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*Fossil Mastodon and Mammoth Remains
In Illinois and Iowa*

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A PRELIMINARY LIST OF
FOSSIL MASTODON AND MAMMOTH REMAINS
IN ILLINOIS AND IOWA

BY

NETTA C. ANDERSON

ON THE
PROBOSCIDEAN FOSSILS OF THE PLEISTOCENE DEPOSITS
IN ILLINOIS AND IOWA

BY

JOHAN AUGUST UDDEN

PUBLISHED BY THE AUTHORITY OF THE BOARD OF DIRECTORS OF
AUGUSTANA COLLEGE AND THEOLOGICAL SEMINARY,
ROCK ISLAND, ILL.

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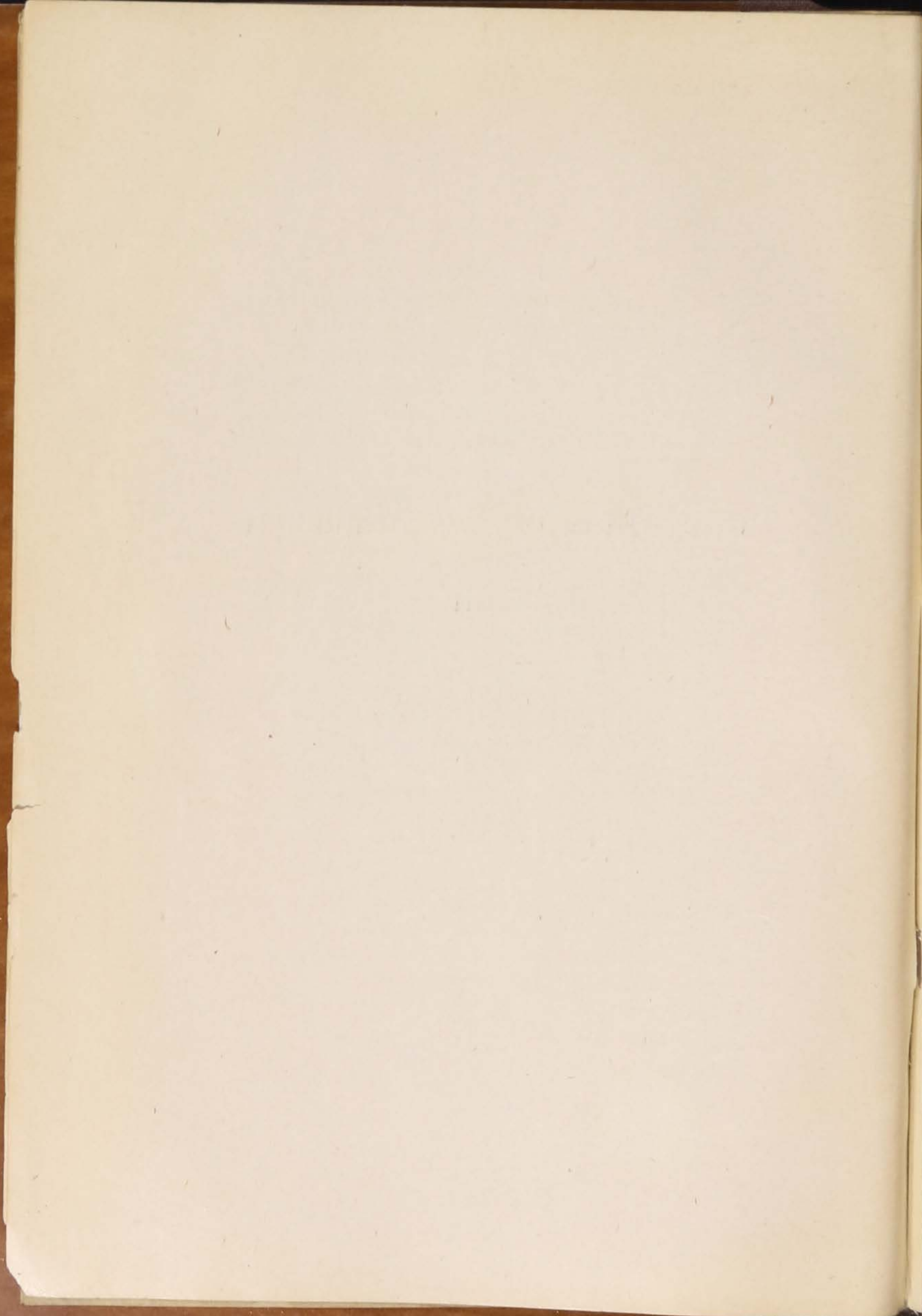
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INTRODUCTORY.

In submitting the subjoined Preliminary List of Fossil Elephant and Mastodon Remains in Illinois and Iowa, which is believed to be the first of its kind in these states, the compiler does not intend to imply that the list is nearly complete; she is impelled to publish the result of her research, thus far, in the hope that such a list may be of assistance in securing further data along this line. The difficulty in securing reliable information can be easily appreciated, for comparatively seldom does the working Geologist see such remains *in situ*, and the museums, their ultimate repositories, appear to keep scant record of the circumstances connected with such finds, their geographical and geological position, date of their discovery, etc.

In presenting this list the compiler would therefore make her humble plea for more complete and more carefully kept data from which the specialist must proceed in determining more nearly the true horizon of these huge Proboscidiens. She also wishes to express her gratitude to the State Geologists and Assistants, to Librarians, Curators of different museums, and to numerous private individuals, all of whom have so cheerfully assisted her, and in particular to Dr. J. A. Udden, of Augustana College, does she feel indebted for invaluable assistance and encouragement.

Rock Island, Illinois, May, 1905

ILLINOIS

CALHOUN COUNTY.

From the clay (drift clay) in the side of a ravine in Calhoun county, Illinois, we recovered the jaw of an elephant beside which Jumbo would seem small. One of the teeth from this jaw weighs nearly eighteen pounds.

(*McAdams, Transactions, St. Louis Academy of Science, Vol. IV, No. 3, p. lxxix.*)

CHRISTIAN COUNTY.

Sangamon River.—A tooth of a mammoth was found by David Miller in a sand drift near the South Fork of the Sangamon river, and was presented to the State Cabinet. This specimen is of a chalky white color and does not appear to have been impregnated with any mineral substance since it was imbedded in the earth.

(*Illinois Geological Survey, Vol. I, p. 38.*)

COOK COUNTY.

Evanston.—The tooth of a mammoth was taken from a gravel pit near Evanston. It was placed in the Museum of Northwestern University.

(*Reported by Prof. U. S. Grant, Northwestern University.*)

Glencoe.—A fragment of a mastodon tooth four and three-fourths inches long was dug up by Mr. James Robertson while ditching in glacial drift at Glencoe. The fragment, which is from the proximal end, is now in the possession of Mr. Walter O'Neill of Lake Forest.

(*Reported by Prof. James G. Needham, Lake Forest College.*)

DU PAGE COUNTY.

About 1875 some mastodon remains were found in a bog about eight miles southwest from Naperville. They were donated to the Museum of Jennings Seminary, Aurora.

(Reported by L. M. Umbach, Northwestern College.)

Wheaton.—About 1890 the remains of a mammoth were found while ditching on the Jewell farm near Wheaton. The remains consisted of about a dozen ribs, as many vertebrae, one femur, and other parts of the legs.

(Reported by Pres. Charles A. Blanchard, Wheaton College.)

EDGAR COUNTY.

The bottoms of the prairie sloughs along the western edge of Edgar county generally contain more or less light brown marly clay containing fresh water shells. From one of these slough bottoms a nearly perfect skeleton of a mastodon was obtained some years since, which, after having been exhibited through all this part of the United States, is said to have been sold to a Philadelphia museum. Fragments of this animal are not rare hereabouts.

(Illinois Geological Survey, Vol. IV, p. 216.)

FULTON COUNTY.

The Museum of Knox College contains the tooth of an elephant which was found in Fulton county. This specimen, which is much decayed, was found near the surface of the ground.

(Reported by Albert Hurd, Curator of Museum, Knox College.)

GALLATIN COUNTY.

Equality.—“Half Moon”—Many mammoth and mastodon bones and enamel plates of teeth, the less enduring parts of the latter mouldered into dust, have been found here. Half Moon is

a salt lick beneath which is a yellowish clay mixed with gravel and sand, belonging to the age of drift. The salt work was originally a swamp, for the bones lie on this drift.

(Illinois Geological Survey, Vol. I, p. 38.)

A fine tooth of a mastodon was found in Gallatin county and presented to the State Cabinet, but under what conditions it was found is not at present known.

(Illinois Geological Survey, Vol. I, p. 38.)

Shawneetown.—Teeth of a mastodon were found close to the water's edge in front of Shawneetown. They were imbedded in a shallow deposit of bluish clay resting upon yellow clay and gravel. Corresponds in geological time with bone beds at Half Moon.

(Illinois Geological Survey, Vol. VI, p. 214.)

GRUNDY COUNTY.

Morris.—In 1868 mastodon remains were found at Turner's Strippings, three miles east of Morris, under eighteen inches of black mucky soil and about four feet of yellowish loam and resting on about one foot of hard blue clay, which covered the coal. The bones were badly decayed, and most of them were broken up and thrown away by the miners. Of the remaining, Mr. J. Evan, of Morris, obtained and presented to the State Cabinet, a part of a thigh-bone, a fragment of a lower jaw, three teeth, and a few of the smaller bones. The locality is a part of the old river bottom, and in the lack of personal observation, I am uncertain whether to believe that the presence of the bones indicates that the animal was mired and died there or to suppose that the carcass was deposited there by the river.

(Illinois Geological Survey, Vol. IV, p. 193.)

Minooka.—"In 1902 Mr. John Bamford, in enlarging a bog-spring, encountered a mass of Bison, Deer, and Elk bones at about five feet below the surface. Passing through nearly two

feet of these, he came upon mastodon bones in abundance. Skulls of at least six different individuals had been found in a well ten feet in diameter when I visited the place in 1902. These animals had evidently resorted to this drinking place and had mired in the bog. Old settlers related several instances of cattle becoming mired at this place in the same way."

(Reported by E. S. Riggs, Assistant Curator of Paleontology, Field Columbian Museum, Chicago.)

HANCOCK COUNTY.

Warsaw.—"About five or six years ago one of my nephews found a large fragment (about one-half or more) of a mastodon tooth, sticking out of the bank of a creek, about five miles below Warsaw."

(Reported by Charles K. Worthen, Warsaw, Ill.)

HENRY COUNTY.

Penny's Slough.—The tooth of a mammoth in a good state of preservation was found in Penny's Slough and presented to the Davenport, Iowa, Academy of Science.

(Information obtained from label on specimen.)

Cambridge.—The Museum of the Chicago Academy of Science contains part of a tusk of a mastodon, recovered at Cambridge from a well, sixteen feet below the surface; condition poor.

(Reported by Frank C. Baker, Curator, Chicago Academy of Science.)

JO DAVIESS COUNTY.

Blue Mounds.—Mastodon remains have been taken from a great number of crevices over the whole area of the lead region, showing the species to have lived in immense numbers and through a long period of time. From a crevice near Blue Mounds,

bones of a mastodon were taken. *Elephas* also inhabited this region, though apparently less abundant than the mastodon. Few teeth found near the surface at

Galena are all the remains of this animal I met in this region.

(*Illinois Geological Survey, Vol. I, p. 162.*)

JOHNSON COUNTY.

Bloomfield.—The remains of a jaw and three teeth of a mastodon were found in the yellow clay about three feet below the surface near Bloomfield.

(*Proceedings, American Association for the Advancement of Science, Vol. X (1856), p. 163.*)

KANE COUNTY.

Aurora.—In 1870 tusks and several teeth of a mastodon were obtained from the superficial deposits of this county near Aurora when the excavation for the track of the Chicago, Burlington and Quincy railroad were made. These remains are in the Museum of Clark Seminary at that place.

(*Illinois Geological Survey, Vol. IV, p. 113.*)

Aurora.—In 1853, while extending the Burlington railroad south of Aurora, workmen found teeth and a tusk of a mastodon in a swamp on the edge of Fox river, where the Burlington repair shops at Aurora are located. The remains were presented to Jennings Seminary by an official of the road, Benjamin Hackney.

(*Reported by Mrs. Susan H. Quereau, Aurora.*)

Batavia.—In cutting a ditch to drain a marshy lake of some two hundred acres, some leg-bones and vertebrae of mastodon (along with Bison and other bones) were found in a sticky clay about five feet below the surface.

(*Reported, after personal investigation, by E. S. Riggs, Assistant Curator of Paleontology, Field Columbian Museum, Chicago.*)

KNOX COUNTY.

Galesburg.—Knox College Museum contains:

a) The tusk of an elephant which was found near Galesburg. The specimen is quite imperfect and was taken from recent deposits near the surface.

b) An elephant tooth, much decayed, which was found while ditching on a farm near Galesburg.

Spoon river.—c) A mastodon tooth in good state of preservation, the enamel nearly perfect, which was found in the bed of Spoon river in Knox county.

(The above three instances reported by Albert Hurd, Curator of Museum, Knox College.)

MACON COUNTY.

The museum of the Chicago Academy of Science contains two rami of the lower jaw and several molars of a mastodon, all in good state of preservation, which were found in Macon county.

(Reported by Frank C. Baker, Curator, Chicago Academy of Science.)

MADISON COUNTY.

Alton.—A portion of the jawbone of a mastodon with two teeth remaining was found in the lower part of the loess, just above the city of Alton. This specimen was found about thirty feet below the surface and near the bottom of the loess, where it was only separated from the limestone by two or three feet of local drift. The bones were of chalky whiteness and in very fine state of preservation.

(Illinois Geological Survey, Vol. I, p. 315)

MARION COUNTY.

Sandoval.—At Sandoval, about twenty-four miles north of Beaucoup, mastodon remains were found twelve feet below the surface, in similar position to the one at Beaucoup.

(Proceedings, American Association for the Advancement of Science, 1856, pp. 148—169.)

OGLE COUNTY.

Byron.—Some years ago a large bone, supposed to be from the foreleg of a mastodon, was found two or three miles above Byron. The bank of Rock river had caved down for some distance back from the stream; some five feet below the surface of the highland coming up to the river and about fifteen feet above ordinary water level, the bone was found sticking in the bank. The bank seems to be a sort of modified drift made up of somewhat marly, dark-colored, alluvial clay intermixed with river sand and considerable gravel. The formation is hardly alluvium, but seems to be a kind of river drift. The fossil is light, porous, and whitish in color, in rather poor state of preservation. We obtained it through the courtesy of Mr. Mix and sent it to the State Geological Cabinet.

(Illinois Geological Survey, Vol. V, p. 110.)

Harper.—A number of years ago Mr. Gross found the tooth of a mastodon on his farm in Forreston township, one mile south of Harper. A small stream cuts through the farm, and one spring, after a freshet, the tooth was found in a large bed of gravel which had been washed to one place along the shore of the stream. The freshet washed a hole about nine feet deep out of the bed of the stream just above this gravel bed, and the finder, thinking that the tooth might have been washed out of this place, made a diligent search for other remains, but failed to find anything. The tooth measures eight inches in length and four and a half inches in width at the widest point, and is in an excellent state of preservation, having smooth polished surfaces. Another tooth was found in the same place a short time before by a Mr. Ainsworth.

(Reported by Miss Abba Fager, Forreston.)

Rochelle.—“In July, 1886, I saw a collection of mammoth fossils at F. G. Rossman's, a farmer living near Rochelle, which he obtained in a bog in the northwest part of section thirty-three, Lynnville township. The fossils found were; one tusk, two

teeth, one piece of jawbone in which one tooth fitted, four pieces of ribs, and about a panfull of small bits of bones. The tusk weighed seventy-three pounds, but was not complete, each end being broken off. The length of the specimen was about five feet, and it measured twenty inches in circumference at the large end and about eighteen inches at the small end. The teeth each weighed twelve and one-half pounds and had a grinding surface nine inches long by four inches broad. The best rib specimen was forty inches long and five and three-fourths inches in circumference at the dorsal end. Another rib, thirty-four inches long, was not complete. The only further notes I have concerning these specimens is that the grinding surface is three or four inches shorter than the longest diameter of the tooth."

(Reported by Frank Leverett, Ann Arbor, Mich.)

Stillman's run.—Remains of the mastodon were found closely connected with the drift gravels. In 1858 a tooth was found in a little tributary of Stillman's run. The locality is low—somewhat marshy. The stream had cut a channel through the black alluvium of the low prairie. The tooth was washed out and lodged against a clump of willows when found. It is a ponderous grinder, weighs seven and a half pounds, is covered with a shining black enamel, and is a fossil in a high state of preservation.

(Illinois Geological Survey, Vol. V, p. 110.)

PEORIA COUNTY.

Peoria.—The remains of a mammoth, consisting of two molar teeth with a portion of the jaw, were found by Captain Smith in the gravel bed No. 2 of the following section in the Peoria bluff:

No. 1. Brown prairie clay and soil.

No. 2. Coarse gravel and sand with boulders.

No. 3. Clay and sand forming seven or eight distinct beds, some containing coarse gravel and boulders.

The specimen was presented to the State Cabinet.

(Illinois Geological Survey, Vol. V, p. 237.)

PIATT COUNTY.

Atwood.—The Museum of Northwestern University contains the tooth of a mammoth found near Atwood in 1879. The tooth was dug up about six feet below the surface.

(Reported by Prof. U. S. Grant, Northwestern University.)

RANDOLPH COUNTY.

Chester.—Mammoth and mastodon remains have been found in Alton and Chester. The fossils (bones) were found in loess. These belong to the collection of the Honorable Wm. McAdams, Alton.

(Illinois Geological Survey, Vol. VIII, p. 8)

ROCK ISLAND COUNTY.

Milan.—A piece of a tusk was found in the excavation made for brick clay by the Rockford Construction Company (1893?) on the north side of Rock river and on the east side of the Milan road south of Rock Island. It was taken from the red oxidized layer which forms the top of the boulder clay in the base of the bluff here and which was covered by a few feet of loess. The piece of tusk was about two feet long, but crumbled and broke into three pieces on exposure to the air. It was perceptibly curved, and measured about six inches in diameter at the proximal end, and about four inches at the distal end. The specimen is in the museum of Augustana College, Rock Island.

Rock Island.—In laying the overflow pipe from basins of the Rock Island water works on the bluff south of the city, a cut was made in the loess to a depth of about twenty-two feet near the edge of the bluff. In the lower part of this cut there was part of a tooth of an elephant and also a piece of a bone of the leg. The specimens were donated to the museum of Augustana College. The loess, at the point in the bluff where the bones were found, is about thirty-five feet thick, and the lower part of it is seen to be somewhat peaty in some of the cuts in the streets to the west.

Rock Island.—In the excavations which were made on the slope of the bluffs between Nineteenth and Twentieth streets in Rock Island in 1897, Dr. J. A. Udden found a carpal bone of an elephant. It was cuboid in form and measured some three or four inches in diameter. It was found on the surface of the ground in an excavation which was near the contact of the loess and the boulder clay.

Rural township.—A well preserved tooth of a mastodon was found in 1900 in a creek in the west half of section nineteen, township sixteen north, range one west (Rural township). The find was made by Mr. A. Dhuyvetter, after a heavy rain which caused high water in the creek. There are reports of other large bones having been found in the same creek. The drift in this township in places rests on pre-glacial gravels, consisting largely of chert. The tooth was secured for the collection at Augustana College.

(The above four instances were reported by Dr. J. A. Udden.)

SANGAMON COUNTY.

Illio polis and Niantic.—In 1870, between Illio polis and Niantic, near the east line of the county, the jaws of a mastodon, with teeth intact, both tusks, and several of the large bones were found beneath a black mucky surface soil, four feet in depth. These bones, together with some buffalo, elk, and deer, were imbedded in quicksand, which probably once formed the bottom of a pool of water to which these animals had resorted. The fossils now belong to the State Cabinet.

(Illinois Geological Survey, Vol. VIII, p. 23.)

The Niantic mastodon was found on the farm of W. F. Corell, in a wet, spongy piece of ground located in a swale or depression of the surface that had evidently once been a pond and had been filled up by the wash from the surrounding highland until it formed a morass or quagmire in dry weather. The bones were about four feet below the surface and partly imbedded in light gray quick-

sand filled with fresh-water shells. Above this quicksand was found four feet of black peaty soil, so soft that a fence-rail could easily be pushed down through it. The quicksand had evidently once formed the bottom of a freshwater pond, fed probably by springs, and was the resort of the animals whose bones were found here.

The first bone met with was one of the tusks, and, supposing it to be a small tree, it was cut in two with an axe before its true character was suspected. The other tusk was taken out whole and measured nine feet in length around the curve and about two feet in circumference where it was inserted in the skull. The lower jaw with the teeth in place and the teeth of the upper jaw and some of the smaller bones were also found in good state of preservation. The depth of the quicksand was not fully ascertained, but it was probed to the depth of two feet or more without reaching solid bottom.

(Illinois Geological Survey, Vol. V, p. 308.)

The tooth of a mammoth was found some years ago, in the bluffs of the Sangamon and near the surface and probably came from beds not older than the loess.

(Illinois Geological Survey, Vol. V, p. 308.)

VERMILION COUNTY.

Fairmount.—Forty-six years ago the remains of a mastodon were found in loess, two miles southeast of Fairmount. The black soil here is from one to two feet thick, and is underlaid by a light brown, tenacious clay filled with calcareous shells of *Limnea*, *Physa*, etc. Bones of a mastodon were found lying partly upon, partly imbedded in this marly clay, the tip of one of the tusks being within thirteen inches of the surface. The slough had been mostly drained of late years, the air had permeated the bed and pretty thoroughly decayed the bones, which were doubtless in good state of preservation so long as constantly covered with water. The parts were promiscuously mingled, showing that the

animal had not long been left to decay undisturbed. Marks of gnawing upon a few of the bones give reason to suppose that the water in which the carcass lay was so shallow as to give access to carnivorous animals. Fragments are in possession of the Chicago Academy of Science.

(*Illinois Geological Survey, Vol. IV, p. 242.*)

Danville.—Near the town of Danville, in the bluff forming the tableland of the country, the following section was observed:

Soil—five feet.

Gravel, with bones of an elephant—eight feet.

Clay—two feet.

Fine washed sand reposing on rocks of coal measures—two feet.

(*Proceedings, American Association for the Advancement of Science, Vol. X (1856), p. 163.*)

Hoopeston.—The tusks which were used in the restoration of a skeleton of *Mastodon americanus* in the American Museum of Natural History were found near Hoopeston in 1879.

(*Report of State Paleontologist, New York, 1902, p. 926*)

East Lynn.—“The only mastodon bones ever found in this vicinity were found while the workmen were digging a ditch on the farm of a man named Guingrich at East Lynn, about twenty-four years ago (1881). I have forgotten almost all the circumstances.”

(*Reported by Charles W. Warner, Hoopeston.*)

WASHINGTON COUNTY.

Beaucoup.—According to Dr. Stevens, in an excavation along the line of the Illinois Central railroad near Beaucoup, at the depth of about eighteen feet were found the remains of a mastodon in the prairie drift, below the yellow clay in the older or reddish clay.

(*Proceedings of the American Association for the Advancement of Science (1856), pp. 148—160.*)

WINNEBAGO COUNTY.

New Milford.—In 1851 a large tooth of a mastodon was found, in a fine state of preservation, in the Kishwaukee. It was drawn up in a seine from near the mouth of the river.

(*Prof. S. P. Lathrop, in the American Journal of Science (2), XII, p. 439.*)

I O W A

ALLAMAKEE COUNTY.

Postville.—During the summer of 1904, Mr. Thomas French found four teeth, the lower jaw, and a portion of the vertebral column of a mammoth sticking out of the bank of Yellow River, where it cuts through his farm, four miles north of Postville. The bank had caved away, exposing the bones, which lay on a gravel bed. The teeth each measured about four and a half by eleven inches and weighed thirteen and a half pounds. The remains are all in an excellent state of preservation.

(Reported by Mr. Thomas French)

BENTON COUNTY.

Shellsburg.—In 1903, Mr. J. Grubb, of Shellsburg, found a mastodon tooth in the alluvium of Bear creek. A portion of a rib was previously found near the same place.

(Reported by Assistant State Geologist T. E. Savage.)

Mr. J. A. Burns, who found the rib, reports further regarding this find: "The tooth and rib were found on my farm in Benton township. The tooth was about the size of an ordinary five or six pound flatiron and was in a splendid state of preservation. It is now in the possession of Mr. Grubb's son, near Kingsley, Iowa. The rib measured about three feet in length. I gave it to a Cornell, Iowa, student."

CEDAR COUNTY.

Several finely preserved mammoth teeth were found on the farm of A. T. Whitnell, on the southeast quarter of the southeast quarter of section six, Springfield township. These were found in a

washout in a small creek. Above the washout a bed of white alluvial clay is overlain by gravels. In which of these the teeth occurred is impossible to say. The teeth are in the museum of Cornell College.

(*Iowa Geological Survey, Vol. XIII, p. 377.*)

Clarence.—Two small molars of a mammoth, in nearly perfect state of preservation, were found in or on the Kansan drift in a shallow creek six miles south of Clarence, and were presented to the Museum of Cornell College. The grinding surface of the teeth is slightly worn.

(*Reported by Prof. Norton, Cornell College.*)

CLINTON COUNTY.

Clinton.—The Davenport Academy of Science contains a mammoth tooth which was found near Clinton and donated to the Museum by Mr. Thomas J. Frasier.

(*Information from label on specimen.*)

Clinton.—The Chicago Academy of Science contains:

a) The whole tusk of a mammoth, in poor state of preservation, which was found near Clinton in Iowa.

b) One molar of a mammoth, in good condition, also found near Clinton and presented to the Museum by J. J. W. Foster.

(*Both instances reported by Frank C. Baker, Curator, Chicago Academy of Science.*)

DAVIS COUNTY.

Floris.—“In 1862 I found in the Des Moines river, near Floris, two mastodon teeth, one weighing fourteen and the other four pounds.”

(*Reported by Justus M. T. Myers, Fort Madison.*)

FAYETTE COUNTY.

Clermont.—Mr. C. E. Allen, of West Union, has a mastodon tooth, which was found in the gravel pit near Clermont.

(*Reported by Assistant State Geologist T. E. Savage.*)

HENRY COUNTY.

Mt. Pleasant.—About ten years ago several teeth and bones of a mastodon were exhumed in sinking a well on the poor-farm at Mt. Pleasant. The remains were found in the Kansan drift or immediately below this drift. I am not certain which. They are in the Museum of the Iowa Wesleyan University at Mt. Pleasant.

(Reported by Assistant State Geologist T. E. Savage.)

Salem.—“I learned of the discovery of the remains of a mastodon and what was said to be the tooth of an elephant (but more probably mastodon), when at Salem in November, 1884, and visited the locality where they were found, but was unable to find the man who had possession of the bones and tooth. The locality is in the valley of Big Cedar creek in section eight, Salem township. The creek had at that time washed a channel into the border of an old bog, in which the fossils were imbedded.”

(Reported by Frank Leverett, Ann Arbor, Mich.)

“Some years ago two teeth of a mastodon were brought me by a couple of men to sell for them. They said they were dug up near the bank of Skunk river, in Henry county.”

(Reported by Dr. J. M. Shaffer, Keokuk, Iowa.)

JACKSON COUNTY.

Maquoketa.—The atlas and two vertebrae of an extinct proboscidian were found near Maquoketa and presented to the Museum of Cornell College.

(Reported by Prof. Norton, Cornell College.)

JEFFERSON COUNTY.

Walnut creek.—In the bed of the creek, where it follows a rocky cliff in the west half of the southwest quarter of section twenty-eight, in Walnut township, Mr. Josia Bates some years ago found the lower jaw of an *E. americanus*. Both molars were

well preserved, and the entire specimen weighed fifty pounds. To what part of the drift it belongs is not evident.

(*Iowa Geological Survey (Udden), Vol. XII, p. 428.*)

LEE COUNTY.

Denmark.—“I saw a large leg bone of a mastodon a few years ago at Denmark, which had been found in Lost Creek Valley in section three or four, Washington township. I think the bone belonged to Mr. Justus M. T. Myers, of Fort Madison.”

(*Reported by Frank Leverett, Ann Arbor, Mich.*)

Concerning this find, Mr. Myers himself reports as follows:

“In 1898 I found in Lost Creek, Lee county, one leg bone, six inches in diameter and nearly three feet long, one of the short ribs, eighteen inches of tusk, and two small pieces of bone of mastodon, all close together. Since then have looked the creek over for miles, but have found nothing more. Associated with these remains were one human leg bone and one flint arrow-head.”

Montrose.—“In 1896 I found one molar of *Elephas primigenius* in a creek below Montrose, and the same year I also found in

Sugar Creek—The molar of another extinct elephant, which I cannot determine.”

(*Reported by Justus M. T. Myers, Fort Madison.*)

“Some years ago there was brought to me—to dispose of—a fine fossil, the larger part of the pelvis—right side—of the mastodon. The acetabulum and attached portions were perfect. Its weight was nearly two hundred pounds (?). This specimen was found on Skunk river, in Lee county.”

(*Reported by Dr. J. M. Shaffer, Keokuk, Iowa.*)

LINN COUNTY.

Bertram.—Part of a tusk of a mastodon was found in a gravel pit at Bertram and presented by S. C. Comstock to the Chicago Academy of Science.

(*Reported by Frank C. Baker, Curator, Chicago Academy of Science.*)

Springville.—The small molar of a mastodon and a large crown of a mastodon molar were found in or on the Iowan drift near Springville, and presented to the Museum of Cornell College.

(Reported by Prof. Norton, Cornell College.)

LOUISA COUNTY.

Indian creek.—An elephant tooth was found in digging a shallow well in a small tributary to Indian creek, section twenty-eight, township seventy-five north, range three west.

(Iowa Geological Survey (Udden), Vol. XI, p. 110.)

Otter creek.—A tooth, the lower jaw, part of the pelvis, several ribs, and a large piece of the tusk of an elephant were dug from the bed of Otter creek near the center of the northwest quarter of section twenty-five, township seventy-three north, range four west. These and the above mentioned specimens were found in what Udden thinks was Sangamon soil.

(Iowa Geological Survey (Udden), Vol. XI, p. 110.)

MARSHALL COUNTY

Albion.—A large molar of a mammoth, in a perfect state of preservation, was found in the Iowa river near Albion, and presented to the Museum of Cornell College. The grinding surface of the tooth is well worn.

(Reported by Prof. Norton, Cornell College.)

MILLS COUNTY.

Glenwood.—“I read a paper on the Glenwood mammoth at the Iowa Academy and had some correspondence concerning it. It seems to have been a young one, as indicated by its size, the imperfect ossification of its bones, and the presence of a simple tooth in front of the molars of the upper jaw. I took measurements and a sketch of the position of the bones, but I cannot at present lay my hand on the paper. The bones were quite poorly

preserved. Some of them are in the museum at Tabor. The peculiar simple tooth, which I took out myself, had about the form as sketched. I do not have it at hand. The remains comprise a dilapidated skull with tusks and teeth, several leg bones, but I think only the ends of some of the latter, perhaps the head of a humerus, are all that are at Tabor. The remains were five to eight feet below the surface of the east slope of the cut north of the railroad between Glenwood and Pacific Junction, not far from Keg creek and north of the railroad. They were in the upper part of the boulder clay below the loess. The deposits near them appeared to be water laid, and were quite gravelly."

(*Private communication from Prof. J. E. Todd.*)

Pacific Junction.—Some bones of an elephant or a mastodon were unearthed near the base of the loess, while grading for the Chicago, Burlington and Quincy railroad at the southernmost point of the bluffs between Keg creek and the Missouri bottoms east of Pacific Junction.

(*Iowa Geological Survey, Vol. XIII, p. 170.*)

Malvern.—Bones of a mammoth were exhumed from the lower part of the loess in grading for the Chicago, Burlington and Quincy railroad. The excavation was made in 1879 at the crossing of First avenue and Railway street. There were three teeth, part of a tusk, and two long bones.

(*Iowa Geological Survey (Udden), Vol. XIII, p. 170.*)

"A mammoth was unearthed when the Wabash railroad went through Malvern, in a cut made just northeast of the crossing of the Wabash and Burlington roads. Several teeth, tusk, vertebrae, and ribs were taken out, and several of them are in the Museum at Tabor. The tusk was eight or nine inches through and several feet long. The vertebrae were dorsal and had the long spinous processes on them. The teeth showed the typical *americanus* form."

(*Extract from a letter by Prof. Todd.*)

These notes probably refer to the same specimens as are reported by Udden.

MUSCATINE COUNTY.

Wilton—In 1874, bones of a mastodon or mammoth were found in the south bank of Mud creek, about half a mile south of Wilton, at a point where the stream, coming from the north, bends abruptly to the west. Measured from the water, the bank at the time rose nearly thirty feet high. The several bones lay at about the same level in the bank. The skeleton had evidently arrived entire at the place, but it was dismembered and scattered before it became finally imbedded. The deposits, containing the skeleton, were modified drift, consisting of alternating strata of very fine sand and clay. The fineness of this material, the regular stratification and absence of organic matter indicated that at the time of the imbedding of the skeleton, the locality was covered with comparatively deep, clear, and still water, "having nothing of the character of a marsh, but rather resembling the bottom of some wide lake or some large, slowly moving river." The topography of the surrounding country and the nature of the drift itself favored the idea that a lake at one time covered the territory of the West Liberty plain and reached up to Wilton, and that sediments from some inflowing river had aided in filling the lake. "Occasionally larger bodies, carried by some more powerful agency, found their way out to the deeper parts and became covered up by the accumulating sediment." The evidence was conclusive that the sediments containing the skeleton were laid down *after the ice had disappeared from the region*. In the excavated skeleton the cranium and the cervical vertebra were missing, but of the vertebrae there were exhumed nine dorsal, two sacral, and one caudal; also thirteen ribs, one segment of the sternum, parts of both innominate bones, one femur, the right tibia, a number of the tarsal, metatarsal, and phalangeal bones, one patella, the right scapula, the lower end of the humerus, and some carpal and metacarpal bones. The right scapula was in a particularly perfect condition.

Measurements were taken as follows:

Scapula—	Inches.
Length, from margin of glenoid cavity to superior angle.....	39
Width, from posterior angle to opposite border.....	28
Glenoid cavity, diameter.....	9½, 5½
Circumference of head.....	32½
Weight.....	51½ pounds.
Longest rib, on outer curve.....	52
Widest rib, across.....	4
Vertebra (first dorsal)—	
Width and depth of centrum.....	5½
Across lateral process.....	11½
Length of dorsal process.....	10
Height of neural arch.....	2½
Width of neural arch.....	2½
Right tibia—	
Length.....	35
Circumference at top.....	22¼
Circumference at middle.....	10¾
Humerus, circumference at lower end.....	37

(*Iowa Geological Survey, Vol. IX, pp. 352—353.*)

Mad creek.—About one mile from where it empties into the Mississippi river, Mad creek has cut away the point of a hill, the top of which is loess. This cut forms an almost perpendicular bank, probably forty feet high. About ten feet from the top is a bed of gravel, perhaps one foot thick. In this gravel bed, Mr. Joe Freeman found a considerable fragment of an elephant tooth.

(*F. M. Witter, Proceedings of the Iowa Academy of Science, Vol. I, part 2, p. 67.*)

Muscatine.—From the loess in the city of Muscatine, Professor Witter has taken teeth, bones, and antlers of a species of caribou or deer, and a tusk and teeth of a mammoth or mastodon.

(*Iowa Geological Survey, Vol. IX, p. 360.*)

PAGE COUNTY.

Blanchard.—Large bones which, from the description given, must have belonged to the mastodon or mammoth, were found fifty-four feet below the surface while digging a well at Blanchard,

in the Tarkio Valley. Evidences point to an ancient, filled and only partly re-excavated water course.

(*Iowa Geological Survey, Vol. XI, p. 413*)

Clarinda.—In the valley of the Nodaway, near Clarinda, some teeth of the mastodon have been found.

(*Iowa Geological Survey (White), Vol. I, p. 353*)

PLYMOUTH COUNTY.

Akron.—Very recently, in the vicinity of Akron, Professor Todd has found elephant bones. These were in the drift.

(*Iowa Geological Survey, Vol. X, p. 117.*)

Professor Todd reports, concerning this find, as follows: "The teeth, tusk, and bone fragments found near Akron were in the upper part of the till, under loess. They were found in a well about two miles east of Akron, and were in the possession of the finders the last I knew. The teeth were those of a mastodon, much worn. The length of the crown of one tooth I measured was nine inches, and the breadth about three. The diameter of the tusk was about three inches."

POLK COUNTY.

Avon.—A few years ago, workmen excavating in the gravel pit at Avon unearthed numerous bones, among which were a large tusk and other bones of some very large animal, either mastodon or mammoth. Unfortunately, no attempt to save the bones was made, so they became broken and lost. The drift in which these bones were found is post-Kansan—pre-Wisconsin (?) in age.

(*Reported by John L. Tilton, Simpson College.*)

Polk City.—A perfectly preserved molar tooth of *Elephas primigenius* was found in 1898 by a Chicago and Northwestern railroad employee at Polk City. The tooth occurred in the gravels which occur at that place, and are evidently late Wisconsin in age.

"These finds are interesting in that it makes it reasonably certain that these huge proboscidiens roamed over these counties during the late Wisconsin or even during post-glacial times."

(*Iowa Geological Survey, Vol. IX, pp. 210-211.*)

Raccoon river.—The femur of a mammoth in good state of preservation was taken from a sandbar of Raccoon river in Polk county. Belongs to the Museum of Drake University.

(*Reported by Prof. L. S. Ross, Drake University.*)

POTTAWATTAMIE COUNTY.

The bones of an elephant are reported to have been found on section thirty-four, apparently in the loess.

(*Iowa Geological Survey (Udden), Vol. XI, p. 260.*)

POWESHIEK COUNTY.

Grinnell.—"About the year 1884, in excavating for a cellar at the corner of Main street and Fourth avenue, a tusk of a mammoth, together with a number of molar teeth and some fragments of other bones, were uncovered. These remains are now in the museum of Iowa College. Excavations in this same vicinity at an earlier date had exposed fragments of undoubtedly the same animal. This last fall, in the excavation for another cellar, other fragments were discovered, all, however, in a state beyond preservation, and mere small pieces. All the pieces found evidently belonged to a single individual. The geological formation in which they occur is the loess. As I remember, the tusk was at a depth of about six feet below the surface. The tusk is about seven feet long and is in a fair state of preservation. The molar teeth are also well preserved. The other pieces are so small that I do not feel able to guess at their original location in the skeleton.

(*Reported by Prof. W. H. Norris, Iowa College.*)

SCOTT COUNTY.

Big Rock.—The Museum of the Davenport Academy of Science contains a tooth of an *E. primigenius*, found near Big Rock and donated by A. W. Manchester.

(Information from label on specimen.)

Blue Grass.—A portion of a skeleton of a mammoth was discovered near Dr. Carpenter's residence (June, 27, 1858), imbedded in yellow clay and lying about ten feet below the surface of the ground. This is not, however, its first discovery. In 1844, in the same locality, the tusks were found, and, it is said, were eleven feet in length. Some of the molar teeth were taken at the same time and in almost perfect state of preservation, the enamel being clearly discernible, as in the case of the one lately discovered.

"The tusks of the animal formerly unearthed were fully the size mentioned, but they soon crumbled to pieces on exposure to the atmosphere. The largest of the molar teeth was about fourteen inches in length. It was exhumed in three pieces, and may now be seen in an almost perfect state of preservation in our cabinet, where also may be seen some of the bones, showing very perfectly their osseous formation and the kind of clay in which they were imbedded."

(Editor Davenport Daily Gazette, June 30, 1858.)

Davenport.—A tusk, several molars, and some bones of the mammoth were exhumed in the west part of the city. They were found at the junction of the yellow and bluish clays, three feet above the peat bed, indicating that the skeleton was deposited after the blue stratum of the loess, the body having floated there or the creature having waded in to his destruction. The specimen is in the Davenport Academy of Science.

(Proceedings of the Davenport Academy of Science, Vol. I, p. 98.)

Dr. C. A. White comments on this locality as follows: "Such of these deposits (alluvium), as partake more of the character of marsh accumulations are found in somewhat similar positions,

but all seem to have taken place at an earlier period in the process of deepening the river valley. For example, one of these deposits occurs almost on the very brow of the bluffs that border the valley of the Mississippi near Davenport. This example is one of unusual interest, in consequence of the existence there of an extensive bed of ancient peat, which is covered to the depth of several feet beneath the prairie soil, and the discovery, in the clay above the peat, of the remains of a mammoth. The exposure was made by the excavation for the Chicago, Rock Island, and Pacific Railroad company, previous to which there was no appearance at the surface to indicate anything more than the ordinary drift deposit."

(Iowa Geological Survey (White), Vol. I, p. 119.)

SHELBY COUNTY.

Defiance.—About 1890 H. B. Sooy came into possession of a huge tusk of a mammoth or mastodon, which measured six feet long and seven inches in diameter at the base and three and a half inches at the tip. He kept it about four months, when it began to crumble, and continued to do so, until all but about two feet of the tip was destroyed. The tusk was found at the bottom of a well on the bank of a small stream about three miles from Defiance. Parties made search for the skeleton by boring close to the old well, and came upon something resembling bone. They then attempted to dig down to the skeleton, but as it lay below the bed of the creek, water came into the hole so fast that the search was abandoned, and no attempt has been made since to investigate further.

(Reported by H. B. Sooy.)

STORY COUNTY.

In 1894, a mammoth was found on the farm of Dr. H. M. Templeton. It was discovered while digging a well which was being sunk in one of the numerous depressions in this part of the

country. This depression formerly contained a few feet of water, and it still receives surface drainage in times of heavy rainfall. The soil was composed of the washings from the surrounding land and the remains of marsh vegetation characteristic of similar surface conditions on the Wisconsin drift. When the digging had proceeded to a depth of about four or five feet, a deposit of bone fragments was discovered. This included the bodies of four or five dorsal vertebrae, portion of one rib, a short section from the lower end of the tibia, and the lower extremity of the left femur, besides a number of fragments difficult to assign to their exact location in the skeleton. The masses would about fill a half-bushel basket. There were none of the long bones complete and none of the pieces would give a very correct notion of the entire length of any of these portions of the skeleton. The parts giving the best idea of proportion are the vertebrae, the head of a rib, in quite good state of preservation, and the lower extremity of the femur. The vertebrae show both anterior and posterior articular surfaces, in a perfect state of preservation. The transverse and vertical measurements of these surfaces are nearly exactly the same, four and one half inches. The antero-posterior diameter, of the vertebral body, is exceedingly short, considering the immensity of the other measurements. The length is but two and one-half inches. This must have given the creature a back grotesquely short in comparison with its gigantic size. The articular facets on the inner surface of the head of the rib measure three and one half inches. The excavations at the anterior and posterior extremities of the vertebral bodies almost blend into one another. The part giving the most correct notion of the enormous size of the animal is the remains of the thigh bone. The fragment represents a section from the lower end of the bone just long enough to show the femoral trochlea and the two condyls. These are almost perfect, with the exception that a small fragment has been broken away from the external posterior part of the external condyl. The internal condyl is in a perfect state of preservation. The extreme length of the articular surface ex-

tending from the lower border to the external condyl to the upper margin of the trochlear surface on which the patella glides is sixteen inches. This mass is from eight to ten times the size of the corresponding part of an average horse. All the parts are quite firm and in such state of preservation that they have not in the least been affected by exposure since their removal from the ground. The conditions were such as to lead to the conclusion that the bones could never have been buried to a greater depth than that at which they were discovered. The superincumbent covering must have been increasing in thickness rather than diminishing, on account of the process of gradual filling now going on in these shallow prairie basins. A number of trial excavations were made in different parts of the depression without unearthing any additional portions of the skeleton.

(*Iowa Geological Survey, Vol IX, pp. 210-211.*)

WARREN COUNTY.

Indianola.—"In June, 1903, workmen engaged in laying a cement foundation for a culvert on the Chicago, Burlington and Quincy railroad, two and a half miles east of Indianola, found large bones at a depth of six feet below the bottom of the draw or ravine. The two fragments brought me are parts of the centra of vertebrae, each about four inches across and two and a half inches thick. There is also a fragment two inches long that seems to be part of a rib. They were found in the Kansan drift. I do not know whether these remains are of the mastodon or mammoth."

(*Reported by John L. Tilton, Simpson College.*)

WASHINGTON COUNTY.

Having observed some newspaper notices of large bones and teeth found in Washington county, Iowa, by Mr. Jerry Hoppin, we went down there on the eighteenth of July (1881), to see what discoveries had been made. We found Mr. Hoppin's farm on sec-

tion fourteen, township twenty-two, range three, and made a careful examination of the objects and the locality where they were discovered. The remains consisted of the following teeth and bones of *Elephas primigenius*, viz.; the two upper molars—beautiful specimens, very well preserved and nearly black. The grinding surface on each is eleven by four and three-fourths inches, and the greatest depth of the tooth nine and one half inches. To each of these teeth is attached a portion of the jaw-bone, showing also a part of the socket of the tusk.

A fragment of a tusk, thirty inches in length and twenty-one inches in circumference. It is very much decomposed and falls to pieces rapidly. A considerable quantity of finely broken fragments was also found.

The atlas, absolutely perfect. The extreme width of this bone is seventeen and one half inches; its anterior-posterior diameter, nine inches; articulating surface, ten by four and one half inches.

Three other well preserved vertebrae, one cervical, one lumbar, one uncertain, having an articulating surface of six and one half inches in diameter.

The left scapula, from which a portion is broken off. Its extreme length is thirty-four inches; greatest width of part preserved, twenty inches; articulating surface, nine and one half by six inches.

One segment of sternum, very perfect. Its dimensions are: length, eleven inches; depth, six and one half inches; and width, four and one half inches.

Head of femur, of hemispherical form, seven and one half inches in diameter.

A portion of humerus, thirty-six inches long, both extremities wanting, and the whole much decayed and very fragile.

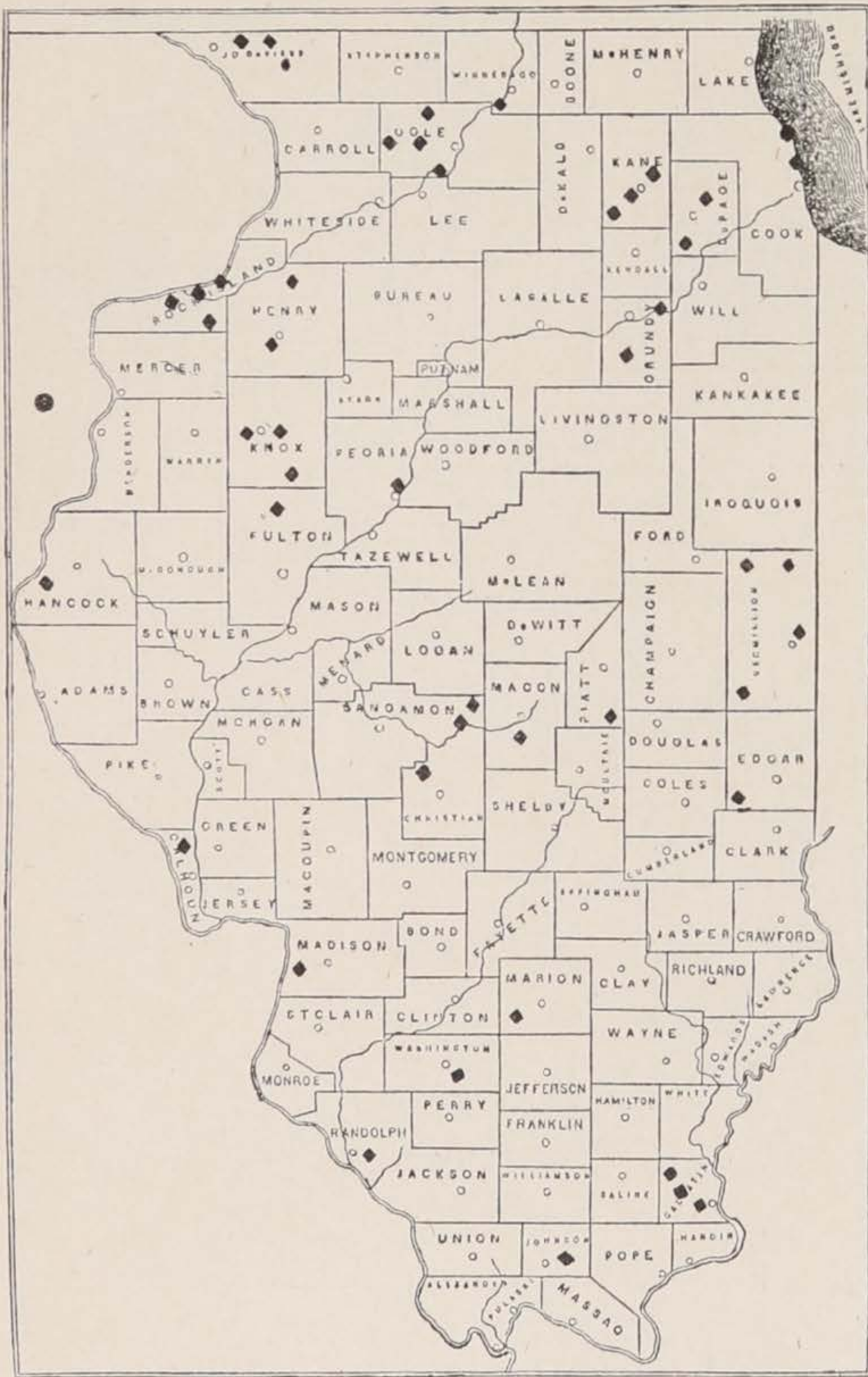
One fibula, quite perfect, twenty-seven and a half inches long.

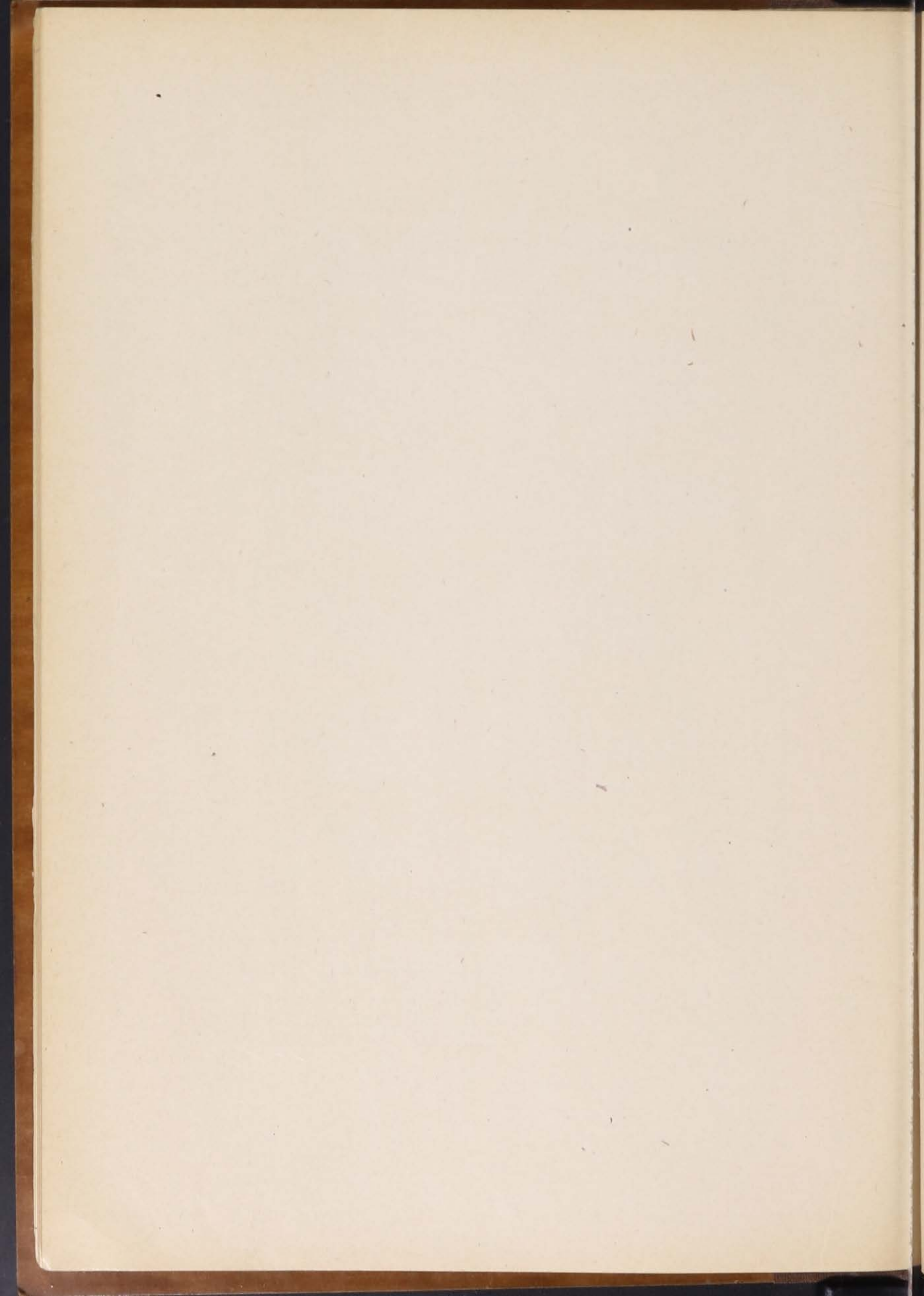
Several fragments of ribs, one piece three feet in length, and some of the pieces indicating the full length of a rib to be over five feet. In addition, there were a good many small and indetermin-

able fragments, though it is possible that, upon a more extended examination of the whole, the true place of them might be ascertained.

These relics were discovered in a small stream, running through the bottomland on the farm. The scapula was first found by Mr. Hoppin's boys while bathing. They at first took it for a piece of wood, but, upon discovering its true character, they made search for more, and found several of the other bones within a few feet of the same place. Mr. Hoppin then continued the search by digging into the adjacent bank, and there found the teeth and several of the other bones. All the bones were found within an area of fifteen feet each way, in the black mud (sedimentary deposit, chiefly of vegetable mold with some clay), and about six feet below the surface of the level ground.

(*J. Gass, Proceedings, Davenport Academy of Science, Vol. III, pp. 177-178.*)





On the Proboscidean Fossils

OF THE

Pleistocene Deposits

IN

ILLINOIS AND IOWA

BY

JOHAN AUGUST UDDEN

The data collected in the foregoing paper by Netta C. Anderson on the fossil Mastodon and Mammoth remains in Illinois and Iowa, give valuable and various information, which seems profitable to briefly summarize and discuss. It brings together a number of observations made by different parties at different places and at different times, extending back sixty years or more. Some special points suggest themselves for review: 1) the conditions of interment of these animals, 2) their specific determination, 3) their relation to different drifts and 4) their association with other fossils.

Mode of Interment.

The eighty odd recorded finds set forth, quite clearly, the conditions attendant on the interment of these animals and the manner of the preservation of their remains. The broad statement is warranted that the greater number of the animals, whose remains have been discovered, perished in low and boggy localities. In two instances it is clear that they had come in search for water and salt, for near Minooka, in Illinois, parts of the skeletons of six individuals were recovered from the ground near a bog spring, and in Gallatin county, in the same state, numerous bones were found near the "Half Moon" salt lick.

In the case of sixty recorded fossils, their location is given with sufficient detail to enable us to make inferences as to their mode of interment. We find that remains of thirteen individuals were discovered in stream beds or in undoubted alluvial deposits. Of these, ten consisted of detached teeth, one was a single bone, one was a jaw, and one consisted of a tooth and a bone. Five finds were found in terraces and glacial gravels, and four of these

consisted of single teeth. Evidently, these single teeth which are found in stream beds and in drift gravels, are not *in situ*, but have been dislodged by streams and glacial currents from the beds which originally contained them, and they have been separated from the other parts of the skeleton to which they belong.

In eighteen instances, remains were found in boggy places, or near springs, and in every case save one these consisted of several parts of a skeleton, usually teeth and some bones. Many of these also came from alluvial deposits, but it is evident that they were found in the places where the animals perished.

But most of the fossils have come from the loess or from near the surface of the boulder clay under the loess. There are twenty-four such finds, and only one is mentioned as consisting of a single tooth. The rest are referred to as "numerous bones", "several bones", "parts of skeletons", or as "remains". In cases of this kind, the fossils are likewise *in situ*. In other cases it is not possible to make out from the data given whether the finds should be classified as from alluvium or as from bogs, for it seems quite likely that some of the bogs may have been on alluvial lands. Barring such, the number of finds representing different modes of interment may be tabulated as follows:

SPECIMENS FOUND IN	Number consisting of two or more parts of a skeleton	Number consisting of single teeth or bones
Streams or in alluvium.....	2	17
Glacial gravels.....	1	4
Bogs or near springs.....	17	1
Loess, or on glacial clays.....	23	1

Specific Determination of the Fossils.

Among the individuals represented in the list, *Mastadon*, *Elephas primigenius* and *Elephas americanus* have been expressly

identified. Specific determination of *Mastodon* is in no case expressed, but it is presumably *M. americanus*. The list mentions in all thirty-nine individuals of this genus. In ten cases identification was made from other parts of the animals than from their teeth, and it may, perhaps, be somewhat uncertain. Twenty-one of these finds are reported as mammoths and five as *Elephas primigenius*, making twenty-six specimens of this species. Nineteen of these determinations were made from teeth, often occurring with other bones, one appears to have been made from a tusk, and four were probably made in absence of either teeth or tusks. *Elephas americanus* is reported from two places in Iowa. Ten of the specimens are spoken of merely as elephants, and these are presumably *Elephas primigenius*. Except in two cases, the determinations of these nine specimens were also made from teeth. In one instance, only a tusk was present, and in another, both teeth and tusks seem to have been wanting. In all, the list includes thirty-five elephants and thirty-four mastodons. Thirteen specimens are reported merely as "proboscideans", as "mammoth or mastodon", or as "elephant or mastodon". In eleven of these cases, the remains did not include any teeth, and in nine there were neither teeth nor tusks. Thus it appears that specific determinations have not been made except in the presence of either teeth or tusks. These furnish the most obvious and reliable characteristics for that purpose. From the above facts, we may conclude that the determinations are sufficiently accurate to warrant the general conclusion from the figures given that the remains of the elephant and of the mastodon are about equally frequent in these two states. It will be noticed that nearly all of the fossils are from the drift-covered region. Professor J. D. Whitney* states that in the lead region (the driftless area) mastodon remains are much more frequent than those of the elephant.

* Geological Survey of Illinois, Vol. I, p. 162.

Table of Specific Determinations.

	Teeth and tusks both present	Teeth present, tusks absent	Teeth absent, Tusks present	Teeth and tusks both absent
"Mammoth".....	2	13	1	5
"Elephas primigenius".....		5		
"Elephas americanus".....	1	1(?)		
"Mastodon".....	2	24	3	5
"Elephant".....		7	1	1
"Proboscidean", "elephant or mastodon", "mammoth or mastodon".....		2	2	9

Relation to Different Parts of the Drift.

The relation of these fossils to the different drifts in the Mississippi valley is by no means clear in every case. Many of the observations were made long before different drifts had been recognized, and some were even made by geologists who did not regard land ice as necessarily an agent in the deposition of the glacial till. A thorough study of the geological position of these fossils would require visits to many of the localities in the field. Though this is impracticable, the data in the list warrant some general observations in this line.

In fifteen cases, the notes furnished by the observers quoted either give insufficient or no data from which we may judge of the relations of the fossil to the drift. These are mostly in cases of discoveries of single teeth or tusks. In fourteen instances it is only known that the remains, likewise mostly teeth, came from some creek or from some river. One tooth is reported as having been caught in a seine. Others are spoken of as exposed in banks of streams, and where these consist of single bones or teeth, one must regard them as in transit and not necessarily as fossils.

originally belonging to the alluvium from which they came. Finally, several teeth have been found in gravels, whose age is unknown, and in which they are evidently inbedded secondarily. It appears that about one half the number of all the fossils recorded cannot be assigned to any particular relation to the drift on the evidence of the original record.

Mastodon remains are reported in one case as coming from the "Kansan drift or immediately below this drift". This find was made in a well on the poor-farm at Mount Pleasant, in Iowa. Coming from such an excavation, circumstances seem to have been favorable for exact determination of the horizon. There were several teeth and bones, and this makes it reasonably certain that the bones were *in situ*. In all likelihood the animal lived, perished, and was buried on the land in eastern Iowa before the advance of the ice which brought the Kansan drift. Fossils in a till can hardly be regarded as *in situ*. They would be ground to pieces by the ice.

Parts of skeletons of the mastodon have been found in somewhat similar positions on the upper surface of the Kansan drift, in the so-called "ferretto zone". This is the old and weathered land surface which developed after the Kansan drift had been deposited. This drift is now covered by loess, but in some localities it has been almost entirely removed. Under thirty feet of loess, which rested on two or three feet of drift, a mastodon jaw with two teeth was found near Alton, in Illinois. In Washington county, in the same state, other mastodon remains are recorded as having come from the same horizon, one from near Sandoval, and another from near Beaucoup. Some teeth, a tusk, and some bones of a mastodon were recently found "in the upper part of the till, under the loess", near Akron, in Plymouth county, in Iowa. This till is also believed to belong to the Kansan.

The "ferretto zone" is to be seen under the loess only beyond the borders of the drift sheets which are later than the Illinoian. Fossils from this zone must be younger than the Kansan drift

itself, as they have become imbedded in its eroded and weathered surface. As long as this till was being subjected to progressive destruction, no remains of land animals could very well be preserved. They would be destroyed with it, except in special situations, where the general condition of erosion may have locally come to a standstill, or may have been reversed. These fossils must hence be regarded as rather belonging to the stage when loess began to accumulate on the Kansan till. This stage is not definitely fixed among the series of events of the glacial period. By some it is believed to be contemporaneous with the deposition of the Iowan drift, but others think that much of the loess is older than this. So that the only thing we can know with certainty of these fossils is that they are post-Kansan and pre-loessian. They may be only slightly younger than the Kansan drift, or only somewhat older than some much later loess.

There is another similar zone over the area of the Illinoian drift. It marks in the same way the time when the loess began to accumulate on the Illinoian till. The conditions attendant upon the beginning of loess accumulation on this till were somewhat different from those resulting in the burial of the ferretto zone on the Kansan. The Illinoian drift surface seems to have been less well drained. It is less affected by oxidation, and boggy conditions were apparently more frequent when the loess began to accumulate. Only two proboscidian fossils are mentioned in the list as clearly imbedded in the Illinoian drift. One was found in some waterlaid material at a point one half mile south of Wilton, in Muscatine county, in Iowa. This consisted of a considerable part of a skeleton. The other was a tusk, occurring just under the base of the loess, in the bluff near the bridge across Rock river, south of Rock Island, in Illinois. The only reasonably certain conclusion we can draw as to the age of these fossils is that they are post-Illinoian and pre-loessial. In neither case were these fossils generically identified.

Of just as indefinite age are such fossils as have been recovered

from the loess. There are at least eight of these. Six or seven came from the base of the loess, and nearly all of these were from the area covered by the Illinoian drift. One, or perhaps two, came from Fremont county, in Iowa, and hence were from the area of the Kansan drift. All of these might perhaps as well be classified with the fossils in the ferretto zone and with those in the loess-covered upper surface of the Illinoian drift, for they were evidently buried at the beginning of the accumulation of the loess in which they lie. If the modern view that the loess is a land deposit is correct, it appears quite probable that its basal part is not everywhere of the same age. The loess may have begun to form on the Kansan drift even before the Illinoian ice invaded this region. On the other hand, the relation of the loess to the Iowan drift is such as to make it unlikely that the bulk of the former deposit is of a later date than this drift itself. Therefore we are justified in believing that the fossils which come from the base of the loess are post-Kansan and pre-Iowan, when found beyond the limits of the Illinoian drift, and when they come from the area of this till, they must be post-Illinoian and pre-Iowan.

From Grinnell, in Iowa, a mastodon is reported as coming from the loess. Grinnell lies on the area of the Iowan drift, and while this drift usually is without any loess covering, such a covering is reported as being present in the adjoining (Tama) county. This loess is, of course, of post-Iowan age, and so must this fossil be, which was excavated from a depth of six feet from the surface. Two mastodon teeth are also reported from a creek on the Iowan drift in Forreston township, in Ogle county, in Illinois, and the greater part of a skeleton of the mammoth was recovered from a boggy place in Lynnville township, in the same county. This latter point is almost on the boundary between the Wisconsin and the Iowan drift, and, it may be, on the surface of the latter. In either case, the interment of this fossil was probably much later than the deposition of the Iowan drift, as it came from near the surface. The same must be said of some other finds which have been made at

shallow depths on the area of the Iowan drift. They are post-Iowan.

Twelve fossils are reported from the area of the Wisconsin drift. Two of these were teeth, presumably not *in situ*, as they were taken from gravel. One, a part of a mastodon skeleton, was taken from a tenacious clay on the early Wisconsin drift (Champaign till sheet of Leverett) near Fairmount, in Vermilion county, in Illinois. The others have come from low and swampy places on the but slightly modified surface of this late till. They seem to belong in the soil on the drift or in local accumulations of wash or perhaps incipient loess deposits on low divides where the drift is practically yet untouched by erosion. These are clearly post-Wisconsin in age.

In some dozen cases, considerable parts of skeletons, or at least a few bones, with or without some teeth, but enough to indicate that the remains were practically in place, have been found in alluvial sediments. Some of these are evidently much older than the others. Bones are thus mentioned by Professor Calvin as having been found in a well at a depth of fifty feet in the Tarkio valley, on the Kansan drift, near Blanchard, in Iowa. Other finds were made in alluvium on driftless territory, as in Gallatin county, in Illinois, and in Allamakee county, in Iowa. All these may be older than the fossils which come from alluvium or later drifts. One mastodon came from the alluvium along Illinois river, three miles east of Morris. Most of the alluvium in this valley must be as late as Lake Chicago, which drained in this direction. It appears certain that both the elephant and the mastodon are represented among the alluvial fossils, on the Wisconsin drift. They are both of post-Wisconsin age, and, judging from their occasional shallow interment in alluvium, in loess, and in modified surface drift, they are sub-recent.

In tabulated form, the relation of the proboscidian remains to the members of the drift are as below:

AGE	Teeth or tusks only	Bones, mostly with teeth or tusks
Specimens of unknown age.		
Mammoth.....	9
<i>Elephas primigenius</i>	2
Elephant.....	7
Mastodon.....	13	2
Undetermined.....		1
Specimens of the pre-Kansan (?) or Kansan (?) age.		
Mastodon.....		1
Specimens from the ferretto zone, post-Kansan and pre-loessian.		
Mastodon.....		4
Specimens from the surface of the Illinoian drift, post-Illinoian and pre-loessian.		
Undetermined.....	1	1
Specimens from the base of the loess, post-Kansan and pre-Iowan.		
Elephant.....		2
Mammoth.....		2
Mastodon.....	1
Undetermined.....		1
Specimens from the loess.		
<i>Elephas americanus</i>		1
Mammoth.....		2
Undetermined.....		1
From the area of the Iowan drift, post-Iowan.		
Mammoth.....		1
Mastodon.....	1
From the area of the Wisconsin drift, post-Wisconsin.		
<i>Elephas primigenius</i>	1
Elephant.....		1
Mammoth.....	1	2
Mastodon.....	2	4
Undetermined.....		1
From alluvium, mostly sub-recent, but some, perhaps, older.		
<i>Elephas primigenius</i>		1
Mammoth.....		2
Mastodon.....		10
Undetermined.....		4

Associated Fossils.

From what is known concerning the age of the latest glacial drift, and from the fact that many of the remains have been found in alluvium which is later than this drift, there seems to be good reason to believe that elephants and mastodons have inhabited these states within the time of the last five thousand years, or perhaps still later. The association of their remains with those of other animals not yet extinct in this part of the world likewise indicates that they have but recently been exterminated. These associated fossils are of various kinds. In Rock Island, the loess which contained elephant bones also contained fragments of coniferous wood, and at Davenport, in Iowa, the peaty loess, from which tusks and other bones were taken, has a seam of diatomaceous earth, in which no less than thirty-three now living species of diatoms have been identified.* Only a short distance from this locality, the same horizon carries the usual land snails, such as *Helicina*, *Succinea*, *Pyramidula*, *Bifidaria*, *Limnæa*, and others which are characteristic of the loess. In Sangamon county, in Illinois, the mastodon-bearing alluvium contained such common pond snails as *Planorbis*, *Cyclas*, and *Physa*, and at Fairmont, in Vermilion county, where mastodon remains were found in what appears to be a waterlaid clay, this contained *Limnæa*, *Physa*, *Planorbis*, and *Sphærium*, all typical pond mollusks of to-day.

The mammals which are mentioned as found in immediate association with the mastodon, are the American buffalo, or the bison, which is reported from three localities, the wolf, the peccary, the deer, and the elk, each of which is reported only once. In the country, around Chester and Alton, in Illinois, where Professor Wm. McAdams made extensive observations on the fossils of the loess many years ago, he is reported as having found in this deposit *Mastodon*, *Megalonyx*, *Bosprimigenius*, *Castoroides*, *ohioensis*, and many small rodents. The latter occur in the so-called

* See Iowa Geological Survey, Vol. IX, p. 356.

loess-kindchen.* But it is not known in this case that these mammals came from the same localities as the mastodon, and the present writer believes it can be shown that all the loess in that region is not of the same age. Hence it is perhaps a question whether the co-existence of these fossils with the mastodon is really proven by Professor McAdams's observations. That they all really did inhabit this country contemporaneously, is none the less most probable.

Man and the Elephants.

On the question of the co-existence of the elephant or the mastodon with man, these data give no direct testimony except in one instance, which is mentioned by M. T. Myers, of Fort Madison. He reports having found "one human leg bone and one flint arrow-head" associated with the remains of a mammoth recovered from the alluvium of Lost creek, in Lee county, in Iowa. It is not known precisely how close this association was, and in view of the importance of the question, this find would seem to merit a more detailed study and a more full statement of facts. The association is reported from a region where so-called "elephant pipes" have been claimed to occur in mounds constructed by earlier inhabitants of this country.* If these pipes are genuine, they prove beyond a doubt that the race who built the mounds were the contemporaries of the elephant, for the pipes are fashioned with the form of this animal. At all events, the evident recency of some of the proboscidian remains makes us expectant of some fortunate discovery giving conclusive proof that man lived on this continent while these huge mammals were yet here.

* Geological Survey of Illinois, Vol. VIII, p. 8.

* Proceedings of Davenport Academy of Natural Sciences, Vol. III, p. 132, and Vol. II, p. 349.

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