Dinosaurs Died of Rickets

Palæontology

By Marjorie MacDill

Thirty-five-ton dinosaurs, that languidly lived and loved in the slimy lagoons of the Mesozoic Age, some 135,000,000 years ago, probably disappeared off the earth because their supply of ultra-violet light was cut off by vast clouds of volcanic dust obscuring the face of the sun. And so the biggest brutes that ever walked became extinct from the action of rickets, universally known today as a malady of babies.

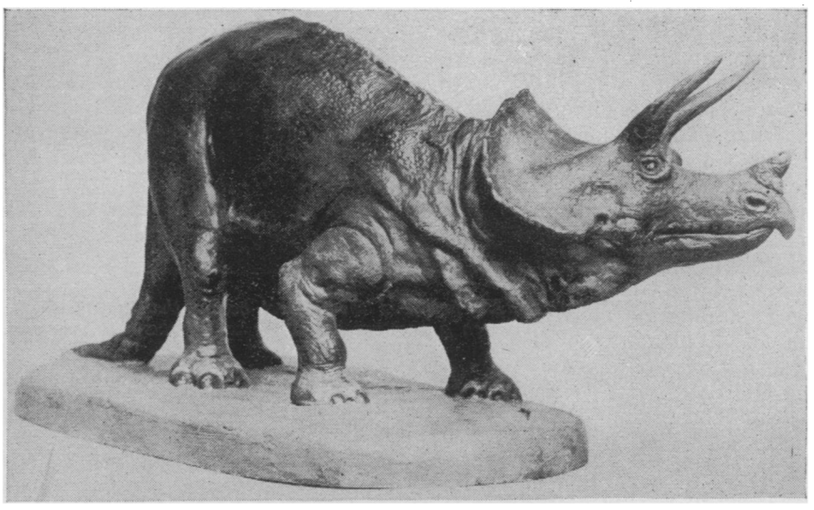
This is one of the newest theories of science to account for the disappearance of the dinosaurs, proposed by Dr. Harry T. Marshall, pathologist of the University of Virginia. Migrations, new enemies and the cold climatic changes brought about by the glaciers of an age of ice, along with the great reptiles' own stupidity, great size, and sluggish habits, all helped the extinction along, but ultra-violet deficiency is felt by Dr. Marshall to be the main cause.

Lack of ultra-violet light and the anti-rachitic vitamin D bring about a disturbance of the mineral chemistry of the body that results in malformed bones. Deprived of sunlight, one of their necessary sources of vitality, and probably forced to eat strange foods as the changed climatic conditions fostered new types of plants, the great beasts gradually grew weaker and weaker.

The period when dinosaur remains begin to disappear from fossil rocks was characterized by one of the most violent volcanic disturbances the earth has known since the very earliest geological time. No series of eruptions down to our own time has ever equaled the vast disturbances of this period. Enormous dust clouds filled the air that effectively cut out the short wave lengths of light indispensable to the vitality of modern animals.

"If the ancient types of animal were dependent upon the sun's short rays," explained Dr. Marshall, "ultra-violet deficiency should have been followed by rather rapid extinction.

"When the cold-blooded reptilia and other animals which flourished through the warm centuries of the Cretaceous were deprived of their accustomed warmth, as the world's climate gradually cooled, either they migrated or they must have become more and more torpid and helpless. Their metabolic activities and internal vital processes were at a lowered level.



THE HUGE HEAD OF TRICERATOPS, almost solid bone from its pointed beak to its wide, armored frill, offered plenty of points of attack for rickets

These conditions restricted the abundant cross-fertilizations which are favorable to the appearance of variant offspring. The sluggish creatures could not protect themselves or their eggs or offspring from enemies more active. The shorter warm seasons and colder climate caused the loss of many eggs and many of the young. The adults and young were probably forced by hunger to eat many strange plants, in the absence of accustomed fodder. Malnutrition and digestive disturbances followed the unfamiliar diets, conditions suitable for the production of rickets.

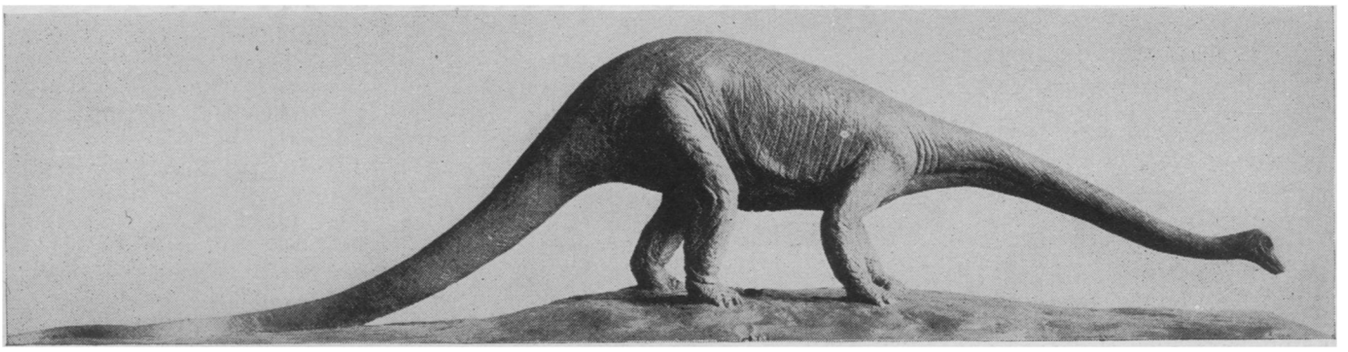
"Favored by centuries of warmth and sunshine, the reptilia and other genera and species were faced with a cool temperature, the results of which have just been outlined, and, at the same time, with ultra-violet deficiency. Little or no ultra-violet radiation would reach the bodies of the creatures directly; the ferns and other fodders, also lacking ultra-violet energy, would be comparable to the winter grasses and winter-grown spinach which recent investigators have reported to be lacking in antirachitic property.

"With their accumtomed diet reduced by the effects of cold on plant and animal life; undernourished, torpid, and lacking the ultra-violet energy, the creatures would become less fertile, at the time that they could less successfully protect eggs and offspring, and at the time also that ultra-violet deficiency reduced the hatchability of eggs and lowered the vitality of the hatched young. The young, in their turn, with inadequate food during the growing periods, and with ultra-violet deficiency, would have the conditions causative of tetany or rickets. The unsuitability of the diet in conjunction with the digestive disturbances of rickets would be disastrous to the affected young. Their resistance to infection lowered during rickets, would synchronize with a period in which the bacteria and protozoa would be released from the inhibiting influences imposed on them in days when ultra-violet rays prevailed.

"The continuance for a few generations of these combination of factors reviewed above, in which ultra-violet deficiency is of importance, would be sufficient to cause the death and disappearance of the animals dependent on a warm climate and abundant ultra-violet radiation. Moreover, such a disappearance ought to occur rapidly—within a few generations—if the species is vitally dependent upon ultra-violet radiation, and if the reduction of that spectral region is pronounced. Extinction produced in this manner should leave only slight traces in the fossil bed. At the most, there would be the chance finding of an enlarged rachitic bone, or of defective teeth, or of one of the rachitic deformities of skull, pelvis or ribs."

Man's acquaintance with the dinosaurs is of very recent date, going back only to the nineteenth century. The first dinosaur remains to be found in America (*Turn to next page*)

Dinosaurs Died of Rickets—*Continued*



THE BRONTOSAURUS FAMILY produced the biggest beasts that ever walked the land—some of them were over 80 feet long. Rickets in such a creature would be worse than the proverbial sore throat in a giraffe

came to light in the Connecticut Valley in 1818; though at that time, of course, no one knew what they were. The first dinosaur to be recognized formally as a new order of reptiles was a carnivorous Megalosaur found near Oxford, England, in 1824.

For a long time all knowledge about the great reptiles was necessarily fragmentary, but thanks to the labors of many eminent palæontologists, we have a fair idea of their appearance, size and habits.

Dinosaurs, whose name comes from two Greek words, "deinos", meaning terrible, and "saurus," reptile, rose to the heyday of their strength and dwindled away into extinction during the great middle period of geologic time. Fifty million years ago they were all gone, but during their age they held the dominance in nature now occupied by the mammals.

With the exception of a few of the whales, certain members of the dinosaur group attained a greater size than any animal the world now knows about. From this great size they ranged down to the dimensions of a barnyard hen. Some walked more or less erect; some walked on all fours; some were covered with huge bony plates or armor; some had no outer protection for their great soft bodies at all; some preferred a vegetarian diet; some ate other dinosaurs or any fresh meat tidbit they could lay their claws on. All united in having extremely small brains in proportion to their bulk. Their nearest living relatives today are the crocodiles and the lizards.

The first dinosaurs to appear on the page of prehistory were carnivorous and walked on their hind legs. As a result of this habit they developed a thick muscular tail not unlike the kangaroo's, that helped in maintaining balance. Their forelegs became smaller and smaller with succeeding generations and eventually were largely used for grasping and holding their prey during a meal. In some of the later species these puny forearms developed formidable claws.

Some of this ferocious family would be pleasant to encounter on a dark night. Tyrannosaurus, its largest representative, reached a length of 40 feet, with teeth from two to six inches long projecting from his jaws. This efficient equipment probably came in handy when attacking the great armored dinosaurs, whose thick, horny plates must have presented a considerable problem even to Tyrannosaurus.

The unarmored quadruped dinosaurs were among the largest animals of all time. Specimens of Brontosaurus and Diplodocus were 80 feet long and must have stood 16 or more feet high. Their weight has been estimated at around 35 or 40 tons. They lived in fresh water lagoons, stretching up their long necks to feed lazily on the luxuriant tropical vegetations overhanging their cozy home. They could swim with ease, propelled by their immensely long tails, and probably did not go about much on land. Their enormous weight and sluggish movements would have rendered them easy prey to their flesh-eating brethren.

The peculiar makeup and modification for life in a particular region such as many of the dinosaurs showed, undoubtedly contributed to their demise toward the end of the Mesozoic. Great, sluggish brutes like Brontosaurus, with their tons of flesh, tiny brains and feeble teeth were obviously unfitted for existence in anything but a warm climate. During any prolonged siege of cold weather, things would have gone very hard with them. Stegosaurus and Triceratops carried specialization to the extreme, while the great reptile carnivores must have required perfect mountains of prey to satisfy their rapacious appetites. Any radical change in climate or food supply must have set the whole hulking lot to whimpering regardless of their great bulk. Favored by centuries of warmth and sunshine, the enormous sluggish creatures were faced with the glacial cold of the ice age and ultra-violet deficiency at the same time.

Large numbers of animals became extinct in the periods following the last of the dinosaurs. It was during the periods known to geologists as the Pliocene and the Pleistocene, that the greatest evolutionary changes in the teeth and certain bones occurred, notably the feet. This argument favors Dr. Marshall's hypothesis, since there is a known relationship between animal growth, calcium balance and plant vitamins, dependent on ultra-violet radiation.

The great development of mammals, a hitherto small and inconspicuous group of animals up to this time, suggests, Dr. Marshall declared, that fluctuations in sunlight with volcanic dust interruptions influenced mammaliam evolution by favoring virile species with more plastic calcium mechanisms and this condition helped mold the new foot and tooth structures of the period.

Research to devise methods for the detection of fossilized bones that show evidence of rickets will undoubtedly throw more light on the interesting theory, propounded by the Virginia pathologist. A study of the incidence and distribution of rickets from the point of view of atmospheric haziness, or of volcanic dust, might furnish further information bearing on this subject.

The cover picture is from a photograph of a model in the American Museum of Natural History, New York City. The photographs of *Triceratops* and *Brontosaurus* were supplied by the U. S. National Museum, Washington, D. C.