

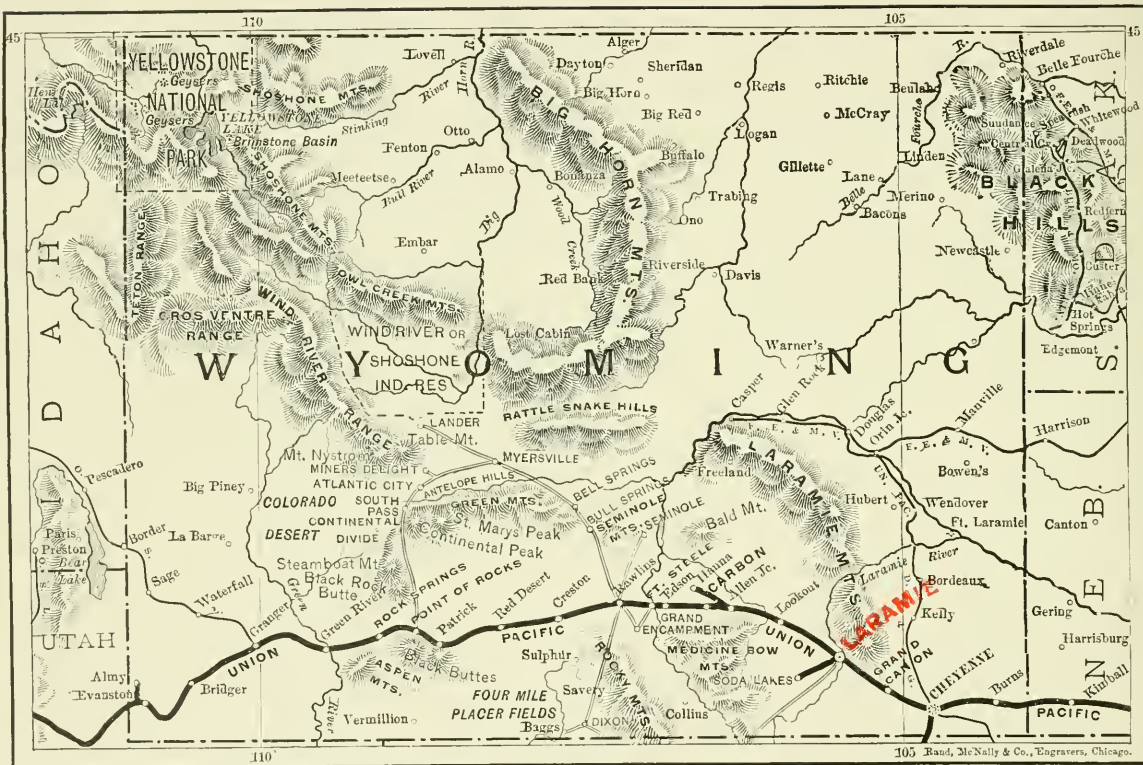


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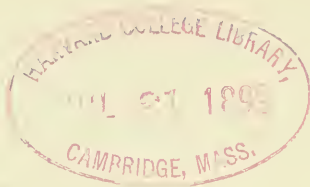
Wyoming's
VERTEBRATE FOSSILS

Pz-S 693



Compliments of
Passenger Department
Union Pacific R. R. Co.

SOME OF
WYOMING'S VERTEBRATE
FOSSILS



F. W. Sanders

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Widener

STRANGE FOSSIL FIELDS OF WYOMING—A GEOLOGICAL WONDERLAND
—VAST PREHISTORIC BURYING GROUNDS—A LAND RICH
IN FOSSIL TREASURES—PETRIFIED BONES
FOR A THOUSAND MUSEUMS.

Wyoming is the geological wonderland of the world. Within the confines of the big western State are the most extensive and fertile fossil fields known. Its sagebrush plains are, indeed, one vast, prehistoric burying ground; and Science has summoned them to give up their dead.

Wyoming is the resting place of the petrified bones of the largest land animals that ever lived. After already bequeathing to geological science the rarest of fossil treasures, the State is again writing a strange chapter in the world's geological history by unearthing the petrified bones of the most colossal animal ever taken from the earth's strata. This stone monster was a dweller in the Jurassic age—a Dinosaur, measuring nearly 130 feet in length, and being perhaps thirty-five feet in height at the hips and twenty-five feet at the shoulders—an animal so terrible in size that its petrified skeleton alone is believed to weigh more than 40,000 pounds.

To the geological department of the Wyoming State University is due the credit of this wonderful discovery. Assistant W. H. Reed, of the Department of Geology, made

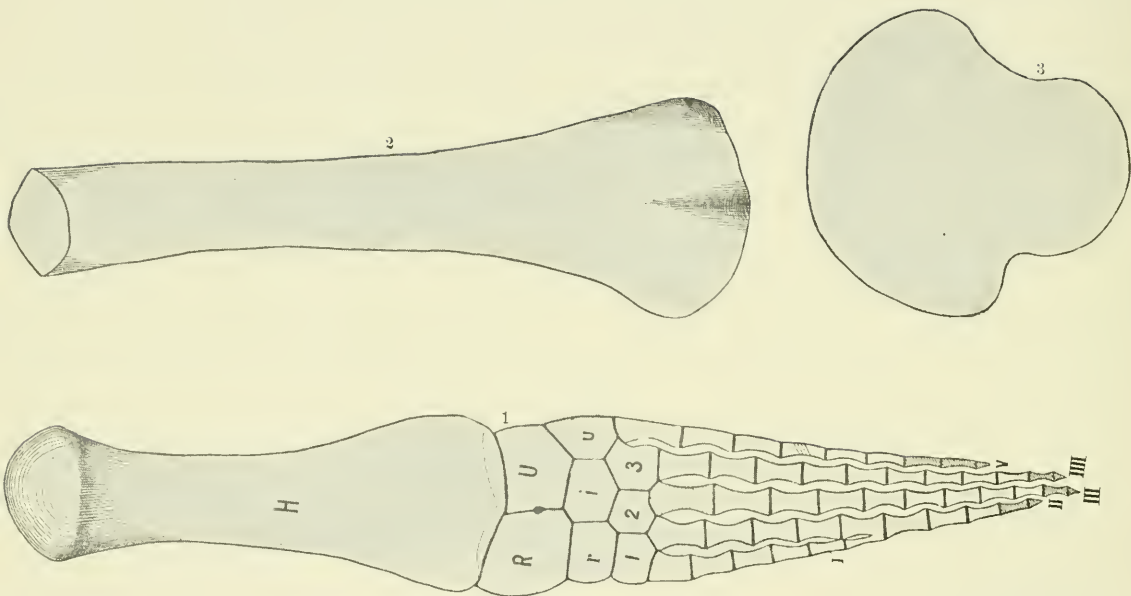


N.-W. CORNER OF "BONE ROOM," UNIVERSITY OF WYOMING.

the great find while prospecting for fossils ninety miles northwest of Laramie, Wyo., last August. On account of a large amount of work on hand when this giant was discovered the party in the field were compelled to let it remain in its natural bed during the winter. Some of the prominent bones were uncovered and sufficient data secured to warrant one in believing that it represents the largest Dinosaur ever discovered. Work on excavating for the remains will be resumed in early spring, and by fall the skeleton will be removed to the University, where it will be restored and placed upon exhibition as soon as the new museum is finished to receive it.

In comparison to a mammoth, this animal was in size as a horse is to a dog. In the known fossil world there is but one creature that can serve in an approximate comparison with it, and this would be only as a child beside it. Prof. O. C. Marsh's famous Brontosaurus at the Yale Museum at New Haven is its only animal criterion of measurement. This was a creature of its own time and kind, a fellow creature in Wyoming, where for millions of years they had slept together in the same graveyard, to be finally resurrected by the same ghoul of science—Mr. Reed. The skeleton at Yale was restored in 1891 by Professor Marsh. Fortunately this animal died alone, and in consequence seven-tenths of the skeleton was found in place. Beside this monster the largest Dinosaurs of Europe, and, indeed, the world, have remained since its discovery as only pygmies, and geological students, for years, have made pilgrimages to New Haven to study and to marvel at its immense skeleton.

This monster is believed to have been about seventy feet in length, and in life to have weighed perhaps 80,000 pounds, the new discovery eclipsing it in this respect by probably more than 50,000 pounds. This animal was perhaps twenty-five feet at the hips, and sixteen



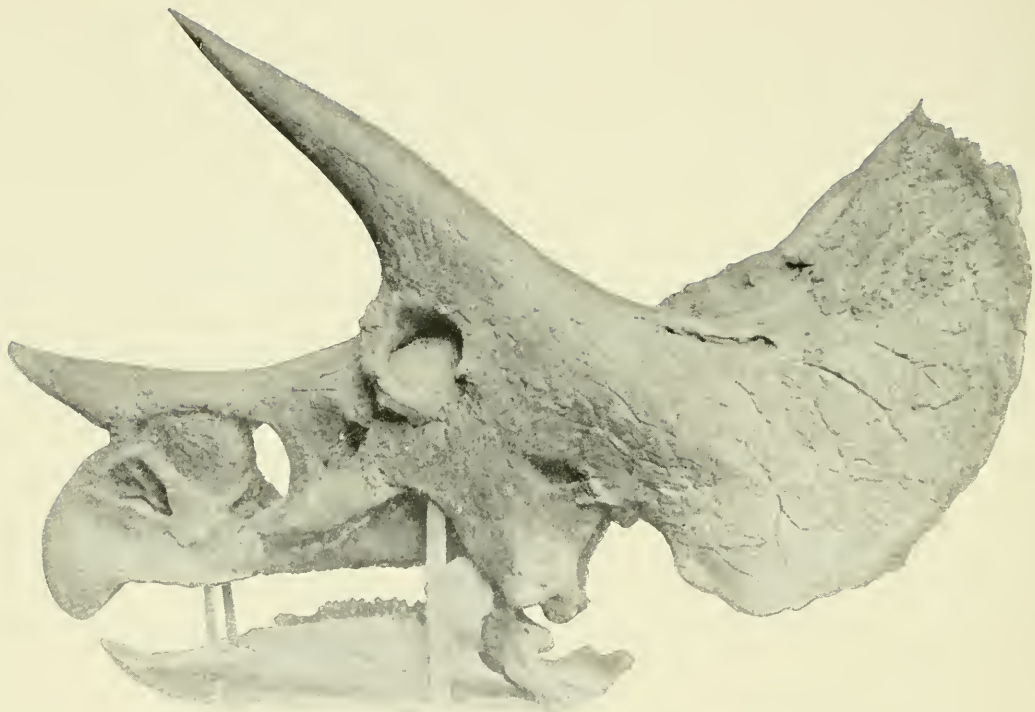
MEGALNEUSAURUS REX (KNIGHT).

1. Front limb, nearly 8 feet long. 2. Humerus. 3. Section of head of humerus. From Natrona County, Wyo.
In the collection of the University of Wyoming.

feet at the shoulders. Its femur alone is slightly more than six feet in length, while the femur of the animal now being resurrected is nearly or quite eight feet in length. A measurement of its lumbar vetebra across the centrum is thirteen inches, while a corresponding vertebra of the fossil recently discovered is over sixteen inches in similar measurement. From the bones disinterred, the Dinosaur in Wyoming, in comparison to the one at Yale, is in size about as three is to two.

The body of the Dinosaur is comparatively short, but extremely thick. Mr. Reed, in conjecturing as to the probable appearance in life of the animal that he is restoring, said:

“An accurate idea of a living Dinosaur is practically out of the question. According to my opinion, I should say that the animal now being brought to light weighed in life about sixty tons, that he had a neck thirty feet in length, and a tail perhaps sixty feet in length. His ribs are about nine feet in length, and the cavity of his body with the lungs and entrails out, would have made a hall thirty-four feet in length, sixteen feet in width, and arched over probably twelve feet in height. Such a space, if properly arranged, would seat at least forty people. A round steak taken from the ham of the animal would have been at least twelve feet in diameter, or more than thirty-five feet in circumference, and would have had a solid bone in the middle 12 x 14 inches, with no hollow for marrow. A set of fours in cavalry could easily have ridden abreast between his front and hind legs, provided he had not objected. Every time he put his foot down it covered more than a square yard of ground and must have fairly shaken the earth. The smallness of the head of this animal is a peculiar thing. I should say that the head of this mighty Dinosaur was probably not larger than a ten-gallon keg. He must have been a very sluggish creature, as his brain cavity would certainly not warrant the belief that that organ weighed to exceed four or five pounds.



HEAD OF TRICERATOPS PRORSUS (MARSH).

About $\frac{1}{12}$ natural size. In the Yale collection. From Converse County, Wyo.

“The indications are, indeed, flattering for our recovering the greater part of the animal's fossil remains; and it will be an almost invaluable fossil treasure. There is no building in Laramie large enough to contain it; and when we get it here we shall probably place it temporarily on the campus.

“Our work has been interrupted by snow. I have taken up the land on which I found the fossil under the placer mining laws of the United States, and we shall work as rapidly as possible in restoring our great prize to a normal condition here at Laramie.”

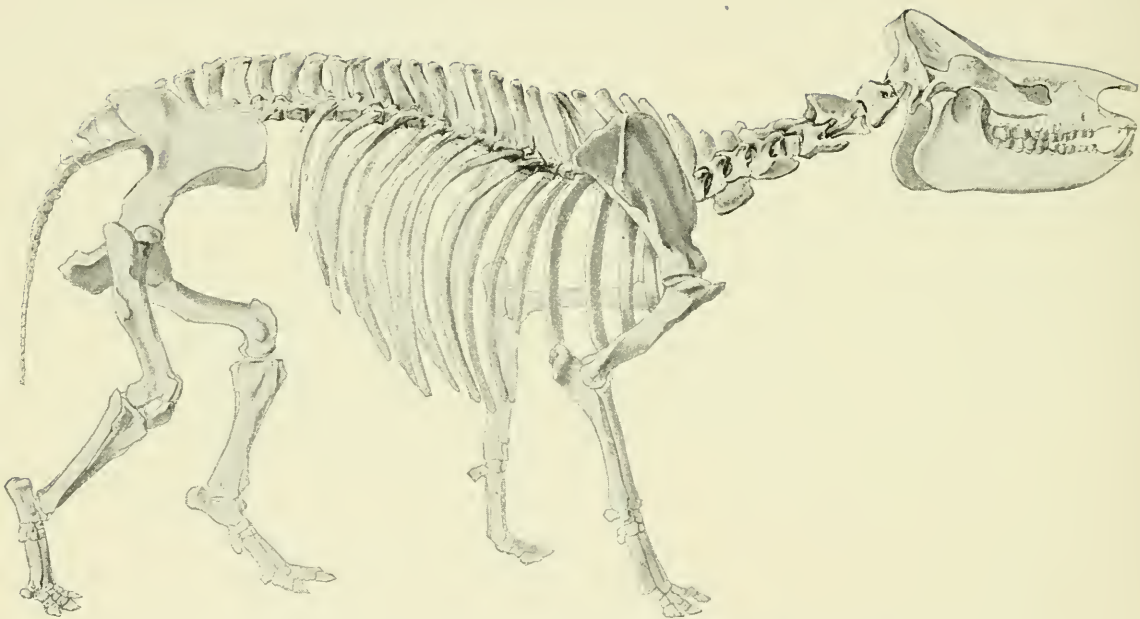
For many years Wyoming has been known to contain some of the world's most noted fossil fields. Since 1877 the State has been known to have the petrified remains of the largest land animals that ever lived.

Professors Marsh, of Yale, and Cope, of the University of Pennsylvania, began the study of these colossal animals in 1877. Professor Cope continued in their study until the time of his death, less than two years ago, while Professor Marsh* is still at work upon them in his elaborate monograph for the United States Geological Survey, for which the greater part of his material has been obtained in Wyoming. From 1877 until 1888, Professor Marsh had field parties continually at work in this State. During the greater part of this period his work was in charge of Mr. Reed.

In the summer of 1894 the University of Wyoming began work in the field to secure a complete collection of fossil remains of these great animals. During the past three years Mr. Reed has spent his entire summers in this work of collection, with a result that he has brought to the western university more than fifty tons of the bones of these huge reptiles.

His recent great discovery is believed to make the University's collection of Dinosaur fossils the greatest in the world. The Wyoming fossil beds, as far as known, are richest in

* As we go to press we learn of Professor Marsh's death.



RESTORATION OF ACERATHERIUM TRIDACTYLUM (OSBORN).

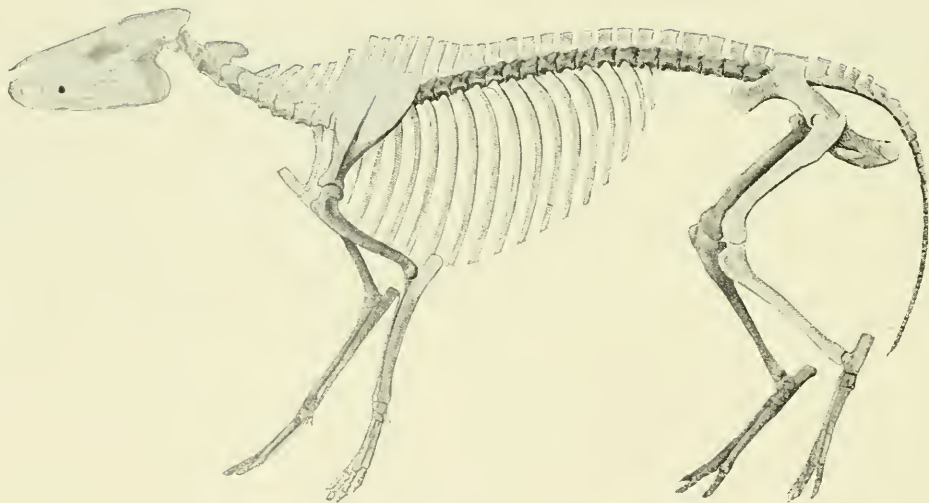
In collection of the American Museum of Natural History. Common in the Wyoming Miocene.

Albany and Carbon counties, in the south central part of the State. The bones are usually found in banks of clay or marl, but occasionally in beds of sandstone. It is not an unusual thing to find a bone bed four or five feet in thickness, with the bones so close together and so mixed up that it is almost impossible to take them out and restore them to a normal place in the body.

At one time in the history of Wyoming, geologists say that the State had numerous fresh-water lakes and a climate that was semi-tropical. At this time, these animals are believed to have inhabited these lakes and swamps in myriads. The animals sank into the mud in dying and their bones were covered over with other deposits and became petrified. The large beds are found where at one time are supposed to have been the mouths of great rivers, the animals after death having floated down these rivers to where they were deposited in these estuaries, thus accounting for the vast deposits in certain places.

It is believed that through the geological ages these animals became covered with perhaps 20,000 feet of rock. The process by which the Rocky Mountains were formed tilted these beds, and subsequent erosion has thus brought to light the burying grounds of millions of years ago.

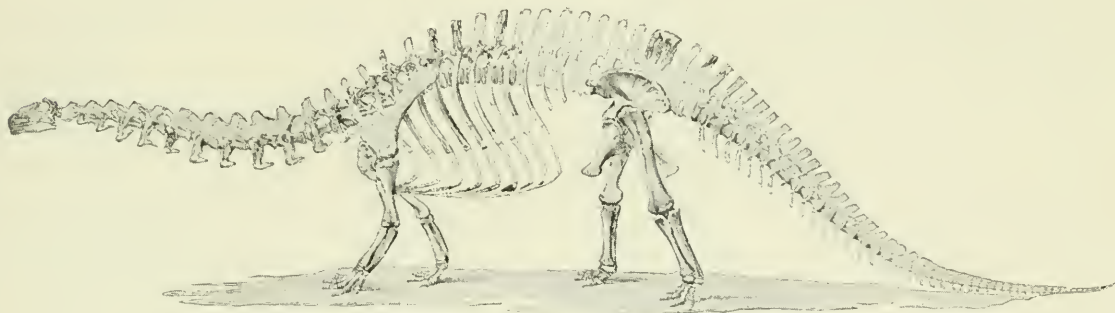
The history of this reptilian age in which the Dinosaur lived has been faithfully, although not fully, written in Nature's unmistakable hieroglyphics, found in these vast burying grounds. The animals of the period, although all lizard-like, were yet widely different in character. The seas were inhabited by fishes, turtles, and sea serpents. On the land were herbivorous, carnivorous, jumping, flying, and armored animals, all reptilian in their nature. Associated with these were a few mammals about the size of a modern mouse, and a few primitive birds.



HYRACOTHERIUM VENTICOLUM (COPE).

In collection of the American Museum of Natural History. From Fremont County, Wyo.

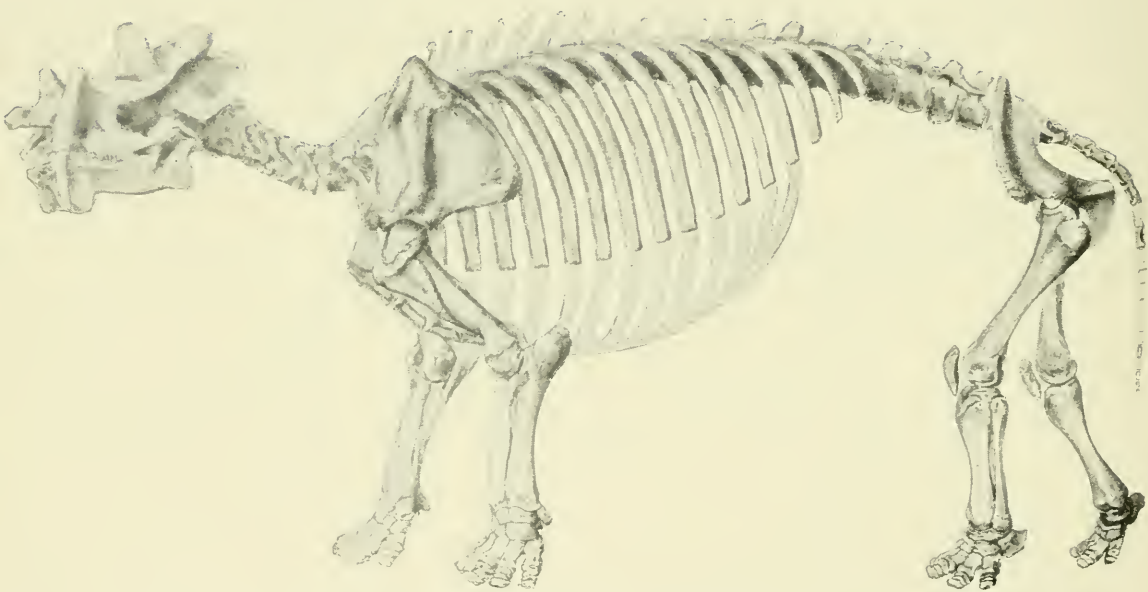
The collection of reptilian fossils at the University of Wyoming embraces portions of many of the reptiles known to the reptilian age, and a great many animals that are new to science and not found elsewhere. This wonderful collection has been gathered together under the direction of Prof. Wilbur C. Knight, of the chair of geology, of the University.



RESTORATION OF BRONTOSAURUS EXCELSUS (MARSH).
About $\frac{1}{400}$ natural size. In the Yale collection. From Aurora, Wyo.

In discussing the probable extent and fertility of the Wyoming fossil fields, Professor Knight has entered into detail, as follows:

“But few people have any idea, as they are whirled over the mountain ranges, the deep



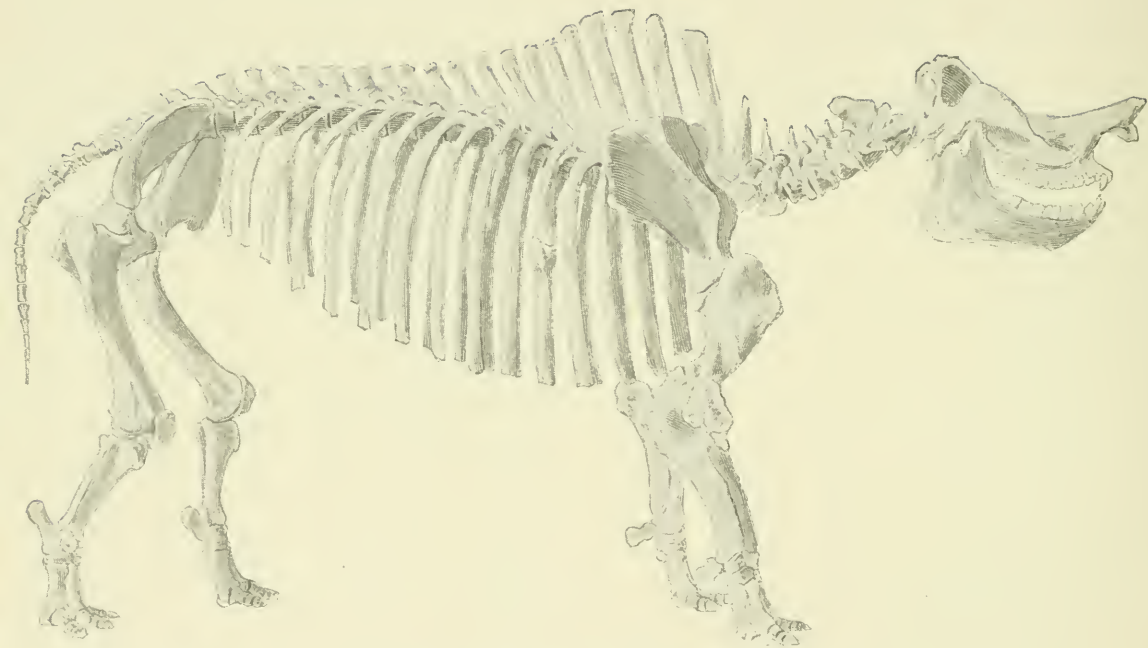
DINOCERAS MIRABILE (MARSH).

About $\frac{1}{20}$ natural size. In collection at Yale. From Uinta County, Wyo.

canyons, fertile plains, and great deserts of Wyoming, that they are in the very midst of one of the greatest treasure-locked regions of the entire world. Some may wish to argue this point; and to such let me say that one has only to visit our National Museum, the American Museum of Natural History, Harvard, Yale, Princeton, and the University of Wyoming to fully appreciate what Wyoming has done for science—and the work has just begun. In another quarter of a century the collections will be doubled, and the material found will play even a greater part in upbuilding the theory of evolution than it has in the past. Up to the present time no State or Territory in the United States, and indeed, no equal area in the world, has done so much for the theory of evolution and comparative anatomy as this State. These are broad and sweeping assertions, but they are nevertheless true and can easily be confirmed by any one who will intelligently consult the memoirs and monographs by Leidy, Cope, Marsh, Osborn, Wortman, Scott, and many others.

“What are these treasures? They are the remains of huge reptiles, so large that only those with a vivid imagination can form any adequate idea of their size; huge mammals of elephantine dimensions mingled with numerous orders of large animals that have long been extinct; besides such as camels, rhinoceroses, dogs, cats, elephants, and monkeys; great sea monsters that were truly sea serpents; fishes that compare favorably with the finny tribe of our great lakes; shell fish almost innumerable, and fossil leaves that prove conclusively that in early ages Wyoming was densely clothed with trees of tropical and semi-tropical verdure.

“Work in collecting from this vast storehouse commenced in the '40s, and during the years that have elapsed since, Wyoming has been a favored collecting ground for the leading geologists and paleontologists of the entire country. The early expeditions encountered the treacherous Sioux, but were not baffled, though they had to “outfit” on the Missouri River



TITANOTHERIUM ROBUSTUM (MARSH).

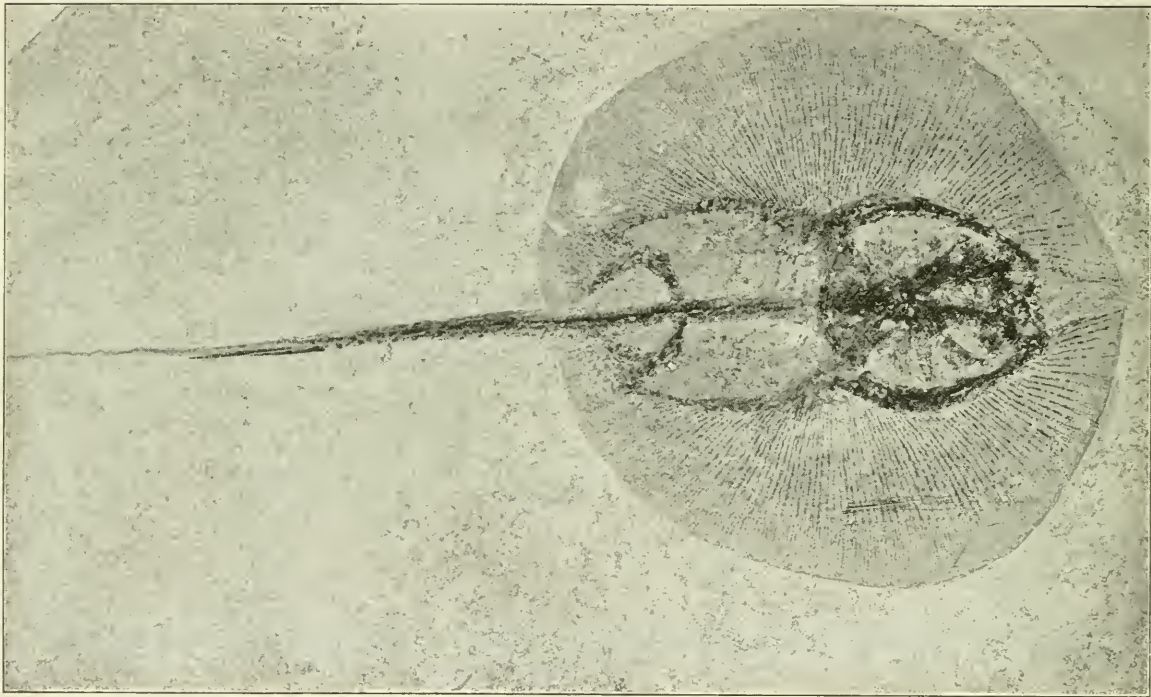
About $\frac{1}{27}$ natural size. From American Museum of Natural History. Common in the Wyoming Miocene.

and travel four hundred miles or more by team before entering the field. The advent of the Union Pacific R. R. added vigor to the research work, and from that day to this, not a season has passed but several expeditions have spent the summer in the Wyoming fields.

“Thus far the work has been carried on only by institutions having ample means, or by private parties especially interested in the work. In consequence the average, in fact the most of our American universities and colleges, know nothing of the vast resources of this State, nor do they know anything about the rare fossils, except as they review the published works of paleontologists. Most of the American students have been deprived of studying these interesting forms, and the average American citizen has never had the opportunity of seeing these great prehistoric remains, simply because they have been taken, as a rule, to the far east, and there placed in large museums.

“The fields are ample for all who wish to avail themselves of the opportunity to collect and create museums as large, if not larger than any that have been built up during the last quarter of the century.

“The work in procuring these rare specimens is as exciting as gold hunting, and many times one finds bones that are worth more than their weight in gold. While the work is intensely interesting, and, one might say, exciting, it has many more sides. There is the contact with the field, which no geologist can afford to be without; there are the numerous questions in geology and paleontology to study which can only be accomplished in the field; then, there are the vicissitudes of camp life — the long drives for a “water hole,” the hunting of grass for horses, and numerous other experiences which all like to repeat after they are home from a summer's field experiences, and are busily engaged in restoring and studying the material gained.



XIPHOTRYGON ACUTIDENS (COPE).

Fossil Ray. University of Wyoming. From Twin Creek, Uinta County, Wyo.

"As stated before, Wyoming has no equal as a fossil field, and while expedition after expedition has taken away material by the car load, the fields are large and hundreds of square miles have never been visited by geologists.

"On account of the numerous mountain ranges the rocks are tilted about our great field, and erosion has cut deep valleys and canyons leading from them, which makes it



DORSAL VERTEBRA OF BRONTOSAURUS.

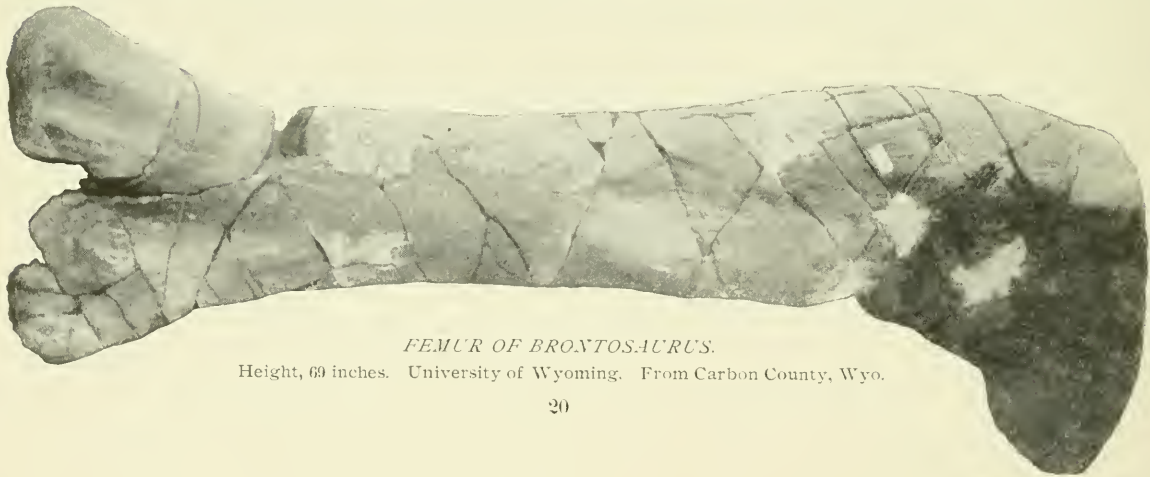
Height, 44 inches. University of Wyoming. From Converse County, Wyo.

possible to examine every foot of a formation in detail. In many places the later formations have been deposited in interior seas, and these have been eroded down to their base, so that the entire section is exposed.



SCAPULA, CORACOID, AND HUMERUS OF A LARGE DINOSAUR.

Length, Scapula and Coracoid, 74 inches. Length, Humerus, 43 inches. University of Wyoming. From Carbon County, Wyo.



FEMUR OF BRONTOSAURUS.

Height, 69 inches. University of Wyoming. From Carbon County, Wyo.

“To those interested, it may be well to dwell at some length upon the fossil fields, their nature, and just what one may expect to find in each.

“While Paleozoic rocks are found flanking every mountain range, they are in no way comparable with the vast beds of sediment found along the Appalachian Mountains. These are Cambrian, Ordovician, Silurian, and Carboniferous; but, taken as a whole, they are seldom over 3,000 feet thick. The fossils they contain are only partially known, and on comparison with similar groups in the east, they are not rich in fossil life. Not over one hundred species have been reported from them.

“The Mesozoic of the west, on the other hand, corresponds in thickness and importance to the Paleozoic of the east, and in its maximum development is nearly 25,000 feet thick. It also covers vast areas along the mountains and in the valleys—stretches half way across the State, and in one place is over one hundred miles in breadth. These rocks are made up of three distinct periods—the Triassic, Jurassic, and the Cretaceous. The Triassic or ‘red beds,’ as they are usually called, are chiefly bright red sandstone and gypsum, and vary from 800 to 1,200 feet in thickness. So far as known they do not contain any fossil life.

“The Jurassic rocks, the second period, are wonderfully rich in reptilian remains, and contain as well many mammals and fishes. The University of Wyoming commenced collecting the reptilian fossils only three years ago, and now has partial skeletons of over one hundred animals. The most of these belong to the so-called Dinosaurs, the largest land animals that ever lived, and so large in fact that when one describes them the majority of people consider the description to be a ‘western yarn’ without foundation. Nevertheless the scientific articles published along this line can be considered correct. The University of Wyoming’s collection can be summed up as follows: Ten Ichthyosaurs (*Baptanodon discus*,

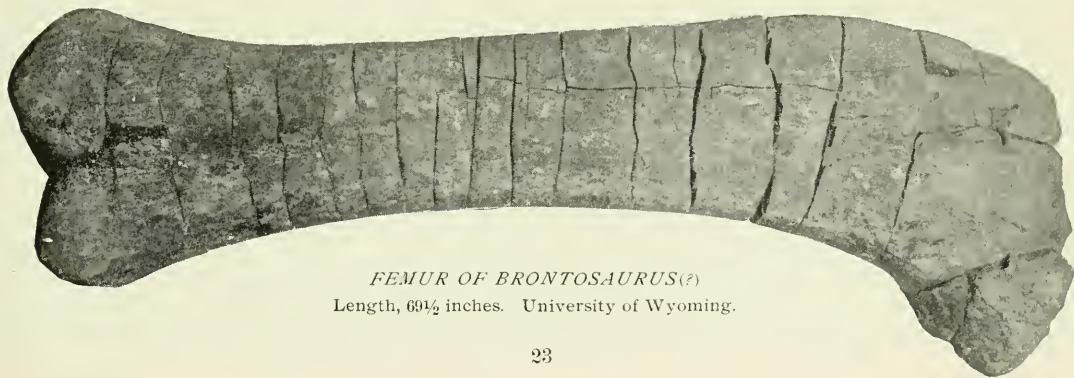


RESTORATION OF CERATOSAURUS NASICORNIS (MARSH).

About $\frac{1}{40}$ natural size. Specimen in the collection at Yale. From Como, Wyo.

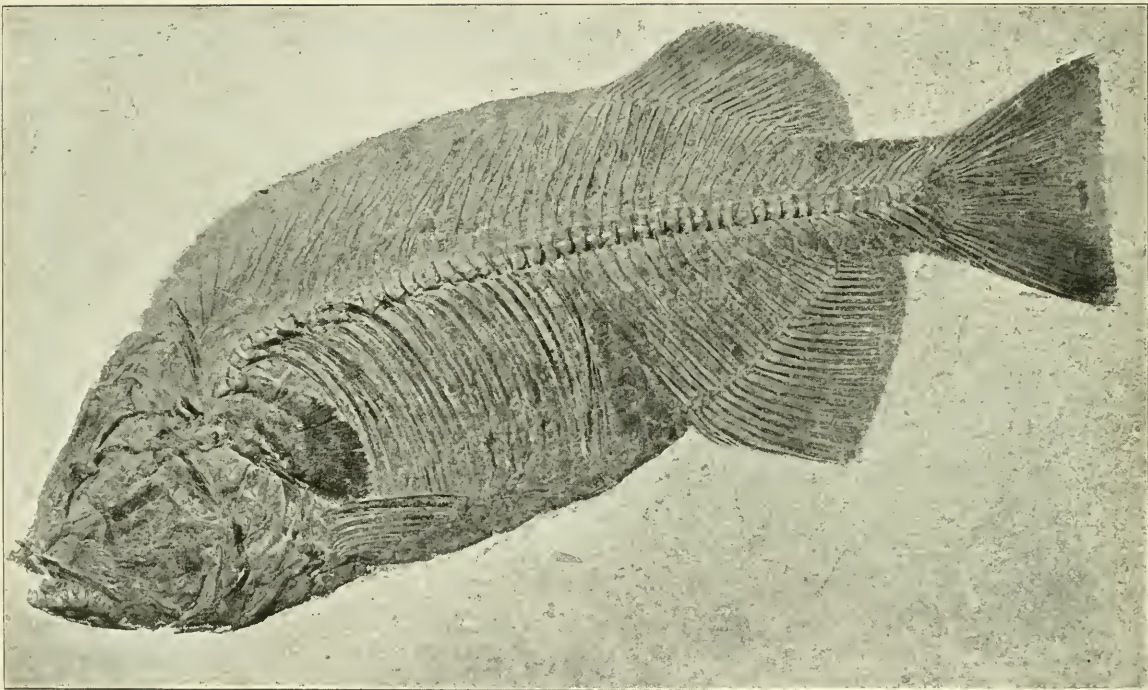
etc.), three Plesiosaurs, one Megalneusaur, and the remainder Dinosaurs. The Megalneusaur represents the largest swimming Saurian known, it having a front paddle nearly eight feet in length. The Dinosaurs range in size from a few feet in length to eighty or more. The remains of these large animals are most interesting, since they are of such a gigantic size. Imagine a femur six feet long or over, a vertebra with its process nearly four feet high, a scapula six feet long, and ribs as large as a forty-pound steel rail and from six to nine feet in length. Altogether there have been at least thirty species of Dinosaurs described from these rocks, and without question this number will be doubled during the next ten years.

“Yale has the greatest collection of these animals known, the University of Wyoming the second, and the American Museum of Natural History, of New York, the third. The scientific men of the world have by some means been led to believe that the Jurassic rocks con-



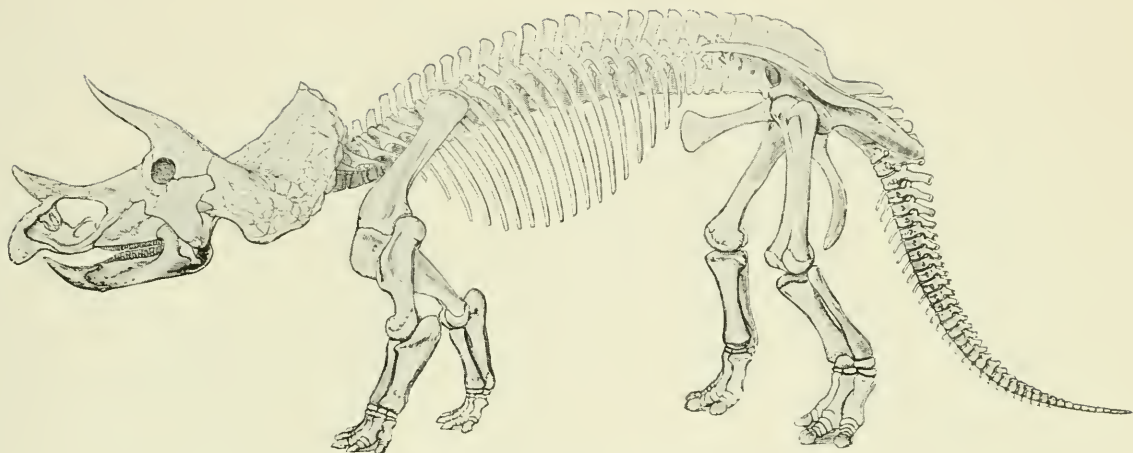
FEMUR OF BRONTOSAURUS(?)

Length, 69½ inches. University of Wyoming.



DAPEDOGLOSSUS TESTIS (?) (COPE).

Length, 24 inches. From Twin Creek, Uinta County. University of Wyoming.

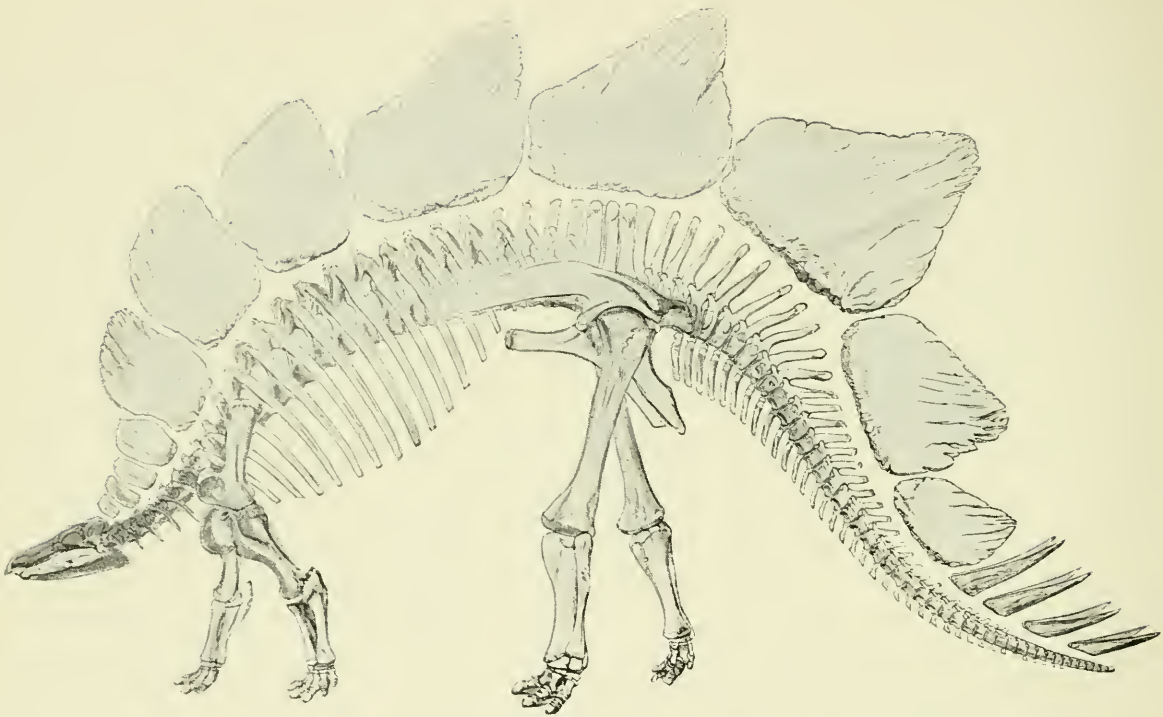


RESTORATION OF TRICERATOPS PRORSUS (MARSH).

About $\frac{1}{50}$ natural size. Specimen at Yale. From Converse County, Wyo.

taining these fossils were only found in small areas, and that these were practically exhausted. Not 10 per cent of the Jurassic exposures in Wyoming have been examined up to this date, and even at the old classic escarpments at Como (Aurora) there are lands not prospected and places where quarries can be opened up as large and productive as any ever known.

“Only a year ago the American Museum expedition found two magnificent skeletons within a quarter of a mile of the railroad, and in sight of several of the quarries opened by



RESTORATION OF STEGOSAURUS UNGULATUS (MARSH).

In the Yale collection. From Carbon County, Wyo.

Professor Marsh in the '70s. There is no reason why any American or foreign museum should be without these, the very choicest of all museum specimens.

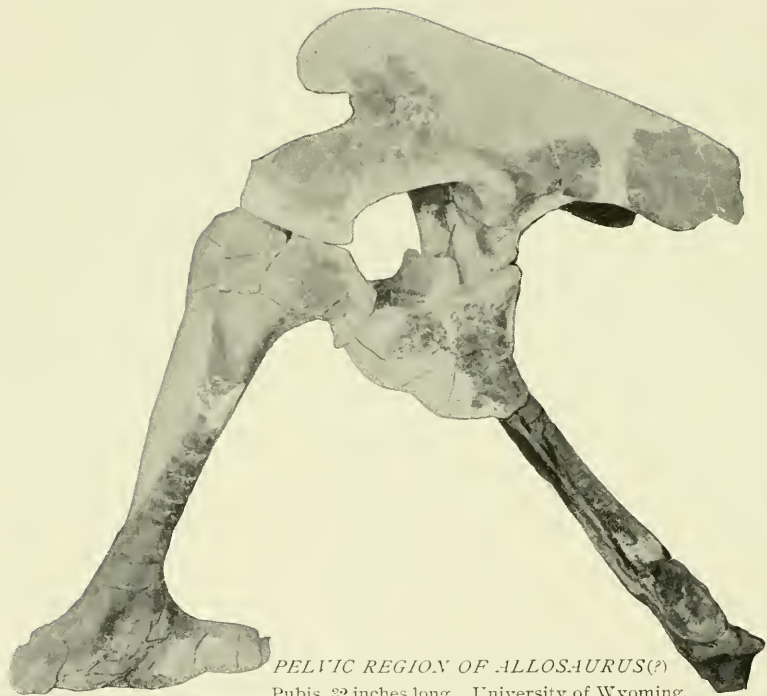
“Besides the fossils mentioned there are about one hundred species of invertebrates to collect, then species of fishes and turtles, and a number of species of extremely rare cycads.

“The Cretaceous rocks cover about one-half of the State, and have a maximum thickness of about 20,000 feet. They are also rich in fossil life, but they are not as well known as the Jurassic, for they have not received the attention from scientific men. In fossil plants they abound, and in case the fossil flora of the Tertiary is included with the Cretaceous, there are 300 species described, and no doubt as many more to discover, that are found in the Cretaceous and Tertiary of other districts, or that are new to science.

“The invertebrate fossil life contains hundreds of species — in fact, all of the Cretaceous species common to the Rocky Mountain region. They are so plentiful that one can often, in a single day, collect 100 species. The vertebrate fossils are also very important, and there are many families and orders represented. The huge Dinosaurs, so common in the Jurassic period, lived also through the Cretaceous, but they were not so abundant, nor did they, as a rule, grow as large. Not over a half-dozen species have been reported from the Wyoming Cretaceous, but with careful and painstaking labor very many more may be discovered.

“Swimming Saurians were also very numerous, but only a few have been reported. The number will no doubt approximate the Kansas fauna when the series are better known. The remains of the fishes should also be mentioned, for there are many species of shark and similar animals.

“The Tertiary is a very extensive formation, and is represented by many groups, which occupy some of the valleys, such as the Big Horn Basin, Wind River, Green River, Sweetwater



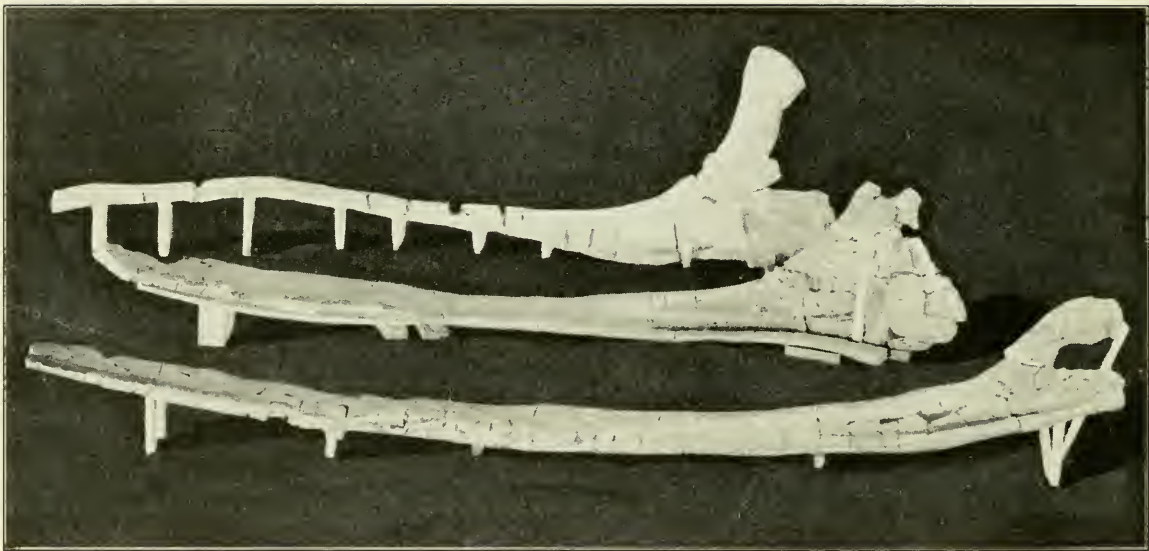
PELVIC REGION OF ALLOS AURUS(?)

Pubis, 32 inches long. University of Wyoming.

River, and the forks of the Cheyenne River. From these beds over three hundred species of vertebrates have been reported, and the most of these are mammals. The Tertiary has been justly called the 'age of mammals,' for prior to this period the mammals were not larger than a mouse. The mammals are found in a great variety—those of elephantine size, and, with them, those that were no larger than an ox, and on down to the size of a rabbit. These Tertiary fields have, from a scientific standpoint, yielded fossils of greater importance to the anatomist and paleontologist than the Jurassic. Here are found the first horses, and from the Wyoming beds nearly a complete series has been obtained. Many of the fossils found in the Green River and Big Horn basins are not known to any other locality. Some of these are so rare that there has been only a single specimen found. Nearly all of these animals bear a scientific name only, but there are representatives of such animals as rhinoceroses, camels, deer, wolves, cats, beavers, and monkeys. Among the most remarkable might be mentioned the following :

“Anaptomorphus, Tomitherium, Mesonyx, Bathyopsis, Coryphodon, Phenacodus, Uintatherium, Hyrachys, Palaeosyops, Hyaenodon, Nimravus, Hyracodon, Titanotherium, Elotherium, Oreodon, and Aceratherium.

“The mammals were not the only life. Many of the fresh-water lakes during the period were swarming with fishes, turtles, and crocodiles, all of which are found in great abundance. The fossil fish found in the Green River shales are the most perfect specimens known. The largest are so beautiful that a single fish has sold for \$100, and choice specimens are held for higher prices. Associated with the fishes are numerous fossil insects that are also rare specimens and highly valued by scientific collectors. The turtles and crocodiles are in great variety and are found in so many bands that they are the common fossils of the lower

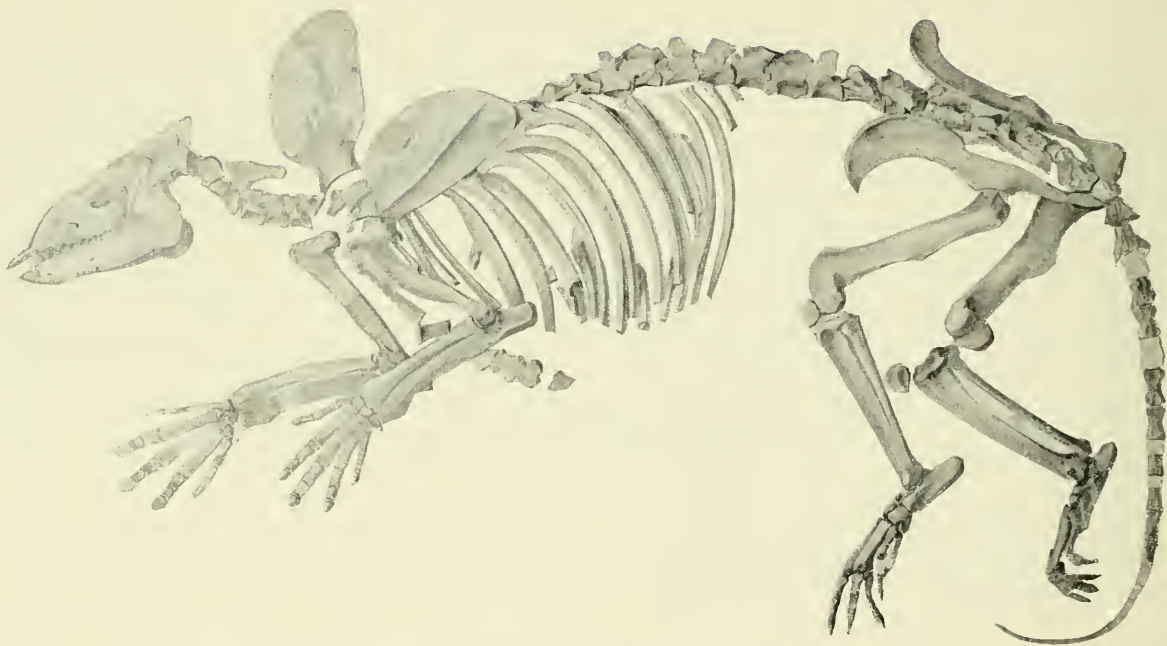


THREE RIBS FROM A LARGE DINOSAUR.

Longest rib, over 6 feet. University of Wyoming.

Tertiary A great many species of invertebrates are also found in these beds. The University of Wyoming has not collected to speak of in the Tertiary fields, since our whole attention has been given to the Jurassic. Incidentally, we have gathered some of the rare fossils; chief among them being a few very fine specimens of the Green River fishes. The only fossil that has been reported from the Pleistocene is an elephant, the lower jaw of which is at the University of Wyoming.

“It is not difficult to understand why Wyoming was justly celebrated as a great treasure field for the museums of the world. Unlike so many other fields, no scientific man nor expedition need turn their back on the State until they feel that they have been fully paid for their efforts. To a certain extent collecting is a profession, and only men with keen eyes, who have acquired the valuable trait of perseverance, accomplished much in any field. Wyoming, however, presents greater facilities than any other locality, for, as Dr. Cope once said, ‘if you can’t find diamonds, you surely can find stones, and in these bones.’ Another feature that presents exceptional opportunities to geologists or paleontologists is that while collecting he is coming in contact with unexplored regions, rich in scientific data, rich alike for any branch of geology. While fossils are being collected there is a great wealth in rock and mineral species, and in the peculiar formations accompanying sedimentation. Collectors entering the field should be provided with teams for transportation, camp equipage, and all that is necessary to make life independent and comfortable.”



PHENACODUS PRIMLEVIS (COPE).

In American Museum of Natural History. From Big Horn County, Wyo.



"BONE ROOM," UNIVERSITY OF WYOMING.

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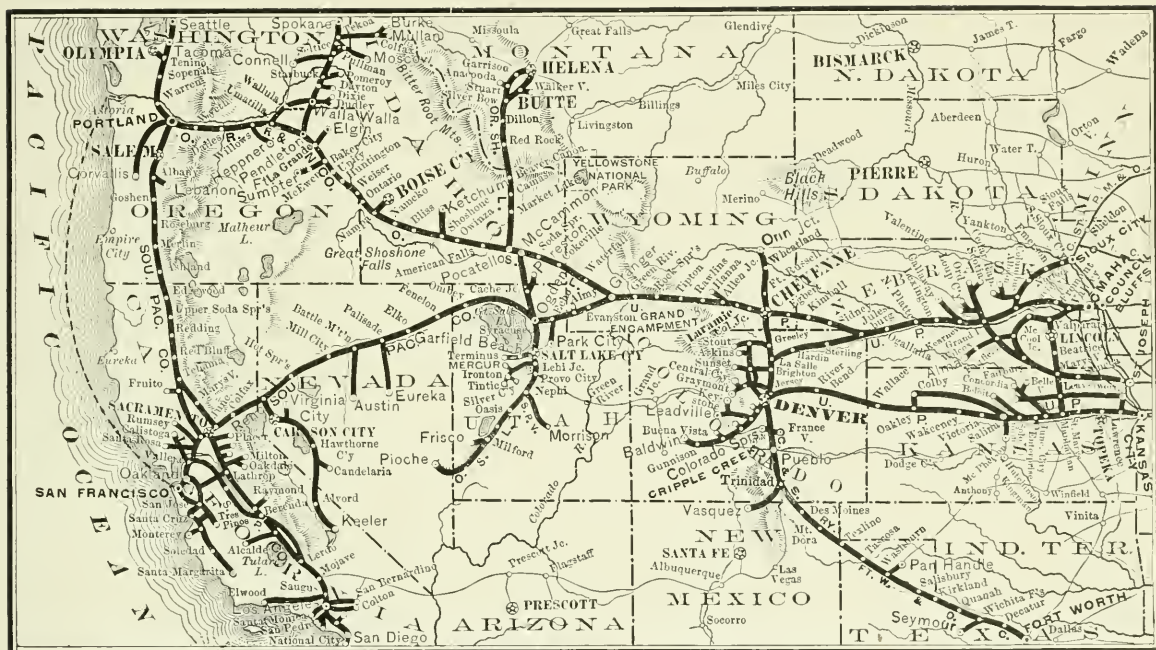
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