SOMETHING ABOUT ANCIENT AMERICAN SAURIANS.

BY J. CARTER BEARD.

The vast region known as the Western Plains, so interesting to visitors, not more on account of the unparalleled magnificence of the scenery than of the curious and wonderful development of its geological features, including, as it does, the tremendous cañons of Colorado, the lava fields of Dakota, the strange painted cliffs of the National Park and the extraordinary geyser region of Wyoming, is the paradise of the paleontologist, for here lived and died the uncounted generations of reptiles that peopled the ancient earth and the waters of North America during the Mesozoic era. But, while all this region affords fruitful fields to the fossil hunter, Kansas has proved the most prolific tract for those who, like Prof. S. W. Williston, have made something of a specialty of ancient American sea saurians.

Of the twenty-five or thirty species which, as yet, have been found distinctive among all the specimens collected, Dakota has contributed three, Mississippi, Alabama, Carolina and New Jersey, together, about ten, and Kansas twelve.

Although expeditions, extending from 1854 up to the present time, have been engaged in collecting fossil remains in the territory described the supply is still unexhausted, and is considered by those who have, perhaps, the best information to be procured on the subject, inexhaustible. In this they may be mistaken, but it cannot be denied that though the number of tons of material of this kind which has been received by our museums and colleges is not easy to estimate exactly, and though room can with difficulty be found for what is already possessed, the cry is still it comes.

Indeed, considering the perishable nature of osseous substance it is really wonderful that anything at all, except perhaps the impressions of parts of animals or their foot-prints in damp soils, that have hardened into rock should remain to us of vertebrates which lived upon the earth at such very remote periods of time.

The structure of bone is such that, under ordinary circumstances, more or less rapid decay must necessarily ensue upon its exposure to atmospheric and aqueous agencies. The hardest bone is traversed with what are called Haversian canals, winding passages which are connected by still smaller passages with lacunæ, and the less solid takes the form of cellulated substance permeated with sarcodic matter, while the long bones are generally hollow and contain marrow, whose corruption and decay, together with that of all the soft tissues occupying bone cavities, infects the ossein, and by breaking away the delicate partitions between tubuli, and by softening all adjacent parts, hastens its disintegration. The labyrinthine system of passages which pervades the whole bony structure, enlarged and emptied of the soft organic matter that occupied it, readily admits water and becomes filled with it. This not only carries vegetable acids that tend to decompose the bone, but in freezing expands and pulverizes it as effectually as if it had been pounded to pieces with a hammer.

Quite as surely subject to destruction are the bones of animals deposited on beds of seas or oceans. Sea water is a slow but almost universal solvent. The dredges of the United States fish commission steamer "Albatross" and of the "Fish Hawk," as well as those of the numerous other vessels which have from time to time explored the bottom of the ocean, have been dragged many miles without bringing to light any other remains of vertebrate animals than a few shark's teeth.

It may, therefore, be readily seen what a very small proportion as compared with the original supply of these bones can have escaped destruction in undergoing the vicissitudes of such an enormous length of time, and from this may be argued the populousness of the Western plains during past geological ages.

The gradual development of new species and genera, and the increase of the numbers of individuals composing them, of the saurians of the Mesozoic era, in the æons preceding the attainment of the highest point in the scale of physical organization reached by reptiles during the Jura Trias period, was indeed, it is believed, so great and extensive that the land areas inhabited by them became overcrowded. It was then that animals best adapted in form and by habits of life to do so began to look to the water for food and, in time of danger, for refuge. In this way the sea, previously monopolized by ammonites, sharks and cuttlefish, became the home of reptiles.

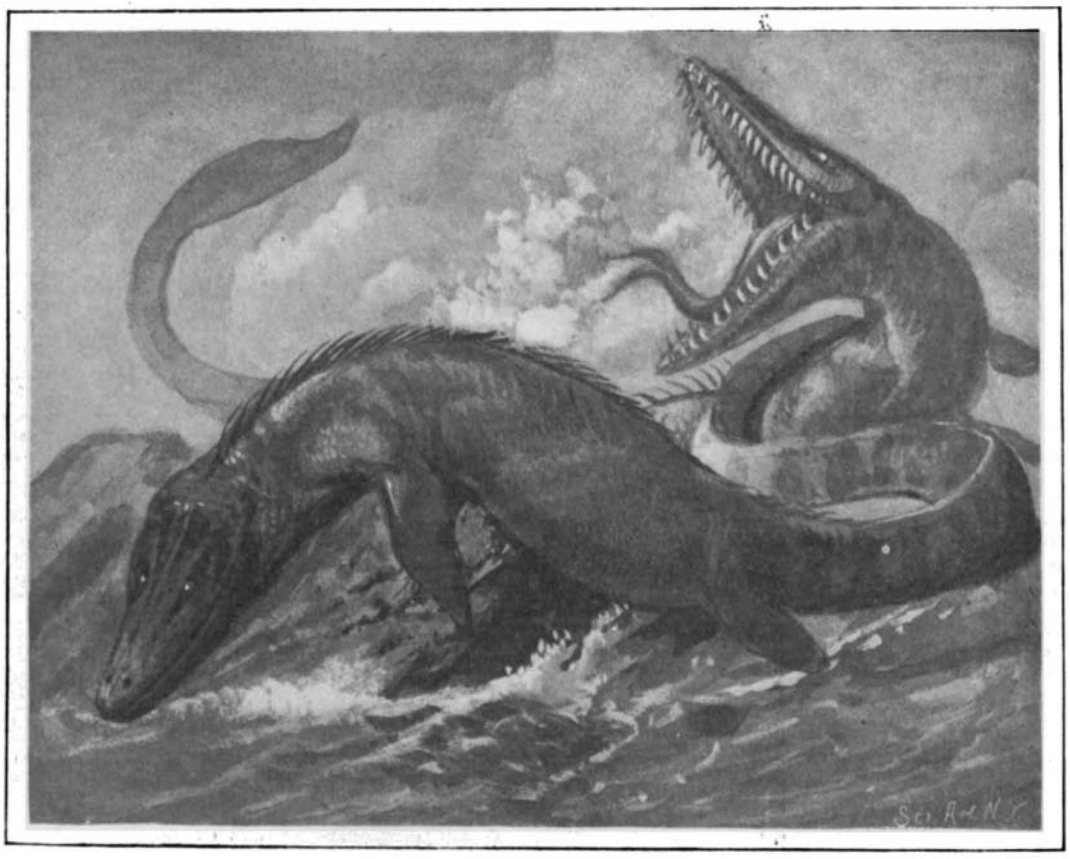
It is well known that by some little known law of nature, certain species of fish, carp for instance, are able to accommodate their growth to the size of the area of water accorded them to swim in, and it seems necessary to conjecture a freer and more extensive working of some such law to account for a process of development by virtue of which insignificant little land lizards, such as the nothosaurus and the Isodectes punctulatus, were able to take upon themselves the colossal proportions and transform their digital limbs into the paddles of the elasmosaurs, plesiosaurs and mososaurs, and the ichthyosaurs, whose remains are so characteristic of the cretaceous fossil beds of Europe and America.

WHAT THE ANCIENT AMERICAN SEA SAURIANS LOOKED LIKE.

The elasmosaurs more nearly resembled a snake bird (ahinga) in form than they did any other creature now living.

They were found 30 to 60 feet in length. Prof. Edward Drinker Cope, the celebrated paleontologist, has furnished a very graphic description of the elasmosaurs:

"Far out on the expanse of the ancient sea," writes the professor, "might have been seen a huge snake-like form which rose above the surface and stood erect with tapering throat and arrow-shaped head, or swayed about describing a circle of 20 feet radius above the water. Then plunging into the depths naught would be visible but the foam caused by the disappearing mass of life. Should several have appeared together we can easily imagine tall flexible forms rising to the height of the masts of a fishing fleet, or like snakes twisting and knotting themselves together. This extraordinary neck (for such it was) rose from a body of elephantine proportions. The limbs were two pairs of paddles like those of the plesiosaurus, from which this diver chiefly differed in the arrangement of bones in the breast."



STUDY OF AMERICAN SAURIANS.—Drawn by J. Carter Beard.

In the elasmosaur shown in the accompanying illustration (Elasmosaurus platurus) the neck represents a length of 22 feet in a total length of 50 feet.

The other animal shown in the water is a mososaur. The general appearance and the habits of mososaurs have been much misunderstood and their size has been exaggerated. The largest of these reptiles, Mososaurus horridus, depicted in the accompanying illustration, was certainly not more than 50 feet long. The skeletons of mososaura, found in the fossil beds of North America, do not average more than from 16 to 20 feet in length. Their proportions have always, up to the present time, been described as serpent-like, and they have been called sea serpents. That they anticipated a number of the anatomical peculiarities of the serpents cannot be denied, but their shapes, as is convincingly shown by an almost complete medallion skeleton upon a slab of rock with the bones scarcely displaced, in the New York Museum of Natural History, were no more snake-like than are those of alligators.

Like the elasmosaurs they had two pairs of paddles. These paddles had webbed digits and were attached to the body in such a manner as to admit considerable freedom of action. Their tails were flattened and much longer than those of the elasmosaurs. Their heads were flat, as are the heads of alligators, and wedge-shaped. Their mouths, armed with four rows of formidable teeth on the roof of the mouth, besides those in the lower jaw, opened so widely, being jointed very far back between the ear and the chin, that though they had not the expandable throats of serpents they could have found no difficulty in swallowing their prey alive. They were covered with small scales like those of a lizard or serpent. Strange to relate, a portion of the scaled hide of a mososaur has been discovered in an excellent condition of preservation. The tongues of mososaurs were long and forked.

THE HABITS OF ELASMOSAURS AND MOSOSAURS.

Elasmosaurs were beasts of prey and without doubt lived upon whatever they could seize and kill, principally fish, for they were more likely to capture them than they were to take other prey, and fish bones and scales are found associated with their remains.

They had long paddles and were built for speed. Prof. Cope fancies that they may have secured and held their prey with their forward paddles. Elasmosaurs were exclusively marine animals. It is not probable that they ever came ashore.

Mososaurs were more formidable reptiles than were elasmosaurs. It is not probable that any animal living during the existence of their type could have withstood their attack. It is possible that mososaurs may have come ashore occasionally voluntarily, but it is problematical. From their plan of structure it is evident their prey must have been the largest creatures that inhabited the waters in which they swam, and it is not at all unlikely they may have attacked and sometimes devoured plesiosaurs and elasmosaurs, as well as smaller species of mososaurs and the great marine turtles of that day.

Converting Salt Cake into Caustic Soda.

A cheap and expeditious method of converting salt cake into caustic soda has been devised by Mr. A. Brand, of London. The process consists of treating the black ash resulting from the first process of the furnace product with a quantity of carbonate of lime, and if necessary carbon is also added in limited amount. The mixture is then submitted to a high temperature. The carbonate by this means is converted into oxide of lime, and the carbonate of soda in the black ash into oxide of soda, while any sulphide of soda that may be present is also converted into oxide of soda. When the furnace product is lixiviated in hot water, there results a strong solution of caustic soda. A further hot water bath will remove the remainder of the caustic soda from the furnace product, and the solution that is left constitutes the liquid for lixiviating the next quantity of furnace product.

The Current Supplement.

The current SUPPLEMENT, No. 1347, has a number of unusually interesting articles. "The Georges Richard Automobiles" describes in great detail the construction of a typical French carriage, including a numbered section of the motor. The East River Bridge Report is continued and is accompanied by a number of diagrams showing the plans recommended. "The Autoplate—An Automatic Stereotyping Machine" describes one of the most clever inventions in the printing trade. The subject is well illustrated. A description, with illustration, of a new powerful English locomotive is given. A new excavator for digging trenches is illustrated. "Two-Tray Development" is by L. E. Farrand.

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(Illustrated articles are marked with an asterisk.)