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Field Book

PENNSYLVANIAN PLANT FOSSILS OF ILLINOIS

Charles Collinson
Romayne Skartvedt

Illinois State Geological Survey

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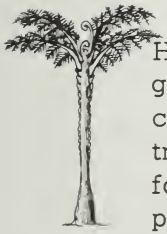
Illustrations by Marie E. Litterer

FOREWORD



THIS FIELD BOOK is intended to guide beginners in their collection and general classification of plant fossils. It illustrates the plant fossils most commonly found in Illinois and relates them to the plants of which they were a part. A list of publications that will furnish more detailed identification of specimens is included. The book has been prepared in response to numerous inquiries to the Illinois State Geological Survey from amateur collectors.

Information has been drawn from numerous sources. The works of Hirmer, Janssen, Lesquereux, Noé, and Langford have been particularly useful.

We are especially indebted to Dr. Robert M. Kosanke, paleobotanist at the Illinois State Geological Survey, and Dr. Wilson N. Stewart, professor of botany of the University of Illinois, for helpful suggestions and use of their libraries.

KEY TO PLANTS ILLUSTRATED ON TIME CHART

1. *Foerstia.* These fossils may be the earliest known occurrence of bryophytes, although some authors have referred them to the brown algae. After Dawson.

2. *Psilophyton.* A primitive vascular plant. After Dawson.

3. *Lepidodendron.* After Hirmer.

4. *Sigillaria.* After Hirmer.

5. *Calamites.* After Hirmer.

6. *Sphenophyllum.* After Fuller and Tippo.

7. *Equisetum.* The only living genus of scouring rushes. After Fuller and Tippo.

8. *Megaphyton.* An ancient true fern. After Hirmer.

9. Modern tropical tree fern. After Fuller and Tippo.

10. *Medullosa.* An ancient seed fern. After Stewart.

11. *Williamsonia.* An extinct cycad-like tree. After Sahni.

12. *Cycas.* A modern cycad. After Chamberlain.

13. *Baiera.* A fossil leaf genus of ginkgo, whose only living representative is the species *Ginkgo biloba,* saved from extinction by careful cultivation in China. Several specimens of this "living fossil" were presented to this country by the Chinese and are now flourishing on many college campuses, including that of the University of Illinois. After Mägdefrau.

14. *Cordaites.* After Grand Eury.

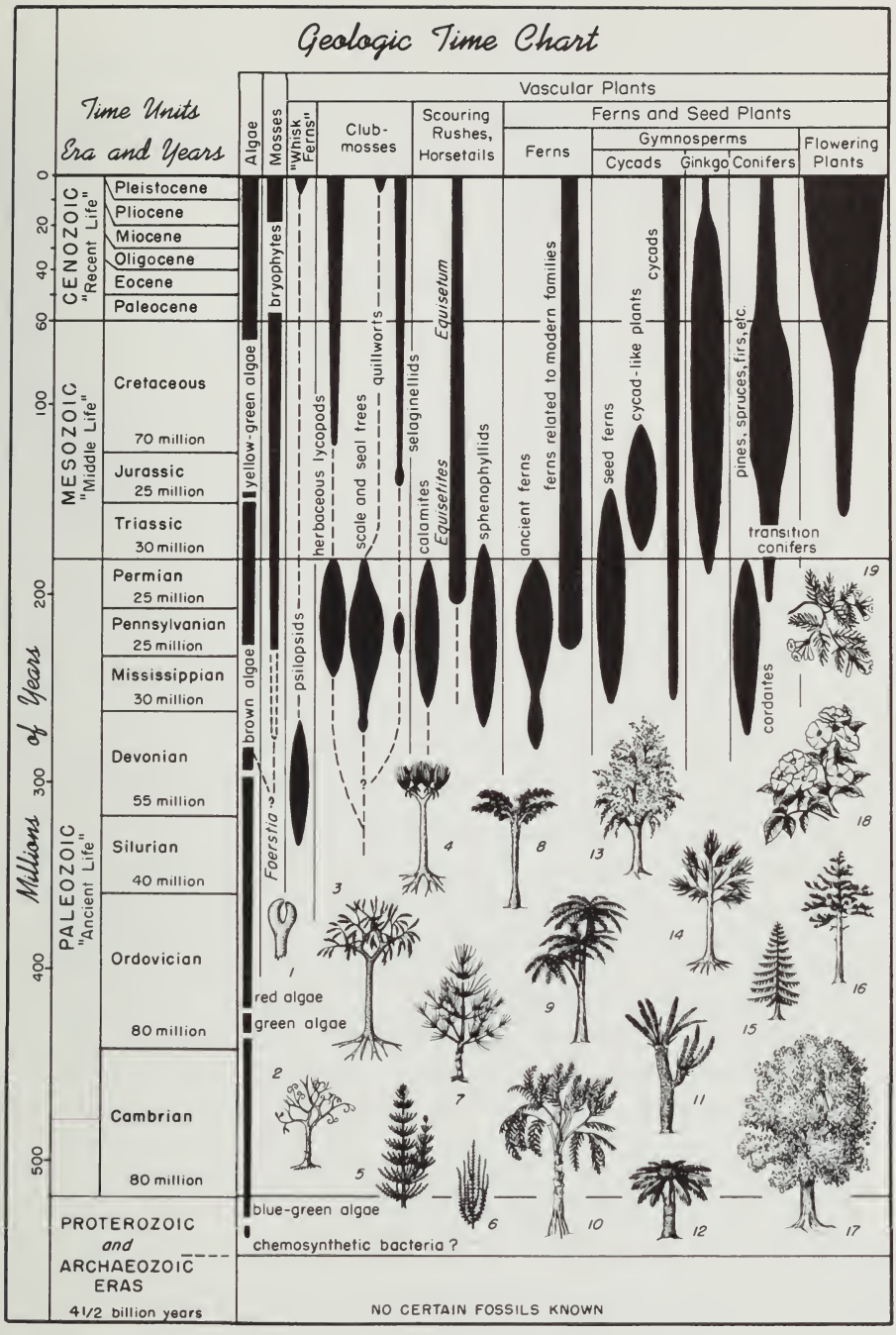
15. *Lebachia.* A "transition conifer," forerunner of present day conifers. After Mägdefrau.

16. *Pinus.* Modern pine. After Mägdefrau.

17. *Acer.* Common maple, an angiosperm whose leaves are also found among Tertiary fossils. After Mägdefrau.

18. *Rosa.* The prairie rose, an angiosperm.

19. *Campsis.* Trumpet vine, an angiosperm.


Geologic Time Chart
Time Units
Era and Years
Millions of Years
0
20
40
60
100
200
300
400
500
CENOZOIC
"Recent Life"
Pleistocene
Pliocene
Miocene
Oligocene
Eocene
Paleocene
MESOZOIC
"Middle Life"
Cretaceous
70 million
Jurassic
25 million
Triassic
30 million
PALEOZOIC
"Ancient Life"
Permian
25 million
Pennsylvanian
25 million
Mississippian
30 million
Devonian
55 million
Silurian
40 million
Ordovician
80 million
Cambrian
80 million
PROTEROZOIC
and
ARCHAEOZOIC
ERAS
4 1/2 billion years
Algae
Mosses
Vascular Plants
"Whisk Ferns"
Club-mosses
Scouring Rushes, Horsetails
Ferns and Seed Plants
Ferns
Gymnosperms
Cycads
Ginkgo
Conifers
Flowering Plants
yellow-green algae
brown algae
red algae
green algae
blue-green algae
bryophytes
Foerstia
psilopsids
herbaceous lycopods
scale and seal trees
quillworts
selaginellids
calamites
Equisetites
Equisetum
sphenophyllids
ancient ferns
ferns related to modern families
seed ferns
cycad-like plants
cycads
pines, spruces, firs, etc.
transition conifers
cordaites
chemosynthetic bacteria ?
NO CERTAIN FOSSILS KNOWN
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Field Book

PENNSYLVANIAN PLANT FOSSILS OF ILLINOIS

Charles Collinson and Romayne Skartvedt

PLANTS THAT FLOURISHED 200 million years ago have made Illinois one of the best known fossil collecting sites in the world. The unusual abundance and preservation of these fossils in the northern part of the state have brought collectors to Illinois from many countries, and prized specimens from that area may be seen in science museums throughout the world.

The remarkable fossils represent plants that lived during the geologic period called the Pennsylvanian or Coal Age and are the result of special geologic conditions that occurred repeatedly during the period.

At the beginning of the Pennsylvanian Period, Illinois was part of a vast lowland that stretched for hundreds of miles to the north, south, and west, and was bordered on the east by highlands. At times much of the plain was swampy and, because the climate was relatively warm and moist, great jungles of fast growing trees, shrubs, and vines covered the landscape. As successive generations of plants lived and died, plant material fell into the swamp waters and, protected there from decay, accumulated.

Frequently during the period, seas spread over the swampy lowlands, submerging the forests and covering

Reconstruction of Pennsylvanian Coal-forming Swamp

them with mud. Each submergence lasted only a short time, geologically speaking. When the seas withdrew, the deposits of sand and mud left behind were cut by streams that carried fresh sand and mud from the eastern highlands. The streams eventually became clogged with sediments and when the lowland was again depressed swamp conditions returned and forests grew afresh. Such a cycle of deposition was repeated again and again during Pennsylvanian time, and after burial each layer of plant material gradually lost most of its liquids and gases and was slowly converted into one of the numerous coal beds presently found in Illinois.

In some places in the state conditions existed that were especially favorable for preservation of plants, and there delicately preserved fossils are found in great numbers. In the most favorable areas, such as in northern Illinois, the plants are preserved in stony nodules called concretions, but they also may be found separately as molds, casts, or petrifactions.

Molds (concave surfaces) and casts (convex surfaces) are fossilization phenomena in which the actual plant, embedded in the surrounding background rock, was dissolved, leaving a hollow space (mold) that subse-

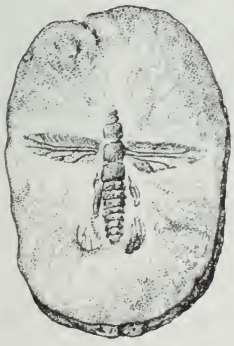
quently filled with other material. A cast was thus formed that preserved the plant's external features.

Most petrifactions are fossils in which silica, carbonate, or other material permeated or replaced the internal structures of the plant and preserved them so well that in most specimens the finest cellular details can be observed. Compressions, another kind of petrifaction, are the pressed carbonized remains of the plant itself.

PENNSYLVANIAN FLORA

The far-reaching Pennsylvanian swamplands had abundant species of trees and other plants that long since have become extinct. Today's common deciduous trees were not present; flowering plants had not yet evolved. Instead, the tangled forests were dominated by giant ancestors of presently existing club-mosses, horsetails, ferns, conifers, and cycads. The undergrowth also was well developed, consisting mainly of ferns, fernlike plants, *Sphenophyllum*, and small club-mosses. The plant fossils give no indication of seasonal variations. The forests, evidently always green, grew rapidly and abundantly, with foliage of unprecedented size and luxuriance. Land animals were just beginning to develop and included sluggish, salamander-like amphibians, large primitive insects, and a few small reptiles. The insects flourished as never before or since in the damp forests and attained remarkable size. Insects

Aphthoroblattina



Teneopteron

more than four inches long were common and some are known to have been more than a foot long with a wingspread proportionately broad. Ancestors of the modern spiders, scorpions, centipedes (one fossil found in Illinois was twelve inches long), cockroaches, and dragonflies are represented by several hundred species.

The fossilized plants of Pennsylvanian time belonged to only a few main categories: scale and seal trees, ancient scouring rushes (horsetails), herbaceous *Sphenophyllum*, ferns, seed ferns, and cordaitean trees.

SCALE AND SEAL TREES
(Plate 1)

Scale and seal trees were abundant during the Pennsylvanian Period and were important contributors to coal beds. Although distantly related to the diminutive club-mosses and ground pines of the present, the trees grew on straight, slender trunks to heights of more than a hundred feet.

Reconstruction of *Lepidodendron* (after Hirmer)

Scale trees were so called because their numerous, closely set, spirally arranged leaves left scarred "cushions" on the branches and trunk, making them appear scaly. Seal trees derived their name from the signetlike appearance of their leaf cushions. The two best known types belong to the genera *Lepidodendron* (scale tree) and *Sigillaria* (seal tree), and fossils of both are common in Illinois.

Lepidodendron had long, slender, somewhat tapering trunks. Some of the trees reached heights of more than 100 feet and measured more than two feet in basal diameter. The trunk ended in a spreading crown formed by repeated dichotomous branching. The leaves were awl-shaped or linear, ranging from one to 30 inches long.

The leaf cushions of *Lepidodendron* are diamond-shaped, longer than broad, and arranged in spiral rows around the trunk and branches. A different name, *Lepidophyllum*, is used for fossils of the long, bladelike leaf when it is found detached.

Reconstruction of *Sigillaria* (after Hirmer)

Spores were borne in long cylindrical cones at the tips of the branches. Those cones referred, or assigned, to the genus *Lepidostrobus* bore both small spores (microspores) and large spores (megaspores) in the same cones. Those in which only a large single spore, a somewhat seedlike structure, was developed in a spore sac (sporangium) are referred to the genus *Lepidocarpon*.

The rather commonly found genus *Stigmaria* comprises so-called "appendages" which, although stemlike in structure, apparently served as roots for the scale and seal trees. These appendages are identified by irregular spirals of circular scars (pits) that mark the attachment points of former rootlets.

Sigillaria, although less common than *Lepidodendron*, was widely distributed during the Pennsylvanian Period.

It differed in growth habit from *Lepidodendron* in that it generally had fewer branches and not uncommonly was unbranched. Some species also possessed a thicker trunk, with hexagonal to elongate leaf cushions separated by vertical ribs. The trunk was crowned, in the manner of the modern palm tree, by a cluster of large, grasslike leaves.

Reconstruction of *Calamites* (After Hirmer)

The detached leaves of *Sigillaria,* extremely difficult to distinguish from *Lepidophyllum* (leaves of *Lepidodendron*), are referred to the genus *Sigillariophyllum* if preserved as compressions and to *Sigillariopsis* if preserved as petrifactions. Unbranched *Sigillaria* trunks have been found that are more than 100 feet long and six feet in diameter near the base, but the average height probably was closer to 50 feet.

Not all Pennsylvanian trees were large, however. Small forms are known, including the important undergrowth genera *Lycopodites* and *Selaginellites.* In woody types the trunk consisted of an inner region of conducting and supporting tissues, surrounding concentric cortical layers, and an outer layer of corklike bark. Although the fossil impressions of the various bark layers have been given separate generic names, these are not commonly used.

SCOURING RUSHES
(Plate 2)

Although related to the small, inconspicuous horsetails of today, the ancient scouring rushes of the Penn-

sylvanian Period grew to the size of trees and were among the most widely distributed plant groups.

Some of these plants attained heights of 40 feet or more, but the average was closer to 20 feet. The trunks were jointed and bore a whorl of branches at the joints (nodes). Their small leaves also grew in whorls at nodes along the smaller branches. Internodal regions were ribbed in the same manner as present day horsetails. Fossils of the trunks are assigned to the genus *Calamites* and quite commonly are preserved in sandstone and shale.

The leaf whorls are placed in the genus *Annularia*. One form commonly found in Illinois has long, pointed, needlelike leaves and is given the name *Asterophyllites*. *Calamostachys*, shown on plate 5, is one of the most common calamite cones.

SPHENOPHYLLUM
(Plate 2)

The name *Sphenophyllum* refers to both stems and leaves of this extinct genus, which was related to the scouring rushes - note its resemblance to *Annularia*.

A small herbaceous plant, *Sphenophyllum* formed much of the swampy undergrowth of the Pennsylvanian Period and is abundant among Illinois fossils. It had a slender, ribbed stem bearing whorls of delicate, wedge-shaped leaves, generally less than three-fourths of an inch long, attached around the stem in multiples of three.

The cones of this group also are slender, delicate structures, bearing a number of sporangia, and are correctly called *Bowmanites*, although they also have been called *Sphenophyllostachys*. These fossil cones frequently are found in Illinois.

Sphenophyllum first appeared during the Devonian Period, some 300 million years ago, but did not become abundant until Pennsylvanian time. The genus continued through the Permian but died out in Triassic time.

FERNS
(Plates 1 and 3)

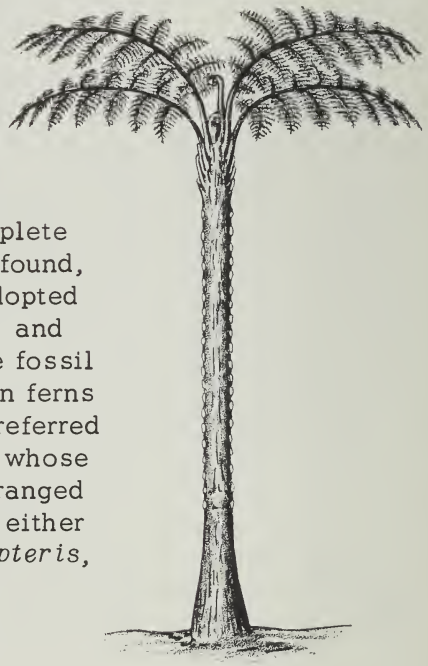
Portion of fern frond showing sori on lower side of leaflets

True ferns, like those living in today's woodlands, were common in the Pennsylvanian forests. Some species attained heights of 30 to 40 feet. Their fronds (compound leaves divided into segments or leaflets) commonly were five to six feet long.

True ferns do not produce cones or seeds, but spores, which develop in cases called sporangia. The sporangia are attached in clusters (sori) to the lower side or margins of the leaves. In modern ferns the sporangia may also occur on fertile spikes.

The shape and position of the sori are used to identify modern ferns, but because leaves that bear sori ("fertile" leaves) are rare among fossil specimens, the number, shape, and attachment of the leaflets and the pattern of the veins are more commonly used for identification.

Because fossils of complete fern plants have not yet been found, separate names have been adopted for detached leaves, stems, and other parts. For example, the fossil stems of some Pennsylvanian ferns found in Illinois have been referred to two genera, *Megaphyton*, whose leaf attachment scars are arranged in two vertical rows, one on either side of the stem, and *Caulopteris*,



Reconstruction of *Megaphyton* (after Hirmer)

Pecopteris *Asterotheca* *Ptychocarpus*

Venation of seed fern leaflets

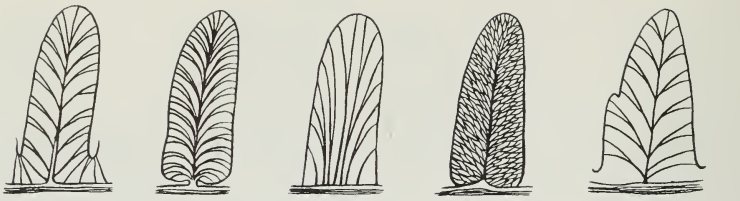
whose leaf scars are arranged in a steep spiral that becomes progressively flatter upward until near the top they appear to be whorled. When the stem is a petrifaction, with internal structures preserved, it is called *Psaronius*. The fronds are referred to a number of genera, but those most commonly found in Illinois are *Pecopteris*, *Asterotheca*, and *Ptychocarpus*.

Medullosa
Reconstruction and original drawing by Wilson N. Stewart

SEED FERNS
(Plate 4)

Seed ferns resembled true ferns in general, but they produced seeds, borne on modified leaves. Where spore sacs and seeds are absent, the leaves of seed ferns are difficult to distinguish from those of spore ferns, although individual seed fern leaflets, called pinnae, are somewhat larger.

Seed ferns included vinelike plants in the undergrowth and trees such as *Medullosa*. Some tree genera were very tall,



Venation of seed fern leaflets

with trunks more than two feet in diameter. Unlike the true ferns, still living today, seed ferns declined steadily after the close of the Pennsylvanian Period and finally became extinct during Jurassic time. During Pennsylvanian time, however, they were much more numerous and varied than true ferns.

Most of the common seed ferns found as fossils in Illinois can be referred to the following leaf genera: *Alethopteris*, *Neuropteris*, *Odontopteris*, *Linopteris*, *Mariopteris* (which may be a true fern), *Cyclopteris*, and *Spiropteris*. *Cyclopteris* includes circular leaves that occurred at the base of leaves referable to *Neuropteris*. *Spiropteris* includes young leaves that had not yet uncoiled and may belong to either true ferns or seed ferns.

CORDAITES
(Plates 1 and 2)

Cordaitean trees, forerunners of modern conifers such as pine and spruce, were important during the

Reconstruction of *Cordaites*
(after Hirmer)

Pennsylvanian Period for they were distributed throughout the world. These trees, among the tallest plants of the time, sometimes grew more than 100 feet high.

The cordaitean trunk was unbranched for three-fourths of the height of the tree and was topped by dense branches bearing large, simple, straplike leaves spirally arranged. The leaves had closely set parallel veins and measured from half an inch to three feet or more long.

Internally, the structure of the trunks was similar to that of modern pine trunks. Casts of the pith are referred to the genus *Artisia*. The seeds were borne in clusters on branches in leaf axils.

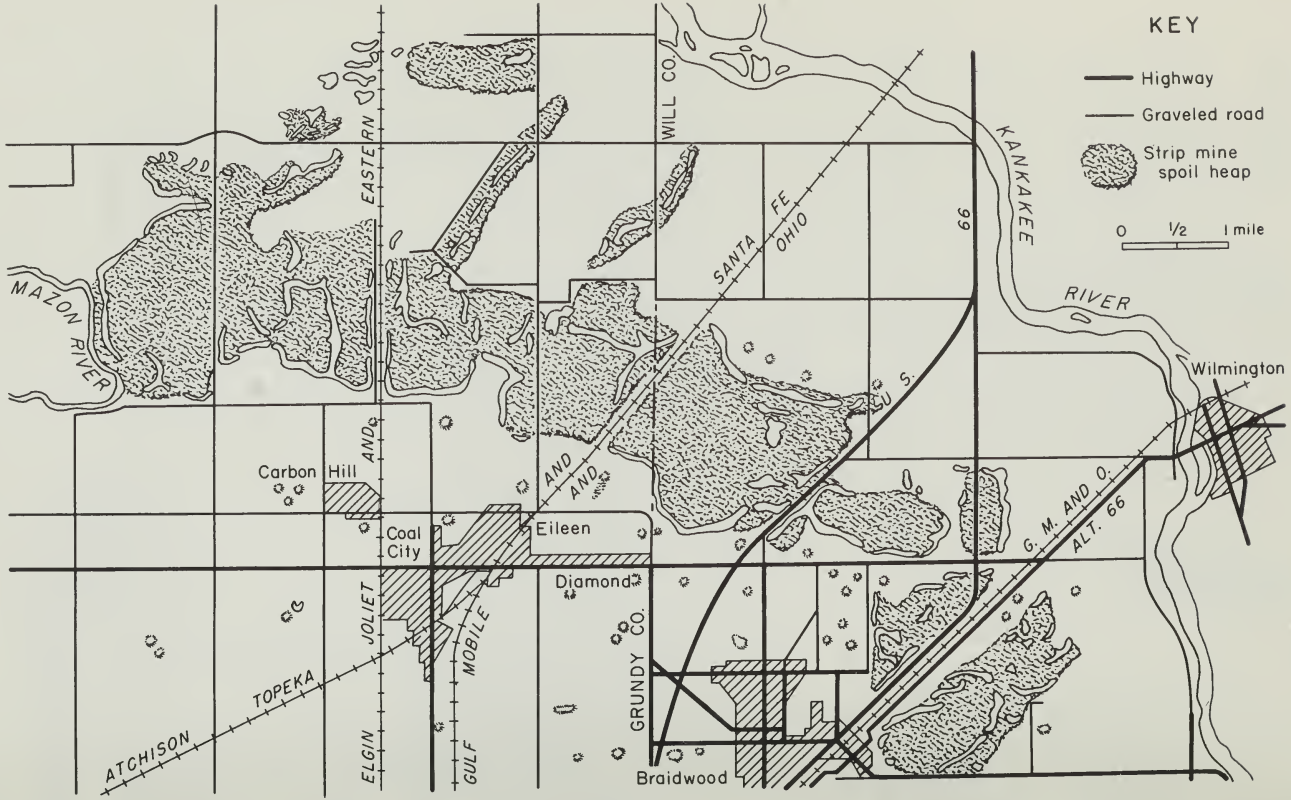
The *Cordaites* were major contributors to some coal beds.

FRUITING BODIES
(Plate 5)

Fossils representing many kinds of plant reproductive structures are found in Pennsylvanian rocks, but unfortunately most of them are not attached to any identifiable part of the parent plant and they cannot be assigned definitely to a particular plant. Such fossils are referred to genera and species solely on the basis of their own characteristics, although, as in other fossil classifications, such "form genera" are presumed to be parts of, or related to, the plants with which they are found in habitual association.

A few such fossils, fairly common in Illinois, are illustrated on plate 5 to show their general shape and size. When attached to an identifiable leaf or leaflet, the seed is referred to as the seed of that leaf genus.

For example, *Holcospermum*, a radially symmetrical seed with ribs and grooves, *Codonotheca*, a stalked, spore-bearing, lobed "cup," and *Neuropterocarpus*, a flask-shaped seed with longitudinal ribs and grooves, all have been associated with *Neuropteris*, a leaf genus.



Mazon Creek Strip Mine Area Showing Distribution of Spoil Heaps.
The small circular areas represent waste from underground mines.

Trigonocarpus, commonly found as a cast of the internal part of a seed, is a trimerously symmetrical body frequently associated with *Alethopteris*. *Pachytesta* includes preserved structures and outer layers of a seed. *Carpolithes* is a catch-all "genus" functioning as a general term for seeds and seedlike forms whose plant group affinities cannot be determined.

COLLECTING AREAS FOR PENNSYLVANIAN PLANTS

Northern Illinois

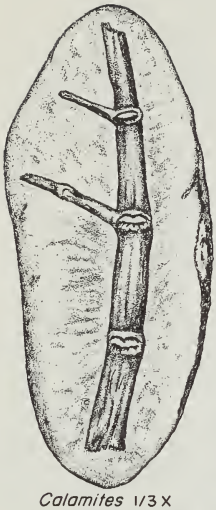
Plant fossils can be found in almost any northern Illinois area where Pennsylvanian rocks are exposed (see back cover), but in some places they are much better preserved and more numerous than in others. Most of the well known collecting areas and a few of the lesser known ones are discussed below. Even though some of the localities were discovered many years ago, they may indicate areas that are still favorable for collecting.

Mazon Creek Area

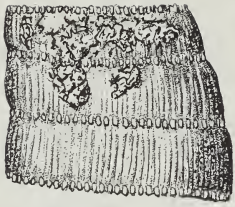
Of all the fossils that have been found in Illinois, the most famous are the plant remains from the world-renowned Mazon Creek area in the northeastern part of the state. In this area in Grundy and Will Counties, plant fossils are found in ironstone concretions in the lower part of the Francis Creek Shale directly overlying the Colchester (No. 2) Coal.

Fossils were discovered in outcrops along Mazon Creek more than a century ago and collections later were made from scores of conical spoil heaps at underground mines. After coal stripping began in the 1920's, great numbers of specimens were collected.

In the stripping operations, the concretion-bearing beds are commonly the last to be placed on the spoil heap. Weathering softens and removes the shales and



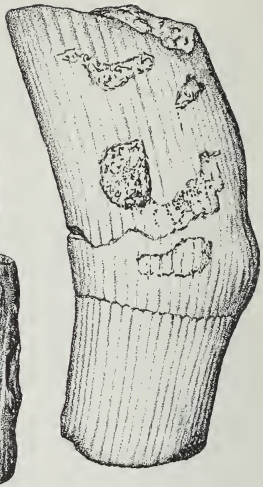
Calamites 1/3 X



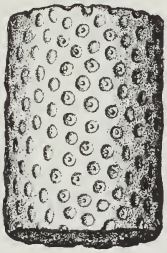
Calamites 1/10X

Fern stem 2/3 X

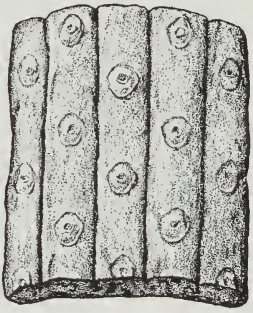
Caulopteris 1/4 X



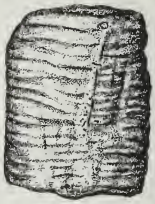
Calamites 3/5 X



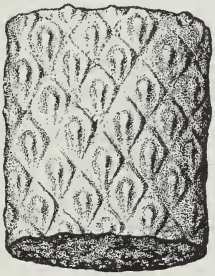
Stigmaria 2/5X



Sigillaria 2/5X

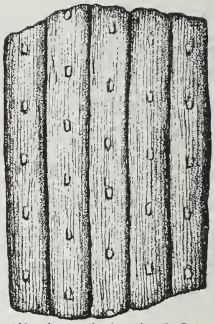


Artisia 3/5 X



Lepidodendron 2/5X

Megaphyton 3/5X



Sigillaria sub-bark 3/5X

Plate 1

leaves the nodules concentrated on the surface. Each season brings a new crop of concretions to the surface.

The concretions generally are oval to elongate and range from less than an inch to a foot or more in maximum dimension. Only about one nodule in ten contains plant remains.

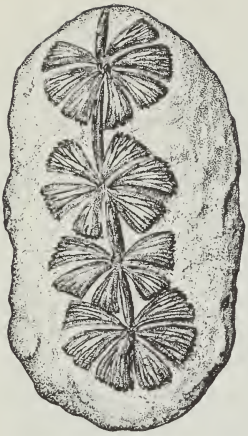
Approximately 25 to 30 species have been found in this region. The productivity of the area was shown by George Langford, Sr., a well known midwestern fossil collector. He and his son split about 250 thousand concretions during a 140-day period and obtained some 25 thousand plant specimens. Fine specimens still can be collected in a few hours.

The plant collecting localities in Will and Grundy Counties along Mazon Creek, four to six miles southeast of the town of Morris, were the first to be well known. Ferns are especially abundant. Fossils of insects, crustaceans, worms, and salamanders also have been found. Collecting conditions vary considerably from season to season, and fossils are not as easily obtained there as from the strip-mine spoil heaps.

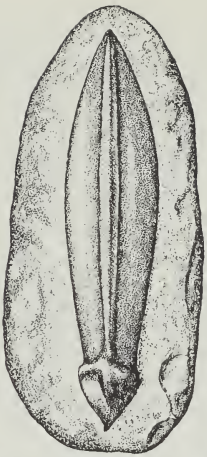
Fossiliferous concretions may be found in a number of the strip mines in the area, although probably most have come from the Northern Illinois Coal Corporation mine between the towns of Braidwood and Wilmington.

In earlier years good collections were made from the spoil heaps of underground mines. Especially notable are the mine dumps of the Wilmington Star No. 7 mine, 2 1/4 miles west of Coal City, and Skinner No. 2 mine, two miles northeast of Braidwood.

In the vicinity of Morris on the northwest edge of the Mazon Creek area, fossil ferns have been found along the north side of the Illinois River and in the banks of the Illinois-Michigan Canal. About a mile north in an area of strip mining, fossil-bearing concretions have been found in shale and irregular sandstone layers.



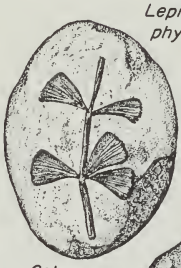
Sphenophyllum 3/5X



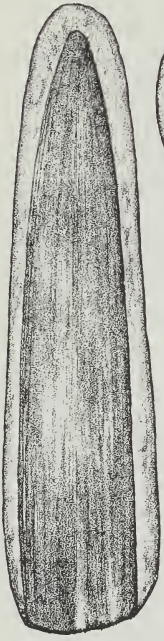
Lepidostrobo-phyllum 3/5X

Annularia 3/5X

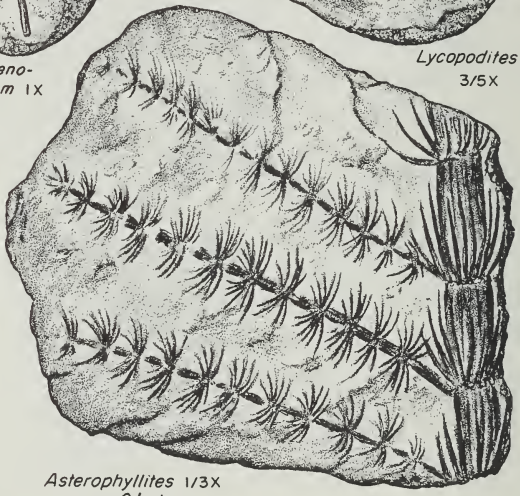
Lycopodites 3/5X



Sphenophyllum 1X



Cordaites 3/5X



Asterophyllites 1/3X

Plate 2

Fossils in concretions also have been collected from a shaly limestone at the south end of the Kankakee River bridge along the Grundy and Will county line.

Bureau County

Some 40 miles downstream from Morris on the Illinois River, plant fossils have been discovered in waste from the Spring Valley Coal Co. mine 1. They also are found in black shale below the LaSalle Limestone in a small gully in the southwest part of town, but at neither place are they plentiful.

Knox County

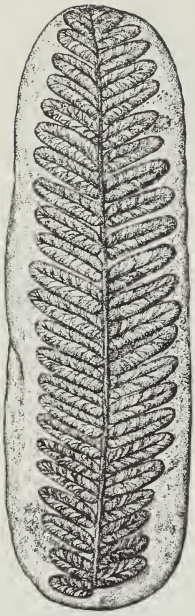
A notable number and variety of well preserved plant fossils have been produced from a locality along Court Creek in East Galesburg. The Rock Island (No. 1) Coal is mined in the area and the fossils appear to have come from the shale overlying it.

Fossil plants also have been found in shales above the Colchester (No. 2) Coal in the vicinity of DeLong and with the Herrin (No. 6) Coal in mines southeast of Victoria.

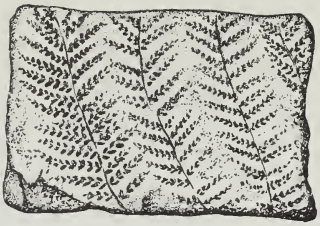
Mercer and Warren Counties

In northern Warren and southern Mercer Counties the sandstone underlying the Rock Island (No. 1) Coal is termed the "Stigmarian" sandstone because of numerous siliceous casts found in the bed. Many of the fossils have been collected from an old mine dump and from ravines along the Edwards River northeast of Aledo.

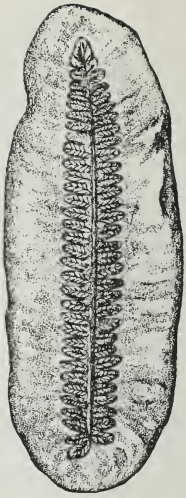
A number of representatives of *Sphenophyllum, Neuropteris,* and *Annularia* have been collected from ironstone concretions occurring in shale that overlies the Colchester (No. 2) Coal about three miles southwest of Alexis. They were found in a gully about a third of a mile southeast of Center School.



Pecopteris 3/5X

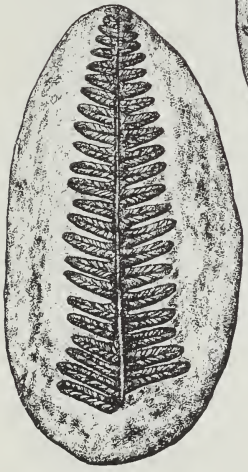


Pecopteris 1X



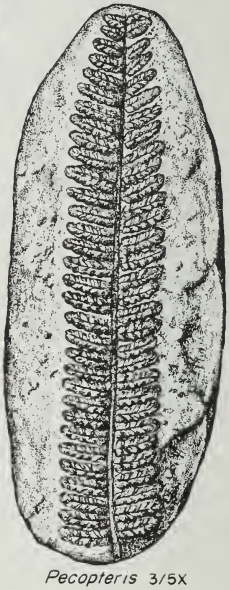
Ptychocarpus 3/5X

Mariopteris 3/5X



Asterotheca 3/5X

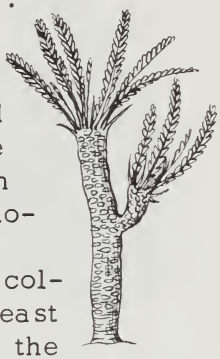
Spiropteris 3/5X



Pecopteris 3/5X

Plate 3

In the same general area but about three miles due south of Alexis, fossil plants also may be found in the clay pits of the Hydraulic-Press Brick Company and the Northwestern Clay Manufacturing Company.



Fulton County

Although there are numerous isolated occurrences of plant fossils throughout the extensive strip mines and outcrops in Fulton County, no exceptionally good collecting localities have been discovered.

Fern and cordaitean leaves have been collected along Mill Creek about a mile northeast of Pleasantview where the fossils occur in the shale overlying the Babylon Coal. In the same general area, impressions and casts of *Stigmaria*, *Lepidodendron*, and *Cordaites* have been found in the Babylon Sandstone.

Three miles north of Pleasantview, a quarter of a mile northwest of Union School, several species of leaves have been collected from the Browning Sandstone where it is exposed in a roadcut.

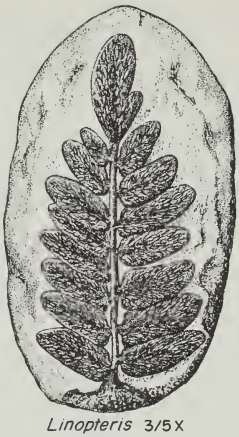
Farther east, there is a fairly good locality in the stream bluff of Kerton Creek about 3 1/4 miles north and a quarter of a mile west of Bluff City. There the plants are found about 18 feet below a coal bed.

Numerous fern impressions also are found in shale beds above the Herrin (No. 6) Coal along the Middle Branch of Copperas Creek, six miles west of Glasford. Other specimens may be found in these beds elsewhere in the area.

McDonough County

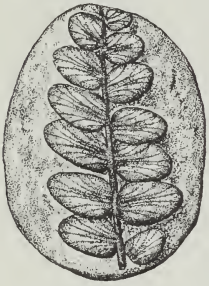
In some of the small underground mines near Colchester, the shale overlying the Colchester (No. 2) Coal contains ironstone concretions similar to

Sphenopteris 3/5X

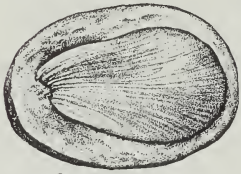


Linopteris 3/5X

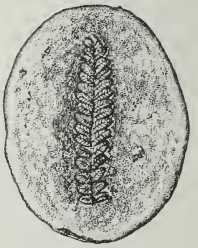
Neuropteris 1/2X



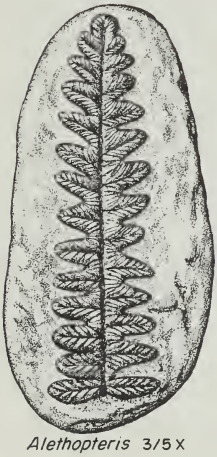
Odontopteris 3/5X



Cyclopteris 1/2X



Alethopteris 3/5X



Alethopteris 3/5X

Odontopteris 1/2X

Alethopteris 3/5X

Plate 4

those from northeastern Illinois. More than 50 species of plant fossils have been reported, but they were collected many years ago from spoil heaps at the mines. Beds of the same age crop out widely in other localities in western Illinois and may contain plant fossils.

Vermilion County

In outcrops about three miles below Georgetown on the Little Vermilion River, a number of fossil plant species and one insect species have been collected from shales overlying the Herrin (No. 6) Coal, locally called the Grape Creek Coal. The fossils occur in concretions much like those from Mazon Creek.

An occasional stem replacement or impression is found in the concretionary shale above the No. 7 Coal in the strip mine area west of Hillery. In fact, isolated fragmentary plant specimens are fairly common in the Danville mining area, but no especially productive localities have come to light.

Other Northern Illinois Localities

In addition to the counties listed above, a number of others have produced plant fossils. For example, there are records of plant fossils found southeast of Franklin in Morgan County, at Neelys in Peoria County, and at a number of places in the southern and western parts of Rock Island County. Local exploration is certain to turn up numerous other collecting places at present unknown.

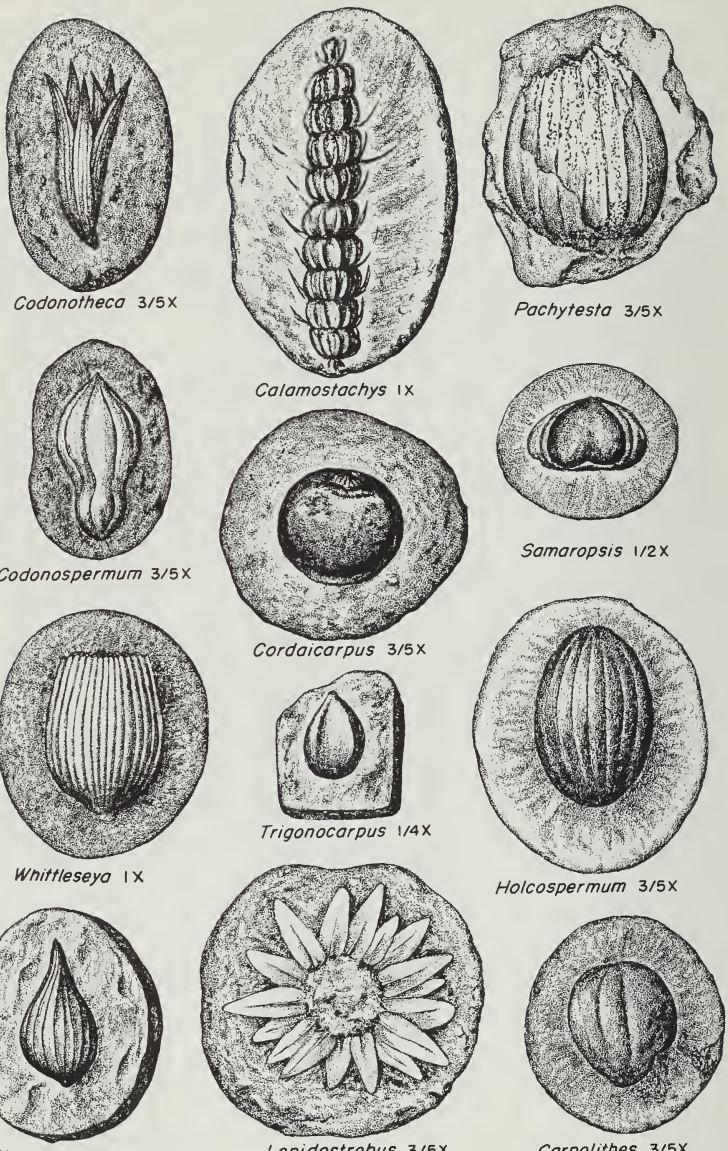

Codonotheca 3/5X
Calamostachys 1X
Pachytesta 3/5X
Codonospermum 3/5X
Samaropsis 1/2X
Cordaicarpus 3/5X
Trigonocarpus 1/4X
Whittleseya 1X
Holcospermum 3/5X
Neuropterocarpus 3/5X
Lepidostrobus 3/5X
Carpolithes 3/5X

Plate 5

Southern Illinois

Lawrence County

Near the Lawrence-Richland county line, not far from the towns of Berryville and Calhoun, there is an area rich in the fossil petrifactions called "coal balls" in which cellular structures of stems and roots generally are well preserved.

Saline, Pope, and Johnson Counties

Saline County has more recorded plant fossil localities than any other southern Illinois county. Fossil plant collecting localities are isolated but numerous in the area southwest of Harrisburg. Mine dumps, such as in the area five or six miles northwest of Eddyville, and many outcrops are available throughout the region. The fossils probably are associated with the Murphysboro, Delwood, Willis, Reynoldsburg, and Battery Rock Coals.

One especially good collecting area is on the south tributary of the East Branch Cedar Creek about $6\frac{1}{2}$ miles south of Stonefort. The fossils are found in six feet of shale overlying the Battery Rock Coal horizon.

Perry and Jackson Counties

Near DuQuoin and Murphysboro, a variety of well preserved plant fossils has been collected from shales overlying both the Herrin (No. 6) Coal and the Murphysboro Coal. Nearly all have come from shaft mines that are not easily accessible to the collector.

One currently good outcrop locality for collecting plant fossils from the shale above the Murphysboro Coal is just southeast of Murphysboro.

Other Southern Illinois Localities

Other collecting localities have been recorded west of McLeansboro in Hamilton County, northwest of Mt.

Vernon in Jefferson County, near Grayville in White County, and in the Friendsville area of Wabash County. There is no doubt that careful search will turn up many more.

Almost anywhere in the large coal producing areas of southern Illinois plant fossils can be found either in spoil heaps or in outcrops along stream, road, and railroad cuts. The thick Pennsylvanian sandstones that crop out in a belt extending through Gallatin, Saline, Williamson, and Jackson Counties generally contain compressions or replacements of trunks or other woody plant parts.

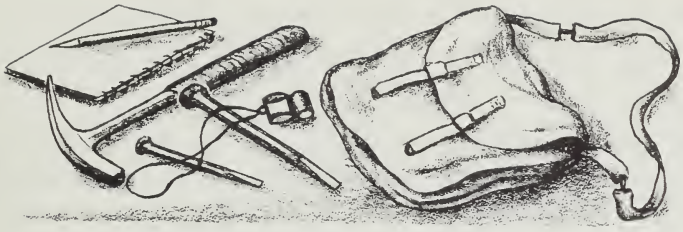
SUGGESTIONS FOR COLLECTING PENNSYLVANIAN PLANTS

Where to Look for Plant Fossils

Pennsylvanian plants are most commonly found in shales directly overlying coal beds. The shales are believed to be of nonmarine origin like the coals and may contain fossils either in ironstone concretions or on the bedding planes. The shale layers as well as the concretions should be examined. Where the bed directly overlying the coal consists of black slaty shale or limestone containing marine fossils, plant remains are rarely abundant or well preserved.

Beneath the coals there generally is an underclay that is interpreted as the material in which the coal forest grew. The underclay is in turn underlain by a sandstone, and both are believed to be mostly nonmarine. Stigmarian axes and "roots" are common in many of the underclays. Plant fossils are common in the sandstone but generally are poorly preserved, except in the local shaly lenses.

The best place to look for plant fossils in northern Illinois, except for the strip mines of the Mazon Creek area, is probably in the spoil heaps from shaft mines. The Colchester (No. 2) Coal has been extensively mined



Tools for Collecting

by the longwall method. This technique causes the mine roof to settle when the coal is removed, and the haulage ways are kept open by removing the roof shale. Inasmuch as the roof shale is the Francis Creek Formation of the Mazon Creek area, it may contain abundant plant-bearing concretions. The shale is not everywhere fossiliferous, however, and in many spoil heaps fossils are rare.

Collecting Equipment

The collector of plant fossils should have the following tools and equipment:

1) Hammer - a bricklayer's hammer will work well.

2) One or two chisels, preferably one large and one small.

3) Knapsack or basket in which to carry specimens.

4) Newspapers and a roll of tissue paper for protecting fragile specimens.

5) Pencil and paper for labeling specimens and making notes about the collecting locality from which the fossils came. Much of the value of a particular fossil lies in knowing precisely where it was found and the layer of rock it came from.

Rules of Courtesy

When entering a collecting area every collector should observe several rules carefully:

1) For your own protection get permission to enter and collect on any private property. Such action also will help to assure your welcome if you wish to come back again.

2) Leave the gates exactly as you find them, open or closed. Do not climb fences that may break or sag under your weight; crawl under or go around.

3) Don't litter, even though far from any house or other buildings. Do not disturb the owner's equipment, stock, or planted areas.

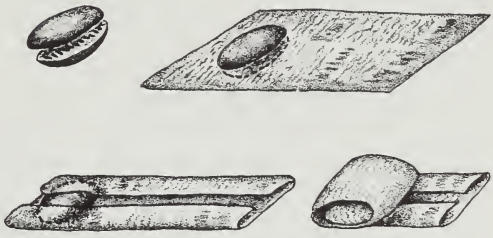
Handling Specimens

The most successful way to split an ironstone concretion is to set it on edge, long axis horizontal, on any fairly large rock and strike the upper edge with the hammer. If the concretion is one that developed around a fossil nucleus, it generally will split along the plane of weakness, revealing the fossil. Sometimes one side of the concretion will break off in the middle, in which case the remainder should be tapped firmly but gently on the upper edge until the fossil is completely uncovered. Pieces of the broken half should be glued together neatly with waterproof cement so that the entire specimen can be retained.

Fossils embedded in shale may be recovered by the same method or by repeatedly tapping a chisel inserted

along the bedding plane. If the fossil is exposed, the matrix can be chiseled away by slow, painstaking effort.

The usual method of wrapping plant-bearing nodules is to place the end of a sheet of newspaper between the two halves of the nodule, fold the paper over the nodule, and roll it up in the sheet.



How to Wrap a Fossiliferous Concretion

When several localities are visited in one collecting trip, the fossils from each should be kept separate; cloth bags are convenient for this purpose. Notes about the locality should be put in the same bag as fossils from that locality so that there is no possibility of confusion.

Some fossils are so fragile or porous that they should be covered with a hardening protective coat of crude gum arabic solution. (Refined gum arabic will not serve.) This may be applied with a fine brush in successive layers, or sturdier fossils may be dipped in it.

When a fossil is so delicate that the surface tension of the gum arabic solution causes the fossil to "spread," celluloid (not plastic) dissolved in acetone should be substituted. Before this solution is used, the specimen must be completely dry or the coating will become cloudy or opaque.

If the specimen is pyritized, it should be sprayed with lacquer or shellac to prevent disintegration. If these protective sprays are used they must be applied to dry specimens during dry weather or the coating will remain sticky.

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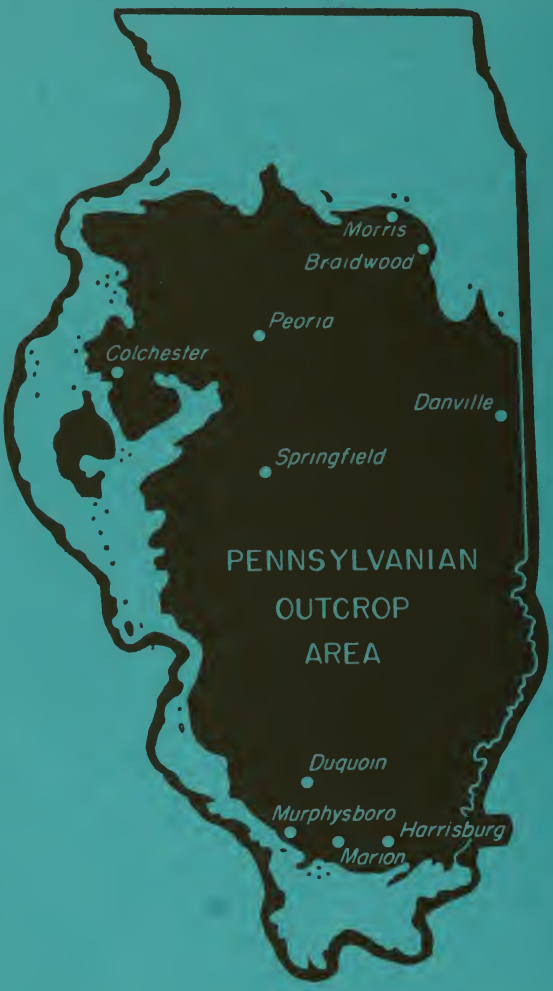

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