

PALEONTOLOGY

30,000,000-Year-Old Drought

Distress of the Past Summer Is Not Confined to Our Own Land or Time, as Witnessed by Fossil Remains

By **DR. FRANK THONE**

DROUGHT in the West, this year and for several years past, has been desperately hard on the beasts of the field. The poor animals stumble through dusty miles where there is no food or water; they fall exhausted and cannot rise, and the buzzards and coyotes feast on their carcasses and leave their white bones as their only monuments.

If they do find a stream, or a pond with a little muddy water still in it, some of them are saved for a while at least, but for others even the promise of rescue is only another door of death. In their eagerness to drink, they rush in beyond their depth, or are bogged in the bottom mud, or slip into a sudden deep place. Their bones find muddy sepulture—perhaps to be joined by the skeletons of the frogs and fish around them, if the drought goes on to the bitter end and the pond dries up entirely.

But this is not unique to our own land or our own time. Droughty death is no new thing under the sun. "The thing that hath been, it is that which shall be; and that which is done is that which shall be done. . . It hath already been of old time," saith The Preacher.

Of old time indeed have been droughts that filled the last water-holes of a despairing land with bones. Thirty million years ago, in the time called eocene, when mammalian life was still an almost new thing under the sun, there were terrible droughts in the land that is now the fertile heart of Germany. Thousands upon thousands of fossils, found in twelve great pits in what is now a giant mine of lignite or brown coal, bear eloquent witness.

Cecilie

Lignite, mostly a neglected resource in the United States, has long been an important fuel in Germany. Pressed into briquets, it is used extensively for both domestic and industrial purposes. Lignite mines are sometimes tremendous affairs, employing many hundreds of workmen in their vast open pits.

Such a one is the lignite mine called by the oddly romantic name Cecilie,

in the Geisel valley, not far from the ancient city of Halle. The lignite deposit there is of a really astounding depth, ranging from 150 to almost 300 feet, so that the wall of the cutting is a veritable artificial cliff.

Bones of extinct animals, and other remains of ancient life, are not common in lignite mines elsewhere in the world, for the humic acids generated by the matted vegetation that formed the lignite slowly ate them away. But in the Geiseltal deposits, inflowing alkaline waters protected them from this action, while ever-renewed deposits of leaves and stems and detritus from above buried them beyond the reach of bacteria and the action of the weather. So it was at first with surprise and then with delight that scientists beheld the uncovering of great masses of buried bones, teeth, and horns of large animals, and even such delicate things as hair, insect wings, and plant leaves.

Such scientific treasure-trove could never be left to the blind destructiveness of steam-shovels and bucket-dredges—

especially not in a land like Germany where science has always been a sort of second religion. At the Martin Luther Museum in Halle there is a well-organized Geological-Paleontological Institute, under the direction of Prof. Dr. Johannes Weigelt. As soon as the fossils began to come to light, Prof. Weigelt and his colleagues were all over the place, systematically salvaging every useful scrap of this scientific hoard of the ages.

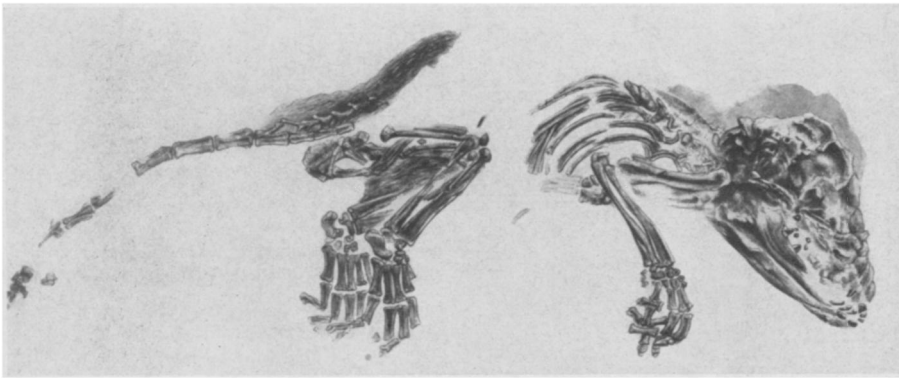
Older Than La Brea

It proved to be a find such as has not been made since the discovery of Ice Age fossils in the great La Brea asphalt pits in California, and in many ways it is completely unique among fossil mines. Geologically far older than the La Brea deposits, the Cecilie finds represent a totally different fauna—most of them animals that no longer exist anywhere in the world. Another unique feature is the presence of so many small and delicate things, that are totally lacking in almost all other fossil deposits: bats' bones, feathers, the remains of the animals' last meals, even brains and nervous systems preserved by geologically miraculous accidents of nat-



EXCAVATING

Scientists at work seeking fossils in the face of a tremendously deep bed of lignite, exposed in a great open-pit mine.

**RARE**

Prize piece of the whole collection: skeleton of Ceciliolemur, an exceedingly primitive relative of the monkeys, about the size of a squirrel.

ural chemistry. The museum treasure-shelves already contain enough to keep scientists happily busy for decades—and the end of new discovery is not in sight.

The barest catalog of the finds is impressive. Remains of some 7,000 vertebrate animals alone include 1,600 fish skeletons, 300 amphibians, 300 turtles, 250 frogs, 200 lizards, 100 snakes, 60 crocodiles, 100 tapir-like creatures called *Lophiodon*, 120 extinct horses representing four distinct species, 25 primitive pigs, 100 bats, and 1,000 small mammals of various types.

Many Teeth

Besides these there are about 2,000 separate teeth, and some 1,000 insects. The latter are mostly beetles, whose splendid gold-shining colors are still preserved. It has even been possible to make chemical analyses of some of the plant and animal remains, and to trace microscopic details of individual cells in some of the specimens.

Perhaps the outstanding zoological prize of this whole perished Noah's arkful of pioneer animals is a little skeleton not much bigger than a squirrel's. This is a very early representative of a lemur, related to the monkeys and apes but much more primitive. Living representatives of this "half-monkey" tribe are now found only in the Old-World tropics, where they are much feared by the natives as "ghosts of ancestors." In a way, the brown-skinned savages are more nearly right than they suspect, for these little creatures are to the monkeys as the monkeys are to us, in the evolutionary scheme of things.

This fossil lemur represents an entirely new genus, and so entitled Prof. Weigelt to the honor of naming it. With a nice sense of the appropriate, he incorporated the name of the place where the find was made, and called

the animal *Ceciliolemur*. By this name will all other fossils like it be known, if by good fortune other specimens are found, whether in the Geiseltal or elsewhere.

It was no easy task to get out the specimens as they were discovered. The bones, which are usually the hardest and most easily handled of fossil remains—indeed as a rule the only fossils found—were here so soft and crumbly when they were exposed to the air that special treatment was required, to hold them together as they were lifted out of the surrounding lignite and prepared for transportation to the museum. This was done by impregnating them with a cellulose plastic, so that as they lie on the museum shelves the specimens are partly as ancient as the brown-coal beds themselves, partly as modern as the lacquer on your car.

Great Risk

The difficulties were not all in the matter of delicate handling, either. Partly they involved very hard labor and a good deal of physical risk. For some of the deposits were at the very bottom of the pit, under permanent standing water, so that electric pumps had to be put to work and the scientists bent over their labors with the threat of drowning held at bay by these big weapons of modern mining engineering. Again, some of the deposits were uncovered high up the sides of the cut, so that the scientists had to work on an uneasy scaffold a hundred feet up in the air. In every case, however, they "brought home the bones."

The nature of both animal and plant remains gives strong evidence that this part of Germany, which now has a climate much like that of Ohio or Kentucky, was very much like the lowland

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DAYLIGHT, TWILIGHT, DARKNESS, AND TIME

By Lucia C. Harrison

This compact volume is the answer to a long-felt need for a book dealing with the significance of the location of a place in latitude and longitude that does not presuppose an astronomical background.

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Gulf Coast of the United States those thirty million years ago.

Wet and Dry

With this notable exception, however: that whereas our Gulf Coast now has a pretty steadily moist climate, the ancient Geiseltal and all the region round about alternated between wet seasons and dry. During the rainy season, vegetation flourished and the animal population thrived accordingly. But when the parching droughts came, animals had a harder time of it. It was then that they crowded upon the water-holes as they do in our own West to this very year of dry distress 1936. Then, as now, they sometimes fell into the water they were drinking, and being too weak to struggle out again, drowned and left their bones to testify to their tragic end.

Another kind of water-trap awaited the beasts of the ancient Geiseltal, that is not so widely found in our present West, though the same kind of thing is abundant in the Gulf Coast region, especially in the northern part of the Florida peninsula. These were sink-holes, round, steep-sided, funnel-like cave-ins, where the thin crust of the earth has broken through the roof of a limestone cavern underneath. In present-day Florida these are often filled with water the year round, and in them alligators live, lurking for prey that ventures or accidentally falls down the steep sides. So was it also in the Geiseltal, for in these filled-up sink-holes one finds crocodile skeletons added to the bones of other victims.

Kinships

These resemblances in topography are not the only links between this part of Germany thirty million years ago and the America of today. Prof. Weigelt points out numerous kinships between his animals and those of like age on this continent. Up until a short time before the days of the Geiseltal fauna, he says, a land bridge existed between Europe and North America, so it is only natural that this should be so.

The stage for the tragical dramas of the drought, as they were played out so long ago in the Geiseltal, was set by droughts perhaps even more severe, and very long before even the Geiseltal was formed. For the whole terrain is underlain with beds of salt and gypsum, and these minerals are formed only when landlocked seas are slowly evaporated down to nothing or near that, as is happening in the Caspian Sea basin today.

On top of the salt and gypsum strata other layers of less soluble material

were piled, becoming in time solid rock. This formed the crust, the foundation of the early Geisel valley. But water, seeping through the soluble minerals beneath, formed cavities, and the crust gradually sank, deepening the valley and permitting the formation of lakes and bogs. These filled with vegetation, and as the valley continued to sink, the bogs continued to build themselves up, developing the enormously thick deposits that are now the lignite beds.

The valley bottom did not all sink at once, or at a uniform rate. Faster solution of the salt and gypsum beneath made "soft spots" here and there, and these collapsed under the weight of the

overlying material, forming the crater-like sink-holes.

How many thousands of years this process went on there is no way now of telling exactly; though it is legitimate to guess that it was tens or hundreds of thousands of years a-doing. And all this time the interplay of abundance and drought, of life and death, went on in the valley, focusing with special intensity around the little lakes and the sink-holes. And the story of this long development is now being taken out of the Cecilie lignite mine by the patient fingers of the German scientists, and you can see it all in the aisles of the Museum of the University in Halle.

Science News Letter, October 3, 1936

INVENTION

Thomas Edison to Speak at 100th Anniversary of Patents

THOMAS EDISON'S voice will speak to dinner guests at the celebration, in Washington, D. C., of the 100th anniversary of the American Patent System on November 23.

Leading inventors, patent attorneys, industrial leaders and government officials will participate in the celebration, it is announced by Dr. Charles F. Kettering, president of the General Motors Research Corporation, in accepting the invitation of the Secretary of Commerce, Daniel C. Roper, to serve as chairman of the National Committee being formed to celebrate the event.

The tentative program calls for addresses in the morning of the Centennial Celebration day at Washington reviewing the progress made in the last century under the present Patent System and the significance of the law on the growth of the United States. The present value of the system to raise the American standard of living will be discussed and the continued growth of the inventive arts in the future forecast.

In the afternoon new "invention babies"—industrial developments just ready to take their place in economic usefulness—will be shown in a series of demonstrations.

Climax of the Centennial day will be a large dinner at the Mayflower Hotel in Washington when special novelties of interest to all inventors will be on the program. Transmission of the original Morse telegraph message will be reenacted between the old Baltimore and Ohio station in Baltimore to the dinner

hall, where it will be received on one of the two original Morse instruments loaned by Cornell University. The late Thomas A. Edison will also address the dinner guests in his own words from one of his early phonograph recordings.

Science News Letter, October 3, 1936

BIOCHEMISTRY

Enzymes Can Be Formed From Inactive Proteins

ENZYMES, the highly complex proteins that make digestion, breathing, body warmth and many other physiological processes possible, can be formed out of inactive proteins by suitable chemical manipulation and heating, Dr. J. H. Northrop, of the Rockefeller Institute for Medical Research, reported to the Harvard Tercentenary. He described a number of experiments where such enzymes had been "manufactured," including one in which the material generated was an enzyme isolated from the still-mysterious germ-destroying bacteriophage.

Science News Letter, October 3, 1936

● RADIO

October 6, 3:15 p.m., E.S.T.
POWER FROM THE SUN—Dr. C. G. Abbot, Secretary of the Smithsonian Institution.

October 13, 3:15 p.m., E.S.T.
SOIL AND SOCIOLOGY—Prof. Paul B. Sears of the University of Oklahoma.

In the Science Service series of radio discussions led by Watson Davis, Director, over the Columbia Broadcasting System.