with the sediment [in which it was found] in order to identify the stratigraphic provenience. It was found by Luis Vázquez Rangel, in the Atepitzingo locality.

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Fig. 76. Unadorned sketch of the engravings of the bone, “Atepitzingo I” before being cleaned.

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Fig. 77. Engraved bones: 1. “Atepitzingo II” specimen. It is a small skull fragment which preserves within an anatomical depression three v-like incisions, united like a Grecian fret [interlaced, angular design]; 2. Specimen “Atepitzingo III”. It also is a skull fragment which shows engraved work in an anatomical depression. Both examples were found at the Atepitzingo locality.

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Fig. 78, 1 & 2. Unadorned sketch of the engravings that were found on examples “Atepitzingo II” and “Atepitzingo III”.

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Fig. 79. Engraved bone specimen “Tetela II”. This is a fragment of long bone whose end was cut and smoothed into the form of a chisel; its external face preserves some engravings. 2. Detail of the engravings. This piece was found in the Tecacaxco (Tetela) locality.

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Fig. 80. Engraved bone, “Tetela III” specimen. It is a fragment of proboscidian long bone of irregular form, whose external face preserves engravings mingled with anatomical casualties natural to the surface of the bone. It was found at Tecacaxco.

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Fig. 81. Detail of the engravings of example “Tetela III”.

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DISCUSSION AND CONCLUSIONS

The specimens described in this memoir are, without exception, remains of extinct animals of the Pleistocene [Epoch], which permits us to place the cultural phenomenon that is investigated [here].

The reconstructive tests have demonstrated fully that the signs of work that are conserved as material [*evidence?*] are from the same epoch, and certainly correspond to butchering operations that only could have been made by the hunters while the bone was still fresh.

The injuries that the bones show are not new to medical science, and traumatology has well studied their etiologic processes, so that neither their contemporaneousness nor their human origin are debatable.

Referring to the fragments of bone that the author considers to have been modified by man and/or that have signs of use, the mechanical and transport tests totally dismiss the possibility that they were products of natural agents. Notwithstanding that the use to which they were destined has not been investigated, it is possible to show their similarity to bone implements of other prehistoric cultures.

Conspicuous in the investigations are the engraved bones, the first of Quaternary age to have been discovered in America. The reconstructive tests, the laboratory studies, and the opinion of very highly qualified specialists leave no margin of doubt respecting their authenticity and cultural value, which guarantees that the

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hunters who experienced the New World in the remote prehistoric past possessed the highest human qualities, including artistic temperament.

The age of the materials have been determined by [insobornables] laboratory tests, whose validity can only be rejected by other scientific tests. Since that has not succeeded, the Valsequillo discoveries are qualified to establish a new precedent in the history of culture, and pose the necessity of revising the concepts that now are held concerning the prehistoric past.

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NOTE:

All the materials described in this work, together with all the materials discovered during the “Valsequillo Project”, the osteological collection of the Department of Anthropology, Autonomous University of Puebla, and the [*other? remaining?*] collections and equipment that the Department of Anthropology of UAP had collected can be found in the power of the National Institute of Anthropology and History [*INAH*]. The [*surrender? delivery?*] of all the materials packed by the author conforms to a detailed inventory and Certified Act by the notary public Lic. Benjamin del Callejo, a copy of which was deposited in the Juridical Department of the University of Puebla [*by? under title of?*] Lic. Oscar Bouchez Markoe.

Page 121 [Table]

CHRONOLOGY OF VALSEQUILLO AND CORRELATED AREAS (34, 35, 36, 37)

The antiquity of the materials here described is a subject that goes beyond the purpose of this work. Nevertheless, for the usefulness it could have for studies of cultural evolution, the results of 14-C and Uranium-series (U234/U238, Th230/U234, Th230/Th232, Pa 231/U235) tests are set down here.

Sample Number	LOCALITY	AGE IN YEARS

[See table for actual information.]

(M) [*Morrena?, Malde?*]
(*) Contains cultural remains.

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LITERATURE CITED

[Add later references in brackets, such as [Steen-McIntyre *et al.* , 1981], and also to body of text.]

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Seal of the State of Puebla

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