

PALEOBOTANY

Arctic Never Tropical

Months of Night Would Have Been Fatal to Plants ; Fossils From High Latitudes Confirm Theory

By DR. FRANK THONE

See Front Cover

FORESTS that grew ages ago in the lands around the North Pole were never tropical, as old-time natural history books used to say. For theoretical reasons, they couldn't have been. And when the theory is checked up by examining fossils from the Far North the fossils give strong evidence that the theory is right. Thus another favorite notion of our younger days is outlawed to the limbo of facts that have been turned into fictions.

Not that there never were any forests around the North Pole. There were; great and luxuriant ones, if the wealth of fossil leaves and other plant parts is any indication. Where the tallest trees now are little willows six inches high, in such places as the islands north of Canada and Siberia, there were once woods as pleasant as any to be found in Ohio or Oregon. But the point is, they were such woods as can be found now in Ohio and Oregon, or perhaps Georgia and Arkansas, and not such jungles as those of Brazil or Burma, as was once imagined.

The destruction of the myth of the arctic tropics is the result of the rubbing together of two scientists' minds. Both of the men are Johns Hopkins professors, and both are interested in plants, though in widely different phases of plant affairs. One is the Dean of the University, Prof. Edward W. Berry, whose scientific specialty is the study of fossil plants of the long ago. The other is Prof. Burton E. Livingston, plant physiologist, who pries into the life processes of plants now in existence. It was Prof. Livingston who set off the theory, and Dean Berry who checked it up by looking over the fossil records, and found it was so.

Nights Too Long

The two men were discussing the problem of ancient climates in the Arctic one time, when Livingston said to his friend: "Look here; there simply couldn't have been Arctic forests of the kind we have in the tropics now, no matter how much milder the earth's climate

may have been in past ages. Think of those months of night they have in the polar lands!"

Dean Berry thought, and saw the point. With the sun completely off the job a dozen weeks or more in the year, and low on the horizon a good deal of the time when it did come back, the dark period must have been a time of very considerable cooling off, no matter how much warmth might have been imported from southern latitudes by way of ocean currents. Even in its palmiest days, the far north must have had something very much like a real winter every year, simply because the principal source of heat was turned off.

But even supposing that somehow or other the northern air could have been kept tropically warm with the sun away for long periods, it would still have been impossible for a tropical forest to exist in the Arctic. For plants must have light as well as warmth. An evergreen, continuously growing tropical forest must have the strong sun pouring on its leaves every day, to supply energy for the formation of foodstuffs that build up the plant's body and are burned up in its life processes. Shut off the sun, and they're simply out of luck.

Try it Yourself

You can test this point on a small scale yourself. Just put one of your tropical houseplants—geranium or begonia or fuchsia—away in a closet that is warm enough but completely dark, and leave it there for a couple of months; keeping it watered, of course. Then, as you wend your way to your florist's to buy yourself a new plant, reflect what a whole Arctic-ful of tropical plants would have been up against the first time the sun dipped beneath the southern horizon and stayed gone for an equal period.

What a feast there would have been, in the damp, warm dark, for preying fungi and swarming blind insects, while the plants, their life-forming leaves paralyzed without light, could make no growth to replace their losses. The returning sun, months later, would have looked upon the fragments of a most

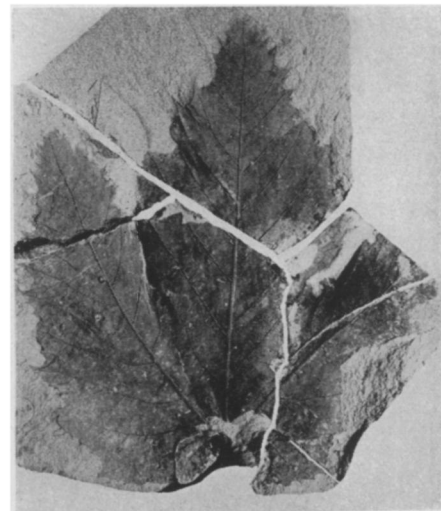
macabre banquet! Only, with such odds against it, the ordinary type of tropical forest could of course never have come into existence at all.

One type of tropical forest, and one type only, could face such a season of dearth as a long-absent sun would force upon it. In lands such as India, where the monsoons blow—rain-bringing winds from one direction half the year and parched waterless winds from the opposite direction the other half—in such lands, there develop what are called "monsoon forests": woodlands that lose all their leaves at the beginning of the dry season as our own more familiar forests lose theirs at the beginning of the cold season, and then burgeon forth again with the returning rains. It is imaginable that tropical trees might have trained themselves to strip and stand bare against darkness as monsoon forest trees strip and stand bare against drought.

What Actually Grew

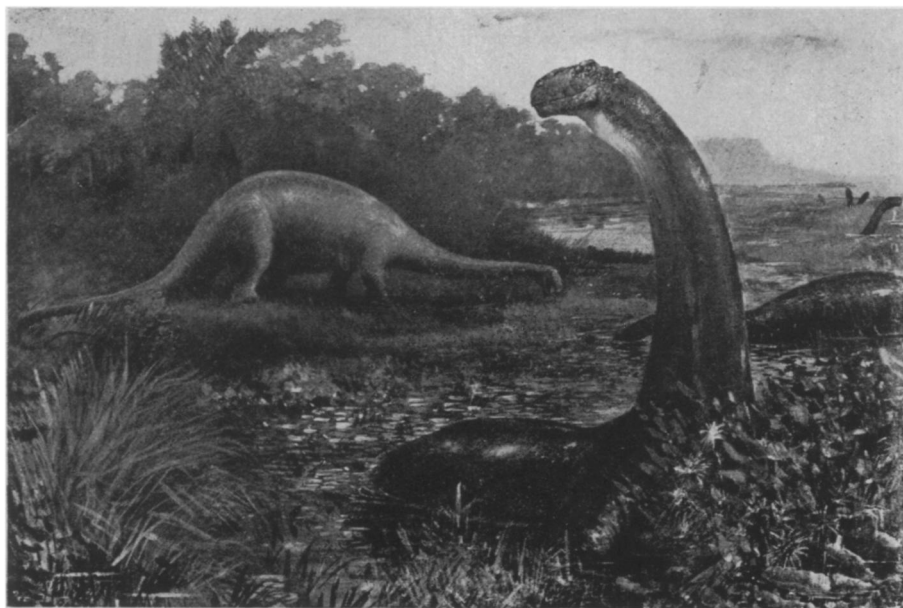
But before attempting to construct such an imaginary dark-adapted tropical forest, it might be worth while to take a look at the fairly abundant fossil plant remains from far northern lands, and see what kinds of trees actually did grow there.

That is what Dean Berry did. He looked over all the Arctic fossil leaves



FOSSIL LEAF

The sycamore, native now "On the Banks of the Wabash" and points south, was a characteristic tree of the ancient Arctic.



NEVER IN ARCTIC

Arctic fossil deposits have never yielded any dinosaur bones. These great reptiles, being cold-blooded, could never have lived through the months of chilly night, even when the regions were warmer than they are now; and they were too big to burrow into the mud and hibernate as smaller reptiles in temperate lands do today.

in collections he could get at, and examined lists compiled by other scientists. And he found plenty of evidence that the old Arctic forests had been like those of the modern temperate zones rather than like those of the tropics. In recent geologic times, when plants were naturally most like modern ones, there grew in the Arctic not such tropical trees as banana and rubber and breadfruit, but old familiar Yankee friends like maple and sycamore and hazel, together with sweetgum and magnolia and cypresses and other trees from down in Dixie. Quite distinctly the fossils told of a temperate climate, possibly even a warm-temperate climate, but certainly not a tropical one. There were also redwoods, which are now to be found only in California; but the modern California redwoods grow at high enough altitudes or far enough north in their state so that they get their regular doses of frost and even of snow. There were species of the curious maiden-hair tree or ginkgo, now known from China and Japan, and cultivated also in America and Europe; but this tree is also used to frost, and will survive even the stiff winters of central Iowa.

With the Saber-Tooth

Forests of this type grew in the lands about the Pole before the last Ice Age, when saber-tooth tigers and enormous elephants and other fierce killers and

lumbering monsters prowled and crashed about where now our cities stand. Forests not unlike them grew in the same lands in even more remote times when dinosaurs wallowed in the swamps and waddled about on the dry land; for animals and plants have evolved at greatly different rates in recent times, and we still have many of the same genera in the garden that the dinosaurs ate, whereas not only the dinosaurs but even the early and "medieval" mammals have utterly disappeared.

Hardy Figs

It is not to be denied that there are some plants of even a little more marked warmth-loving nature. Figs, for instance. But Dean Berry calls attention to the hardiness of some fig species, citing trees that bear regular crops as far north as Baltimore. It is also not impossible that even harder species may have existed in the past, and died out since.

Another possibly troublesome plant, of even more marked tropical affiliations, is a genus of palm, or what is supposed to be a palm, for the specimen is imperfect and the determination uncertain. But assuming it to be a genuine palm, there is no necessity for admitting it to be a tropical one. The palmetto of our own South grows quite freely as far north as the Cape Fear River in North Carolina, where frost is by no means unknown. Even in Florida, where the

palmetto is at its best, not merely frosts but hard, ice-forming freezes, are occasional visitants. And it is stated that some hardy palm species can grow successfully out-of-doors the year round in southern England. So even a couple of palms do not necessarily spoil the temperate-zone climate of the ancient Arctic.

Searched the Past

Not content with establishing temperate-zone floras for several relatively recent geological periods in the Arctic, Dean Berry pushed his investigation back to the very earliest times for which plant fossils are known from the far north. The further back he got, of course, the less knowledge he could claim of the climatic preferences of the plants. For these earlier plants are now as dead as the dinosaurs, and most of them have left no direct descendants.

However, if we may hazard a guess that ancient ferns and horse-tail rushes were anything like modern members of the same families, that leaves the Arctic still cool, for these types belong to temperate regions quite as much as they do to the tropics. Even the great tree-fern forests of New Zealand get snowed upon quite frequently. Even cycads, which are plants that look like palms and are often sold as "palms" but are really more nearly related to the pines, do not necessarily indicate past tropical conditions in the north, though most cycads are hot-land plants now. There is one species of cycad that grows thickly in the pine woods of northern Florida, where it endures and survives the same occasional freezes that the palmetto has to stand.

Another point that was settled by Dean Berry's study was the old perennial question of a "wandering pole." Some scientific speculators supported the theory that the axis of the earth has not always been where it now is, but that the poles have shifted occasionally. The zonation of the fossil plants around the pole, Dean Berry finds, lends support to the idea of a permanently located axis rather than to this theory of a wandering one.

What Did Animals Do?

Although Dean Berry refrains from discussing animals except incidentally in reporting on his study, a few inferences may be allowable. For animals no less than plants must have felt the effects of the long dark and consequent chill, and the fall of leaves from the trees and the death of other vegetation. Winter in the ancient Arctic must have been something like winter in the United

States of today, with the added feature of permanent darkness the whole season through. Hence the animals of the ancient Arctic must have been able to find their food even in the dark, or by moon or aurora light, as the caribou and musk-ox and polar fox do now; or else they must have dodged the problem by going into hibernation and sleeping the winter out. There was, of course, more food, as the presence of such enormous gross feeders as woolly mammoth and hairy rhinoceros and giant bison have testified with their bones.

The discovery of a land-living dinosaur in the Arctic would be a somewhat embarrassing thing for Dean Berry's hypothesis. Fossils of sea dinosaurs, like Ichthyosaurus, have been found in the far north; but these need not count. They lived in the water, and probably moved about the world as freely as whales do now. But a terrestrial dinosaur—at least one of any size—would indicate either a fairly high year-round temperature or else some adaptation to

cold weather not possessed by any existing reptile or other cold-blooded animal. While warm-blooded creatures can brave the winter, the cold-blooded beasts must get out of the way. Land-living reptiles, and many aquatic ones as well, burrow into the ground or mud when autumn chill warns them, and emerge when the sun warms the earth in spring.

But a Diplodocus was too big to be a successful burrower—to twist Falstaff a bit, he would have required a mountain for his mummy-case. It is just possible that he might have wallowed himself deep enough into a swamp or lake bottom, but really not very likely. However, although dinosaur bones have been found pretty well up in Canada, and abundantly in Mongolia, none are on record yet from the lands of the long dark, so Dean Berry's idea is still safe from being tramped on by their ponderous feet.

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Scientists are not yet sure just what the function of this part of the brain is, although it is being extensively investigated at present.

In the case Dr. Ackerly reported, discovery of the absence of this brain tissue resulted in clearing of the criminal charges against the patient, who has since been put under proper supervision to protect himself as well as the community.

"Without the encephalogram procedure, injustice to both parents and patient would have continued," Dr. Ackerly reported.

Science News Letter, March 21, 1936

GENERAL SCIENCE

"Who Owns Our Science?" Writer Wants to Know

THE GREATEST and deadliest of plagues is poverty, the lack of wherewithal with which to buy what people are collectively willing and able to produce.

Dr. Paul de Kruif, he of "Microbe Hunters" and "Hunger Fighters," in his new book probes with literary lance this cancer of money lack, satirically titling it with a query about little, helpless children: "Why Keep Them Alive?" (Harcourt, Brace).

Dr. de Kruif tells tales of medical advances made ineffective by money lack. There was Joan, who died of rheumatic heart disease, an illness that passes by well-fed children. Little Joan whose father was on relief, little Joan whose heart might not have beat itself out if she had had an economic chance.

Joan's story stirred Dr. de Kruif to ask, how this infamy in a land of enormous wealth could continue? This suggestion lost him a friend, grown rich from applying science to human use.

So Dr. de Kruif formulates his new understanding in fighting, *v i b r a n t* words: "I knew that the clever men who monopolized the common inheritance of science would never share it, fundamentally. I knew that their greed, based upon fear, made them indifferent to a heartbroken child.

"I understood that the question today, that will finally set friend against friend, brother against brother, is this one—who owns our science?"

"I saw that once the plain people, the mass, understand the whole truth of the story of children like our Joan, once they get it clear in their heads what it is that limits the food, the clothes, the shelter, the science that

PSYCHIATRY

Discovery of Brain Defect Clears Patient of Charges

HOW a special kind of X-ray picture, which showed an absence of part of the brain tissue in a 19-year-old boy, cleared the young patient of criminal charges was told by Dr. Spafford Ackerly of the University of Louisville School of Medicine at the meeting of the American Orthopsychiatric Association.

The patient was facing a long term sentence because of persistent automobile stealing when he was brought by his family lawyer to the psychiatrist. The patient had a record of petty stealing and misbehavior at school. He was given to "impulsive wanderings," when he would suddenly drop what he was doing and depart for distant cities,

hitch-hiking or, more often, going in a stolen automobile.

Physical and neurological examination and ordinary X-ray pictures of his head showed nothing wrong. He had a normal intelligence rating and had reached the second year of high school. The lad was a convincing talker, made a good impression and was so well-mannered that he was termed a "little Chesterfield." After one of his escapades he would be very contrite, but this feeling did not prevent another escapade.

Finally the psychiatrists decided to make an encephalogram. This is a special kind of X-ray picture. Some of the fluid within the brain and spinal cord is withdrawn and an equivalent amount of air is injected. X-ray pictures taken after this procedure show the various cavities or ventricles of the brain more clearly than plain X-rays do.

The encephalogram of this 19-year-old boy showed a defect in the front part of his brain. Operation was then performed and a "marked absence" of this part of the brain, called the prefrontal lobe tissue, was found on both left and right sides.

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