An Elephantine Graveyard

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It is a somber, yet fascinating, thought that the earth is a vast graveyard. Trout in mountain streams lurk beneath blocks of stone containing the teeth of mammoth sharks, and quail scurry over the burial grounds of carnivorous dinosaurs that walked with a bird-like grace, balancing on two legs the bulk of an elephant. Only a small proportion of New Mexico's creatures are alive and active today; the majority of them are eons dead and take on form again only through fossil remains and in the imagination. Though they are extinct, the study of ancient animals is important to the naturalist. Life evolves along a continuum; the finch nesting in the backyard developed with the dinosaurs from a common ancestor. In many ways, they are remarkably similar. It is impossible to fully understand our present wildlife or prognosticate about its future without a knowledge of its past. Perhaps equally important is the sheer sense of wonder generated by the bizarre and incredibly old organisms of life's earlier hours, and the most wonderful of all these were the dinosaurs.

A problem with any discussion of these animals is that they have no common names, and are known only by Latinized scientific terms. Many people enjoy these, finding they read with the stately pace of poetry; others are less than enthusiastic. They were originally designed to overcome the language barrier by identifying an object in a common tongue. Today, with few speakers of Latin or Greek, they are more representative of a common ignorance but are still valuable in giving each animal a unique and universal identity. At best, these offer a meaningful description. For instance, Triceratops can be roughly translated as "three-horned face," an accurate portrait. Occasionally, a fossil's name refers to a person, and this can have a historical or anecdotal interest. *Actinocrinus dalyanus*, a crinoid (or sea lily) discovered in New Mexico, was christened after George Daly. The manager of the Lake Valley silver mine, Daly met his death at the hand of Apaches in 1880 on the same day the Bridal Chamber, a fantastically rich body of ore, was uncovered. A more recent local discovery was a "wart-like protuberance of dubious affinities,' whose proud finder attempted to have it called *Kruschevia,* in honor of the then Russian head of state. Unfortunately, he misspelled the name.

One more difficulty must be overcome before proceeding, and that is the dimension of time. The dinosaurs dominated the world's land masses during the Mesozoic era, which encompassed over 150 million years. This is divided into three periods, the Triassic, beginning 225 million years ago, the Jurassic, starting 180 million years ago and the Cretaceous, which lasted from 135 million to approximately 70 million years ago. Each of these periods — as might be expected from the length of time involved — had distinct conditions and faunas, although many of the dinosaurs remained unchanged in basic design. It is important to remember that, far from being an odd and brief curiosity of nature, they were among the most successful creatures in the history of life.

Dinosaurs are presently classified as reptiles, a once enormous group

whose modern members include the snakes, lizards, crocodiles and turtles. They are cold-blooded — that is, rely on external conditions to regulate the body temperature — have scales; and they lay eggs independent of water, the key to their success. There is a current debate about the real nature of dinosaurs' body processes. Some investigators say there is evidence indicating the dinosaurs were more active than previously supposed, conceivably even warm-blooded. The argument is far from over. It is safer, if perhaps conservative, to consider them atypical reptiles, some of which had interesting physical problems of literally gargantuan proportions.

Appearances count for a great deal; unfortunately, little is known, so that this is an area more or less open to personal taste. Skin is rarely preserved, and the few specimens that have been found indicate that some species had a rough surface consisting of small, polygonal plates. Others had a pebbled hide something like a golf ball. It has been suggested that the smaller forms may have had feathers, an elaboration of the reptilian scales. As far as color is concerned, one can only offer conjecture. Large animals of today, such as elk, alligators and ostriches, are drab as a rule, and it is most likely that the dinosaurs were of similarly solemn hues.

Triassic Dinosaurs of New Mexico

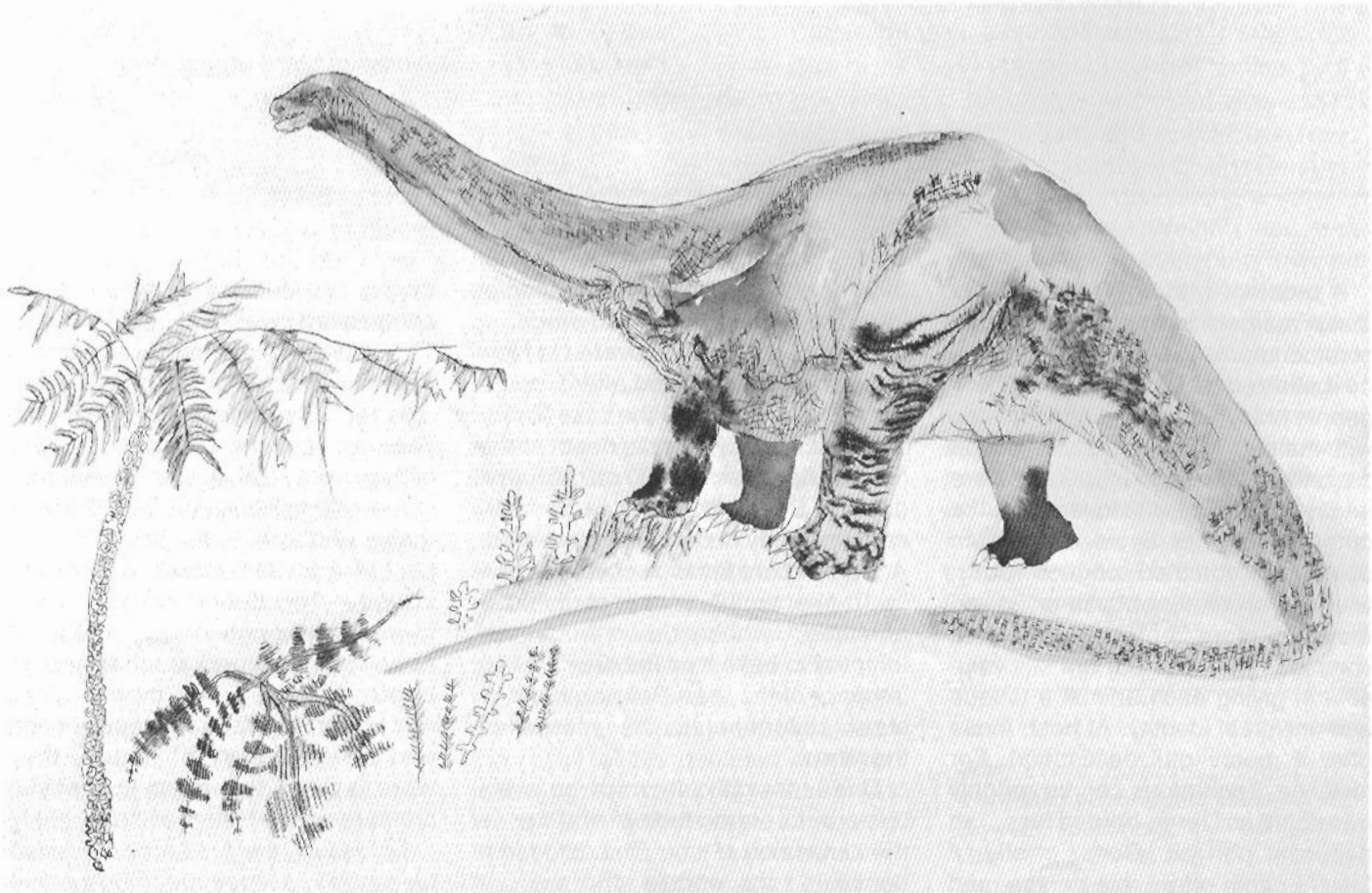
Fossil plants present at that time include conifers, especially the specie that constitutes the tall trees of the petrified forest in Arizona, and horsetails, among many others. The remains of phytosaurs, crocodile-like reptiles, indicate a landscape crossed by sluggish rivers.

In 1947 at Ghost Ranch, near Abiquiu, an historic find was made that the famous paleontologist George Gaylord Simpson called "probably the most important discovery ever made in the American Triassic." He was speaking of scores of complete skeletons of the primitive dinosaur *Coelophysis,* found massed together in a single deposit. *Coelophysis* is a dramatic exception to the common view that all dinosaurs were immense creatures. Nothing could be further from the truth; some were no bigger than chickens. Just as all mammals are not built with the proportions of a rhinoceros, so the great reptiles came in a variety of sizes. *Coelophysis* was lightly constructed, walked on its hind legs, was about six feet long, and probably weighed only forty to fifty pounds. It was apparently a quick, agile predator of even smaller animals.

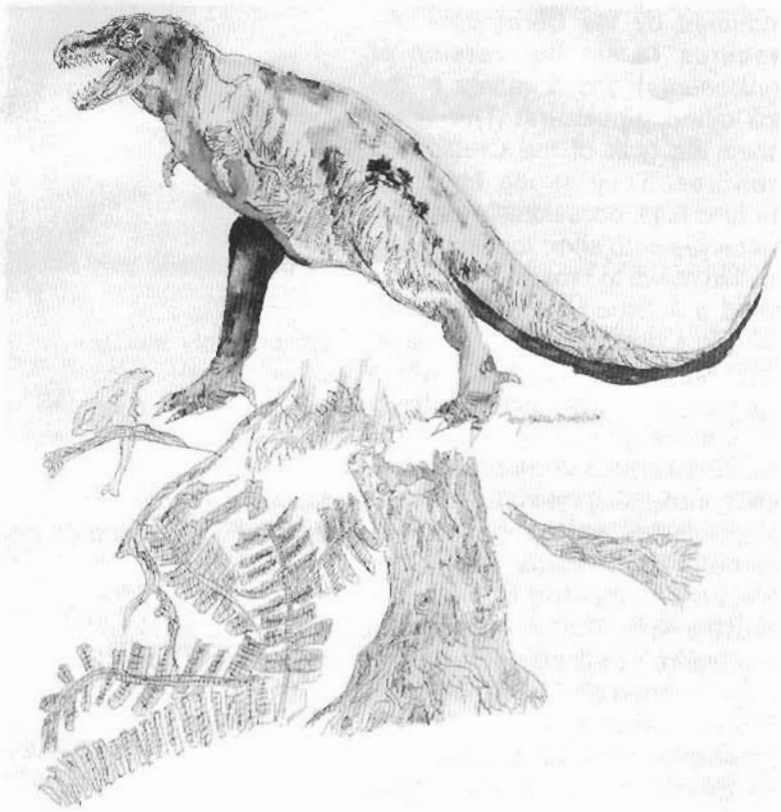
Jurassic Dinosaurs of New Mexico

This is far and away the most poorly represented period in New Mexico's fossil record, a puzzle since surrounding states have revealed a wide variety of dinosaurs. It was not until 1953 that a graduate student from the University of New Mexico found the first fragments of Jurassic dinosaurs. At three sites near Correo, Acoma and Grants, he came upon the bones of the typical and well known *Stegosaurus, Brontosaurus,* and *Allosaurus.*

Stegosaurus was a great, rotund,



Brontosaurus



Tyrannosaurus rex

four-legged beast, twenty feet in length and considerably heavier than a yoke of oxen. Along the back were a series of bony plates, and the tail was tipped with a set of spikes, apparently a defensive measure. It ate plants, and it is marvelous that an animal with such a diminutive head could eat enough to keep the massive body functioning. Compared to the other groups of dinosaurs, it enjoyed a limited success and was the only major family that did not survive until the great extinction at the end of the Cretaceous period.

Brontosaurus is probably the most famous of all the dinosaurs; the great body, long neck and tail and small head are familiar to almost everyone. It was a member of the family known as Sauropods, and while some were heavier and others longer, it has captured the public imagination and is thought of today as the epitome of hugeness. Not that any apologies are necessary; it was, after all, nearly seventy feet long and weighed about thirty tons. It was so big, as a matter of fact, that until recently there was some doubt as to whether it could have left the water required to buoy up its ponderous mass. Tracks have been found now that show it did, indeed, go out on shore. Still, it probably spent a great deal of its life in the widespread Jurassic lakes and swamps, something like the hippopotamus of today.

Allosaurus was the largest predator of its day, up to forty-two feet in length and weighing eight or nine tons. The vertebrae were interlocked and the body compacted, so that the body balanced by the tail and pivoted as a unit at the hips of the hind legs. Capable of stupendous violence, it most likely strutted like some nightmarish fowl, making a ponderous rush at its victims, kicking with the great clawed feet and slashing with the awesomely toothed jaws.

Cretaceous Dinosaurs of New Mexico

During the Cretaceous period, most of New Mexico was under the warm waters of a shallow sea where lived, among other things, oysters two feet long. In what is now the San Juan Basin, however, there lumbered about and were preserved a myriad of the last of the dinosaurs.

Among the most common of these were *Ceratopsia*, or horned dinosaurs. These were four-legged herbivores, with pachyderm-like feet, a relatively short tail, and a massive bony frill or shield that swept back from the skull over the neck. The head bore varying quantities and sizes of horns, depending on the specie. *Monolonius*, from about four miles west of Farmington, had a single horn upon its nose. *Pentaceratops*, a nearly complete skeleton of which was unearthed on the south branch of Myers Creek and is now at Uppsala, Sweden, possessed a short horn on the nose, two longer ones on the brow, and two projections from the side of the head. This animal was quite important at one time, being the then southernmost known example of its kind. The Ceratopsia are fascinating and fantastic creatures. The armor and armaments were probably used in combats amongst them-

selves. Many of the frills are scarred, and one can picture the males jousting like contemporary bison for dominance in the herd. Their use as weapons was no doubt important as well, considering the monstrous carnivores that stalked the late Cretaceous highlands.

One of these found in New Mexico was *Gorgosaurus,* a fearsome twenty-nine-foot flesh eater. An even larger local predator, *Dienodon,* was related to and only slightly smaller than the famous *Tyrannosaurus rex. Dienodon* and its mountainous ilk were peculiar creatures. The forearms had dwindled to tiny, dangling, two-clawed appendages that must have been absurdly useless. Their enormity was such that they may not have been active hunters, but rather were scavengers or bandits that overpowered smaller, more agile predators to steal their prey.

The foliage of the Cretaceous was, to some extent, quite modern. During this period, the angiosperms, or flowering plants, had undergone tremendous radiation. Willows, waterlilies, oaks and laurels grew in the San Juan Basin area and were consumed by the *Ceratopsia, Almasaurus* (a smaller version of *Brontosaurus*) and a variety of the duck-billed dinosaurs. The latter formed the bulk of the Cretaceous herbivores. They strode about on their hind legs, occasionally lowering themselves onto short forelimbs with hoof-like claws to browse. Their jaws formed a flattened, tooth-filled "bill" similar to a duck's, hence the name. They were widely successful, with a great number of different types. Many bore unusual protuberances on the head that contained mucous membranes, increasing the surface area of the nostrils and amplifying the sense of smell. *Kritosaurus,* from Ojo Alamo, had a swelling in the upper side of the nose. The back of the head of *Parasaurolophus* was pulled into a scimitar-shaped projection. Because of the number of individuals and the extensive diversity of species, they have been compared to the African antelopes of today.

All of this plenty came to a geologically abrupt end at the close of the Cretaceous. The extinction of the dinosaurs is one of those attractive mysteries that invites conjecture.

Kristosaurus

Astronomists have postulated catastrophic stellar explosions that bathed the world in deadly radiation. Entomologists have suggested that the then recent larvae of butterflies ate the available foliage, starving the dinosaurs before nature introduced parasitic wasps to regain her balance. One biologist has hypothesized that certain ferns with laxative properties died out, leaving the great legions to perish from constipation. It is a pleasant conceit to believe that mammals toppled the lengthy dynasty by eating the reptiles' eggs and generally out-thinking them, but the truth is that mammals had subsisted next to the dinosaurs for most of the Mesozoic period and were never capable of competing with them. A more likely explanation is that the dinosaurs suffered a major ecological disaster. Mountain building raised the land, emptying the inland seas and destroying a diversity of environments and fertile estuaries.

Whatever the means, the end was mass death. Mammals that had hidden for millions of years in the shadows of the "terrible" reptiles inherited a globe strangely empty of competition. In the millenia that followed, they flourished and eventually produced Man, a being capable of casting back his mind and appreciating the many wonders of the dinosaurs.

Gorgosaurus

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