

"BEHOLD THE MIGHTY DINOSAUR"

By J. LeROY KAY

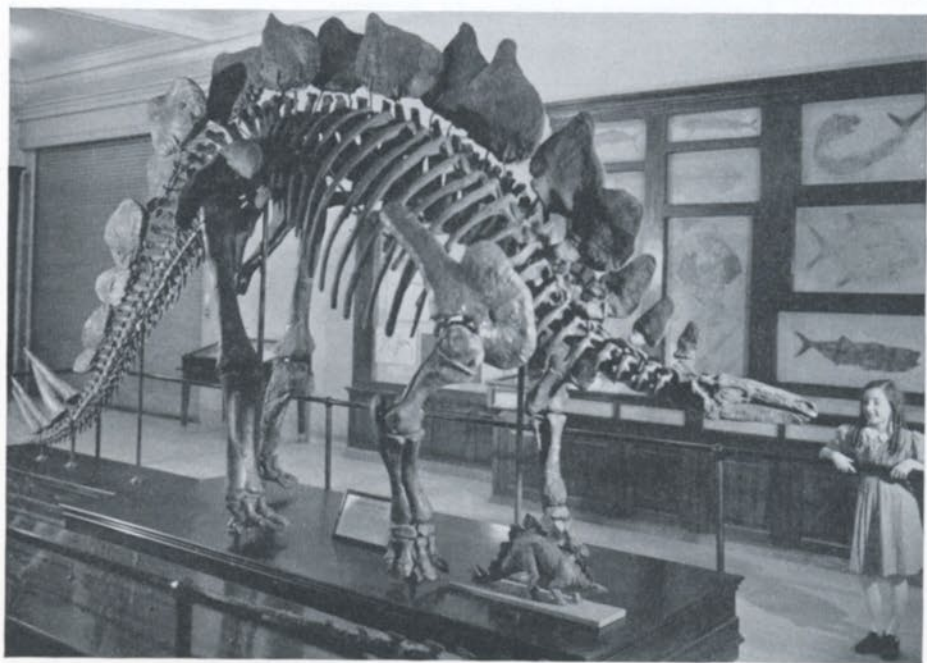
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THERE have been placed on exhibition in the Carnegie Museum's Hall of Paleontology three new herbivorous dinosaurs—*Stegosaurus*, *Camptosaurus*, and *Dryosaurus*. They are all of the Jurassic period—a time during the Mesozoic Era when the sea invaded great areas of Europe, Asia, and Western North America. Land dinosaurs abounded, and the Jurassic seas were ruled by marine reptiles. Robust giants of the past roamed our own Far West, some walking on all four legs and others upright on their hind feet.

Even though their habitat and period were the same—the West in the Mesozoic Era—the three newly installed specimens are quite different in form and habits. They were brought in to the









Carnegie Museum by a field expedition to the Morrison formation of the Dinosaur National Monument in north-eastern Utah—a locality that is at present a semiarid district on the south flank of the Uinta Mountains, an east-west range connecting the Rocky and Wasatch group. The fossils were found in a coarse sandstone that was deposited as sand in an ancient river that flowed from west to east when the dinosaurs were living there, long before the present mountains in that district were formed.

Along this ancient river and adjacent swamps grew cycads, ferns and fernlike plants, and huge horsetail rushes like the rushes growing in the swamps of South America today. The flowering



STEGOSAURUS OR ARMORED DINOSAUR

GEOLOGIC TIME DIVISIONS

| ERAS | PERIODS | DURATION IN YEARS | DOMINANT LIFE | CHARACTERISTIC LIFE |
|-------------|----------------------|----------------------|------------------------------------|--|
| CENOZOIC | RECENT | 10,000 | MAN |   |
| | PLEISTOCENE | 1,000,000 | | |
| | PLIOCENE | 6,000,000 | | |
| | MIOCENE | 12,000,000 | MAMMALS | |
| | OLIGOCENE | 16,000,000 | | |
| | EOCENE | 20,000,000 | | |
| | PALEOCENE | 5,000,000 | | |
| MESOZOIC | CRETACEOUS | 65,000,000 | REPTILES |  |
| | JURASSIC | 35,000,000 | | |
| | TRIASSIC | 35,000,000 | | |
| PALEOZOIC | PERMIAN | 25,000,000 | AMPHIBIANS |    |
| | CARBONIFEROUS | 85,000,000 | | |
| | DEVONIAN | 50,000,000 | FISHES | |
| | SILURIAN | 40,000,000 | | |
| | ORDOVICIAN | 85,000,000 | INVERTEBRATES | |
| | CAMBRIAN | 70,000,000 | | |
| PROTEROZOIC | UPPER PRECAMBRIAN | 650,000,000 | PRIMITIVE MULTICELLULAR LIFE |  |
| ARCHEOZOIC | LOWER PRECAMBRIAN | 650,000,000 | UNICELLULAR LIFE |  |

plants had not yet appeared, therefore there were no butterflies, moths, or bees—the insects adapted for feeding on flowers—but there were beetles, cockroaches, and dragonflies. The climate was warm and mild; and small archaic mammals, the ancestors of the modern forms, were appearing.

Here lived the dinosaurs, both large and small, of which the petrified skeletons may be seen in the Carnegie Museum. What caused their extinction is a matter for debate. We may suggest climatic changes causing drouth or food changes; then there is the thought of epidemic, or overspecialization, or the competition of the oncoming mammals. Each student has his own pet theory on the subject. We do know, however, that the country has changed many times since the dinosaurs lived. The sea encroached upon the land, and sediments to the thickness of thousands of feet were deposited on the floor of the ocean. These sediments are now known as shales and limestones, and in them are preserved the fossilized remains of the inhabitants of this sea, such as marine reptiles, fishes, and shells of invertebrates. As the sea slowly receded again, due to the gradual rise of the land, great marshes and deltas were formed, a return to conditions like those in which the Jurassic dinosaurs lived. At this time a new type of dinosaur had inherited the earth, such as the Trachodons, or duck-billed dinosaurs. This was at the close of the Cretaceous period and the Mesozoic Era.

This close of the Mesozoic Era—or Age of Reptiles, as it is called—marks the beginning of the upthrust of these sediments that for millions of years were being deposited on top of the Morrison dinosaurs. The various layers or strata were pushed up at steep angles to form the sides of the present Rocky Mountain series. Again it took millions of years for the agencies of erosion to wear the mountains down until the river sands, now sandstones, in which the dinosaur skeletons had been buried, were again exposed.

Here, in 1909, at an elevation of five thousand feet above sea level, the Carnegie Museum began the excavation of the largest deposit of Jurassic dinosaurs ever discovered. During the thirteen years that the Carnegie Museum has worked this deposit, approximately seven hundred thousand pounds of fossils in the rock have been shipped to the Museum. By a painstaking and laborious process many of these fossil skeletons and bones have been freed from the matrix that encased them, and are now on exhibition. Others have been sent to various institutions in exchange for parts needed here. And still the task goes on.

Of the many kinds of dinosaurs found, the oddest of the lot is the Stegosaurus, or armored dinosaur, which is twenty-one feet long, stands nine and one-half feet at its highest point, and must have had at least the robust weight of the largest of living elephants. Unlike the Camptosaurus and Dryosaurus, it was a quadruped; and although the massive front limbs were short, it walked on all four feet. The hind limbs were long, giving the vertebrae of the back a steep slope toward the front. This characteristic, with the backward sloping tail, gave the animal its sharply arched vertebral column. The front parts of the jaws of the Stegosaurus were toothless, and what small teeth it did have in the back of its mouth could not be seen from the outside at all.

The most conspicuous peculiarity of this bizarre and fantastic animal, however, is the structure of large bony plates rising massively along the spinal column and terminating in large bristling spines or spikes more than two feet long near the end of the tail. This dermal armor is arranged in two alternating rows projecting upward and slightly outward. On the sides of the plates are well-developed blood-vessel impressions indicating that they were covered with closely fitting skin. In the region of the throat, at least, there were closely packed, small, rounded ossicles protecting that part of the body.

Another very unusual characteristic of the Stegosaurus was its central nervous system. The brain was very small; in fact, the smallest ever known relative to the size of the animal. Passing backward along the neural canal to the sacrum, one finds an enlargement many times that of the brain cavity: probably a co-ordinating center for the control of the massive hind parts of the body. As Bert Leston Taylor says in "The Dinosaur":

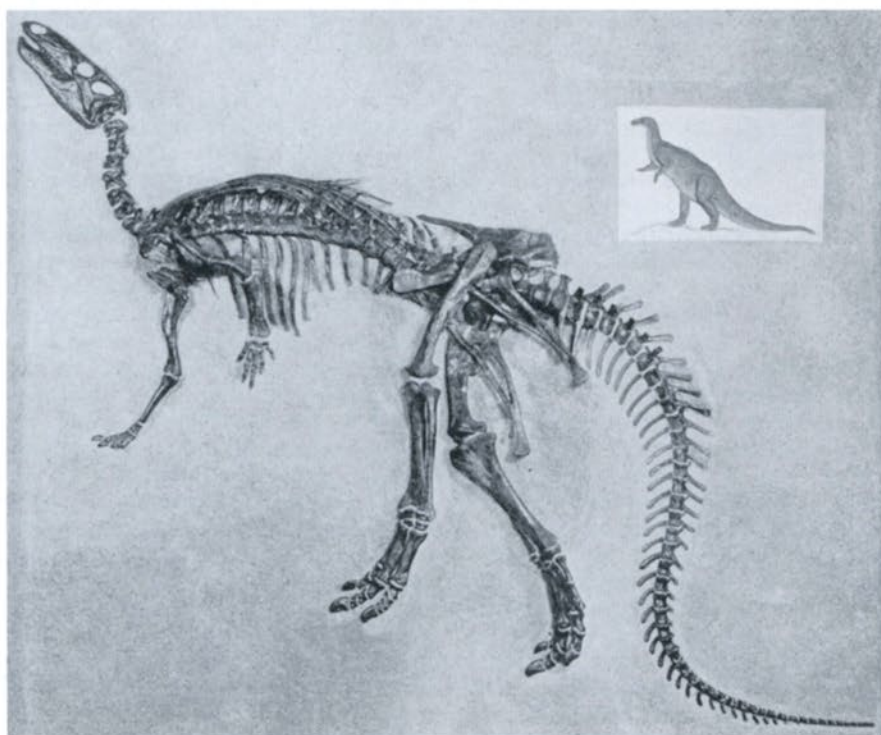
Behold the mighty dinosaur,
Famous in prehistoric lore,
Not only for his weight and strength
But for his intellectual length.
You will observe by these remains
The creature had two sets of brains—
One in his head (the usual place)
The other at his spinal base.
Thus he could reason a priori
As well as a posteriori.
No problem bothered him a bit:
He made both head and tail to it.

So wise he was, so wise and solemn,
Each thought filled just a spinal column.
If one brain found the pressure strong
It passed a few ideas along;
If something slipped his forward mind
'Twas rescued by the one behind;
And if in error he was caught
He had a saving afterthought.
As he thought twice before he spoke
He had no judgments to revoke;
For he could think without congestion,
Upon both sides of every question.

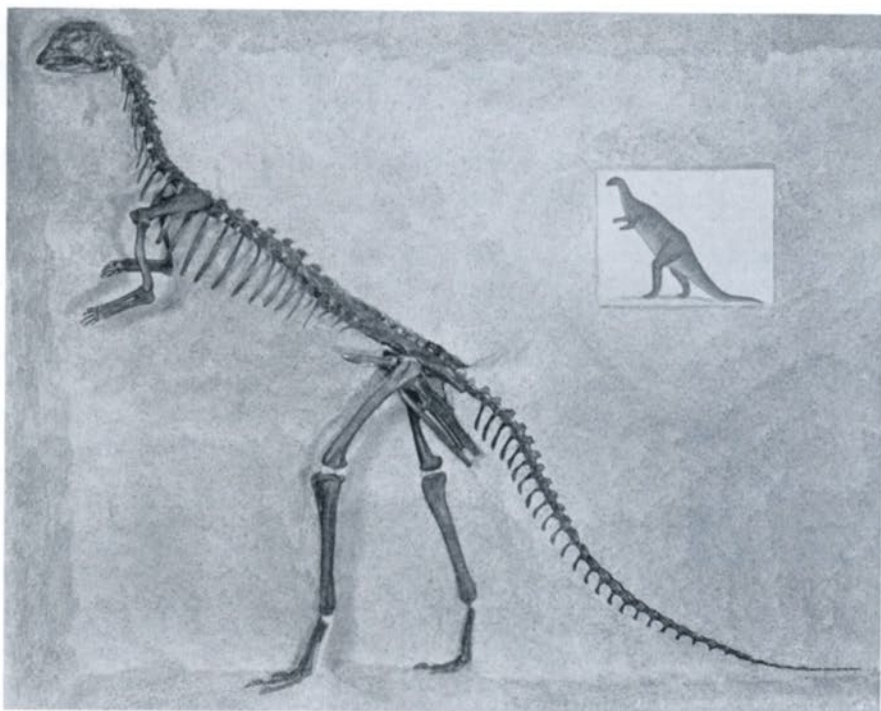
Oh, gaze upon this model beast
Defunct ten million years at least.

The structure of the skeleton of the Stegosaurus would indicate a stout, cumbersome, slow-moving animal with a very low intelligence, whose only means of defense in a world of creatures often three times its size was the bony covering on its body and probably its spiked tail.

Although the Camptosaurus belongs to the same order of dinosaurs—Orni-



CAMPTOSAURUS OR FLEXIBLE DINOSAUR



DRYOSAURUS OR BIRDLIKE DINOSAUR

thischia—as the *Stegosaurus*, it is quite unlike that genus primarily in that it retained its primitive bipedal characteristic of walking mostly on its two hind feet and did not have the bony covering as did the *Stegosaurus* and several of its relatives. *Camptosaurus* is one of the best known of the small Jurassic dinosaurs, for there are several skeletons in various museums, and its near counterpart, the *Iguanodon* of Europe, was among the first dinosaurs to be studied.

Although a bipedal form, it probably used its front limbs for support when feeding because the front legs are proportionately longer and more strongly built than most bipedal dinosaurs of equal size. The teeth were spatulate with serrated margins, and, like most reptiles, as one set wore away others took their place; so that this dinosaur always had a set of teeth during its lifetime. Like the *Stegosaurus*, they were

confined to the back part of the jaw, the front being toothless but presumably covered with a horny beak. The tail was rather long and probably was used as a balancing organ or the third leg of a tripod.

Of the three specimens included here, the *Dryosaurus* is the least known, and what is known is only from partial skeletons. Even though its teeth and beak indicate a browsing habit, many of the characteristics are those of a bird. *Dryosaurus* was undoubtedly a very agile animal and had much less trouble eluding its enemies, the carnivorous reptiles, than did the cumbersome *Stegosaurus*. The Carnegie Museum specimen, exhibited in the rock in which it was found, has the missing parts restored after other individuals. While it is not complete, it adds considerably to our knowledge of this form, which is one of the most streamlined and graceful of the Jurassic dinosaurs.