in bringing about a resolution of syphilitic lesions in the central nervous system, leading to astonishing clinical recoveries from paresis and even maniacal mental disorders. The saving to the state of Wisconsin alone, through the discharge of patients suffering from various forms of insanity occasioned by syphilis, who have been apparently permanently relieved of their mental disability, has already many times paid for the total cost of the entire research.

While the chemical phase of the cooperative effort has not as yet produced such startling results, it has contributed information of a fundamental character in organic research on mercurials and arsenicals. In the employment of new synthetic methods, compounds of arsenic have been obtained in which the well-known "tonic" action of arsenic has been attenuated to a remarkable degree, so that these substances give promise of being very valuable in the symptomatic treatment of emaciated patients. Many new facts concerning the toxicity of mercury compounds have been found.

Among the most important results of the pharmacological phase of this cooperative research has been the working out of a quantitative method for the comparison of the therapeutic value of the many different compounds studied. Qualitative estimations can not be expected to yield accurate knowledge upon as complex a problem as this, particularly when such estimations are limited only to a single criterion of therapeutic action. In the method devised by Professor Loevenhart and his associates, a standardized inoculation or infection is made; each treated animal is followed with a corresponding untreated but infected animal, and the dosage of the compound used is calculated from the maximum tolerated dose; the course of the blood Wassermann, the exact character of the initial lesion and the number of infecting organisms present at any one time are all accurately determined, and then, by means of a formula, the therapeutic value of the drug as compared to neo-arsphenamine (which has been arbitrarily selected as a standard) may be calculated. This method has yielded information impossible to secure by ordinary qualitative technique.

The routine blood Wassermann, which has been performed on all experimental rabbits, has given surprising knowledge of a fundamental character upon immunological reactions in general, and in particular upon the significance of the Wassermann reaction itself. This is being closely studied by Professor Lorenz at the present time.

Another interesting contribution from the pharmacological phase of this general research has been one by Dr. Albert Young and Professor Loevenhart, on the action of organic arsenicals upon the optic tract. It had long been supposed that the deleterious effect of organic arsenicals on the optic tract was due to the presence of pentavalent arsenic in the compounds. This work rather conclusively proved that injury is due to the presence of either trivalent or pentavalent arsenic in the para position to an amino or substituted animo group.

In Conclusion

It is felt by the workers concerned in this cooperative venture that the real effort is just beginning. The hopefulness of undertaking to find arsenical and mercurial organic compounds which might be better than anything yet known for the treatment of syphilis of the central nervous system has been justified, and this is provoking greater optimism for the future. So much promising study is in sight that enthusiasm among the group is increasingly evident at each meeting. It is hoped that this plain recital of the story of a working cooperative scientific research, with its implied disappointments and reverses, as well as with its successes, may prove to be the needed stimulus to the inauguration of similar efforts elsewhere.

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THE ANTIQUITY PHANTOM IN AMERICAN ARCHEOLOGY

INTEREST in American antiquities has increased rapidly in recent years, and researches are extending to many fields heretofore untouched. So fascinating is the lure of great antiquity that numerous untrained explorers are entering the field, and the highly colored accounts of their discoveries are broadcasted with fanciful elaborations by predatory journalists. We hear, for example, of numerous pre-Columbian discoveries of America; of ancient races preceding the Indians; of civilizations antedating those of the Nile and the Euphrates; of glyphic inscriptions miles in length that await a translator; of skeletons of men twelve feet in length; of dinosaurs and ibexes engraved on rock surfaces; of the ruins of a Chinese city; of America as the probable birthplace of humanity; and so on, *ad infinitum*. These fanciful announcements by untrained adventurers in the realm of science, being without chronological or other support, are soon forgotten, but when geological chronology is appealed to by explorers, whose statements and conclusions find a place in scientific journals, the case becomes more serious and deserves more than passing attention.

Recently there has come to my notice a brief ar-

ticle by F. B. Loomis,[1] published in the *American Journal of Science,* entitled "Artifacts associated with the remains of the Columbian elephant at Melbourne, Florida," which article should not be passed over without comment on the part of students interested in the much discussed question of the antiquity of man in America. This is especially true since the very limited evidence recorded is regarded by Mr. Loomis as conclusive proof of the Pleistocene age of the relics recovered—proof that man in Florida was contemporaneous with a great group of animals long since extinct. Reciting in some detail the recovery of the four specimens, illustrations of which are given, he assigns them without hesitation to the Pleistocene, and this notwithstanding the fact that all were obtained from superficial hammock deposits within three feet of the surface and are of types characteristic of the art of the Indian tribes of Florida.

It has been my practice during many years of archeological research to begin on the surface of the site under examination with the known peoples and their culture, following the story downward in the successive formations until all traces of occupation disappear; and I may state that in no case in many years of more or less continuous investigation in the American field have I found a trace of human handiwork not assignable with safety to the Indian tribes, historic or prehistoric, and none so deeply imbedded in geologically ancient strata as to preclude the possibility of introduction from recent horizons. I wish, therefore, to apply this method of approach to the Florida evidence under consideration.

Mr. Loomis's record of his finds is as follows: (1) a rudely chipped flint implement, the fragment of a leaf-shaped blade, a knife or spear head, found in a bed of sand three feet beneath the surface of the hammock and associated somewhat closely with the fossil bones of an elephant; (2) three bits of fossil bone bearing traces of human handiwork recovered from superficial beds of sand and muck as follows: a "handle" so completely worked that the original bone could not be identified; the radius of a deer deeply grooved lengthwise and girdled with a groove so as to be broken according to these guides; a tibia through which a hole had been partly drilled. These were found not far away in masses of hammock thrown up by a canal dredge.

It is well known that Florida has been occupied by the Indian tribes for many centuries. They built their mounds of earth, sand and available shell material and buried their dead in the mounds and in the superficial hammock. They fished in the streams and hunted game in the forests. In their villages they practiced their varied arts, shaping their implements, utensils and ornaments of every available material. It is thus to be expected that traces of their presence would be distributed throughout the superficial deposits to the depth of several feet. They quarried implement-making material wherever found, and the fossil bones, necessarily often exposed to view in the stream beds and in excavations, would, in a land of limited rock exposures, be a valued source of supply. That they utilized the fossil material in their arts and worked it in precisely the manner indicated in the Loomis finds is made clear by the researches of Clarence B. Moore, who, in his great series of works on the antiquities of Florida, illustrates a number of implements and ornaments carved from this material and recovered from Indian sites in the general region under consideration.

The bearing of these facts upon the finds of human handiwork associated with Pleistocene fossils requires discriminating attention. The fragment of flint blade is of particular interest—"it lay in the lower part of a bed of undisturbed sand, thirty-six inches below the surface." Numerous fossil bones occurred in the base of the sand layer which at the particular point was eight inches in thickness. "Both below and above this layer occurred layers of muck composed of leaves, wood, fine clay, sand, etc." The lower layer was considerably more than a foot in thickness and extended downward to the underlying marine marl. Mr. Loomis explains this rather extraordinary section of alternating sand and muck, with enclosures of fossil bones and the fragment of the flint implement, by assuming certain changes of level and resultant deposition, all of which he places within the Pleistocene period. At a particular stage, still within this period, "there was washed in, along with the sand, numerous bones, teeth, chips, implements, etc., all, however, being present in or near the swamps at the time." It may be questioned, however, whether the student whose researches in Florida seem to have been limited to a few feet of hammock deposits can speak with authority of the changes of level and the resultant depositions that have taken place not only during the Pleistocene, but during all post-Pleistocene time.

Passing over the question of the changes of level and their possible results, who shall say that a bed of sand, overlain by two feet of hammock, in a region occupied for uncounted centuries by the Indian tribes, has remained wholly undisturbed? The author's determinations regarding the geological conditions and

[1] *American Journal of Science,* Vol. VIII, December, 1924, page 503.

relationships are thus open to reasonable question; and it appears that his claim to authority in this branch is weakened by his manifest lack of archeological acumen. In describing the fragment of flint blade, with the evident purpose of enforcing his conclusions regarding Pleistocene antiquity, he observes that "the flint implement found with the mammoth bones is made of black chert, *roughly chipped and with none of the fine workmanship characteristic of the Indians.*" He is thus apparently unaware of the well-known fact that the Indians used chipped stone implements of every stage of rudeness and that indeed the broken implement found by him represents the type of blade most commonly used by the Indian tribes in their ordinary arts. The idea that either rudeness or refinement in the stone chipping art is exclusively characteristic of any period from the remote Paleolithic down through the ages to the present is no longer entertained by archeologists.

For half a century, that is to say, since the idea of the Paleolithic implement of Europe as a necessarily rude artifact gripped our American archeologists, every rudely chipped stone has been in imminent danger of assignment by its form alone to great antiquity; at the same time every relic of aboriginal art, reduced by accident to a more ancient horizon than that to which it belongs, has had to fight for its rightful place in the geological scale. When, forty years ago, I began my studies of the subject, I found that many of our institutions, including the National and Peabody Museums, had showcases filled with rudely chipped stones, the refuse of Indian workshops, labelled "American Paleolithic Implements." The controversy was bitter and long continued, but to-day it may be difficult to find in any museum, American or foreign, a single American specimen so labelled.

Geologists are slow to recognize the fact that human relics belonging on or near the surface are liable to intrusion by various means into older underlying deposits and that to very considerable depths. Florida furnishes a striking illustration of the danger of illy considered conclusions. We have here a series of unconsolidated deposits a few feet in depth resting upon undisturbed formations. The danger of intrusion of comparatively recent artifacts in these few feet is made apparent when we consider the activities of the Indian tribes as we know them, and also by the possible changes in superficial deposits by natural agencies. The Indians built their mounds of these deposits and buried their dead in them. They dug clay for their pottery and quarried materials for their implements. In this way objects of art were liable to introduction to the full depth of the deposits. It is also to be noted that the wounds made by these disturbances tended to heal rapidly, leaving no trace of the exotic origin of the objects enclosed. These objects are thus subject to discovery and misinterpretation by the unwary explorer. Natural agencies were also at work, complicating the conditions. Who shall say how often in a thousand years, for example, the meandering streams undermined their banks and rearranged the beds of sand and muck and their contents; who shall say what disturbances were due to the uprooting of trees and the burrowing of animals; and who shall say how often in a thousand years changes of level have taken place, how often the waters of the sea or of expanding inlets have rearranged the few feet of unconsolidated materials composing the hammock? All that archeologists need ask is that geologists, in their researches in Florida, allow for a zone or horizon of doubt extending to the full depth of possible intrusion from above, reserving their final determinations until the evidences are so conclusive as to be beyond danger of error. There can be no risk in this since, if there was a Pleistocene man there can be no question that in good time the evidence of his association with the Pleistocene animals will accumulate until overwhelming. It would be better to do this than to take the risk of imposing upon the world a mistake that might be difficult to eradicate.

Viewing the whole situation broadly, considering the failure so far to date the close of the Pleistocene and the fact that no trace of the great mammals is found in the pictographic or other art of the aborigines, there is good reason to hold that the flint blade found by Mr. Loomis was broken by a Florida Indian in the attempt to utilize bits of fossil bone in implement-making and at a period ten thousand or more years after the last elephant had disappeared from the forests of Florida. As the evidence stands to-day, and I have followed it closely, I can not accept it as conclusive, and unless geologists concede the danger of error and allow for a wide zone or horizon of doubt I shall feel it a duty to hold and enforce the view that the evidences of Pleistocene man recorded by Loomis at Melbourne, as well as those obtained by Sellards and others at Vero, are not only inadequate but dangerous to the cause of science. A similar attitude toward the illy considered announcements of followers of the phantom of antiquity should be rigidly maintained by all conservative students of the history of man in America.

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