PALEONTOLOGY

Dinosaur Memorial

Cliff in Utah Is Being Carved To Show Forms of Great Creatures—The Bones Themselves, Not Images

By DR. FRANK THONE

MUSEUM walls offer magnificent opportunity and challenge to curator, sculptor, mural painter. You can back up against them a pair of majestic Assyrian winged bulls, brought from a long-buried city of the East. You can cover them with Byzantine mosaics, rescued from the ruins of an ancient basilica. You can paint upon them vivid panoramas of life as it was when the earth was young. Super-blackboards they are, in the museum's super-schoolroom, disciplining even grownups into learning something of their lesson through the sheer authority of their wonder.

In the halls of the great museums where the mighty bones of giants of the past are displayed, it is not uncommon to set against the walls' wide spaces huge slabs of rock with the dinosaur fossils still sticking in them, the stone chiseled away to leave the bones projecting in high relief. A paddle-limbed plesiosaurus, for example, just as he sank to the bottom and died and decayed, a hundred million years ago, scarce a bone in his immense skeleton budged out of place. Or a land-dwelling dinosaur, as its great carcass was borne down to the sea by some tremendous river flood of ancient time ("a mountain of a mummy," in Jack Falstaff's watersoaked phrase) and silted over with fine-grained stuff that afterwards slowly hardened into sandstone. We have all seen such preparations, and given them the tribute of our awe and wonder. Scientists, we tell each other, must be very clever fellows, and remarkably patient, too, to work out all the striking detail of these lucky finds.

On Mountainsides

But scientists are out now to outdo their own accomplishments. Not even the long and lofty halls of the greatest museums suffice to contain their ambitions. Sculptors have forsaken studio and art gallery to drill and blast whole mountain sides into the images of national heroes and statesmen; students of the earth's cyclopean past will have their mountainside carvings, too.

The world's first carven cliff of dinosaur bones is now shaking under the drills and picks and hammers of workmen preparing the way for the scientific chiselmen who will follow, to bring about the resurrection of a whole mass of saurian fossils and show them, in place, as on a mighty wall, to be seen and wondered at of men.

National Monument

The place is Dinosaur National Monument, in northeastern Utah, one of the smaller areas included in the U. S. National Park system, but not administered as a National Park. There are many such National Monuments scattered over the country. The name is simply a convenience-classification; it does not necessarily imply that a given area has anything monumental about it. Dinosaur National Monument, however, really has monumental possibilities, and they are in the process of being made real and visible.

The concept of carving away the stone covering that hides a whole cliff of dinosaur bones is a bold one. It was originated by the curator of vertebrate paleontology at the American Museum of Natural History, Dr. Barnum Brown. A really good museum curator must have some sense of showmanship; and while there is nothing circusy about Barnum Brown, he does get ideas that would unquestionably have won the respect of the original Barnum for his more scholarly namesake.

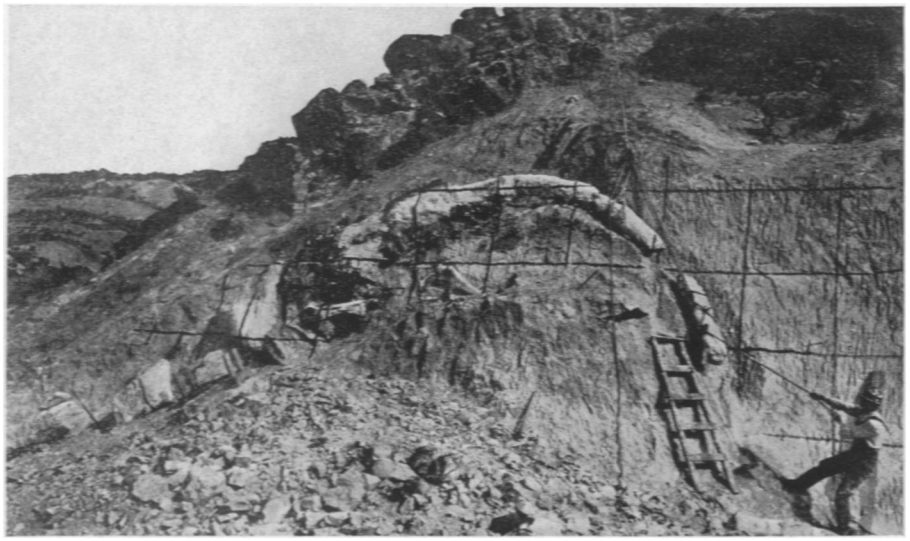
Like all bold concepts, the idea of a cliff-face museum of dinosaur bones is fundamentally simple. It takes advantage of two outstanding things; a most unusual accumulation of saurian fossil skeletons, many of them complete and little disturbed; and a lucky chance of geology that turned what was once a floor into a wall.

Lagoon Floor

When the dinosaur bones were deposited in the particular stratum that is the reason-for-being of Dinosaur National Monument, that stratum was the bottom of some cozy coastal lagoon or wide river estuary. The great carcasses drifted into one rather limited area, nudged along by some trick of wind

EXCAVATION SITE

An aerial view showing tram lines for dirt removal and, in background, workers' camp.



CARVING OUT THE BONES

Showing the work in progress. Square markings aid in charting the exact position of the skeleton in the rock.

or water current, sank to the bottom, and eventually became buried skeletons.

That was in Jurassic time, which ended about 125 million years ago. The Jurassic was the heart of the 200-million-year-long Age of Reptiles—the Thirteenth Century of the earth's zoological Middle Ages. Then ruled on earth, and in the heavens above, and in the waters that are under the earth, such an array of reptilian giants as were never before seen and never shall be seen again. Greatest of these, at least in bulk, were the sauropods; they included the monster brontosaurs and diplodocus, and the rarest and most gigantic of all, the huge barosaur—bodies as big as boxcars, necks like palmtree trunks, interminable tails. Barosaur measured 80 feet over all.

Into the quiet water of the ancient lagoon they drifted, their skeletons piling up side by side and overlapping each other—a charnel-pit of giants, under the water and the drifting silt. Ever thicker piled the silt; with unimaginable slowness but with inevitable sureness it hardened into stone, sealing the fossilized bones tightly in place. All this time the land was flat; the great mountains of the West had not yet begun to lift their heads.

Young Hills

Then the slow heaving began. The mountains grew to the youthful ripeness that is now theirs—for the Rocky Mountain system is young, geologically speaking. Strata were bent and tilted until some of them stood on end. Among them were the strata in which the dinosaur bones were sandwiched; they finally came to stand at an angle of 80 degrees—just a little back-slope from the vertical.

How much of the dinosaur layer was exposed to the weathering of ages and so lost, fossils and all, can never be known. But the part that is left is a veritable Bonanza of bones—thousands upon thousands of them, waiting to be mined.

For the "cliff" of fossils which Barnum Brown's enthusiasm and tenacity is changing from dream into reality is a buried cliff. You have to dig down and clear away the other rock layers from in front of it to get at it. The sculptors take an existing cliff and carve faces and figures upon it. The scientist has to make his cliff first; but the patterns for the sculpture will be on it when he gets it dug out.

Great Slab

Dinosaur bones were first dug at this site by Dr. Earl Douglass of the Carnegie Museum of Pittsburgh; the U. S. National Museum and the University of Utah have also removed many fossils. These diggings worked across the exposed top of the fossil-bearing stratum, and down either end; but there is still a great buried slab in the middle. It is to expose this that an artificial canyon is now being dug in front, by various groups of Government emergency labor under the direction of the U. S. National Park Service.

After this deep, long pit has been completed will come the turn of the skilled chiselmen of the American Museum of Natural History. With air-driven tools they will carve away the embedding matrix of stone from around the bones, leaving them firmly fastened to the background with the cement of ages, but standing out clear and bold in high relief.

This is very "fussy" work. You are not carving in blank stone from a model before you; the model is buried in stone of almost the same color, and you have to cut to a hair's-breadth accuracy. A millimeter too little and you have left your work messy; a millimeter too much and you have ruined a bone. It will be an anxious job, requiring two and a half years for completion. Fragmentary bones will be cleared away, leaving only the connected skeletons.

It will not do, of course, to leave these carefully carved-out fossils exposed to the weather, particularly the powerful weather of the West, stormy in winter, hot in summer. The precious carvings would begin to erode away immediately.

So Dr. Brown's plans call for a vaulted roof to cover the whole thing—the artificial canyon forty feet wide, with its north wall, bearing the fossil carvings, thirty feet high and 190 feet long. The building will be mostly roof, because the entire "hall" is under ground.

Dr. Brown visions it: "Spotlights will be directed on each of the skeletons. In the center of the room are to be placed

lifelike models, made to scale, of each of the animals whose skeletons are seen in the rock, and on the south vertical wall of the building will be placed a gigantic mural 190 feet long and 20 feet high, showing the topography of the country, the flora, and the animals in their natural habitat as they existed 140 million years ago."

The National Park Service will have charge of the completed exhibit. Administration buildings and living quarters will of course need to be erected, with water supply and general improvements, and a huge parking space for the accommodation of motorists.

There is a third party to the undertaking, the State of Utah. Utahans have a right to be proud of their "show", which will be the only thing of its kind in the world. Thousands of people will come from everywhere, desiring to behold and wonder.

Utah therefore comes up with its share. It has added to the original bit of land (a mere 80 acres) that constituted Dinosaur National Monument twelve whole square miles, taking in most of the adjacent spectacular scenery. Utah will also construct a difficult piece of road connecting with National Highway 40 at the town of Jansen.

The wonders that we shall go out into the desert to see are still unknown. They will not be disclosed until the tools of the American Museum chiselmen begin to eat into the huge slab of rock which Government emergency workers are now laying bare in the rough.

But there is every reason to believe that the show will be a good one, for the "samples" that have been collected from around the central slab comprise samples of just about everything the heart of an ardent dinosaur fan could wish for.

Harken to Barnum Brown's catalog of things already (*Turn to Page 366*)

DOGGING PUSSY'S STEPS

So close after Pussy was the dog in this ancient cat-and-dog chase that the two paws touch. A soft brick over which they scampered caught this footprint record.

ARCHAEOLOGY

Dog-Chases-Cat Is News When It's Dug Up in India

DOG-CHASES-CAT isn't ordinarily news. But when it happened 5,000 years ago in India, and when footprints of the dog and cat are discovered by archaeologists—that's news.

Pussy is more important than Fido in this case: for, until this discovery, no one associated pussycats with ancient India. Tigers, yes; but the household cat supposedly came to India far later than 3000 B. C. Yet, here is the mysterious print of a very ancient cat's paw, and right on her heels is the paw print of a dog, about the same size.

The prints are on a clay brick, from ruins of Chanhu-daro in the Indus Valley of northern India. These are the ruins that have attracted wide interest because of great quantities of toys found in the old city. Quite evidently, Chanhu-daro was a toy manufacturing center, certainly the oldest ever found. The site has been explored by a Joint Expedition of the Boston Museum of Fine Arts and the American School of Indic and Iranian Studies.

The paw prints at Chanhu-daro have been preserved all these centuries, because the animals happened to scamper over a brick that was moist and fresh. No one smoothed off the paw marks, and they hardened into a permanent record.

How does this cat fit into cat history?

Egypt is accepted, almost without question, as the first home of the domestic cat. Early Egyptians, risking scratches, tamed a wild cat of northwest Africa. They venerated it, among other animals reverenced for special qualities, and many a cat was mummified when it died.

From Egypt, cats were carried to other

lus. Vaccine of the Saranac Laboratory contains a virulent bovine tubercle bacillus, but is killed.

Dr. Kinghorn hopes that this caseous vaccine, when perfected, will be of decided value in preventing the development of tuberculosis in young children who have no tuberculosis.

Science News Letter, December 4, 1937

From Page 359

of outer space, are adventurers. They have climbed rugged mountain peaks, carried their instruments high into the stratosphere in balloons, sailed the seven seas and sank their equipment deep in lakes.

Now, it is disclosed at the meetings of the American Physical Society that they have donned miners' crash-helmets and carried their delicate measuring apparatus into deep mines.

V. C. Wilson of the University of Chicago reported to the physicists' meeting his experiments carried out in a mine in Michigan to a depth of 1600 feet.

The mine chosen had its shaft slanting at 34 degrees to the vertical so that by placing the instruments at different places along the shaft any thickness of rock could be studied for its absorption of the rays.

At the maximum depth of 1600 feet it was found that the piercing radiation still came through the great rock mass. Its value, however, was only one twenty-thousandth of the intensity at the surface.

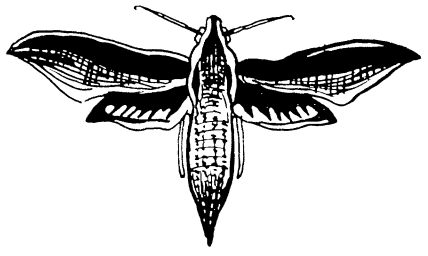
Science News Letter, December 4, 1937

Short-wave radio sets have proved so useful in emergency communication in U. S. National Forests that 2,300 sets are in use.

ECOLOGY

NATURE RAMBLINGS

by Frank Thone



Insect Specialists

SOME flowers insist upon the attention of specialists for accomplishing their pollination.

Not many, to be sure: the vast majority of flowers have open, easily accessible nectar and pollen stores, so that the ubiquitous honeybee and other insects of about the same size and lack of specialization can visit them and perform this vital service toward the production of fruit and seed. Apple and alfalfa, orange and white clover, buckwheat and tulip-tree, a wide variety of others, find the "old family bee" quite adequate.

But there are some flower forms that have become so highly specialized that only a correspondingly specialized insect can be of any use to them.

Particularly is this true of flowers with very deep, narrow throats, like tobacco, petunias, and certain species of lilies, like the beautiful white Madonna lily. The insects that can most successfully pollinate these are certain species of hawk-moths—those big-bodied, whirr-winged moths that some persons mistake for hummingbirds. Hawk moths have tongues so long that usually they never touch the flowers with their feet—just hover with their heads partway into the tube, and thrust that incredible proboscis down after the nectar. And, incidentally, daub their heads and bodies with pollen, to be carried to the next flower they visit.

Hawk-moths are so important to one of our major commercial crops, tobacco, that if their numbers were seriously reduced—say by the eradication of the weeds their big, fat caterpillars feed on, it would be necessary to begin the cultivation of special patches of food plants for them.

Bumblebees are another important group of long-tongued insects essential to the welfare of an important crop, this time red clover. Breeders have been trying to get a short-flowered red clover that honey-bees can pollinate, but bumblebees still remain a heavy standby to the red clover seed crop.

Charles Darwin is credited with a classic ecological chain, proving that old maids are necessary to the clover crop. Something like this: Old maids keep cats. Cats kill field mice. Bumblebees find good nesting-places in the empty mouse burrows. The more bumblebees the better the clover crop. Q. E. D.

Science News Letter, December 4, 1937

From Page 364

removed, during earlier museum collecting expeditions:

"The specimens that have been removed from this quarry represent eleven genera of dinosaurs, mostly gigantic sauropods, also crocodiles, turtles, and a lizard; and we have reason to believe that other genera are represented in this accumulation.

"The bones are unusually well preserved and but little crushed. It is a veritable Noah's Ark of animal remains characteristic of the Jurassic Period.

"Here are skeletons of the largest of the sauropods mingled with the skeletons of powerful but smaller flesh-eating dinosaurs, the heavily armored forms like *Stegosaurus,* as well as the smaller bird-like dinosaurs. Intermingled with these are an occasional turtle-shell, crocodile remains, fresh-water shells, cycads, fossil leaves, and wood fragments."

All on a tilted table 190 feet long and 30 feet wide—a dainty dish to set before an interested public!

Science News Letter, December 4, 1937