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# EARLY MAN IN AMERICA
# INDEX TO LOCALITIES, AND SELECTED BIBLIOGRAPHY

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## ABSTRACT

The writer has assembled the principal results from the investigations of early man made in America, especially North America, from 1839 to 1939. Special attention is directed to associated vertebrate faunas and geologic conditions. A selected bibliography and index to localities in North America are given. It is concluded that man in America was contemporaneous with several vertebrate genera and species now extinct. Among extinct mammalia regarded as associated with man on the basis of more than one occurrence and on observations by more than one worker are elephant. mastodon, camel, horse, bison, sloth, armadillo, glyptodont, tapir, dire wolf, sabre-tooth tiger, peccary, beaver, deer, and cave bear. A considerable number of other extinct species of mammals, birds, and reptiles, based on observations at one or more localities, are probably to be included as associates of man. Human materials have been found in unmistakable association with these animals under varied geologic conditions such as in stream terrace, cave, loess, peat, and lake deposits. Some of the extinct animals associated with man, formerly regarded as index fossils of the Pleistocene, appear to have continued their existence into relatively late geologic time. The supposition that all species with which man is associated continued into the Recent epoch is not justified. Additional information on the time of extinction of these animals and on the age of human remains found in association with them has been obtained in recent years from a study of physiographic features, particularly stream terraces. These observations are in agreement with the conclusion derived from a study of the fossils that man reached America previous to the close of the Pleistocene period.

## INTRODUCTION AND ACKNOWLEDGMENTS

The problem of early man in America has been before geologists and anthropologists for a century. Extended discussions have followed reports of human remains or artifacts found in association with extinct animals or under other conditions believed to indicate antiquity. At the time of the founding of the Geological Society of America, 50 years ago, such reported occurrences evoked no great surprise. A good summary of the prevailing opinion of that time may be obtained from McGee's paper (1888). Subsequently, doubt as to the authenticity of the discoveries of early man arose accompanied by vigorous opposition to the idea of early man in America. The term early man is here applied to human relics of some appreciable antiquity in a geologic sense.

One who follows the discussions on this subject during the past century will find (1) approximately 30 years following Koch's discoveries, with few important finds other than that of Dickeson in Mississippi; (2) about 20 years, or until 1889, of fairly general acceptance of the idea of early man in America based on relatively few discoveries, among which, however, were some, as at Trenton, New Jersey, that seemed at the time well authenticated; (3) 25 or 30 years during which the authenticity of all claims of early man were vigorously opposed by some geologists and anthropologists; and (4) the more recent period during which discoveries of human remains or implements in association with extinct animals have been made with greatly increased frequency. During this latest period increased attention has been given to the subject by geologists and anthropologists which accounts in part at least for the increased frequency of such discoveries.

In the course of a century of discussions, in part highly controversial, the literature on this subject has become extensive and so involved as to encourage neglect. The purpose of this paper is to present an index to all localities of reported finds in North America and to cite the principal literature on each locality. Four of the more recently discovered localities in South America are briefly discussed.

The writer is indebted to all who have published on this subject and especially to a great many workers in this field who, through correspondence or otherwise, have aided in checking locality references. Special acknowledgment is made to Charles Amsden, Ernst Antevs, Barnum Brown, Kirk Bryan, R. P. Conkling, H. J. Cook, Samuel Eddy, M. R. Harrington, Frank C. Hibben, E. B. Howard, A. E. Jenks, F. H. H. Roberts, Jr., E. B. Sayles, C. B. Schultz, G. G. Simpson, H. T. U. Smith, Clinton R. Stauffer, and W. D. Strong and to Louis Dixon who has helped in checking the bibliography. The following publications containing

bibliographies on this and related subjects have been consulted in connection with the preparation of this bibliography: Fischel, H. E. (1939); Howard, E. B. (1935); Osborn, H. F. (1936); Roberts, F. H. H., Jr. (1936a); Wormington, H. M. (1939); Bibliography of North American Geology, United States Geological Survey, Bulletins 746, 823, 834, 858, 869, and 892.

The following index to localities of reported occurrence of early man in North America is arranged by countries and states. For each locality there is given: Location, reference to literature, and comments. The intention has been to include all localities in which human materials are reported to have been found associated with extinct animals or in deposits that appear to be of an age equivalent to those that elsewhere contain extinct animals. A few localities, included for convenience of reference, probably do not meet these requirements. On the other hand, some localities doubtless have been overlooked that should have been included. The present location of collections is given when known.

## CANADA

### MANITOBA

*Valley River.*—Locality Lake Agassiz beach near Valley River. Literature: Tyrrell (1890); Johnston (1933).

Johnston was unable to verify the presence of artifacts in the gravels.

### SASKATCHEWAN

*Mortlach.*—Locality near Mortlach. Literature: Howard (1939a); Roberts (1939).

Artifacts including Folsom and Yuma points were found associated with bison bones in "blow outs" near Mortlach. The age is indeterminate.

## CUBA

### ORIENTE

*Caleta Cavern.*—Locality about 16 miles southwest of Punta Maisi in the easternmost part of Cuba, discovered, 1915; announced, Harrington, 1921. Literature: Harrington (1921).

Bones of the ground sloth *Megalocnus* were found in kitchen midden refuse. Association with human relics is probable but not certain. A similar find was made in a rockshelter near Portales de Guane in the Province of Pinar del Rio near the opposite (western) end of Cuba.

## MEXICO

### FEDERAL DISTRICT

*Peñon.*—Locality Peñon de los Banos in the Valley of Mexico about 2½ miles east of Mexico City, discovered January, 1884; announced, Barcena, 1885. Literature: Barcena (1885; 1886a; 1886b); Barcena and Antonio del Castillo (1886); Boule (1923, p. 407); Cope (1895, p. 594); Hrdlička (1907, p. 32); Newberry (1886).

Fresh water deposits described by Newberry as travertine contain part of a human skeleton. Elephant remains were found nearby in strata interpreted by Barcena as of the same age as that containing the human remains.

## UNITED STATES

### ARIZONA

*Whitewater Creek.*—Locality on Whitewater Creek at and near Double Adobe School, 12 miles northwest of Douglass. Principal literature: Antevs (1937b, p. 129-132; 1937c, p. 335); Wormington (1939, p. 45-46).

According to Antevs (personal communication) the artifacts occur with or below bones of horse, bison, camel, dire wolf, elephant, and other mammals not yet determined. Artifacts of similar type have been found at other localities in this region in sand and gravel deposits and old stream courses, overlain by clays and other deposits similar to those of the Whitewater Creek locality (Sayles, letter of July 8, 1939). The collections are at the Gila Pueblo, Globe, Arizona.

### CALIFORNIA

*Angeles Mesa.*—Locality one-third mile west of the Angeles Mesa drive and 300 yards south of the Pacific Electric Airline near Los Angeles, discovered, March, 1924; announced, Stock, 1924. Principal literature: Hay (1927b, p. 175); Merriam (1924); Stock (1924).

Human remains including at least 6 individuals and 1 or 2 artifacts were encountered in excavating at depths of 19 and 23 feet. No associated vertebrate fossils were found. A camel bone and a horse bone were found at a nearby locality in deposits that may or may not be a continuation of the deposits containing the human bones. The collections are in the Los Angeles Museum of History, Science, and Art.

*Borax Lake.*—Locality in Borax Lake, one mile north of Manakee, Lake County. Principal literature: Harrington (1938a; 1938b); Wormington (1939, p. 46-47).

Artifacts were found in a fossil alluvial cone to a depth of 10 feet. Folsom culture was found near the surface underlain by pre-Folsom culture including short unspecialized pestles and metates consisting of rough slabs showing slight grinding but no shaping (Harrington, letter of August 21, 1939). The collections are at the Southwest Museum, Los Angeles, California.

*Calaveras.*—Locality at Bald Hill, one-half mile northeast of Altaville in the southwestern part of Calaveras County, discovered about 1866. Principal literature: Becker (1891); Blake (1899); Boutwell (1911); Hay (1927b, p. 225); Holmes (1899, p. 623-641; 1901; 1919, p. 61); Hrdlička (1907, p. 21); Keith (1929, p. 471-473); Kollman (1884); Lindgren (1911); Merriam (1936, p. 1315); Schmidt (1872, p. 253-259); Sinclair (1908); Whitney (1880); Wright (1890, p. 563).

This much discussed skull is in the Peabody Museum of Natural History, Harvard University.

*Lake Mohave.*—Locality about 140 miles northeast of Los Angeles, discovered, December, 1934; announced, Campbell, 1936. Principal literature: Amsden (1937); Antevs (1937a; 1937b, p. 126-129); Barbieri (1937); Bode (1937); Campbell (1936, p. 297); Campbell and Campbell (1937); Free (1916); Wormington (1939, p. 41-43).

Artifacts have been found on the beaches of a former lake. No extinct animals have been reported. From a study of the history of the lake, Bode places the age as late Pleistocene, Antevs as late pluvial. The artifacts are deposited in the Desert Laboratory of the Southwest Museum at Twenty-Nine Palms, California.

*Los Angeles.*—Locality near Los Angeles, discovered, January, 1936; announced, Bowden and Lopatin, 1936. Principal literature: Bowden and Lopatin (1936); Hrdlička (1937c, p. 99-100).

Human bones, including part of skull, were found at a depth of 13 feet from the surface. In the same deposit about 1000 feet from the locality yielding the human bones and in the same stratum, proboscidean remains were found, identified as *Archidiskodon imperator* (Leidy). The deposits are stratified, consisting of black soil, 7 feet; peat, 2 feet; black clay, 2 feet; yellow clay, 1 foot; gravel containing bones, 2 feet. The collection is at the University of Southern California.

*Potter Creek Cave.*—Locality on Potter Creek, near Baird, Shasta County, explored, 1902-03; announced, Sinclair, 1904. Principal literature: Cope (1879; 1891); Howard (1936b, p. 407); Matthew and Gidley (1906); Merriam (1906, p. 223-225); Putnam (1906, p. 230-234); Sinclair (1904); Sinclair and Furlong (1904, p. 412-413).

Sinclair is of the opinion that the fauna of this cave is of "later Quaternary age." Among many pieces of splintered bone, two pieces found interbedded with the cave fauna represent, in the opinion of Putnam, Matthew, and Gidley, the work of man. The extinct vertebrate species listed by Sinclair (1904, p. 17-18) are the following: *Arctotherium simun* Cope, *Ursus* n. sp., *Felis* n. sp., *Canis indianensis* Leidy, *Taxidea* n. sp. (?), *Spilogale* n. sp., *Teonoma* n. sp., *Thomomys* n. sp., *Aplodontia major* n. subsp., *Platygonus* (?) sp., *Euceratherium collinum* n. gen. and sp., *Bison* sp., Camelid, *Megalonyx wheatleyi* (?) Cope, *Megalonyx jeffersonii* (?) (Desmarest), *Megalonyx* n. sp., *Megalonyx* sp., *Mastodon americanus* (Kerr), *Elephas primigenius* Blumenbach, *Equus occidentalis* Leidy, *Equus pacificus* Leidy. The collections are at the University of California.

*Pinto Basin.*—Locality in the northeastern part of Riverside County, discovered, 1935; announced, Campbell and Campbell, 1935. Principal literature: Amsden (1935a); Campbell and Campbell (1935); Campbell (1936, p. 296); Scharf (1935); Wormington (1939, p. 38-41).

Artifacts have been found in the site of former drainage and under conditions indicating a climate more moist than at present. Extinct animals, including horse and camel, have been obtained also. Actual association of the extinct animals and the artifacts, however, has not been established.

The collections are in the Desert Laboratory of the Southwest Museum at Twenty-Nine Palms, California.

*Rancho La Brea.*—Locality Rancho La Brea, Los Angeles, discovered, February, 1914; announced, Merriam, 1914. Principal literature: Boule (1923, p. 408); Hay (1927b, p. 182); Hrdlička (1918, p. 17-22); Merriam (1914); Stock (1930a, p. 28).

Many extinct vertebrates have been obtained from the asphalt pits of Rancho La Brea. In pit number 10, human bones were found at depth 6 to 9 feet. According to Merriam, the associated fauna is of later age than that of some other pits and is either early Recent or very late Pleistocene. The collections are largely at the Los Angeles Museum of History, Science, and Art and at the University of California.

*Samwell Cave.*—Locality on the east side of McCloud River about 16 miles above its mouth, Shasta County, discovered, 1903; announced, Furlong, 1904. Principal literature: Furlong (1904); Merriam (1906); Putnam (1906).

A piece of chipped lava was found in association with extinct animals. Furlong considers the chipped lava as probably included at the same time as the animal remains but considers the proof not conclusive.

*Table Mountain.*—Locality on Mormon Creek near Tuttletown, Toulumne County. Principal literature: Becker (1891, p. 189); Blake (1899); Hay (1920; 1927b, p. 226); Holmes (1899, p. 615-623; 1901; 1919, p. 62); Merriam (1936, p. 1315); Wright (1890, p. 502).

Merriam believes that many of the artifacts supposed to be found in the auriferous gravels had been moved from their original position in connection with hydraulic mining operations. A seemingly well authenticated discovery is that made by Clarence King who, according to Becker, discovered, in 1869, an artifact unmistakably in place in the gravel deposits under the lava cap of Table Mountain. Apparently nothing short of a restudy with extensive excavation will afford a satisfactory understanding of this locality.

### COLORADO

*Dent.*—Locality near Dent, Weld County, discovered, 1932; announced, Figgins, 1933. Principal literature: Figgins (1933a); Howard (1935, p. 148); Roberts (1937b, p. 160); Strong (1935, p. 223); Wormington (1939, p. 13).

A large Folsom-like spear was found on November 5, 1932, associated with the skeleton of an elephant. A second artifact was found on July 7, 1933, also in association with elephant bones. Twelve elephants are said to be represented in the collections from this locality which is described as a terrace of South Platte River. The species is not fully determined but is probably of the *Parelephas columbi* group or possibly intermediate between *Parelephas columbi* (Falconer) and *Mammonteus primigenius* (Blumenbach). The collections are mostly in the Colorado Museum of Natural History.

*Lindenmeier*.—Locality 28 miles north of Fort Collins in Sec. 27, T. 12 N., R. 69 W., 6th Principal Meridian, discovered, 1934; recognized as Folsom, 1930; announced, Roberts, 1935. Principal literature: Kirk Bryan (1937a, p. 143-152); Bryan and Ray (1939); Coffin (1937); Figgins (1935c); Howard (1936b, p. 408; 1937a, p. 111); Renaud (1932a); Richards (1936, p. 370); Roberts (1935a; 1935b; 1936a; 1936b; 1937b, p. 158-160; 1938; 1939); Strong (1935, p. 223-224); Wormington (1939, p. 18-21).

Artifacts are found in a camp site at maximum depth of 14 or 15 feet below present land level. This was the first discovery of an occupational site of Folsom man. Bison remains found near the camp site probably represent a bison kill. The species, according to Gazin, is *Bison taylori* Hay and Cook. Bryan (1937a, p. 149) correlates the terrace containing the artifacts with the 25-foot terrace in the mountain section of Cache la Poudre River and with the 30-foot terrace of South Platte River. A proboscidean tusk has been found by Roberts but not in immediate association with the artifacts (personal communication). The collections are mostly at the Smithsonian Institution, Washington, D. C.

*Soda Creek*.—Locality on Soda Creek (long. 105°40′; lat. 39°35′), discovered, September, 1860; announced, Berthoud, 1866. Principal literature: Berthoud (1866, p. 342-345); Hrdlička (1907, p. 20).

Human skeletal remains were found in boulder deposits at a depth of 22 feet. No extinct species are reported. Geologic conditions are not adequately described, and the disposition of the collection is unknown.

*Yuma County*.—Localities on the uplands and stream divides in Yuma County, announced, Cook, 1931. Principal literature: Cook (1931a, p. 102-103); Figgins (1934; 1935b); Renaud (1932b).

Artifact and bones of elephant and two species of bison were found. Cook is of the opinion that some of the elephant bones and some bison bones show markings made by implements previous to fossilization. Of the two bison, one, according to Cook, is *Bison taylori* Hay and Cook. The other is a smaller species. The species of elephant is not given.

### DELAWARE

*Claymont*.—Locality near Claymont, discovered, July, 1887. Literature: Cresson (1890).

Two artifacts were found in gravel in railway cut. No associated fossils were found.

*Wilmington*.—Locality near Wilmington. Literature: Cresson (1892).

Artifacts are reported to have been found in clays. No associated extinct animals were found.

### FLORIDA

*Flagler Beach*.—Locality near Flagler Beach, discovered, 1931; announced, Connery, 1932. Literature: Connery (1932).

Artifacts are reported to have been found at a depth of about 2½ feet from the surface. It is said that one of the artifacts lay near or between the jaws of an elephant. The level of the bones is below ground water level. The deposits consist of sandy layers with much organic material. The unconsolidated nature of the deposits would seem to create doubt as to the assurance of contemporaneity of the artifact and fossil. The disposition of the collection is unknown.

*Lake Monroe.*—Locality in bluff bordering Lake Monroe, discovered about 1852. Principal literature: Agassiz (1854); Hrdlička (1907, p. 19); Usher (1854).

Human skeletal remains are reported to have been found in fresh water marl by Pourtales. The depth, condition of occurrence, and disposition of the collection are unknown. No extinct vertebrates are reported from this locality.

*Melbourne.*—Three localities have been described near Melbourne as follows: 1½ miles southwest of Melbourne; 2 miles west of Indian River, on east bank of drainage canal; and one mile west of golf course on south bank of drainage canal. Discovered, 1923 and 1925; announced, Loomis, 1924, and Gidley and Loomis, 1926. Principal literature: Cooke (1926; 1928); Cooke and Mossom (1929, p. 218-220); Gidley (1926a; 1926b; 1926c; 1927; 1929a; 1929b; 1930; 1931); Gidley and Loomis (1926); Goddard (1926); Hay (1927b, p. 274); Howard (1935, p. 142); Hrdlička (1937c, p. 95-98); Leverett (1931); Loomis (1924; 1926); Romer (1933, p. 78); Simpson (1929).

The essential facts of the geologic section at Melbourne are as follows: At the base, a marine shell marl, the deepest formation reached in the excavation; above this, a nonmarine sand stratum containing vertebrate fossils and human remains; and an uppermost deposit, consisting largely of muck and loose sand. To the marine shell marl, which is widely distributed in Florida, the writer in 1912 applied the name Anastasia formation, the type locality being on Anastasia Island near St. Augustine, Florida. The nonmarine sand stratum contains vertebrate fossils and occurs widely on both the east and west coasts of Florida; Cooke and Mossom applied to it the name Melbourne bone bed, the type locality being at Melbourne. The overlying muck and sand deposits are local in occurrence and apparently conform to present topographic features. They are, however, a distinctive unit separated by erosional unconformity from the underlying Melbourne bone bed. For this unit the writer now proposes the name Van Valkenburg beds, the type locality being on Van Valkenburg Creek at Vero Beach, Florida.

The first artifact associated with extinct animals at Melbourne was found by Loomis in December, 1923, at a locality on the G. L. Singleton estate, 1½ miles southwest of the city. The fossils in immediate association with the artifact were *Parelephas columbi* (Falconer) and *Odocoileus sellardsiae* Hay. The bones and the artifacts were in the base of the sand stratum of the Melbourne formation. The artifacts and associated skeleton of *P. columbi* are in the museum of Amherst College. Additional excavations were made by Gidley and Loomis in 1925. Here at or near the top of the Melbourne bone bed they found artifacts and charcoal in immediate association with bones of *Mylodon, Megalonyx,* and *Chlamytherium.*

The second locality is on the east bank of a drainage canal, 2 miles west of Indian River, near the club house of the Melbourne golf course. A crushed human skull and some other bones were found within a few inches of the top of the sand stratum of the Melbourne formation. Gidley (1929a, p. 493) is of the opinion that the skull belongs to the Melbourne bone bed. It is to be noted, however, that the skull lay essentially at the contact of the Melbourne formation with the overlying Van Valkenburg beds and hence may possibly belong to the latter formation. Additional excavations were made by Gidley in 1927-28. At that time an artifact was found near the middle of the Melbourne bone bed and numerous artifacts and some human skeletal remains at the contact of the Melbourne bone bed and the overlying Van Valkenburg beds.

The third locality is one mile west of the golf course on the south bank of a drainage canal. Artifacts and pieces of pottery were found at or near the contact of the Melbourne bone bed and the Van Valkenburg beds.

The vertebrate fossils obtained from the Melbourne formation at Melbourne, according to Gidley and Loomis, are very much the same as from that formation at Vero. A list of the vertebrate species has been given by Hay and by Simpson. Gidley is of the opinion that the fauna of this bed is Pleistocene (1929a, p. 493). Among extinct species of mammals from this locality identified by Loomis and by Gidley (Hay, 1927b, p. 273-274) are the following: *Elephas columbi, E. imperator?, Mastodon americanus, Canis dirus, Smilodon* sp., *Equus complicatus, E. leidyi, E. littoralis, Tapirus haysii, Bison latifrons?, Odocoileus sellardsiae, Platygonus* sp., *Camelops?* sp., *Megalonyx jeffersonii?, Mylodon* sp., *Chlamytherium septentrionalis, Glyptodon* sp., *Dasypus* sp. The collections are at the U. S. National Museum, Washington, D. C., and at Amherst College, Amherst, Massachusetts.

*New Smyrna.*—Locality at New Smyrna, discovered, 1929; announced, Gidley, 1929. Literature: Gidley (1929b, p. 20).

Gidley found artifacts in "undisturbed natural association" with bones of extinct animals. No additional information on the locality seems to have been published.

*Osprey.*—Four localities for human remains have been reported near Osprey, Manatee County, as follows: Osprey, 1871; North Osprey, 1872; South Osprey, about 1888; and Hanson Landing, 1886. Announced, Heilprin, 1887. Principal literature: Agassiz (1854); Heilprin (1887); Hrdlička (1907, p. 53-55); Leidy (1889, p. 10-12); Vaughan (1907); Webb (1907).

Human skeletal remains were found at the surface or at shallow depth. No extinct species were obtained in immediate association with the human remains. Vaughan is of the opinion that the deposits are post-glacial. The collections are in the National Museum, Peabody Museum, and Army Medical Museum.

*Palma Sola.*—Locality on beach at Palma Sola. Principal literature: Hay (1923, p. 379).

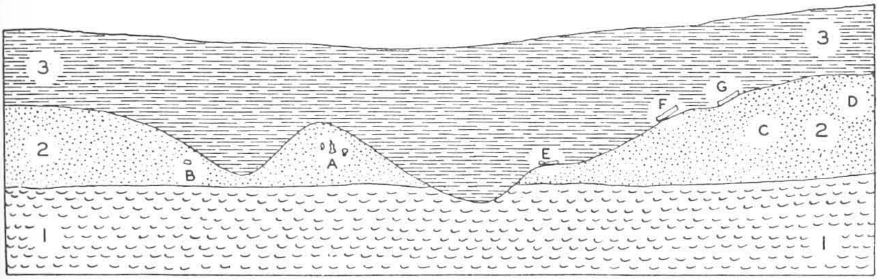


FIGURE 1.—*Sketch to show succession of strata at Vero, Florida*

(1) Anastasia formation; (2) Melbourne bone bed; (3) Van Valkenburg beds; (A) Human foot bones and parts of pelvis and bone implements; (B) Spall; (C) Fossil turtle; (D) Bone implements and foot bone of horse; (E, F, G) Human bones. (From Florida State Geol. Survey, 8th Ann. Rept., Figure 6, 1916.) Scale, horizontal and vertical: 1 inch = 7 feet.

A fossilized human skull has been found. Various fossils are washed up on the beach, but their association with the skull is not established.

*Vero.*—Locality in the valley of Van Valkenburg Creek one-half mile north of Vero Beach, discovered, October, 1915; announced, Sellards, 1916. Principal literature: Balch (1917, p. 481-482); Berry (1917); Boule (1923, p. 409-411); Chamberlin (1917a; 1917b); Cooke (1926; 1928); Cooke and Mossom (1929, p. 220-224); Gidley (1930); Hay (1917a; 1917b; 1917c; 1918a; 1918b; 1918c; 1919a, p. 108-109; 1923; 1926; 1927a; 1927b, p. 275; 1928c); Holmes (1918a; 1918b); Howard (1935, p. 140-142); Hrdlička (1917; 1918, p. 23-65; 1919; 1937c, p. 95); Keith (1929, p. 467-468); Leverett (1931); MacCurdy (1917a; 1917b); Merriam (1935; 1936, p. 1316); Nelson (1918b); Romer (1933, p. 78); Sellards (1916a; 1916b; 1916c; 1917a; 1917b; 1917c; 1917d; 1918; 1919; 1937); Simpson (1929; 1930a); Shufeldt (1917); Sterns (1918; 1919); Vaughan (1917); Wickham (1919); Wieland (1918); Wilder (1924, p. 288-289).

The geologic section at Vero has been fully described in earlier publications, but for convenience of reference a graphic representation is given in Figure 1. As at Melbourne, there are three distinct geologic units in the section. At the bottom is the Anastasia marl, No. 1 of the sketch, a marine formation in which neither vertebrate fossils nor human relics have been found. Resting on the marl is a nonmarine sand stratum, No. 2, to which the name Melbourne bone bed has been applied by Cooke and Mossom. Overlying the Melbourne bone bed, separated by an erosional unconformity, is a deposit of sand and muck, No. 3, to which the writer now applies the name Van Valkenburg beds, this being the type locality.

The essential facts are that the Melbourne bone bed and the Van Valkenburg beds at this place both contain vertebrate fossils and human remains. Failure on the part of several writers to distinguish between these two deposits has led to confusion in the literature. Thus Holmes (1918b) has not recorded the fact that the pottery described by him came only from stratum No. 3, the Van Valkenburg beds. Likewise,

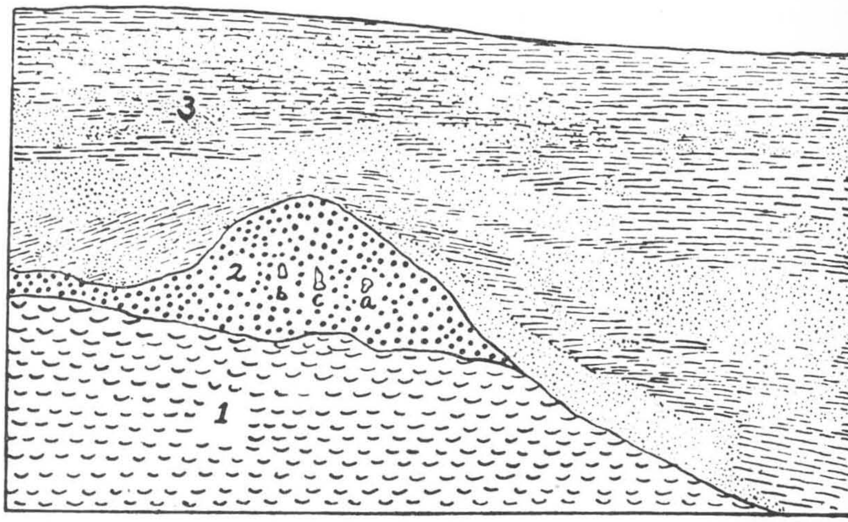


FIGURE 2.—*Detail of a part of the section from Figure 1*

(a, b) Human foot bones; (c) Scapula of deer and bone implements. (From Florida State Geol. Survey, 8th Ann. Rept., Figure 5, 1916.) Scale, vertical and horizontal: 1 inch = 2.5 feet.

MacCurdy (1917b) has assumed, supported to some extent by Berry, that no appreciable interval of time separates stratum No. 2, the Melbourne bone bed, from the Van Valkenburg beds. With this erroneous assumption he arrives at the conclusion that all the human remains and artifacts found at Vero are relatively recent in age and that this great fauna persisted in Florida into Recent time. The contention of Hrdlička that the human skeletal remains and artifacts in these stratified deposits represent relatively modern burial by human agency is too much without reason or merit to justify discussion.

Human foot bones and parts of the pelvis, flint chips or spalls, and bone implements were found in the Melbourne formation (Figure 1). To show more definitely the place of the human foot bones in the section, the writer made at the time the excavations were in progress the more detailed sketch shown in Figure 2. This part of the section is shown by photograph on Plate 1. The erosional contact between the Van Valkenburg beds and the Melbourne bone bed is very definite, as may be seen in the photograph.

Extinct species of mammals collected in place by the writer from the Melbourne bone bed at this locality are the following: *Megalonyx jeffersonii* (Desmarest), *Chlamytherium septentrionalis* (Leidy), *Dasypus* sp., *Equus leidyi* Hay, *Equus complicatus* Leidy, *Tapirus veroensis* Sellards, *Camelops?* sp., *Mastodon americanus* (Kerr), *Parelephas columbi* (Falconer), *Aenocyon ayersi* (Sellards), and *Smilodon* (*Trurifelis*) *floridanus* (Leidy). For identification of the large fauna and flora found in the Melbourne and Van Valkenburg formations, the reader may consult the extensive literature, especially papers by Berry, Hay, Sellards, Simpson, Shufeldt, and Wickham. The collections obtained at Vero are in the Museum of the Florida State Geological Survey, Tallahassee, Florida.

*Winter Beach.*—Locality a drainage ditch just east of Florida State highway No. 4 about 3 miles north of the Vero locality and approximately midway between the towns of Gifford and Winter Beach, discovered 1936.

Dr. C. R. Stauffer reports that in 1936 and 1937 Mr. P. D. McKellar, of Jackson, Minnesota, obtained bones of the ground sloth, camel, mastodon, and other animals from the Melbourne bone bed. On many of the bones obtained by Mr. McKellar, Dr. Stauffer found what he believes to be marks of flint knives and bruises of stone hammers made in breaking the bones. The marks were evidently made on fresh bones, and the breaks were also those of fresh bones and not the fracture of heavily mineralized specimens. One or two bones, Dr. Stauffer states, appear to have been used by man for some temporary purpose (letter of July 8, 1939). The collections are in the University of Minnesota and in a museum at the courthouse in Jackson, Minnesota. Dr. A. E. Jenks, who also visited this locality in 1937, believes that the bones are man marked (letter of July 10, 1939). Dr. Stauffer has kindly sent some of the bones to the writer. The markings on proboscidean and other bones appear to have been made by flint knives in cutting slices of meat from the bones.

### IDAHO

*Nampa.*—Locality at Nampa, discovered, 1889. Literature: Holmes (1919, p. 70).

An image, taken from a boring, is considered by Holmes as having no authenticated evidence of antiquity.

### ILLINOIS

*Rock Bluff.*—Locality on Illinois River at Rock Bluff near crossing of 40th Parallel, discovered, June, 1866. Principal literature: Hrdlička (1907, p. 28-32); Kollmann (1884); Schmidt (1872, p. 237-244).

Human skeletal remains found in a crevice in limestone imbedded in "clay, sand and broken stone" at a depth of "several feet." No associated fossils were found. The collection is in the National Museum.

*Walkerville.*—Locality near Walkerville, Green County, discovered, May, 1879; announced, McAdams, 1881. Literature: McAdams (1881).

A stone ax is reported to have been found at the base of the loess deposits at a depth of 72 feet.

INDIANA

*Cromwell.*—Locality near Cromwell, announced, Burmaster, 1932. Literature: Burmaster (1932); Harrington (1933, p. 180).

A mastodon skeleton was found resting on clay and protruding upwards through overlying peat. An artifact was found on the clay within 20 feet or less from the mastodon. Another artifact was found in the peat deposit. Charcoal was found on the clay and under the skeleton. Collections in Buffalo Museum of Science, Buffalo, New York.

*Medora.*—Locality on East Fork of White River, near Medora, Jackson County, discovered, 1886; announced, Cresson, 1890. Literature: Cresson (1890).

An artifact was found in gravel 8 feet below the surface and about 50 feet above water level in the river. No fossils are reported.

IOWA

*Muscatine.*—Locality near Muscatine, discovered about 1891; announced, Witter, 1892. Principal literature: Shimek (1917, p. 98); Witter (1892).

Two artifacts and parts of tooth of an elephant found in loess deposits at depth of 12 and 25 feet. The species of elephant is not given. The disposition of the collection is unknown.

*Sioux City.*—Locality 3 miles east of Sioux City, discovered about 1869; announced, Aughey, 1876. Principal literature: Aughey (1876, p. 254-255).

An artifact was found in loess deposits in railway cut 15 feet below the surface. No associated extinct animals are reported. The location of the artifact is unknown.

KANSAS

*Lansing.*—Locality on the Concannon farm on the right bank of Missouri River, 5 or 6 miles southeast of Leavenworth, discovered, February, 1902; announced, Williston, 1902. Principal literature: Boule (1923, p. 407); Calvin (1902); Chamberlin (1902); Holmes (1902a; 1919, p. 71); Hrdlička (1907, p. 47-53); Keith (1929, p. 468-469); Salisbury (1902); Shimek (1903); Todd (1903); Upham (1902a; 1902b; 1902c); Williston (1902b; 1903; 1905b); Winchell (1902; 1903; 1917, p. 134).

Human remains were found in loess at depth 20 feet. T. C. Chamberlin, Salisbury, and Calvin consider it possible that the loess in which the skeleton rests is a secondary deposit. Winchell, Williston, and Upham regard the deposition as original. The skull is in the Smithsonian Institution, Washington, D. C.; the lower jaws and some other skeletal material are in the Museum of Vertebrate Paleontology of the University of Kansas. This locality has recently been revisited by Smith, Hibbard, and Eiseley and may be restudied in the near future (letter of H. T. U. Smith, June 23, 1939).

*Russell Springs.*—Locality on Twelve Mile Creek, a small tributary to Smoky Hill River, about 12 miles east of Russell Springs, Logan County, discovered, 1895; announced, Williston, 1897. Principal literature: Boule (1923, p. 400-401); Lucas (1899); McClung (1908); Martin (1902); Renaud (1928, p. 31); Romer (1933, p. 79); Schultz and Eiseley (1935, p. 312); Stewart (1897); Williston (1897; 1898; 1902a; 1905a).

In the summer of 1895, H. T. Martin and T. R. Overton, of the University of Kansas, found some bone fragments that had been washed from blue clay. According to Martin, the clay stratum rested on chalk at a level 10 or 12 feet above the bed of the small stream. A quarry was opened which proved to contain an unusual cache of bison remains. Parts of seven or eight bison skeletons were obtained, from which one skeleton was subsequently mounted in the University of Kansas Museum. This bison, originally referred to *Bison antiquus* Leidy, was later described by Lucas as *Bison occidentalis* Lucas. When these skeletons were removed a worked flint was found under one of them 15 or 18 feet from the margin of the quarry and at a vertical depth of about 20 feet. Mr. Martin gives details of the discovery as follows (letter of January 15, 1918):

"In reply to your letter in regard to the finding of the arrowhead with the skeleton of *Bison occidentalis* Lucas collected by the writer in the Pleistocene of western Kansas and now mounted in our Museum, I beg to state that the work of cleaning and removing the skeleton was continuous. After we reached within a few inches of the bone layer, the surface was cleaned off perfectly level for a space of fifteen by twenty to twenty-five feet. The skeleton lay with the head pointing nearly east, and the skull separated about three feet to the southwest, so what when I commenced removing the parts after pasting, the scapula came in the second block to be removed. These sections separated from the matrix beneath freely, so that when the scapula was removed, it left a nearly perfect impression in the bluish marly matrix, leaving the arrowhead plainly in view firmly embedded in the hard matrix. When this was removed, it too left a perfect mold in the firm clay, so you can see that accidental intrusion in any way imaginable was absolutely impossible.

"The arrowhead was embedded more deeply at its base, while the point was pressed firmly against the shoulder blade. The skeleton lay on its right side and the arrowhead underneath the right scapula. These positive facts should, and I hope will, convince the most sceptical that any theory they may advance as to the possibility of accidental intrusion of the arrowhead subsequently to the deposition of the skeleton is positively precluded by the firm impression left in the solid matrix beneath the shoulder blade. All bones of the skeleton were cleaned off and removed by the writer."

Having collected in Kansas with Mr. Martin and having been otherwise associated with him for several years, the writer has personal knowledge of his exceptionally painstaking methods of collecting and removing vertebrate fossils. His statement of the manner of occurrence of the artifact under the scapula of this bison will appeal to all who knew him as thoroughly trustworthy, affording a reliable record of the presence of a worked flint under the skeleton of *Bison occidentalis* Lucas. Martin's judgment as to the contemporaneity of the flint and the bison has been expressed by him as follows:

"It must have been within the body of the animal at the time of death or have been lying on the surface beneath its body."

Williston (1902a, p. 315) reports that he obtained, nearby, two extinct mammals, *Mammonteus* (*Elephas*) *primigenius* (Blumenbach) and *Platygonius compressus* LeConte, from the plains marl. This marl overlies the blue clay stratum which contained the bison bones at this locality.

*Smith County*.—Locality on a stream terrace, Smith County, discovered, 1937; announced, Smith, 1938. Principal literature: Smith (1938); Eiseley (1939a).

Artifacts were found in stream terrace. Bison, probably the existing species, and invertebrate fossils were present. The collections are at the University of Kansas.

### LOUISIANA

*Avery Island*.—Locality at a salt mine on Avery Island, discovered, 1890; announced, Joor, 1895.

Pottery and a basket were found in a muck bed at a depth of 10 or 12 feet (Joor, 1895). Underlying the muck is blue clay containing extinct animal remains including mastodon, horse, and sloth. No human materials were found in association with the extinct animals. The collections were placed in Tulane University.

*New Orleans*.—Locality in excavation for gas tank in the city of New Orleans, discovered, 1844. Principal literature: Drake (1850, p. 76); Hrdlička (1907, p. 15); Lyell (1863, p. 43-44); Nott and Gliddon (1854, p. 272); Usher (1854, p. 338).

Human bones are reported in an alluvial deposit at a depth of 16 feet. No associated vertebrate fossils were found. The disposition of the collection is not known.

### MASSACHUSETTS

*Worcester County*.—Locality in Northborough, Worcester County, discovered, 1884. Principal literature: Putnam (1885).

Parts of skull and teeth of a mastodon were found at the bottom of peat deposits. About 18 feet from the mastodon skull occurred a human skull and jaws which, likewise, rested on the underlying deposits at the base of the peat deposits.

### MINNESOTA

*Browns Valley*.—Locality in a gravel pit in Browns Valley near Fertile, discovered, July, 1934; announced, Jenks, 1934. Principal literature: Jenks (1934); Worthington (1939, p. 27-28).

Artifacts and a human skeleton were found, representing a burial. Jenks regards three of the artifacts as of the Folsom culture. Wormington regards the artifacts as of the Yuma culture. The collections are mostly with Wm. H. Jensen, Browns Valley, who discovered the site.

*Lake Itasca*.—Locality at Lake Itasca, discovered, 1937.

Exploration by Jenks and Eddy in 1937 yielded bones of *Bison antiquus* and a few flaked knives at a depth of 8 feet under marl and peat deposits (Eddy, letter of July 21, 1939).

*Little Falls*.—Locality on Mississippi River at Little Falls, discovered, 1879; announced, Babbitt, 1883. Principal literature: Babbitt (1883; 1884); Haynes (1890); Holmes (1893c; 1919, p. 84); Upham (1884; 1888; 1902a); Wright (1890, p. 509).

Artifacts were found in a Mississippi River terrace. The depth of the artifacts below the top of the terrace is given as "12 or 15 feet." Subsequently, Holmes trenched the face of the terrace and expressed the opinion that the artifacts found by Miss Babbitt were a part of the superficial deposits. Apparently no additional investigations have been made. No extinct species of animals are reported. The collections obtained by Miss Babbitt are in the Peabody Museum of Harvard University.

*Pelican Rapids*.—Locality on Minnesota State highway No. 30, about 3 miles north of Pelican Rapids, Ottertail County, discovered, 1931; announced, Jenks, 1932. Principal literature: Antevs (1935, p. 305; 1937d; 1938a); Kirk Bryan (1935); Bryan and MacClintock (1938); Hrdlička (1937c, p. 101-104); Jenks (1932a; 1933; 1935, p. 5-7; 1936; 1938); Kay and Leighton (1938); Sardeson (1938); Thiel (1936); Wormington (1939, p. 54-57).

A human skeleton and some artifacts were found in lake deposits at a depth of 12 feet. In the opinion of Jenks, Bryan, Kay, Leighton, and MacClintock, the human materials are of the age of the lake deposits; Antevs, Sardeson, and Hrdlička believe the human remains to be of later age than these deposits. No extinct animals were found. The collections obtained are at the University of Minnesota.

*Sauk Valley*.—Locality in gravel pit near Lake Guerney in West Union Township, Todd County, discovered, June, 1935; announced, Bryan, Retzek, and McCann, 1938. Principal literature: Bryan, Retzek, and McCann (1938); Jenks and Wilford (1938); Wormington (1939, p. 58-59).

Human skeletal remains were found in a gravel deposit at a depth of from 2 to 4 feet. No associated fossils reported. The collection is in the possession of Rev. Henry Retzek.

*Valley of Saint Croix River*.—Three or more localities in the Valley of St. Croix River in Interstate Park, discovered, 1934; announced, Eddy and Jenks, 1935. Principal literature: Eddy and Jenks (1935).

At the original locality kitchen midden deposits were found underneath peat bog deposits. The midden deposits are said to contain artifacts and many bones of an extinct bison. Eddy (letter of June 28, 1939) reports that

"all of these sites consisted of large numbers of remains of *Bison antiquus* Leidy, caribou, and other mammals, many of which bore knife marks and some of which had been fashioned into implements."

One wooden artifact was also discovered. These finds were all in marl, maximum depth 22 feet, deposited in former lakes which, according to pollen profiles and other evidence, indicated an early post-glacial date. The collections are at the University of Minnesota. (Jenks, letter of July 22, 1939.)

MISSISSIPPI

*Natchez.*—Locality near Natchez, discovered, 1846; announced, Dickeson, 1846. Principal literature: Dickeson (1846); Howard (1936b, p. 394; 1936g, p. 1327); Hrdlička (1907, p. 16-19); Keith (1929, p. 465-467); Leidy (1889, p. 9); Lyell (1849; 1863, p. 200-205); Schmidt (1872); Usher (1854, p. 349); Winchell (1917, p. 133).

Lyell, who examined the pelvic bone of man and other fossils, states that the human bone "appeared to be quite in the same state of preservation and was of the same black color as the other fossils." Leidy also observed that the degree of fossilization was exactly the same as that of the bones of extinct mammals which were found with it and that the bone differs in no respect from that of the corresponding recent bone of man. The fossils reported to occur with the human bone (Leidy, 1889) are: *Mastodon americanus* (Kerr), *Megalonyx jeffersonii* (Desmarest), *M. dissimilis* Leidy, *Ereptodon priscus* Leidy, *Mylodon harlani* Owen, *Equus major* (Leidy), and *Bison latifrons* (Harlan). The horizon from which the bones were thought to have been derived is a clay stratum at a depth approximately 30 feet from the surface. The top of the terrace from which the fossils were obtained is about 200 feet above the present river level. The collection is in the Academy of Natural Sciences of Philadelphia (Howard, 1936g).

MISSOURI

*Benton County.*—Locality on Pomme de Terre River in Benton County, discovered, 1839; announced, Koch, 1839. Principal literature: Dana (1875, p. 337); Howard (1935, p. 143); Koch (1839a; 1843; 1857, p. 63).

Koch reports mastodon bones found at a depth of 20 feet with which were associated "several stone arrowheads." One of the artifacts was found underneath the femur of the mastodon "so that it could not have been brought thither after the deposit of the bones." The disposition of the collection is unknown.

*Gasconade County.*—Locality a spring in the valley of Bourbeuse River in Gasconade County, discovered, October, 1838; announced, Koch, January, 1839. Principal literature: Dana (1875, p. 338-339); Howard (1935, p. 143; 1936b, p. 394); Koch (1839a; 1839b; 1857); Harrington (1933, p. 177); McGee (1888).

Koch reports having found remains of a mastodon skeleton at a depth of about 8 or 9 feet in alluvial deposits. With the bones was evidence of fire as well as "several arrowheads, a stone spearhead and some stone axes." Some of the mastodon bones, according to Koch, had been burned. So far as the writer has found record, this was the first reported find of man's relics in association with extinct animals in North America. These and other collections made by Koch were kept for a time in a museum in St. Louis. According to John Francis McDermott (letter of July 31, 1939), Koch sold his museum in 1841 and upon leaving St. Louis took his collections with him, some of which were disposed of in Europe. The whereabouts of the mastodon remains and associated artifacts is unknown.

*Kimmswick.*—Locality 25 miles west of St. Louis. Literature: Holmes (1902b, p. 108-129).

Remains of mastodon and elephant are found. Some artifacts are reported, but proof of actual association, according to Holmes, is lacking. Some fossils from this locality are in the U. S. National Museum (Gazin, letter of September 27, 1939).

NEBRASKA

*Agate.*—Locality one-half mile east of Agate.

At this locality, according to Cook, elephant, extinct deer, and undetermined bison were found in and under a peat bed in association with artifacts (letter of August 28, 1939).

*Angus.*—Locality near Angus, Nuckolls County, discovered, August, 1931; announced, Figgins, 1931. Principal literature: Bell and Van Royen (1934a, p. 58-60); Figgins (1931); Harrington (1933, p. 180); Strong (1932a, p. 152; 1932b; 1935, p. 221); Wormington (1939, p. 11-13).

An artifact of the Folsom culture is reported to have been found in association with the skeleton of an elephant. The formation containing the fossil elephant and artifact consists of stratified deposits of sand and gravel, with thinner layers of silt, clay, and marl, overlain by wind-blown sand and prairie loess to a depth of 16 feet. The elephant has been described by Osborn as *Archidiskodon meridionalis nebrascensis* n. var. The collection is in the Colorado Museum of Natural History.

*Bridgeport.*—Locality Bridgeport near Dalton, Morrill County. Principal literature: Renaud (1934, p. 12-19); Schultz (manuscript).

Artifacts are found in association with *Castoroides ohioensis* Foster and *Bison antiquus taylori* (C. B. Schultz, personal communication). The collections are in the University of Nebraska State Museum.

*Crawford.*—Locality in headwater drainage of White River, near Crawford, discovered, 1935; announced, MacClintock and others, 1936. Principal literature: MacClintock, Barbour, Schultz, and Lugn (1936).

Artifacts and fire pits have been found in the valley of Sand Creek at varying depths up to about 25 feet. The artifacts and fire pits underlie and antedate varved deposits. Schultz (letter of June 24, 1939) states that *Bison antiquus taylori* has been found in the valley of Sand Creek. The collections are in the University of Nebraska State Museum.

*Cumro.*—Locality in South Loup Valley, Custer County, about 7 miles southwest of Cumro (T.13 N.; R.19 W.; Sec. 35), discovered, 1929; announced, Schultz, 1932. Principal literature: Antevs (1935, p. 304); Bell and Van Royen (1934a, p. 53-56); Schultz (1932, p. 271-273); Strong (1932b, p. 2; 1935, p. 220).

An artifact was found in association with a bison skeleton in loess deposits at depth of 16 feet. Schultz is of the opinion that the loess is of late Wisconsin age (letter of June 24, 1939). The bison skull was wanting, but the species was thought to be *Bison occidentalis* Lucas, or a closely related species. The collections are in the University of Nebraska State Museum.

*Dalton.*—Locality on East Fork of Greenwood Creek, about 10 miles northwest of Dalton, discovered, September, 1932; announced, Bell and Van Royen, 1933. Principal literature: Bell and Van Royen (1933; 1934a, p. 51, 63-69; 1934b, p. 303); Strong (1935, p. 222-223).

Artifacts were found in terrace deposits at a depth of 7½ feet. The height of the terrace is 14 to 20 feet above stream level. No extinct fossils are reported in immediate association with the artifacts. The collections are in the University of Nebraska, Department of Anthropology.

*Gilder's Mound.*—Locality 3 miles north of Florence, Douglass County, discovered, October, 1906; announced, Barbour and Ward, 1906. Principal literature: Barbour (1907a; 1907b; 1907c; 1907d; 1907e); Barbour and Schultz (1936b); Barbour and Ward (1906a; 1906b); Blackman (1907); Boule (1923, p. 407); Gilder (1907a; 1907b); Hrdlička (1907, p. 66-98); Keith (1929, p. 469-471); Osborn (1907a, p. 372-373); Shimek (1908); Winchell (1917, p. 135).

Human remains were found to a depth of 12 feet. No associated extinct animals were obtained. The collections are in the University of Nebraska State Museum.

*Grand Island.*—Locality on south bank of Platte River, 8 miles southwest of Grand Island, Hall County, discovered, 1923 and 1931; announced, Meserve and Barbour, 1932. Principal literature: Barbour and Schultz (1932a); Bell and Van Royen (1934a, p. 56-58); Meserve and Barbour (1932); Schultz (1932, p. 273-275); Strong (1932b; 1935, p. 221).

Two artifacts have been found in association with a bison, originally identified as *Bison occidentalis* Lucas, now regarded as *Bison antiquus taylori* (Schultz, letter of June 24, 1939). The fossils are found in a dark silt stratum. The depth of the bone bed is about 4 feet. The collections are in the University of Nebraska State Museum.

*Omaha.*—Locality in a railway cut 2½ miles southeast of Omaha, discovered, 1872; announced, Aughey, 1876. Principal literature: Aughey (1876, p. 254); Hay (1918a; 1929a, p. 95).

Aughey obtained a large flint arrowhead from the loess deposits at a depth of 20 feet. The artifact was 13 inches below and a little to one side of the lumbar vertebra of a proboscidean. The present location of the fossil and artifact is unknown.

*Scottsbluff.*—Locality in north bank of Spring Creek near Signal Butte, Scotts Bluff County (S.W. ¼, Sec. 11, T. 21 N., R. 57 W.), discovered, August 4, 1932; announced, Barbour and Schultz, 1932. Principal literature: Barbour and Schultz (1932b; 1936a, p. 434-442); Bell (1932); Bell and Van Royen (1934a, p. 60-62); Figgins (1934); Howard (1935, p. 147-148); Lugn (1934, p. 353; 1935, p. 183-188); Romer (1933); Schultz (1934); Schultz and Eiseley (1935; 1936a); Strong (1935, p. 221).

Eight artifacts were found in immediate association with *Bison taylori* Hay and Cook (Barbour and Schultz, 1936a, p. 434). The bones and artifacts occur in stream deposits. The overlying material, 12 feet or more in thickness, is said to be wind blown (Schultz and Eiseley, 1935, p. 307). The collections are in the University of Nebraska State Museum.

*Signal Butte.*—Locality on a mesa near Scottsbluff, discovered, 1931; announced, Strong, 1932. Principal literature: Amsden (1937, p. 94); Strong (1932a, p. 155; 1933; 1935); Wormington (1939, p. 32-34).

Amsden considers the culture stage of the lowest level at this locality comparable to that of Lake Mohave. Strong is of the opinion that this site contains material related to but later than the Folsom horizon at the Lindenmeier site. No extinct animals have been obtained. The collections are in the Smithsonian Institution, Washington, D. C.

*Snake Creek site.*—Locality in ancient stream bed near the head springs of Snake Creek, discovered, 1908; announced, Osborn, 1922. Principal literature: Boule (1928); Cook (1927b, p. 114-116); Gregory (1927); Gregory and Hellman (1923a; 1923b); Keith (1929, p. 474); Nelson (1928); Osborn (1922a; 1922b; 1927); Renaud (1928, p. 27-31); Woodward (1922).

A fossil molar tooth found in Pliocene deposits was described by Osborn as a new genus, *Hesperopithecus*, representing an ape or man. On the basis of additional material subsequently obtained, Gregory concluded that the tooth was from an extinct peccary. Many bone fragments were found in the same formation, but none of these, in the opinion of Nelson, were shaped by man. The collections are in the American Museum of Natural History.

### NEVADA

*Gypsum Cave.*—Locality in the foothills of Frenchman Mountains about 16 miles east of Las Vegas, discovered, 1930; announced, Harrington, 1930. Principal literature: Amsden (1931); Antevs (1935, p. 309); Harrington (1930; 1933; 1934c); Howard (1935, p. 146; 1936b, p. 406); Romer (1933, p. 81); Stock (1931); Wormington (1939, p. 35-38).

Artifacts were found in association with sloth (*Nothrotherium shastense* Sinclair), camel (*Camelops* sp. and *Tenupalama* sp.), and horse (Harrington, letter of August 21, 1939). The collections are in the Southwest Museum and California Institute of Technology.

*Lake Lahontan.*—Locality on Walker River in the southern part of Lake Lahontan basin, discovered, October 6, 1882; announced, Russell, 1885. Principal literature: Antevs (1935, p. 304); Gilbert (1889); Harrington (1933, p. 178); Hay (1929a, p. 95);

Holmes (1919, p. 68); McGee (1887; 1888, p. 23; 1889b); Powell (1893, p. 324-325); Russell (1885, p. 246-247); Wright (1890, p. 558).

McGee (1889b, p. 304) states that the obsidian implement found by him was projecting point outward from the later clay deposits of Lake Lahontan. It was found in the vertical bluff at a depth of 25 feet from the surface. The fossils of this later Pleistocene lake epoch are listed by Hay as elephant, horse, bison, and camel.

*Las Vegas.*—Localities in the drainage area of Las Vegas River about 10 miles north-northwest of Las Vegas, discovered, 1933; announced, Simpson, 1933. Principal literature: Simpson (1933); Harrington (1934a).

Simpson reports "highly suggestive if not absolutely conclusive" evidence of existence of man with the fauna of Pleistocene type. Pieces of charcoal and a flake were found with the following fossils: *Thomomys? perpallidus, Equus pacificus* Leidy, *Equus* sp., *Camelops hesternus* (Leidy), *Odocoileus* sp., and *Bison* sp. Later Harrington found in a nearby locality additional charcoal inclusions; also split and burnt animal bones and one elephant molar, probably *Parelephas columbi* (Falconer). The maximum depth of the charcoal in the deposits is 14 feet. The collections are in the American Museum of Natural History, New York, Southwest Museum, Los Angeles, and California Institute of Technology, Pasadena, California.

*Smith Creek Cave.*—Locality in a cave near Baker, discovered, 1933; announced, Harrington, 1934. Principal literature: Harrington (1934b).

The cave deposits at this place contain charcoal, split and burned bones, presumably indicating human agency. The associated fossils are camel (*Camelops*), horse (two species), and other undetermined bones (Harrington, 1934b, p. 306; and letter of August 21, 1939). The collections are in the Southwest Museum and California Institute of Technology.

#### NEW JERSEY

*Trenton.*—Locality in gravel deposits on bluff of Delaware River, 2 miles south of Trenton, discovered, September, 1872; announced, Abbott, 1872. Principal literature: Abbott (1872; 1873; 1877; 1881, p. 471-551; 1883; 1889); Balch (1917, p. 474-477); Boule (1923, p. 402); Cresson (1892); Goddard (1927, p. 264); Hay (1919b; 1929a, p. 95); Haynes (1883); Hollick (1898); Holmes (1893a; 1898; 1919, p. 76); Howard (1936b, p. 394); Hrdlička (1907, p. 35-47); Keith (1929, p. 461-465); Knapp (1898); Kümmel (1898); Lewis (1880; 1881); McGee (1889a); Mercer (1898); Powell (1893); Putnam (1898); Richards (1939); Russell (1899); Salisbury (1898); Shaler (1880; 1889; 1893); Smith (1910); Spier (1916; 1918); Volk (1911); Wilder (1924, p. 286-288); Wilson (1898); Wissler (1916, p. 236); G. F. Wright (1883; 1888a, p. 427; 1890, p. 509; 1892, p. 242-249; 1893, p. 29-32; 1898; 1911).

Artifacts have been reported at three levels. The uppermost level is in the surface soil; the second level is in yellow sand or sandy clay about 2 feet thick. Underneath the yellow sand is a gravel deposit known as the Trenton gravel. The gravel deposits are said by Abbott, Volk, and others to contain artifacts.

Among fossils reported from the Trenton gravel is a fragment of a human mandible found at a depth of 16 feet, also a parietal bone and femur. Mastodon and bison are reported in these deposits (Abbott, 1881, p. 482). The first artifact was found by Abbott in September, 1872, in the gravel at a depth of 16 feet (Abbott, 1873, p. 206). In a recent paper Richards reports that excavation carried on at this locality during the past three years has failed to yield artifacts from the Trenton gravel. The excavations in the Trenton gravel, however, were not extensive (Richards, letter of July 23, 1939). The artifacts from the yellow sand, Richards concludes, are of no great antiquity. Much of the material is in the Peabody Museum, Harvard University; the American Museum of Natural History; the University of California; and the New Jersey State Museum.

### NEW MEXICO

*Burnet Cave.*—Locality about 26 miles west of Carlsbad (approximately 50 miles by road) on south fork of Rocky Arroyo on eastern side of Guadalupe Mountains (Sec. 35, R. 21 E., T. 22 S.), Eddy County, discovered, 1930; announced, Howard, 1930. Principal literature: Howard (1930; 1931; 1932; 1933, p. 524; 1935, p. 62-79; 1936b, p. 406; 1936f; 1936g, p. 1327-1329; 1937a, p. 112); Howard and Antevs (1934); Merriam (1936, p. 1316); Roberts (1937b, p. 157-158); Schultz and Howard (1936); Woodward (1935, p. 406); Wormington (1939, p. 15).

In Burnet Cave, a Folsom-like point was found at approximately 5½ feet, hearths at varying depths, and animal bones to a maximum depth of 8½ feet. Among extinct animals in the cave deposits were camel, horse, musk ox, bison, and cave bear. Schultz (letter of June 24, 1939) lists the following extinct species from this cave: *Arctodus* sp., *Equus excelsus, Equus tau, Camelops* sp., *Rangifer? fricki, Tetrameryx onusrosagris, Euceratherium collinum morrisi, Preptoceras sinclairi neomexicana,* and *Bison antiquus taylori.* The collections are in the University of Pennsylvania Museum, the Academy of Natural Science of Philadelphia, and the University of Nebraska State Museum.

*Cimarron.*—Locality on south bank of Cimarron River 8 miles east of Folsom, discovered, January, 1935; announced, Figgins, 1935. Principal literature: Figgins (1935a); Hrdlička (1937c, p. 98-99); Hooton (1937); Roberts (1937a); Shapiro (1937); Woodbury (1937).

A human skull and parts of a skeleton were found in stream deposits 13½ feet below the surface. The geology seems not to have been fully investigated. The human remains were described by Figgins (1935a) as a new species, *Homo novus mundus.* Roberts and others who have examined the skull consider it to represent *Homo sapiens* Linnaeus. No associated vertebrate fossils have been reported. The collection is in possession of J. D. Figgins.

*Clovis.*—Several localities near Clovis in Blackwater Draw (T. 1 S., R. 34 E. and R. 36 E.), discovered, 1932; announced, Howard, 1933. Principal literature: Antevs (1935, p. 309; 1936b); Frank Bryan (1938); Chaney (1935); Cotter (1937a); Howard

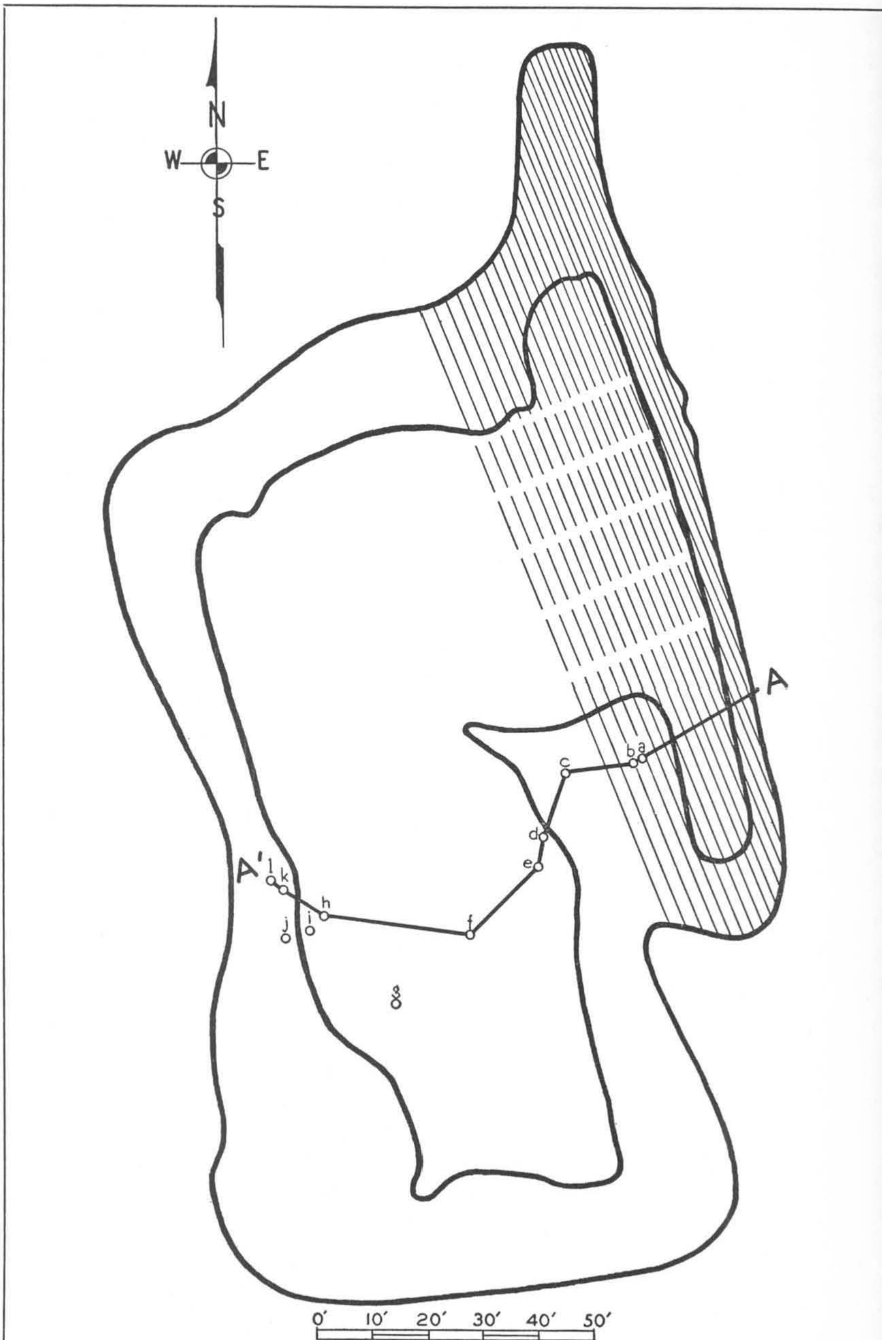


FIGURE 3.—*Outline of gravel pit on Hanagan ranch*

Shading indicates area of well-developed conglomerate at base of Clovis beds. (A-A') Line of section of Figure 4; (a to l) Location of measured sections.

(1933, p. 524; 1935, p. 79; 1936a, p. 333; 1936b, p. 407; 1936c; 1936d; 1936f; 1936g, p. 1329-1333; 1936h; 1937a, p. 111; 1939b); Richards (1936); Roberts (1937b, p. 157); Stock and Bode (1937); Woodward (1935, p. 406); Wormington (1939, p. 15-18).

Numerous artifacts have been found, including spears, knives, and scrapers. Among extinct animals present are elephant, horse, bison, camel, and peccary. The elephant has been identified by Stock and Bode (1937, p. 234) as *Parelephas* cf. *columbi* (Falconer) and the horse as *Equus* cf. *excelsus* Leidy.

Of the several localities in the Clovis area, the greater amount of material has come from a gravel pit on the P. H. Hanagan ranch. The geologic section at this pit, aside from the underlying bed rock, includes two formations; the older consists chiefly of gravel and sand with some sandy clays and in places, at the top of the formation, a caliche stratum. No fossils have been reported from this formation. Unconformably overlying these deposits is a formation consisting of several strata interpreted by the writer as follows: (1) At the east side of the pit, conglomerate consisting of sand, clay balls, and pieces of caliche is overlain by dark sand; the whole is replaced at the center of the pit by light sand and at the west side of the pit by "speckled" sand. (2) Above these deposits, an ash-like stratum containing diatoms grades at some localities into an impure diatomaceous earth; this stratum has been referred to in the literature as "ash-gray beds" and "blue sands." (3) At the top of the section is a brown sand stratum. The ash-gray beds and the overlying brown sand persist across the width of the pit; the ash-gray beds are found at all the localities yielding fossils in the Clovis area. This formation, consisting of the three horizons described, contains all of the fossils and artifacts found in the Clovis area. For these deposits Antevs proposed the term Clovis Lake clays. Since the formation includes sands as well as clays, the writer prefers the term Clovis beds.

That an unconformity exists in this section was commented on by the writer in letters to Stock and Howard in 1938. A section across the gravel pit is given in Figure 4. From this section it will be seen that a caliche stratum is present at the east side of the exposure. This caliche stratum is definitely under the unconformity; large pieces of the caliche up to one foot or more across have been reworked and included in the overlying deposits. In Figure 3, the part of the pit in which the unconformity is well marked by a basal conglomerate is indicated by shading. At the west margin of the pit where the conglomerate is wanting and where the "speckled" sand rests on loose sand or on sand and gravel, the unconformity cannot be readily recognized.

The writer's interpretation of the section is as follows: The sand and gravel of the formation below the unconformity is stream laid and very possibly is part of an ancient stream terrace. The caliche stratum represents secondary accumulation of calcium carbonate at or near the original soil level, previous to the deposition of the overlying deposits. The presence of the caliche at this level is definite evidence, the writer believes, that the terrace containing the stream-laid gravel was a land surface

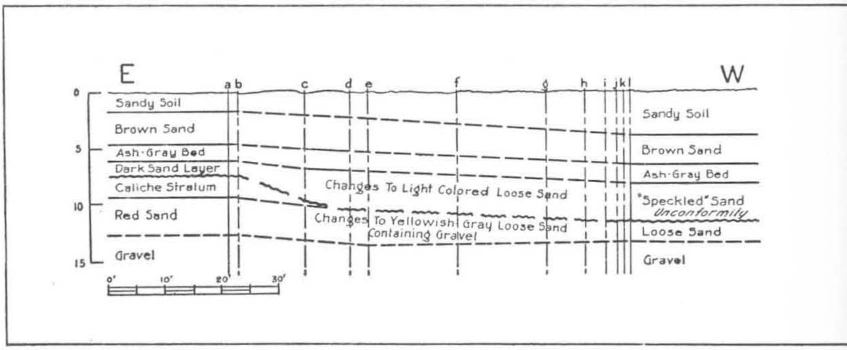


FIGURE 4.—*East-west section across gravel pit on line A-A′ of Figure 3*
Reconstructed in part. (a to l) Location of measured sections.

subject to accumulation of caliche at soil level for a long period of time previous to the deposition of the overlying beds. The fossils and artifacts, as previously stated, are contained in the later deposits. This particular locality was apparently near the margin of a lake. The pieces of caliche and clay balls which are abundant in the conglomerate were washed from the nearby shores of the lake and were carried to their present resting place either by wave or stream action or both. This conclusion as to the relatively late age of the deposits holding the fossils and artifacts is in agreement with the conclusions of Howard, Antevs, Stock, and others. The unconformity within the section, however, which gives added support to this conclusion, although implied, seems not to have been previously commented upon. Frank Bryan, in a recent paper, has assumed that the fossils and artifacts at this locality are of the age of the stream-laid gravels and hence very ancient. With this conclusion, the writer, as indicated above, does not agree. On the contrary, the fossil-bearing beds, the writer believes, are of much later age than the underlying gravels, from which they are separated by an unconformity representing a long interval of time. The collections from this locality are in the University of Pennsylvania Museum and the Academy of Natural Sciences of Philadelphia.

*Conkling Cavern.*—Locality 14½ miles southeast of Las Cruces, discovered, 1929; announced, W. A. Bryan, 1929. Principal literature: W. A. Bryan (1929); Conkling (1932); Howard (1935, p. 146; 1936a, p. 332; 1936b, p. 405); Romer (1933, p. 80); Wormington (1939, p. 52-53).

Human remains were found in this cave at three levels at depths of 12, 21, and 52 feet. Remains of extinct animals were found at successive levels from 10, 12, and 52 feet (Conkling, letter of August 17, 1939). The extinct animals were in some instances in immediate association with the human skeletal remains. No artifacts were found. Among extinct animals obtained from this cave were *Nothrotherium*, *Camelops*, and *Equus*. Collections are in the Los Angeles Museum of History, Science, and Art.

*Folsom.*—Locality in a small stream valley occupied by an arroyo 28 miles southeast of Raton, New Mexico, discovered, 1926; announced, Figgins, 1927. Principal literature: Amsden (1931); Antevs (1935, p. 309); Brown (1928; 1929; 1932); Kirk Bryan (1929; 1937a, p. 140-143); Cook (1927a, p. 243-244; 1928b; 1931a, p. 102); Figgins (1927, p. 232-234); Hay and Cook (1930); Howard (1935, p. 145; 1936b, p. 407; 1936f; 1937b, p. 331); Renaud (1928, p. 43); Roberts (1937b, p. 153-157); Romer (1933, p. 79); Wormington (1939).

Sixteen or more artifacts have been obtained in immediate association with an extinct bison, *Bison taylori* Hay and Cook, and, according to Figgins (1933b, p. 21), *Bison oliverhayi*. However, Brown who has examined this bison material considers that *B. oliverhayi* is based on a female skull of *B. taylori* and hence is not a valid species (letter of September 5, 1939). Remains of some 40 or 50 bison were found within a small area representing, in the opinion of Brown, a bison kill by early man. A few fossils other than *Bison taylori* were obtained, all or nearly all of which are living species. This is the type locality for the Folsom culture. The age of the deposits, in the opinion of Brown, is late Pleistocene or possibly early Recent (1929, p. 129). Bryan considers the age as late Pleistocene. The collections from the locality are in the Colorado Museum of Natural History, Denver, and in the American Museum of Natural History, New York.

*Sandia Mountain area.*—Locality on east side of Las Huertas Canyon, in the northern part of Sandia Mountains, discovered, 1936; announced, Hibben, 1937. Literature: Hibben (1937).

Artifacts and a fireplace have been found in Sandia Cave. Among fossils found in the cave are horse, camel, and mastodon. The collections are at the University of New Mexico, Albuquerque.

*Shelter Cave.*—Locality on west flank of Bishop's Cap (Pyramid Peak), about 2½ miles west and south of Conkling Cavern in Organ Mountains. Literature: Stock (1930b; 1932).

This cave has yielded some relics of human occupancy. The relation of human materials to extinct animals has not been definitely determined.

### NEW YORK

*Lake Ontario.*—Locality in village of Gaines, Orleans County, discovered about 1867; announced, Gilbert, 1887. Principal literature: Gilbert (1887); Holmes (1919, p. 79).

A hearth was found at depth of 15 to 18 feet in terrace deposits interpreted by Gilbert as belonging to the period of decline of glacial climate.

### NORTH DAKOTA

*Arvilla.*—Locality in a gravel pit near Arvilla, discovered, 1908; announced, Jenks, 1932. Literature: Jenks (1935, p. 11-14).

Artifacts said to have been made of elephant ivory were obtained from burials. The collections are with Professor Jenks.

### OHIO

*Loveland.*—Locality in a gravel pit in valley of Little Miami River near Loveland, discovered, 1887; announced, Wright, 1888. Principal literature: Holmes (1893b, p. 148-153); Leverett (1893, p. 188-189); Wright (1888a; 1888b, p. 258-259; 1890, p. 532; 1892, p. 250; 1893, p. 33).

An artifact is reported to have been found by Dr. Metz in a river terrace deposit at a depth of 20 or 25 feet. Two other objects which may or may not be artifacts were obtained from the same deposits. Mastodon bones were found in close proximity (Wright, 1892). The gravel deposits, according to Leverett, are of the age of the associated late glacial moraines of this region. Leverett was not convinced that the artifact could not have been in some way introduced into the deposits.

*Madisonville.*—Locality in a cistern in Madisonville, discovered, 1885. Principal literature: Abbott (1889, p. 296); Holmes (1893b, p. 153); Leverett (1893, p. 186-188); Wright (1888a, p. 432; 1888b, p. 257-258; 1890, p. 530-532; 1892; 1893, p. 32-33).

An artifact was found at a depth of about 8 feet at the contact of red clay on gravel. The red clay, according to Leverett, may be late Pleistocene, even post-glacial. No extinct animals were found in association with the artifact. The collection is in the Peabody Museum of Harvard University.

*Miami River.*—Locality in terrace of Miami River near Madisonville, discovered, 1885. Literature: Wright (1892, p. 250).

An artifact was found in a river terrace deposit at a depth of 8 feet.

*Newcomerstown.*—Locality in a gravel pit at Newcomerstown, discovered, 1889; announced, Wright, 1892. Principal literature: Holmes (1893b, p. 155-159; 1919, p. 80); Wright (1892, p. 251; 1893, p. 33-39).

An artifact is reported to have been found in a gravel pit at a depth of about 15 feet. No extinct animals reported.

### OKLAHOMA

*Afton.*—Locality a spring at the head of a branch of Horse Creek, a tributary of Neosho River, near Afton, discovered, 1901. Literature: Holmes (1902b).

Many artifacts were found at this spring. The association of the artifacts with extinct animals is questioned by Holmes.

*Frederick.*—Locality a gravel pit on the A. H. Holloman farm, one mile north of Frederick, discovered, 1926 or earlier; announced, Figgins, 1927. Principal literature: Antevs (1935, p. 304); Cook (1927a, p. 244-247; 1927b, p. 116-117; 1928a; 1931b); Evans (1930); Figgins (1927, p. 234-239); Gould (1929b); Hay (1928a; 1929a); Hay and Cook (1930); Howard (1935, p. 145); Renaud (1928, p. 37); Romer (1933, p. 80); Sellards (1932); Spier (1928a; 1928b).

According to the operator, A. H. Holloman, several artifacts and fossils have been obtained. According to Hay and Cook, the fossils include the following genera: *Amyda, Camelops, Elephas, Equus, Felis, Glyptodon, Gomphotherium, Lama?, Megalonyx, Mylodon, Odocoileus, Ovibos?, Platygonus, Symbos?, Stegomastodon, Tapirus, Testudo?.*

The gravel pit is in the highest terrace of Red River in this region and is more than 150 feet above present water level in the South Fork of Red River, which is the nearest tributary. In lowering the drainage to the present level, successive terraces were formed, the youngest of which contains extinct animals. Four of these terraces have been named (Sellards) as follows, in order from the oldest to the most recent: Holloman, Hefner, Mitchell, and Davidson. The Holloman terrace is the one in which the artifacts are reported; the Davidson terrace is a broad low terrace adjacent to Red River and its tributary, North Fork. With the lowering of the drainage there occurred a westward or southwestward shifting of the North Fork of Red River. The exceptionally complete preservation of the terrace system in the vicinity of Frederick is due to the shifting of this tributary. On the opposite side, that towards which the North Fork has shifted, almost no high terrace deposits have been preserved.

The deposits of the Holloman terrace were, in the writer's opinion, sealed in Pleistocene time and remained undisturbed, except as erosion cut into the terrace at its east margin, until quarrying operations uncovered the gravel. Since the time when the terrace was formed, the Red River drainage system has lowered its level more than 150 feet in this part of the State. In the process of stream development extensive lower terraces were cut. The development of these terraces resulted in the partial destruction of the older Holloman terrace. Other and lower terraces down to the present Recent valley of the river attest the downcutting of the drainage system. The lowering of this part of the system, with associated terrace development, implies adjustment throughout much or all of the Red River drainage system. Erosion east and south of the present Holloman terrace has resulted in removal of the gravel and sand sheet which quite certainly extended beyond its present margin. An upland, which has since disappeared, necessarily bounded the terrace eastward. The Holloman terrace, under this interpretation, is Pleistocene and by no means the most recent Pleistocene of this region, since successively lower terraces down to or nearly to the present river likewise are Pleistocene.

If artifacts are present in the gravel deposits of the Holloman pit, and there seems to be no reason to question the observations of Mr. Holloman, they are unmistakably of Pleistocene age. The collections are in the

Colorado Museum of Natural History, the University of Oklahoma, and with A. H. Holloman, Frederick, Oklahoma.

### OREGON

*Fossil Lake.*—Discovered, 1878; announced, Cope, 1878. Principal literature: Cope (1878; 1889, p. 970-982; 1895, p. 599); Howard (1935, p. 144; 1936b).

Artifacts at this locality are said to be "mixed with" bones of extinct animals. The extinct mammals listed are elephant, horse, camel, and sloth. Contemporaneity of the artifacts and fossils, in the opinion of Cope, is probable but not proven. Location of the collection is unknown.

*Silver Lake.*—Discovered, 1879; announced, Cope, 1889. Principal literature: Cope (1889); Howard (1935, p. 144; 1936b, p. 394).

Cope found camel, horse, and sloth in a lake bed associated with obsidian implements (Howard, 1935). The artifacts are in the U. S. National Museum, no. 148127. Some of the collection from Silver Lake is in the Smithsonian Institution, Washington, D. C.

### SOUTH CAROLINA

*Charleston.*—Locality on banks of Ashley River about 10 miles upstream from Charleston, announced, Schmidt, 1872. Principal literature: Hrdlička (1907, p. 20); Schmidt (1872).

Human bones, artifacts, and pottery were reported to have been found by F. S. Holmes in association with mastodon. Details of occurrence and of the geologic conditions are wanting. The location of the collection is unknown.

### TEXAS

*Abilene.*—Localities on Clear Fork of Brazos River and on Elm Creek in the vicinity of Abilene, discovered, Ray, 1929. Principal literature: Leighton (1936); Ray (1929; 1938); Sayles (1936); Wormington (1939, p. 44-45). An additional bibliography on these sites will be found in the Bulletin of the Texas Archeological and Paleontological Society.

Artifacts are found in alluvial deposits at varying depths up to about 30 feet. Burials made as the valleys were being filled by alluvial deposits are not uncommon. Extinct animals have been found in alluvial deposits similarly located on these streams. The collections are largely in the possession of Dr. Cyrus N. Ray and the Texas Archeological and Paleontological Society, Abilene.

*Buckner Ranch.*—Locality on the Buckner ranch on the right bank of Blanco Creek about 12 miles east of Beeville, Bee County, discovered, 1938.

Several artifacts have been found to a maximum depth of 16 feet in stream terrace deposits. Charcoal, burnt rock, and hearths are likewise present. Fossils found in immediate association include *Parelephas columbi* (Falconer), *Mastodon americanus* (Kerr), *Equus,* bison, and glyptodont. The collections are at The University of Texas. Excavations are in progress at this locality (Sellards, manuscript).

*Cowan Ranch.*—Locality on the Cowan ranch, 9 miles northwest of Miami, Roberts County, discovered, December, 1934; announced, Mead, 1935. Principal literature: Mead (1935); Sellards (1938); Studer (1935); Wormington (1939, p. 13-15).

Four artifacts were found in immediate association with the Columbian elephant, *Parelephas columbi* (Falconer). The collection is at The University of Texas and with J. A. Mead, Miami, Texas.

*Hopper Ranch.*—Locality on the Hopper ranch, about 11 miles southwest of Lipscomb, Lipscomb County, discovered, 1938.

Artifacts of the Folsom culture were found in association with extinct bison (Schultz, manuscript).

*Lagow sand pit.*—Locality Lagow sand pit, Dallas, discovered, October, 1920; announced, Shuler, 1923. Principal literature: Lull (1921); Shuler (1923).

Human bones were found in a gravel pit at a depth of 5 feet. The gravel deposits are part of a stream terrace, the top of which is about 50 feet above the flood plain of Trinity River. The overlying strata are reported to have been undisturbed. The degree of fossilization of the human bones is said to be about the same as that of the associated animal bones. The species identified from the sand pit are as follows (Lull): *Smilodon fatalis* (Leidy), *Odocoileus* sp., *Tetrameryx shuleri* n. gen. and sp., *Bison alleni* Marsh, *Camelops huerfanensis dallasi* n. subsp., camel, gen. and sp. indet., *Equus* cf. *E. fraternus* Leidy, *Elephas columbi* Falconer. The collection is at Southern Methodist University, Dallas, Texas, and at Yale University.

*Lone Wolf Creek.*—Locality on Lone Wolf Creek near the east city limits of Colorado, Mitchell County, discovered, 1924; announced, Cook, 1925. Principal literature: Cook (1925; 1926, p. 335-336; 1927a, p. 240-243); Figgins (1927, p. 229-231; 1935b, p. 4); Goddard (1926); Hay (1927b, p. 288); Hay and Cook (1930); Renaud (1928, p. 33); Romer (1933, p. 79); Wormington (1939, p. 26-27).

Three artifacts were found associated with the skeleton of a bison subsequently described as *Bison figginsi* by Hay and Cook. The artifacts and fossils occur in valley fill, now being rëexcavated by the present stream. The fossils occur a little above present low-water level. In addition to the bison skeleton, Cook (1927a, p. 241) obtained at a slightly lower level teeth of horse, camel, and elephant. The collections are in the Colorado Museum of Natural History, Denver, Colorado.

*Lubbock.*—Locality on United States highway No. 84 about 3 miles northwest of Lubbock.

Artifacts and fossil bones of bison and elephant were obtained and reported to the writer from the spoils bank of a canal by Adolph Witte in 1938. The locality is being excavated by the Department of Anthropology of Texas Technological College.

*McLean.*—Locality on a small stream tributary to Mulberry Creek about 30 miles southwest of Abilene, discovered, July, 1938; announced, Bryan and Ray, 1938.

Principal literature: Kirk Bryan and Ray (1938, p. 263-268); Ray and Kirk Bryan (1938, p. 257-258); Wormington (1939, p. 15).

A spear point was found closely associated with part of a skeleton of an elephant, *Parelephas columbi* (Falconer). The collection is in the possession of the Texas Archeological and Paleontological Society, Abilene, Texas.

*Malakoff.*—Locality near Malakoff, Henderson County, discovered, 1929; announced, Sellards, 1930. Literature: Sellards (1930).

In 1929 a stone, rudely carved to represent the head of man, was found at the base of a gravel pit at a depth of 16½ feet (Sellards). A second similar carved stone was found in 1935 and a third in 1939 (Sellards, manuscript). Associated fossils include sloth, horse, elephant (*Parelephas columbi*), camel, and bison. Excavations are in progress at this locality. The collection is at The University of Texas.

*Round Rock.*—Locality on Brushy Creek near Round Rock, Williamson County, discovered, 1934; announced, Pearce, 1935. Principal literature: Pearce (1935); Sellards (1935; 1936).

Artifacts have been found in stream terrace deposits. No extinct vertebrates have been found in immediate association with the artifacts. The collection is at The University of Texas.

*White Rock Creek.*—Locality in the valley of Brazos River in McLennan County. Literature: Frank Bryan (1931).

Frank Bryan reported finding an artifact at a depth of 40 feet in a gravel pit. The elephant is an abundant fossil at this locality.

## SOUTH AMERICAN LOCALITIES

### GENERAL DISCUSSION

A discussion of South American localities of early man reported previous to 1912 will be found in a publication by Aleš Hrdlička in collaboration with W. H. Holmes, Bailey Willis, F. E. Wright, and C. N. Fenner (1912). Later publications on the same subject are those of Sir Arthur Keith (1925; 1931), Walter, Cathoud, and Mattos (1937), Spillman (1936), and Bird (1938).

### CHILE

*Fell's Cave.*—Locality in a shelter cave in the valley of Río Chico, north of Magellan Strait and east of Laguna Blanca. Literature: Bird (1938).

A layer 3 to 9 inches thick at the bottom of the cave deposit contained fire hearths, stone flakes, rubbing stones, stone and bone artifacts, and broken and burnt bones of horse, sloth, and guanaco. The next overlying stratum formed by rock caving from the roof is 16 to 28 inches thick and is sterile. Above this layer the horse and sloth were absent and the artifacts were unlike those below.

*Palli Aike Cave.*—Locality 20 miles east of Fell's Cave. Literature: Bird (1938).

Broken and burnt bones of horse and ground sloth were found with occupational refuse including stone and bone tools. At a lower level were found charcoal and stone flakes and seven sloth skeletons.

### ECUADOR

*Punin.*—Locality near Riobama, discovered, 1923; announced by Anthony in 1925. Principal literature: Anthony (1925).

The fossil was found in a volcanic ash bed containing a Pleistocene fauna. Among common species of this deposit, according to Anthony, are the following: *Equus andium* (?), *Dibelodon andium*, *Mylodon* sp. (?), *Protauchenia*, *Arctotherium* sp. (?), *Smilodon* sp. (?). Of this occurrence, Anthony says:

"Serious consideration must be given to the implied contemporaneity of this cranium with the Pleistocene species of the Punin beds."

The collections are in the American Museum of Natural History, New York.

*Alangasi.*—Locality near the village of Alangasi, about 13 kilometers east of Quito, Ecuador. Principal literature: Spillman (1936); Osborn (1936).

Spillman reports that in April, 1928, he found a complete skeleton of a mastodon associated with potsherds, fireplace, and spear heads. The bones of the animal were charred. The evidence is said to indicate that the animal had been killed and roasted by man and that the event occurred in Recent time. Osborn (1936, p. 571) identified this mastodon as *Cuveironius* (*Bunolophodon*) *postremus*.

## SUMMARY OF PRINCIPAL EXTINCT MAMMALIA ASSOCIATED WITH HUMAN REMAINS IN NORTH AND SOUTH AMERICA

### ELEPHANT

The presence of man in America previous to the extinction of the elephant on this continent has been fully established. The elephants most commonly reported with man's remains are those of the species or group of *Parelephas columbi* (Falconer). The definite association of this or a closely related species with artifacts has been established by Howard (1933) at Clovis, New Mexico, and by the writer (1938) at the Cowan Ranch locality in Roberts County, Texas. This association has also been recently observed by the writer at the Buckner Ranch locality in Bee County, Texas, and at the Malakoff locality in Henderson County, Texas. Other localities where this association has been observed are Vero and Melbourne, Florida (Gidley, 1927; Loomis, 1924; Sellards, 1937); McLean, Taylor County, Texas (Ray and Bryan, 1938); and Las Vegas, Nevada (Simpson, 1933; Harrington, 1934a). The association at

Dent, Colorado, is probably with this species (Figgins, 1933a, p. 7). This species occurs also at Frederick, Oklahoma (Hay and Cook, 1930), and at the Lagow sand pit, Dallas (Shuler, 1923).

Several other occurrences of elephants associated with human remains have been reported. Williston (1905a) states that the marl deposits overlying the blue clays in which the artifact was found by Martin at Russell Springs, Kansas, contains the woolly elephant, *Mammonteus (Elephas) primigenius* (Blumenbach). Sinclair (1904) reports that this species is present in the Potter Creek Cave in which were found the pieces of bone identified by Gidley, Matthew, and Putnam as worked by man. The imperial elephant, *Archidiskodon imperator* (Leidy), is reported by Bowden and Lopatin (1936) as occurring in the same deposits as the human skeletal remains near Los Angeles, California. Osborn (1932) has identified the elephant found associated with artifact at Angus, Nebraska, as *Archidiskodon meridionalis nebrascensis*. An elephant, species not identified, has been reported in deposits above artifacts at Whitewater Creek, Arizona (Antevs, personal communication). Hay (Hay and Cook, 1928) has described a new species of elephant from the gravel deposits reported to contain artifacts near Frederick, Oklahoma. The elephant is reported also from Lake Lahontan, Nevada, in deposits from which McGee obtained an artifact.

### MASTODON

Mastodon remains have been found in association with human remains at several localities in North and South America. The species represented in most, if not all, instances in North America is the American mastodon, *Mastodon americanus* (Kerr). The first reported occurrence in North America of extinct animals in association with man, of which the writer has found record, was by Koch (1839a), who claims to have found in October, 1838, a mastodon skeleton and associated artifacts in the valley of Bourbeuse River in Gasconade County, Missouri. The next year, a similar discovery, according to Koch, was made in the valley of Pomme de Terre River in Benton County, Missouri. In South Carolina, Holmes although he did not publish on the subject, is said to have found artifacts, including pottery, in association with mastodon remains. Dickeson (1846) believed that human skeletal remains were derived from the same stratum as were the mastodon and other fossils obtained by him at Natchez. In 1916, the American mastodon, along with other extinct species, was found in association with human remains at Vero, Florida (Sellards, 1916a), and later, under similar conditions, at Melbourne Florida. Hibben (1937) reports *Mastodon* in association with artifacts at Sandia Cave, New Mexico. This species is present also in Potter Cave, California. In Ecuador, South America, Spillman (Osborn, 1936, p. 571-574) reports a mastodon skeleton associated with spear heads, potsherds, and a fireplace, representing, in the opinion of Spillman and others, a relatively recent feast on roasted mastodon.

### SLOTHS, ARMADILLOS, AND GLYPTODONTS

One of the early reported discoveries in America of man associated with extinct animals was by Lund at Lagoa Santa in Brazil, South America. In caves on the shore of Lake Sumidouro in the province of Minas Geraes, Lund from 1835 to 1846 found what he believed to be evidence of human habitation contemporaneous with ground sloth and other animals now extinct. According to Walter, Cathoud, and Mattos, new investigations are being made of caves of the Lagoa Santa region. The genus *Glossotherium* has been reported in association with human remains at Eberhardt Cave of Ultima Esperanza, near Last Hope Inlet, Patagonia (Stock, 1931, p. 23). Bird (1938) found fossil ground sloth associated with artifacts in Fell's and Palli Aike caves in Chile.

In North America, *Megalonyx*, has been found at Vero and Melbourne, Florida; Frederick, Oklahoma; Potter Cave, California; Malakoff, Texas; and Natchez, Mississippi. *Mylodon* has been found at Melbourne, Florida; Frederick, Oklahoma; and Natchez, Mississippi. *Chlamytherium* and *Dasypus* have been found at Vero and Melbourne, Florida; and *Glyptodon* at Frederick, Oklahoma, and Melbourne, Florida. A striking find of human skeletal remains in association with sloth was made in 1929 at Conkling Cavern in New Mexico. At this cave the human remains are found with and below sloth remains, genus *Nothrotherium*. This sloth has been found also in Gypsum Cave, Nevada.

### HORSE

In the southern part of the United States, horses of several species occur in relative abundance in deposits containing human remains. The following are some of the localities in North America at which fossil horse of the genus *Equus* has been found with or near man's remains or artifacts: Buckner Ranch, Malakoff, Lagow sand pit, and Lone Wolf Creek, Texas; Burnet Cave, Clovis, Conkling Cavern, and Sandia Mountain area, New Mexico; Melbourne and Vero, Florida; Gypsum Cave, Smith Creek Cave, Lake Lahontan, and Las Vegas, Nevada; Whitewater Creek, Arizona; Natchez, Mississippi; and Frederick, Oklahoma. Bird (1938) found fossil horse associated with artifacts in Fell's and Palli Aike caves in Chile.

### BISON

Extinct bison, of several species, have been found in association with human remains at many localities on the North American continent.

Bison are present at the Natchez locality. In 1895 an artifact was found associated with an extinct bison at Russell Springs, Kansas (Williston, 1902a). In Nebraska in recent years, a similar association has been recorded at Bridgeport, Crawford, Cumro, Grand Island, and Scottsbluff; in Minnesota at St. Croix Valley and Lake Itasca localities; in New Mexico at Burnet Cave, Folsom, and Clovis; in Florida at Melbourne; in Nevada at Las Vegas; and in Texas at Lone Wolf Creek, Buckner Ranch, Malakoff and at the Hopper Ranch localities.

### CAMEL

Camel remains, chiefly, but not entirely, of the genus *Camelops,* have been found with or near human remains or artifacts at the following localities in North America: Gypsum Cave, Las Vegas, Smith Creek Cave, and Lake Lahontan, Nevada; Burnet Cave, Conkling Cavern, Clovis, and Sandia Cave, New Mexico; Lagow sand pit, Texas; Vero and Melbourne, Florida; Frederick, Oklahoma; Whitewater Creek, Arizona; and Malakoff, Texas.

### OTHER EXTINCT MAMMALS, BIRDS, AND REPTILES

Among other extinct mammals reported with or near human remains or artifacts from more than one locality are the following: Tapir, Vero and Melbourne, Florida, and Frederick, Oklahoma; dire wolf, Vero and Melbourne, Florida, and Whitewater Creek, Arizona; sabre-tooth tiger, Vero, Florida, and Lagow sand pit, Texas; peccary, Russell Springs, Kansas, Potter Creek Cave, California, Melbourne, Florida, Clovis, New Mexico, and Frederick, Oklahoma; *Odocoileus sellardsiae* at Vero and Melbourne, Florida. *Castoroides ohioensis* has been found at Bridgeport, Nebraska, and the cave bear, *Arctodus,* at Burnet Cave, New Mexico. *Gomphotherium* sp. and *Stegomastodon* sp., found in the gravel pit at Frederick, Oklahoma, should be mentioned as possible associates of man's remains. Several other extinct species are listed in the Burnet Cave, Potter Creek Cave, Vero, and Melbourne faunas. The extinct stork *Jabiru weillsi* Sellards from Vero has not as yet been found elsewhere. This is true also of three other new species of birds found at Vero, described by Shufeldt. A new bird is reported by Harrington from Smith Creek Cave. From the Vero deposits Hay has described several extinct turtles.

### MARKINGS ON FOSSIL BONES AND STONES

The writer has called attention to and illustrated markings on a proboscidean tusk and on fossil bird bones from Vero, Florida; the markings are believed to have been made by man (Sellards, 1916c, pl. 22). Roberts has briefly described markings on fossil bones from Lindenmeier which he regards as having been made by man. These bones, according to Roberts (1939, p. 103), bear "incised lines indicating that the people had a simple form of geometric art." Eddy and Jenks report knife marks on bones of caribou and *Bison antiquus* Leidy, found in the valley of St. Croix River, Minnesota. Cook (1931a, p. 102) found markings which he believes were made by man on elephant and bison bones from Yuma, Colorado. Among proboscidean and other fossil bones obtained near Winter Beach, Florida, are some that show what appear to be marks of flint knives made in cutting the flesh from the bones. From gravel pits at Malakoff, Texas, three images rudely carved in stone have been obtained by the writer. These will be more fully described when excavations, which are now in progress, have been completed.

## CONDITIONS OF OCCURRENCE

Remains of early man occur in the Americas under varied conditions, such as peat, glacial outwash, loess, cave, stream terrace, lake, and blanket or formation deposits. The remains of mastodon and man in or under peat deposits have been reported at a few localities. At Worcester, Massachusetts, Putnam (1885) found man and mastodon skulls at the base of a 6-to 8-foot peat deposit. In recent years Burmaster (1932) has found mastodon and an artifact at the bottom of peat deposits at Cromwell, Indiana. Since the rate of formation of peat deposits is unknown, there is little information on which to estimate the actual age of such remains, and, accepting the association as proven, it is still as much a question of the recency of the extinction of the mastodon as of the antiquity of man. The writer has found the mastodon in the lowest and latest terraces of the Texas streams, and there is, likewise, the observation of apparently very recent mastodon in South America (Osborn, 1936).

The occurrence of human remains in glacial outwash and loess deposits has been vigorously contested. Classic localities are the relatively recent finds by Jenks and associates in Minnesota and, in loess deposits, the finds at Lansing, Kansas. At the Minnesota locality, very strong evidence is presented for the glacial age of the human remains. At the Lansing locality, the question at issue is as to whether the loess deposits are original or reworked. Artifacts have been reported from loess deposits at Walkerville, Illinois (McAdams, 1881), Muscatine and Sioux City, Iowa (Witter, 1892; Aughey, 1876), and at Omaha, Nebraska (Aughey, 1876).

Striking results have been obtained from exploration of caves in the United States in recent years. Particularly instructive are the finds obtained from Burnet Cave by Howard and associates; from Conkling

Cavern by Conkling and W. A. Bryan; from Sandia Cave by Hibben—all in New Mexico; and from Gypsum Cave in Nevada by Harrington and associates. In all of these caves extinct animals are more or less definitely in association with man's remains. Potter Creek and Samwell caves in California should also receive consideration in this connection. The proof of age in these caves rests chiefly on this association, although in Conkling Cavern there is a depositional record; the uppermost deposits contain human remains and sloth and are separated by a hard rock stratum from the lower deposits, which also contain human remains and associated fossils. However, the age determination in caves rests primarily on the faunal association.

The lake deposits of Arizona, California, and Nevada have afforded much new information. Whitewater Creek, Arizona (Antevs, 1937b), and Clovis, New Mexico (Howard, 1933), afford proof of association of man with extinct animals under climatic conditions differing from those of the present time. Several other localities—Borax Lake, Lake Mohave, and Pinto Basin, California—indicate the presence of man under conditions of greater moisture than exist in the same region at the present time. Lake Lahontan is a classic locality of reported artifact and extinct animals in the late history of that lake.

Stream terrace deposits in relation to human history are discussed in a subsequent section. With the active developments of recent years, many stream terrace deposits containing human remains are now known. Two localities containing human materials in blanket or formation deposits are Melbourne and Vero, Florida. To these is probably to be added the Winter Beach, Florida, locality, mentioned in this report. The formation from which the oldest human materials come at these localities is the Melbourne bone bed, as defined by Cooke and Mossom (1929, p. 218). This formation is Pleistocene in age.

## TIME OF EXTINCTION OF CERTAIN MAMMALIAN SPECIES

One or two decades ago, the discussions on early man in America centered around the alleged discovery of remains or artifacts with extinct animals. It was then commonly assumed that the proof of man's association with extinct species would of itself be conclusive proof of the presence of man in America in the Pleistocene. In recent years, the proof of this association having been established, the discussion has shifted to the possible recency of the extinction of the animals. Formerly the animals themselves were supposedly competent witnesses as to age of deposits. Now that their competency is called into question, these animals can no longer serve as index fossils, and supplementary proof of age must be found elsewhere.

## STREAM TERRACE DEPOSITS

Several years ago the writer emphasized the fact that stream terraces afford definite evidence of relative age of deposits and that man's remains may sometimes be obtained from these terrace deposits under conditions that will establish relative age and to a degree actual age (Sellards, 1936). Since that time progress has been made in the study of terrace deposits with the result that a better understanding is being obtained both as to the age of man and as to the range of species. Bryan (1937a, p. 148-149) has shown that the Folsom culture of the Lindenmeier site in Colorado is found in deposits which, traced downstream, become a terrace about 20 feet above stream grade, this being one of the terraces of tributaries of Boxelder Creek. These deposits, continued to Cache la Poudre River, become the 25-foot terrace of that stream and the 30-foot terrace of South Platte River.

During the past year the writer has demonstrated the presence of artifacts in the 25-foot terrace of Blanco Creek in Bee County, Texas, at the Buckner Ranch site. Among the artifacts of this locality are Folsom, Yuma, and other points, the culture being of Folsom age or later. Terraces vary in height with size of stream, and since the terraces on the small streams at the Lindenmeier and Buckner sites are so nearly of the same height, it is probable that the two localities are of the same geologic age or nearly so. The Malakoff locality of Henderson County, Texas, to be described in a later paper, lies in an older terrace. Stream terrace deposits in Nebraska are being actively studied by several investigators. The highest terrace from which artifacts have been reported is the Holloman terrace at Frederick, Oklahoma. This terrace is more than 150 feet above present water level in the adjacent streams (Sellards, 1932). It is certain that definite developments in the study of early man in America will be obtained from further study of stream terrace deposits and their fossil content, including man's remains.

## SUMMARY

The evidence now available proves that man has had a long continued existence in America, and that he was contemporaneous in the Western hemisphere with a considerable number of mammals and some birds and reptiles now extinct. The evidence of this association is derived from field observations by many observers at various localities under varied conditions of occurrence.

The age determination of human remains and artifacts is based not only on associated fossils but likewise on a study of the physiographic features, particularly the position of the stream terrace deposits in which the human relics and fossils are found.

The fact that all human skeletal parts thus far obtained in America are referred to the modern species does not preclude the possibility of their being of Pleistocene age since many vertebrate species other than *Homo sapiens* continued from Pleistocene to the present time. On the contrary there are many records indicating the presence of man in America previous to the close of the Pleistocene period and under climatic conditions differing from those of the present time. Man is present in the Pleistocene of America.

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