

FOSSIL MAN IN FLORIDA.

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The discovery near Vero Beach, Florida, a few years ago, of human remains associated with those of an extinct fauna, as first announced by Dr. E. H. Sellards in 1916,¹ aroused considerable interest. The age of these remains and the manner of their occurrence was discussed later² by a group of scientists invited by Sellards to visit the locality. In this symposium the problem was considered from various viewpoints by geologists, paleontologists, and anthropologists, but they came to no general agreement either as to the age of the deposit in which the human remains were discovered or as to whether or not these remains and the extinct animal bones associated with them actually belonged to the same geologic period. Interest in this problem lagged for a time but has been revived by the discovery of fossil bones and human remains in the vicinity of Melbourne, about 30 miles north of Vero, under conditions very similar to those at Vero. The credit for the discovery at Melbourne must be awarded to Mr. C. P. Singleton, a local resident and nature lover, who reported it to the United States National Museum late in the year 1922. A preliminary investigation was made by Prof. F. B. Loomis of Amherst College, in December, 1923, the results of which have been published.³ Early in January, 1925, Professor Loomis and Dr. J. W. Gidley of the United States National Museum met at Melbourne, and there, after a rapid survey of the region, tentatively formulated a plan and made preliminary arrangements for a systematic exploration of the localities in the vicinity of Melbourne and a reexamination of the fossil locality at Vero. This joint expedition was afterward approved by the authorities of Amherst College and the Smithsonian Institution, the part undertaken by the latter being under the auspices of the Bureau of Ethnology. Accordingly, Loomis and Gidley, beginning June 23, spent about six weeks in Florida in intensive and carefully directed field work, with gratifying results.

¹ This Journal, vol. 42, 1-18, 1916.

² Symposium on the age and relations of the fossil human remains found at Vero, Florida, Journ. Geol., 25, 1-62, 1917.

³ This Journal, 8, 503-508, 1924.

Grateful recognition is due Mr. Singleton for the generous service rendered in securing permission for exploration in the Melbourne district and in the selection of sites for digging. In addition to these and more personal courtesies, he divided between Amherst College and the National Museum valuable specimens collected at the expense of both time and money on his part. At Vero Beach, Mr. Isaac Weills, who gave such important local aid to Sellards, was of great assistance to us, and to him also our grateful acknowledgments are due.

Human bones and artifacts were located at a few places in the vicinity of Melbourne. All had stratigraphic positions similar to those at Vero, and all were associated more or less intimately with remains of extinct animals, hence are additional evidence on the origin of man in America. Because of these similarities, the published discussions on the Vero district may be profitably recalled as introductory to the description of the new finds in the Melbourne region. A brief reference to the various opinions expressed will suffice, since the published papers up to the latter part of 1917 have been so fully and ably reviewed by Sellards.⁴

Sellards in several short accounts, beginning in June, 1916,⁵ described the character of the deposits, the probable geologic sequence and age of the beds, and the details of fossil associations. He recognized at the Vero locality an underlying marine shell deposit, or coquina layer of wide extent which he called the No. 1 bed. Above this lies a series of stream deposits 6 to 9 feet thick, divided into two layers. He designated the lower portion of these as No. 2 bed and the upper as No. 3 bed. According to his observations, most of the artifacts and human remains were found near the bottom of No. 3 bed, or at the contact plane between No. 2 and No. 3. A few of them were found within the No. 2 bed, and Sellards concluded from this that human remains extended throughout the stream deposits, including No. 2 and No. 3 beds, both of which he considered Pleistocene in age, basing his conclusion on the fossil remains of vertebrates found in the deposits. In his opinion the human bones and artifacts were buried at the same time as, and in a similar manner to, the remains of extinct animals with which they were associated.

Dr. R. T. Chamberlin studied the manner of deposition of

⁴ Ninth Ann. Rept. Florida State Geol. Survey, 69-82, 141-143, 1917.

⁵ This Journal, 42, 1-18, 1916. Eighth Ann. Rept. Florida State Geol. Survey, 121-160, 1916. Journ. Geol., 25, 4-24, 1917.

the deposits and published two reports.⁶ In his first paper he held that the vertebrate remains in both the stream deposits had been washed from deposits further inland, and hence were not diagnostic of the age of the beds in which they were found. In his later report, he abandoned this hypothesis, in part at least, conceding that the fossils of the lower portion, or No. 2 bed, represent contemporary life, and agreed with Sellards that this bed represents an earlier time division than the upper, or No. 3 bed. He maintained, however, that the human remains are confined to the No. 3 bed, which he considered "mid-Recent" in age, and he assumed that the bones of extinct species found with the human remains in this bed are derived as inclusions from the No. 2 bed, which was being eroded from farther up stream during the time of deposition of the No. 3 bed.

Dr. O. P. Hay,⁷ from a first-hand study of the deposits and analysis of the vertebrate fauna, believed that the deposits in question are not only Pleistocene in age but that the upper portion (No. 3) belongs to the mid-Pleistocene, while the lower bed (No. 2) belongs to the lower part of the epoch. He also maintained that the human remains are as old as the beds in which they are found.

Dr. E. W. Berry,⁸ through a study of the fossil plant remains, most of which came from the No. 3 bed, concluded that the beds are "undoubtedly late Pleistocene" in age, and expressed the opinion that there is no great time hiatus between No. 2 and No. 3, and no great difference in age from bottom to top of the section. Berry suggested that these deposits are either of Peorian (pre-Wisconsin) age or at a time immediately after the retreat of the Wisconsin ice. He also strongly defended the opinion that the human remains are of the same age as the beds in which they are found.

Dr. T. Wayland Vaughan,⁹ in studying these deposits from the viewpoint of a geologist and invertebrate paleontologist, took a commendably conservative attitude in discussing the subject and decided that the age of the human remains has not been proven, and suggested a suspension of judgment based on the evidence presented up to that time. Vaughan concluded that bed No. 3 may be of Recent geologic age, and

⁶ Journ. Geol., 25, 25-39, 667-683, 1917.

⁷ Journ. Geol., 25, 52-55, 1917.

⁸ Journ. Geol., 25, 661-666, 1917.

⁹ Journ. Geol., 25, 40-42, 1917.

therefore the presence of human bones need not be given special attention unless it can be positively shown that in this bed Pleistocene fossils occur above human remains. Vaughan conceded the Pleistocene age of the No. 2 bed as proven.

The anthropologists seem to be of one opinion regarding the Vero discovery, namely, that, regardless of the age of the beds in which the human remains were found, or of the age of the associated fossil remains, the human bones and artifacts are relatively modern and do not differ materially from those of the Indians living in Florida at the time of its discovery by the Spaniards.

Dr. G. G. MacCurdy¹⁰ seems to accept the human remains and artifacts as normal inclusions but is not convinced that the beds in which they are found belong to the Pleistocene period.

Dr. Ales Hrdlicka,¹¹ after a very careful examination of the deposits in which considerable actual excavation was carried on under his personal supervision, concluded that if the beds are of Pleistocene age, the human remains and artifacts are inclusions of relatively recent date, due to human burials.

It has also been suggested by Dr. W. H. Holmes¹² that the human bones and artifacts found in these stream deposits have come there through holes made by burrowing animals or the uprooting of trees, or other agencies, and therefore should be considered as extraneous inclusions from the surface or from some more recent deposits.

DISCOVERIES IN THE MELBOURNE DISTRICT.

LOCATION AND TOPOGRAPHY.

The town of Melbourne is located in Brevard County about 30 miles north of Vero where Sellards' original finds were made. Within three miles of Melbourne there are three localities at which the bones of extinct animals and associated human relics have been found, and this small area is here referred to as the Melbourne district. All these places had been discovered by Mr. Singleton, and at one of them, as stated previously, Professor Loomis carried on preliminary excavations in 1923.

¹⁰ Journ. Geol., 25, 56-62, 1917.

¹¹ Journ. Geol., 25, 43-51, 1917.

¹² Science, n. s., 52, 256, 1925.

The Melbourne district consists of a low, flat country, no part of which rises more than 20 feet above sea-level. It is part of the east coastal strip bordering the Indian River. Originally it was swampy, being partially drained by small, sluggish streams. One branch, entering the district from the northwest, runs southward through the city golf course, which is about two miles west of the Indian River at Melbourne. Another branch coming in from the west joins this stream just south of the golf course. Recently a large drainage canal has been cut through this area and the country is being converted into subdivision plots for the extension of the town of Melbourne.

GENERAL STRATIGRAPHY.

The drainage canal cuts the old stream channel in several places and follows or parallels it running southward through the Melbourne golf course. This deep and extended excavation reveals that a great part of the district is immediately underlain by stream deposits older than the present day drainage system. These rest on a bed of shells (coquina) of much wider extent than the stream deposits. The shell layer is obviously Sellards' No. 1 bed, and the stream deposits are similarly divided into a lower relatively clean and somewhat stratified sand (No. 2 bed) and a later stratified sand containing much vegetable matter (No. 3 bed). The No. 2 bed seems to be much wider in extent than the No. 3 bed, which is confined to a relatively narrow area conforming in general to the swampy areas of the present day in this general locality. No. 3 bed has been cut through by the shallow and narrow stream channels of the present drainage system, along which the No. 2 bed is now exposed in places. In several areas it is evident that the No. 2 bed was considerably eroded before the No. 3 bed was laid down, and in a few places it has been entirely removed so that No. 3 bed lies directly on the coquina shell layer.

GOLF CLUB LOCALITY.

The first locality where human remains were found is about 2 miles west of Indian River at Melbourne, on the east bank of the large drainage canal, and about 200 feet southwest of the club house on the Melbourne golf course. The surface of the ground here was underlain by 18 inches to 2 feet of

stratified deposits containing much vegetable matter and typical of the No. 3 bed of the Vero district. This bed was absolutely undisturbed until removed by our excavations. Below lay the No. 2 bed, which at this place was shown to be about 5 feet thick and to rest on the No. 1 bed.

This site was chosen for digging because fossil bones had been located in the No. 2 bed exposed on the canal bank, and a large excavation was made in searching for more of these bones. In the No. 2 bed were found numerous fragments of fossil bone which gave evidence of Pleistocene age for the bed. More important, as this excavation progressed, a crushed human skull with pieces of finger, arm, and leg bones near it, was located. This was found within a few inches of the top of No. 2 bed. Within a foot of the skull was found a fossil horse tooth; nearby and at the same level, several bones of other animals, including an extinct species of box turtle; and about 25 feet away, also at the same level, the jaw of a tapir.

The crushed human skull with its attached lower jaw was flattened horizontally as if it had been pushed down into the sand from above; but over it lay, undisturbed, stratified material of the No. 3 bed. Thus it is evident that the skull must have come to place in No. 2 bed before No. 3 bed was laid down. There is no possibility that this skull was placed there by human burial. It must have reached its position by natural processes; but it is quite conceivable that it may have lain on the erosional surface between No. 2 and No. 3 beds, and have been pushed down into No. 2 bed by trampling and thus may represent a slightly disturbed surface portion of No. 2 bed. Therefore the skull may be later in age than the deposition of most of No. 2 bed, and may represent the interval of time when erosion was going on. However, there are the other bones found in this same upper 6 inches of the No. 2 bed to be considered. They seem to belong to the fauna of the No. 2 bed. Moreover, the human skull and, what is especially significant, the teeth, show the same degree of fossilization as the associated extinct animal remains, and a greater degree of fossilization than the human remains found in the old Indian mounds examined in the neighborhood. That this difference in fossilization is not due to local environmental conditions is rather evident from the fact that one of the burial mounds examined was in a swamp where conditions of moisture and character of surrounding matrix were almost

identical with these factors as observed at the golf course locality. Thus, the manner of occurrence, condition of preservation, and association of material, all indicate that this specimen is older than the No. 3 bed.

BANK OF CANAL NEAR KISSIMMEE HIGHWAY LOCALITY.

The second locality examined is about one mile west of the golf course on the south bank of the drainage canal which, going up stream, crosses the Kissimmee highway and turns nearly due west just north of the golf course. Here were found artifacts including an arrowhead, small chips of flint and agate, and pieces of broken pottery. These were scattered over an area of 15 or 20 square feet, and were included in a layer only a few inches thick near the top of the No. 2 bed, in similar position and association as just described in discussing the occurrence of the human bones at the golf course. That is, the objects of human origin were near the contact plane and were overlaid by 18 inches to 2 feet of undisturbed, typically stratified deposit of the No. 3 bed. Here the contact plane between the No. 2 and No. 3 beds showed distinct evidence of erosional unconformity, and No. 2 bed is only about 3 feet thick.

THE SINGLETON ESTATE LOCALITY.

The third locality in the Melbourne district is on the G. L. Singleton estate about one mile south-southwest of the golf course locality, and about 100 feet west of the place where, in December, 1923, Loomis collected an arrow point and bone implements intimately associated with the bones of a mammoth skeleton. Here were found a large, finely worked arrowhead or spear point, a human rib, and several pieces of charcoal. These were associated with teeth of *Mylodon*, *Megalonyx*, and *Chlamytherium*, and a great number of scattered carapace scutes of *Chlamytherium*. A tooth of the *Mylodon* lay almost in contact with the arrowhead. Again, as at the other localities, the artifacts and associated fossil bones were found in a comparatively thin layer at the top of bed No. 2, and at approximately the same level as the mammoth bones and associated arrowhead collected nearly two years earlier by Loomis. The greater part of the No. 3 bed had been removed earlier in the season by workmen for agricultural purposes, leaving

only 2 or 3 inches immediately overlying the No. 2 bed but apparently it was originally about 3 or 4 feet thick. This made the exploration at this place of a considerable area of the No. 2 bed quite easy. The fossil bones and teeth found were for the most part near the top of No. 2 bed, and those with which the arrowhead was intimately associated were thickly scattered over an area of several square feet, and evidently had not been disturbed since their original deposition.

VERO BEACH LOCALITY.

The Amherst-Smithsonian expedition also did some exploring at Vero Beach, Sellards' type locality. Continuing where Sellards had left off on the south bank of the canal, we found artifacts associated with fossil bones, but these were at or just above the contact plane between No. 2 and No. 3 beds. Also some excavating was done along the north bank of the canal and along the old stream channel mentioned by Sellards and Chamberlin, just north of the canal. These workings all showed conditions of deposition and structure of the sedimentary deposits above the coquina shell layer, very similar to those observed at Melbourne.

SUMMARY OF CONCLUSIONS.

Briefly summarized the general results of the 1925 expedition may be stated as follows:

It was found that the character and stratification of the deposits, both at Vero and Melbourne, are practically as described by Sellards and Chamberlin for the Vero district—that is, the relatively shallow sedimentary stream deposits rest upon the eroded surface of the coquina shell layer and are distinctly divided into two zones with an erosional unconformity between them. The upper of these (No. 3 of Sellards) is composed of alternating beds of white sand and black layers containing considerable vegetable matter; the sand is usually cross-bedded. This banded structure would make it easy to detect filled-in excavations had they been made. The lower, or No. 2 bed, is composed of material containing a greater percentage of sand and less vegetable matter, and the cross-bedding which occurs in it is less marked than in the No. 3 bed, and there are no black layers of vegetable matter. The sand of this bed is in places brown in color, and contains relatively abundant fragments of fossil bones. The fossil bones

found in this bed had not been disturbed since their original burial, and therefore probably represent the local life of the period of their deposition. They denote a distinctly Pleistocene fauna.

The bones occurring in the No. 3 bed are, for the most part, more modern in type—that is, many of them represent species still living—and like those of the No. 2 bed, they represent animals of the same age as the deposits in which they are found, except that a few scattered bones, especially in the lower layers, seem to be inclusions from the eroded portion of the No. 2 bed. Evidences of human occupancy may be found at any level in this bed.

The critical zone, or the one in which human bones and artifacts were found in association with remains of extinct animals, both at Vero and Melbourne, includes the layer just above the contact plane at the base of the No. 3 bed, the contact plane, and a layer of only a few inches thickness just below the contact plane. From this it may be assumed that man first reached Florida about the time of the beginning of the erosional interval between No. 2 and No. 3 beds. Since this zone seems not to have been secondarily distributed, and since the association of remains found in it seems to be a natural one, it follows that at this time there was still living in Florida a remnant at least of the Pleistocene fauna, including the mammoth and mastodon.

AGE OF DEPOSITS.

As to how long ago these deposits were laid down there is still a question which will require more systematic and detailed geological study. There seems little doubt that these stream-channel deposits lying above the coquina or shell layer, shallow though they are, represent a considerable period of time.

There is abundant evidence of alternating changes of level in this part of Florida, extending from some period of the Pleistocene to Recent times. The underlying shell layer is very wide in extent, and indicates that during the time of its deposition Florida was covered by the sea. This was followed by an uplift which brought the land mass considerably above sea level, and caused an erosional period, during which a drainage system was established on the old sea bottom. The present drainage of Florida was inaugurated at this time, including the St. John's River and its tributaries, the tribu-

taries of the Indian River, and possibly the Indian River itself, although it seems more probable that this remarkable body of water was formed by the sea building up a very extended off-shore barrier on a widely expanded, shallow sea-shelf. Beach ridges on the seaward side of this barrier are now in the process of formation.

At a later period (probably pre-Wisconsin) this eroded plain was brought sufficiently near to sea-level to check erosion and cause the filling of at least the lower portion of the valleys. This fill is the lower of the two freshwater beds, No. 2 of Sellards, and contains a purely Pleistocene fauna.

Another change of level brought the land mass upward, and a second erosional period began, which left its mark on the surface of the No. 2 bed, in several places cutting deeply into it or in a few places clear through it. This phase is represented by the unconformity between beds No. 2 and No. 3.

At a still later time, apparently due to another subsidence, erosion ceased and deposition again took place, making the No. 3 bed. In this bed, the horse, camel, and tapir are apparently wanting, except where included from the eroded surface of No. 2 bed, but it still has mastodon and mammoth of the Pleistocene fauna.

This No. 3 bed, where it is not cut into by the small streams of the present-day drainage, is covered by a few inches of loam, remnants of the late swamps which are now being drained by large artificial canals. Whether erosion or deposition is now going on is not easy to determine; but lying so near sea-level and so far removed from any high land, it is quite conceivable that such a swamp tract might remain practically unchanged for thousands of years.

From this reexamination of the fossil-bearing stream deposits at Vero Beach, and this detailed study of similar deposits in the Melbourne district, which has furnished important new evidence, it may safely be assumed that man, although of modern type, reached Florida before the total extinction of the mammoths and mastodons. But that this arrival occurred far within Pleistocene time does not seem probable. Mammoths and mastodons are known to have survived in the Great Lakes regions up to the time of the formation of the swamp deposits which followed the last retreat of the glaciers in North America, and it seems not improbable that a considerable remnant of the Pleistocene fauna survived the glacial periods in Florida and other localities of the southern and south-

western United States, and remained there after the great ice sheets had disappeared in the North. However this may be finally concluded, the present evidence as here interpreted seems to indicate quite clearly that the time of man's first appearance in Florida should be placed at a time much earlier than has hitherto been supposed, possibly early post-Pleistocene, and that these people seem to have preceded the Indians who built the mounds characteristic of the east coast of Florida.

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