ANCIENT ILLINOIS INSECTS FLOURISHED IN COAL SWAMPS

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THE OLDEST winged insects that we know flourished in the rich coal swamp forests in the Pennsylvanian period, beginning 280 million years ago. Great is their age, and great is their diversity, as it was even in those far-off times, when they left their wings to become fossilized with the leaves of the coal trees.

FOSSIL-BEARING NODULE

It contains an impression of an insect wing. This and other nodules collected for the Museum around Braidwood, Illinois, are of Middle Pennsylvanian age, or about 250 million years old.

The oldest among the insect groups (orders) now living are, very surprisingly, cicada-like insects, and next to these, the roaches. These, indeed, are the only orders of insects surviving of a considerable company of orders that lived in the Pennsylvanian period. The others either died out entirely or changed in the gradual process of evolution into more familiar forms. As competitors, the earliest cicadas and roaches had the ancestors of our dragonflies and grasshoppers, many of them larger than most modern insects, if we may set aside certain legends of Texas and Alaska mosquitoes.

The coming of the insect season happily coincides with the coming of the field season, the time when weather and roads are again suitable for gathering fossils and other specimens for the Museum collections. This year George Langford, Curator of Fossil Plants, and I will again undertake several trips to the coal-stripping area near Braidwood, about fifty miles south of Chicago. Here, in great piles of waste clay, cast aside in uncovering the coal, are the fossil-bearing nodules, delight of amateur and professional alike.

MODEL OF FOSSIL INSECT WING

Made by running a cellulose solution over the fossil impression in a Braidwood, Illinois, nodule and peeling it off after it has dried.

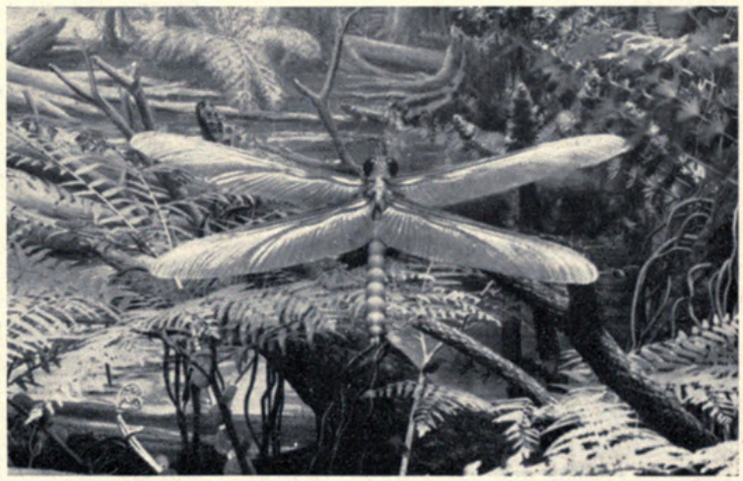
Nodules are rounded stones formed by the hardening of a soft shale around a fossil as a core. Probably the organic substance of the fossil, in its decay or carbonization, promotes the deposition of mineral around the fossil, thus forming the nodule soon after the leaf or insect wing is originally buried. Nodules occur by the hundreds on the spoil heaps, where the unhardened shale, exposed to the weather, soon falls to clay. In the course of a day's collecting one gathers and cracks a few bushels of them.

But many bushels of nodules must be cracked before a single fossil insect appears. Next to the small amphibians and certain scarce plants, insects are the rarest of fossils from Braidwood and are prized accordingly. Nevertheless, if we include the small outcrop of the same nodule-bearing shale on the banks of Mazon Creek, a few miles to the west, this is one of the world's most productive and illustrious Pennsylvanian insect localities. One hundred and thirty-five species of insects have been described from the Braidwood and Mazon Creek nodules, and others in the Museum collection are now being studied.

What kinds of insects were these that flitted through the primeval forest of Illinois? They were two main types: those that kept their wings outstretched (Paleoptera) and those that folded them back when not flying (Neoptera). The Paleoptera are the more primitive type, but already 250 million years ago, in the middle of the Pennsylvanian period, they were in the minority. Of the Braidwood insects, only a seventh part belongs in the three paleopterous orders, including one species close to the ancestral line of the dragonflies. There were about thirty species of roaches, most of them rather larger than the common house roach. Almost all of the other insects belonged to a large, now extinct, neopterous order, known as the Protorthoptera, ancestors of our katydids, grasshoppers, and crickets. The Neoptera had an advantage in the competition for survival, for their delicate and important wings were safe from damage when folded back.

The two wings shown in accompanying illustrations are typical of the Protorthoptera in the Museum's collection, representing hitherto unpublished species. The veins supporting the wing membranes are more numerous than in most modern insects. Reduction in wing veins, accompanied by changes in the body, is a characteristic step in insect evolution. Some specimens of Braidwood insects have both wings and bodies, and are the oldest complete insects known. Older Pennsylvanian deposits yield solitary wings, and most of the Braidwood specimens, too, consist of wings alone.

Thus a study of Pennsylvanian insects must place much weight on the characters of the fossil wings. Scientific descriptions, which must always be published when a new species is named, are devoted to matching ("homologizing") the veins with those of other known insect species. Fortunately, there is enough possibility of variation in wing veins to make them excellent characters for study of classification and evolution of insects.



DRAGONFLY WITH TWO-FOOT WING SPREAD

Restoration of giant insect in the Museum's habitat group of a Coal Age forest showing it as it is believed to have appeared in life about 250 million years ago. The Museum scientists and artisans were guided in preparing the dragonfly model by data on the six known fossil specimens found in a strip-mine dump in central France, a deposit slightly more recent than that in northern Illinois.

Fortunately, too, the impressions of wings in the Braidwood nodules are so clear that all veins are visible. The swamp mud that covered the wings ages ago was almost as fine-grained as modeling clay, forming an ideal medium for preserving delicate markings. This is true for the other fossils in the nodules as well as for the insects. So the time spent in cracking nodules in search of insect wings is well spent even on those days when no insects appear, and thus the Museum is annually enriched by several hundred specimens of finely preserved fossil plants.