

Incessant labor finally wore upon his health. "For some years he appears to have fully recognized the fact that his day as an active investigator was over, and he had contented himself with directing others. When he was sent as advisory counsel by the United States to the Halifax Fish Commission he prepared an essay on fish culture into which he threw all the wealth of his vast information and experience on this subject. He kept that manuscript unpublished, hoping to add to it, but recently put it in the press, and it is now in course of being printed, and will be a posthumous contribution of inestimable value to the history of the pursuit to which he gave so much time and attention. In like manner he lately placed the results of his ornithological studies in the hands of Professor Ridgeway, and they are now in course of publication by a leading Philadelphia firm. His life is rounded and his career has closed with a record of achievements that will grow in public estimation the more it is contemplated."

When he went in June last, to Wood's Holl, the chief summer station under the Commission of the Fisheries, he was much broken in health; and, although he rallied for a while, but a few weeks passed before the end came. His wife and his daughter survive him.

ALVAN CLARKE died on the 22d of August at Cambridge, in his eighty-fourth year, having been born at Ashfield, Massachusetts, March 8, 1804. The science of astronomy owes much to Mr. Clarke. Through his skill and judgment, dependent largely on delicacy of touch and sight, and the promptings of astronomical zeal started up by the discovery of some new double stars made with an instrument of his own construction, he became famous as a maker of telescopes, and had orders, more than he could fill, from foreign as well as American observatories. His discoveries led to correspondence with the English astronomer, Mr. W. R. Dawes, and afterwards to some years of study abroad between 1850 and 1860. His first large telescope, 18½ inches in diameter of object-glass is in the observatory at Chicago; one of 26 inches at the U. S. Observatory, Washington; another of the same size, at the Observatory of the University of Virginia; one of 32 inches, at the Pulkowa Observatory, Russia; and one of 36 inches at the Lick Observatory of California. The Russian telescope brought him a gold medal from the Czar. The manufacture of telescopes has been carried on by him in connection with his sons, George B. and Albert Graham Clarke, who have like skill and perfection of work.

APPENDIX.

ARTICLE XXXV.—*Notice of New Fossil Mammals*; by
O. C. MARSH.

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AMONG the large number of extinct mammals recently received at the Yale Museum from the West, are several of especial interest, as they serve to mark definite horizons in the Tertiary deposits east of the Rocky Mountains, or show important characters not before observed. A notice of some of these species new to science is given below, and more complete descriptions will appear elsewhere.

Bison alticornis, sp. nov.

This species of *Bison* is represented by various remains, the most important of which is the portion of a skull, figured below. This specimen, which may be regarded as the type, indicates one of the largest of American bovines, and one differing widely from those already described. The horn-cores, instead of being short and transverse, as in the existing bisons, are long and elevated, with slender, pointed ends. They have large cavities in the base, but in the upper two-thirds are nearly, or quite, solid. Their position is well shown in the cuts below, figures 1 and 2. The frontal region between the horn-cores is broad, somewhat convex, and very rugose.

Figs. 1 and 2.



FIGURE 1.—Part of skull, with horn-cores, of *Bison alticornis*, Marsh; front view.
FIGURE 2.—The same specimen; seen from the left.
Both figures are one-eighth natural size.

The remains of this species are found in the sandstones of the Denver group, at the eastern base of the Rocky Mountains, where they indicate a well-marked horizon, which may be called the Bison beds. These deposits are more recent than the Equus beds, and are probably late Pliocene.

The locality of the type specimen is on the banks of Green Mountain Creek, near Denver, Colorado, where it was found by George L. Cannon, Jr., of Denver. Portions of the same specimen were subsequently secured by Whitman Cross of the U. S. Geological Survey. Other remains were obtained by G. H. Eldridge of the Survey, and all were sent to the writer for examination.

Aceratherium acutum, sp. nov.

Remains of the present species are abundant in one horizon of the Pliocene east of the Rocky Mountains, and a large number of fine specimens have been secured, which are now

FIG. 3.

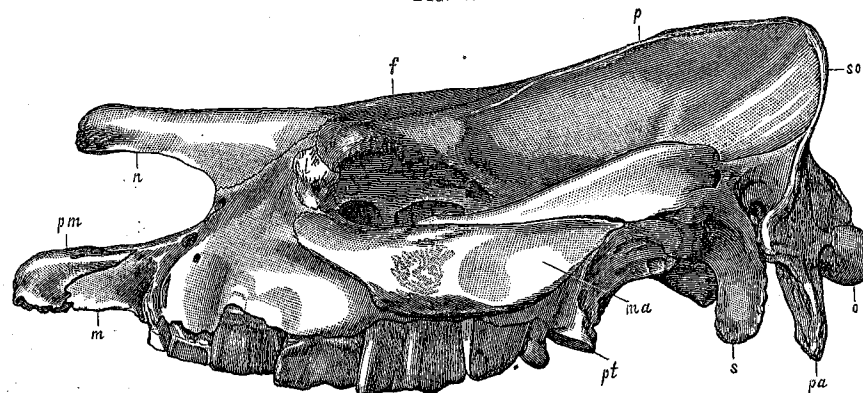


FIG. 4.

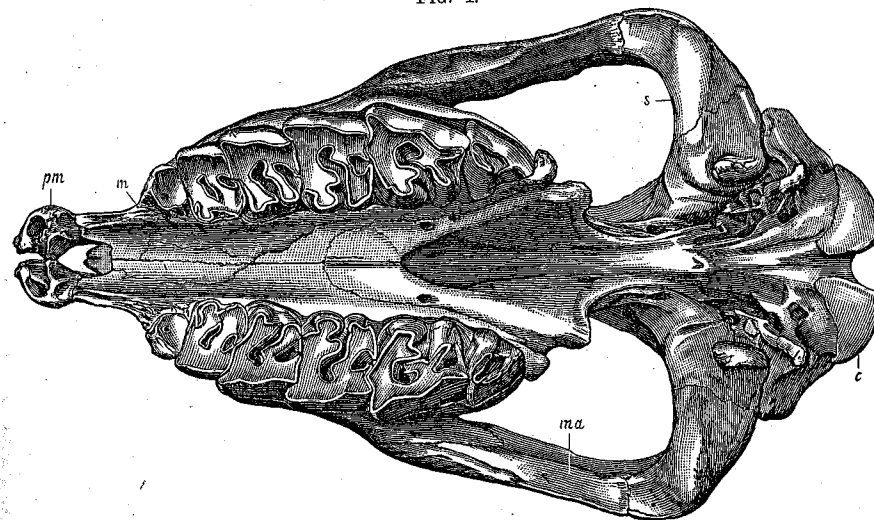


FIGURE 3.—Skull of *Aceratherium acutum*, Marsh; seen from the left.
FIGURE 4.—The same specimen; seen from below.
Both figures are one-fifth natural size.

in New Haven. The skull represented above, in figures 3 and 4, has been selected as the type. It is narrow at the base, with widely expanded zygomatic arches, and with the facial portion

tapering rapidly in front. There is a well-marked sagittal crest, and a strong constriction between the temporal openings. The frontal bones expand rapidly forward, and meet the broad, smooth nasals, which converge anteriorly into the pointed ends which have suggested the specific name. The paroccipital process is strong and elongate, and the post-glenoid is shorter and more massive. The premaxillary bones are weak, and project considerably beyond the end of the nasals. They each supported a single incisor.

A striking feature of the skull is the very large size of the molar teeth, which are well shown in figure 4.

There were no lower jaws found with the present skull, but in other specimens of this species, they are well represented. Each ramus is of moderate depth, the angle rounded, and the lower border gently convex below. On each side of the symphysis is a small incisor, and outside of this, a large, worn tooth, which is probably a canine. There is a short diastema, and behind this, are six robust teeth.

The locality of these remains is in Phillips County, Kansas, and the special horizon in which they occur so abundantly is in the Pliohippus beds of the Upper Pliocene. The specimens here described were obtained by J. B. Hatcher of the U. S. Geological Survey.

BRONTOTHERIDÆ.

The large collections of the *Brontotheridæ* secured by the writer in his various expeditions in the West have been supplemented by important discoveries made during the last two years, mainly under the auspices of the U. S. Geological Survey. Remains of more than one hundred individuals, many of them with the skulls in good preservation, have recently arrived in New Haven, and are now under examination. The results of an investigation of the whole group will be brought together by the writer, in a monograph now well advanced toward completion. Some of the more important of the new forms are briefly described below, and these will all be fully illustrated in the monograph.

Brontops robustus, gen. et sp. nov.

The present genus is quite distinct from any of the forms previously described, and the type is the most perfect specimen of this group yet discovered. The skull and lower jaws are almost as perfect as in life, and the greater part of the skeleton has also been secured. The skull is large and massive, with widely expanded zygomatic arches, and short and robust horns, projecting well forward. In general form, it resembles

the skull of *Brontotherium*, but may be readily distinguished from it by the dental formula, which is as follows:

Incisors $\frac{2}{1}$; canines $\frac{1}{1}$; premolars $\frac{4}{4}$; molars $\frac{3}{3}$.

The presence of four premolars in each ramus of the lower jaw is a distinctive feature in this genus. This character, with the single, well-developed incisor, marks both the known species.

The type species here described is one of the largest of the group, and the skeleton on which it is based is already represented on many plates of the monograph in preparation. The skull is about thirty-two inches (81 cm.), in length, and twenty-six and one half inches (67 cm.), across the zygomatic arches. The pelvis is over four feet (120 cm.), in width.

This unique specimen was discovered by the writer and H. C. Clifford, his guide, in 1874, near the White River in northern Nebraska. The geological horizon is in the upper part of the *Brontotherium* beds of the Lower Miocene.

FIG. 5.

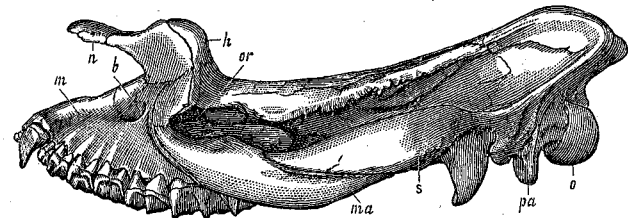


FIG. 6.

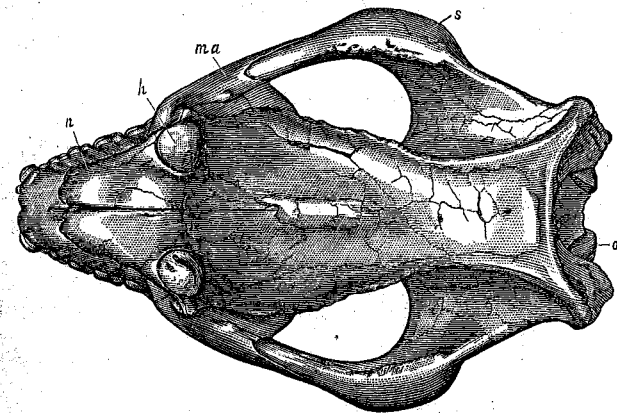


FIGURE 5.—Skull of *Brontops dispar*, Marsh; side view (young male).

FIGURE 6.—The same skull; top view.

Both figures are one-eighth natural size.

Brontops dispar, sp. nov.

A smaller species of this genus is represented at present by a nearly complete skull with lower jaws and entire dentition. The skull is less massive, and proportionately more elongate than in the type species, and the lower jaw more slender. The latter is shown below, in figures 7 and 8, which also illustrate some of the generic characters.

The skull of a young animal, apparently of this species, is represented in figures 5 and 6. The sutures are many of them distinct, especially those in the facial region, and thus the elements of the horn-cores, in this genus at least, can be readily determined. The front of the elevation is formed by the

FIG. 7.

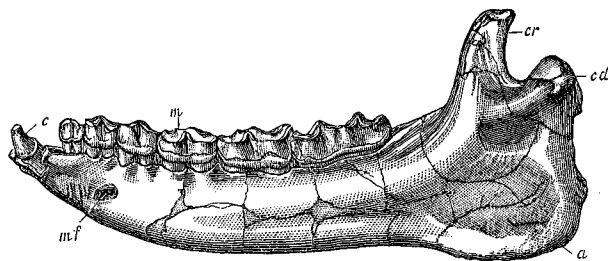


FIG. 8.

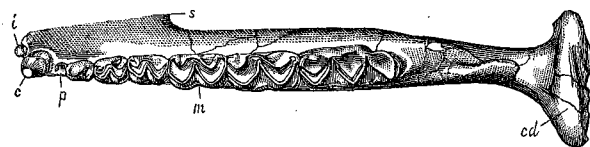


FIGURE 7.—Lower jaw of *Brontops dispar*, Marsh; side view.
FIGURE 8.—The same jaw; top view.
Both figures are one-eighth natural size.

nasal, and the main portion by the frontal. The maxillary contributes only the outer face of the base, but in some of the other genera, its share appears to be larger.

The specimens above mentioned were found in the Brontotherium beds of Dakota, by Mr. J. B. Hatcher of the U. S. Geological Survey.

Menops varians, gen. et sp. nov.

The present genus is most nearly related to *Diconodon*, and in its molar teeth agrees with that form. It differs in the

presence of two upper incisors on each side. The superior dentition is as follows:

Incisors, 2; canine, 1; premolars, 4; molars, 3.

In figure 9, below, is shown the type specimen, which is evidently the skull of a large adult male. Figure 10 represents a female skull apparently of the same species. The latter skull is much less robust, and the horn-cores are very small, although the dentition and sutures show that the animal was fully grown.

FIG. 9.

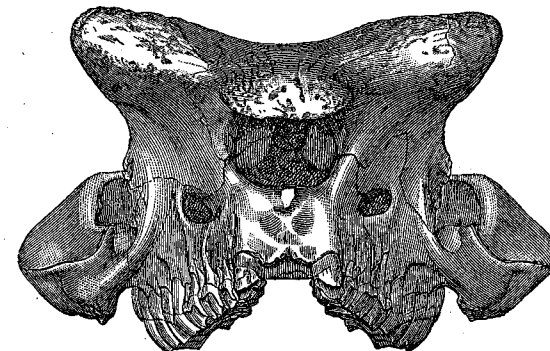


FIG. 10.

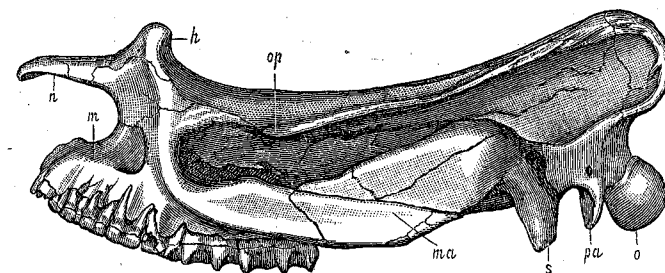


FIGURE 9.—Skull of *Menops varians*, Marsh; front view (male).
FIGURE 10.—Skull of same species; side view (female).
Both figures are one-eighth natural size.

The interesting specimen shown in figure 9 was obtained by Mr. George A. Clarke, from the Brontotherium beds of Dakota. The other specimen was found in the same region by Mr. J. B. Hatcher.

Titanops ourtus, gen. et sp. nov.

This genus contains the largest members of the *Brontotheridce*, and some of the last survivors of the group. They are distinguished from all the other known types, by the long, narrow skulls, lofty, flat horn-cores, and short nasals. The upper dentition corresponds nearly to that of *Brontotherium*, but the upper molars have all two inner cones.

FIG. 11.

FIGURE 11.—Skull of *Titanops curtus*, Marsh; front view. One-eighth the natural size.

Figure 11 shows the front view of the type specimen, which indicates well the above features. The nasals are the shortest known in the group.

This specimen was obtained by the writer, in the lower Miocene of Colorado.

Titanops elatus, sp. nov.

A second specimen, about equal to the last in size, but representing a different species, is shown in figure 12. The nasals are much longer, and the occipital crest much higher, than in the type species. The zygomatic arches are unfortunately wanting, but the lower jaw is present, nearly in place. It shows no marked characters different from that of *Brontops*.

This specimen is from the Miocene of Dakota, and for important aid in securing it, the writer is indebted to Prof. F. E. Carpenter of the Dakota School of Mines.

FIG. 12.

FIGURE 12.—Skull of *Titanops elatus*, Marsh; front view. One-eighth the natural size.

Allops serotinus, gen. et sp. nov.

Another genus nearly related to *Brontotherium* is represented at present by a well-preserved skull, and various other remains. This skull in its general form resembles that of *Brontotherium*, but differs in having only a single upper incisor, and the last molar has the posterior inner cone more strongly developed.

The superior dentition is as follows:

Incisor, 1; canine, 1; premolars, 4; molars, 3.

In the type specimen, the canine is small, extending but little below the premolars. There is no diastema. The upper premolars have a very strong inner basal ridge. The nasals are very wide, expand forward in the free portion, and are notched in front.

The entire length of this skull is thirty-one inches (79 cm.), the distance across the zygomatic arches twenty-one inches (53 cm.), and the length of the horn-cores about ten inches (25 cm.)

This specimen was found near the top of the *Brontotherium* beds in Dakota by Mr. J. B. Hatcher, who has done much by his discoveries to increase our knowledge of this group.

Tale College, New Haven, Sept. 24th, 1887.