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GRAVEL MAN AND PALÆOLITHIC CULTURE; A PRELIMINARY WORD.

BY W. H. HOLMES, SMITHSONIAN INSTITUTION, WASHINGTON, D.C.

THE theory of a palæolithic man in eastern America has been before the archæological world for a number of years and much has been said *pro* and *con*. A large body of evidence, believed by advocates of the theory to be satisfactory and conclusive, has been collected and published, and theories, borrowed and evolved, have been promulgated, discussed, and modified until the literature of the subject has grown to imposing volume.

It should be observed, however, that the term "palæolithic" does not fully cover the ground. The subject is not a simple one. Two important questions are involved, and these should, for the sake of clearness, be treated separately. These questions are, first, Is there evidence of a glacial man in eastern America? and second, Is there evidence of a palæolithic or primal stage or period of culture? Although closely related in some respects, these questions are, in the main, independent of one another. The existence of an ice-age man may be proved without securing the least evidence of the existence of a palæolithic period, the latter expression implying a primal and well differentiated stage or period of art in stone. It is possible to collect a large body of objects of art from a given formation without being able to make any deductions whatsoever as to the particular stage of culture represented, since certain types of artificial products necessarily appear at all periods from the beginning to the end of the stone age, making hasty conclusions unsafe. On many sites representing middle neolithic culture of modern date countless numbers of flaked stones may be collected without the discovery of a single specimen that the advocates of a palæolithic man would not, three years ago, have called palæolithic. Practically the same conditions will no doubt be found to prevail on Aztec and Maya quarry sites, representing the most advanced stone-age culture.

On the other hand, the existence of a palæolithic, or primal stage of culture, if such there was in this country, may be proved independently of glacial gravel finds, for it is possible that such a stage of art may have existed before, during, or after the gravel-forming epochs. The proofs would be found in pre-glacial or post-glacial formations or upon inhabited sites of any period furnishing the necessary data; but demonstration is not easy in any case, as it is necessary in each instance to show that the art recovered is actually palæolithic art and not merely a partial representation of neolithic art — of the ruder tools or the rejects of an advanced people. The burden of proof rests with advocates of the theory, since they assume to introduce to the world cultures, peoples, and conditions not within the limits of ordinary experience.

It will be seen that in the discussion of these questions two distinct classes of testimony are involved, one dealing with the phenomena of human handicraft, and the other with the phenomena of geologic formations. These phenomena are complex and their relations obscure and subtle in a high degree, and it would appear that until students of the great questions of chronology and culture acquire a thorough scientific knowledge of geology as well as of all early phases of human art the discussions in which they indulge can be of little real value.

The fact is that the field has, up to this time, been occupied mainly by amateurs who have not mastered the necessary fundamental branches of science. The work done is mainly their work, the literature produced is mainly their literature, and the world has received its impressions from this source. This no doubt is an unavoidable condition of the evolution of archæologic science. It is necessary that all departments of investigation should pass through this novitiate or formative stage and the world of science must look with lenience upon the mistakes of the period, for that which is to-day or may be to-morrow is in great part the outcome of that which was yesterday. But the time has now come for a change — for the opening of an era when scientific acquirements of the highest possible order shall be brought to bear upon these questions. Anthropologists are now to unite with geologists in investigating the early history of man and his culture, just as the geologist has been for years assisting the biologist in unfolding the history of living things.

The requirements of the investigation may be briefly outlined and the present status of the evidence characterized. In the first place, the discussion of the early history of man requires a scientific knowledge of certain phases of art, including especially all flaked-stone art. Until very recently the origin, genesis, and history of artificially flaked stones have been but imperfectly understood. Those forms not properly designated implements were not separated from those properly so called, although it is found that the former probably greatly outnumber the latter, and as long as all were indiscriminately treated as implements their discussion was little more than a farce. The discussion of flaked-stone art in America has consisted mainly in describing and illustrating unfinished forms and rejects of manufacture as implements and in speculating on their possible age, functions and ethnic bearings. This fundamental misconception as to the nature of a large portion of flaked stones has led to most deplorable mistakes in interpretation, and erroneous theories of age and culture have been hatched and fed and still feed upon these primary blunders. The whole discussion of early man has been so surcharged with misconceptions of fact and errors of interpretation that all is vitiated as a stream with impurities about its source. Until an exhaustive scientific study of the origin, form, genesis, and meaning of all the handiwork of man made use of in the discussion is completed, the discussion of man and culture is worse than useless, and speculation can lead but to embarrassment and disaster.

The geologic aspects of the case are hardly more satisfactory than are the anthropologic. In the discussion of the early history and chronology of man and his arts geology must play a prominent part. Two questions, for whose answers we must appeal to this science, are constantly arising, first, What is the age, or relative age, of the formations concerned in human chronology? and, second, What is the exact nature of the association of works of art with these formations. It is readily seen from the nature of these questions that they require expert answers, but persons unskilled in geologic science cannot be expected to give expert answers. Those persons who have turned their attention to these studies have not, as a rule, been competent to determine the age or relative age of the sedimentary deposits, and they were equally incompetent to determine, in obscure cases, the exact relations of associated works of art with these formations, although constantly essaying to do so. I have for many years been engaged more or less fully in geologic work, but so obscure are the phenomena of the glacial and post-glacial formations, that I do not permit myself to make and use any observation in which these phenomena are seriously involved without consulting one or more geologists of the highest standing in that particular field. There are so many chances for error in observation and so many pit-falls for the unwary theorist, that it may well be questioned whether or not the student of archæology not highly skilled in geologic sci

ence can be justified in seeking unaided to enlighten the world upon these questions.

The fact is that a large part of the literature relating to the palæolithic and ice-age questions is so hopelessly embarrassed with the blunders and misconceptions belonging naturally to the initial stages of the investigation that it is but little more than a stumbling-block to science, notwithstanding the possibility that there may be many hints of truth in what has been written. It would appear to be a more collossal task, however, to discover these hints of truth in the literature of to-day than to wrench them afresh from the rocky tomes of nature.

In conclusion, I would add that if there was, as is claimed, an ice-age man or at any time a palæolithic man in eastern America, the evidence so far collected in support of these propositions is so unsatisfactory and in such a state of utter chaos that the investigation must practically begin anew. That it will begin anew is rendered practically certain by the facts that geologists are now showing a decided disposition to take up that part of the work naturally belonging to them; and that primitive forms of art in stone are now for the first time receiving the critical attention necessary to make them available in a scientific discussion. Thus it appears that the suggestion embodied in the title of this communication may not be wholly unwarranted and inappropriate.

THE NEST OF THE TRAP-DOOR SPIDER.

BY D. CLEVELAND, SAN DIEGO, CALIFORNIA.

The trap-door spider (*Mygale henzii* Girard) is widely diffused in California. While wandering over the Mesa (table lands), just back of this city a few months ago I was struck by the great number of their nests in favorable localities. In the adobe land hillocks are numerous; in fact, in many places, they are as thick as the ground will permit. They are about a foot in height, and some three or four feet in diameter. These hillocks, which are an interesting formation in themselves, are selected by the spiders, apparently, because they afford excellent drainage, and cannot be washed away by the winter rains. Their stony summits are often as full of spiders' nests as they well can hold. These subterranean dwellings are shafts sunk vertically in the earth, except where some stony obstruction compels the miner to deflect from a downward course. These shafts are from five to twelve inches in depth, and from one-half to one and a half inches in diameter, depending largely upon the age and size of the spider.

When the spider has decided upon a location, which is always in clay, adobe or stiff soil, he excavates the shaft by means of the sharp horns at the end of his mandibles, which are his pick and shovel and mining tools. The earth is held between the mandibles and carried to the surface. When the shaft is of the required size, the spider smooths and glazes the wall with a fluid which is secreted by herself. Then the whole shaft is covered with a silken paper lining, spun from the animal's spinnarets.

The door at the top of the shaft is made of several alternate layers of silk and earth, and is supplied with an elastic and ingenious hinge, and fits closely in a groove around the rim of the tube. This door simulates the surface on which it lies, and is distinguishable from it only by a careful scrutiny. The clever spider even glues earth and bits of small plants on the upper side of his trap-door, thus making it closely resemble the surrounding surface.

The spider generally stations itself at the bottom of the tube. When, by tapping on the door, or by other means, a gentle vibration is caused, the spider runs to the top of his nest, raises the lid, and looks out and reconnoitres. If a small creature is seen, it is seized and devoured. If the invader is more formidable, the door is quickly closed, seized and held down by the spider, so that much force is required to pry it open. Then, with the intruder looking down upon him, the spider drops to the bottom of his shaft.

A young friend of mine has spent much time lately watching and investigating the operations of this spider. He found by many experiments—all with the same result—that when the door of his nest is removed, the spider can renew it five times—never more than that. Within these limitations, the door torn off in the evening was found replaced by a new one in the morning. Each successive renewal showed, however, a greater proportion of earth, and a smaller proportion of silk, until, finally, the fifth door had barely enough silk to hold the earth together. The sixth attempt, if made, was a failure, because the spinnarets had exhausted their supply of the web fluid. When the poor persecuted spider finds his domicil thus open and defenceless, he is compelled to leave it, and wait until his stock of web fluid is renewed.

From forty to fifty cream-colored spiderlings are hatched from the yellow eggs at the bottom of the nest. When these have attained only a fraction of their full size—before they are half grown—their affectionate mother drives them out into the world to shift for themselves. After a brief period of uncertainty, they begin active life by making nests, each for itself, generally close to "the old homestead," sometimes within a few inches of it. These nests are always shallow and slender, and are soon outgrown. When the spider attains its full size it constructs a larger nest.

The spider is seldom seen outside of its nest, which it rarely leaves—during the day, at least, and then only for a few minutes, and for a short distance. Upon any alarm, it hastens to its nest, lifts the door, which quickly springs back into its place, and is held down by the householder until the alarm has subsided.

I now have a large nest, containing a mother and her yellow spiderlings, which I am carefully watching and studying.

BALANCES OF THE PERUVIANS AND MEXICANS.

BY WALTER HOUGH, WASHINGTON, D.C.

THE employment of weights and measures among the existing uncultivated peoples is a subject upon which but little information has been gathered. The following instances of the use of balances and weights in pre-Columbian America are interesting from an archæological point of view.

In the Archæological Museum of Madrid there are two pairs of balances and four beams, from sepulchres of the Yncas at Pachacamac, Peru. The possession of this probably oldest weighing appliance by the ancient Peruvians is very curious. A flat strip of bone suspended edgewise by a cord midway forms the beam. To the ends of the beam are hung, by short cords, slings of net-work made of fine thread, the free edges being strengthened by cord.

One of these balances is plain, while the beam of the other is elaborately fretted and engraved with circles-and-dots, and curves outlining the fretted spaces. Red paint has been rubbed in these incisions. The long suspending cord is strung alternately with a row of small beads of turquoise and red and white shell and a large, flat, oblong piece of shell pierced through the axis. The string is terminated by the figure of a bird and a fret ornament of shell representing a seated human figure with head-dress. Three small pendants of beads and shell hang below this and the whole forms an ornate and striking specimen.

One of the beams exhibited is of bone, ornamented with circles-and-dots, so regular, that they would appear to indicate the use of another instrument of precision, the compass.

Dr. Brinton has ascertained that the weights were small stones.[1] It would seem that, for the purpose of equalization of weights, the equilibrium of the beam being gauged by the eye, these balances are quite accurate. They are in perfect order at the present time.

In the Mexican collection at the Columbian Historical Exposition in Madrid there are two spherical objects of basalt, from the ancient Tarascos of Michoacan, which Dr. Troncoso, director of the Mexican National Museum, believes are weights. He supports this view by stating that at present the Indians use similar stone weights on their imperfect balances, which are formed of two small trays of wood, each suspended by three strings from the end of a wooden beam, which is balanced by a cord fastened at the middle.

It is possible that the use of the balance will be found to have been more extensive in America than is suspected.

[1] Proceedings Numismatic and Antiquarian Society, Philadelphia, 1891.