Geol Survey

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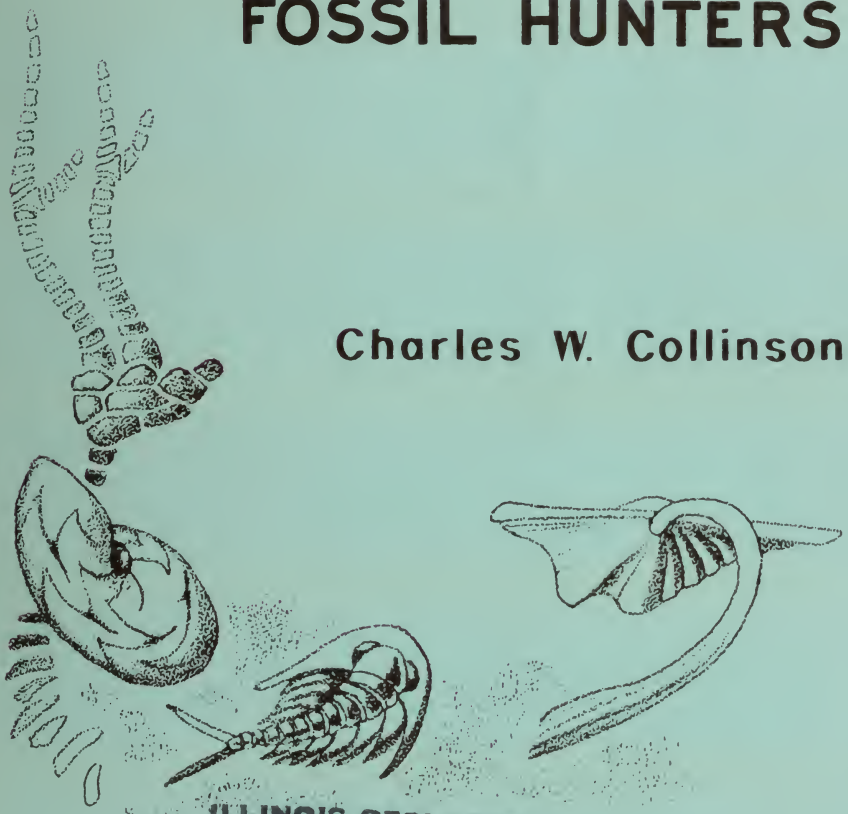
GUIDE FOR BEGINNING FOSSIL HUNTERS

Charles W. Collinson



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Charles W. Collinson

Illustrations by Marie E. Litterer

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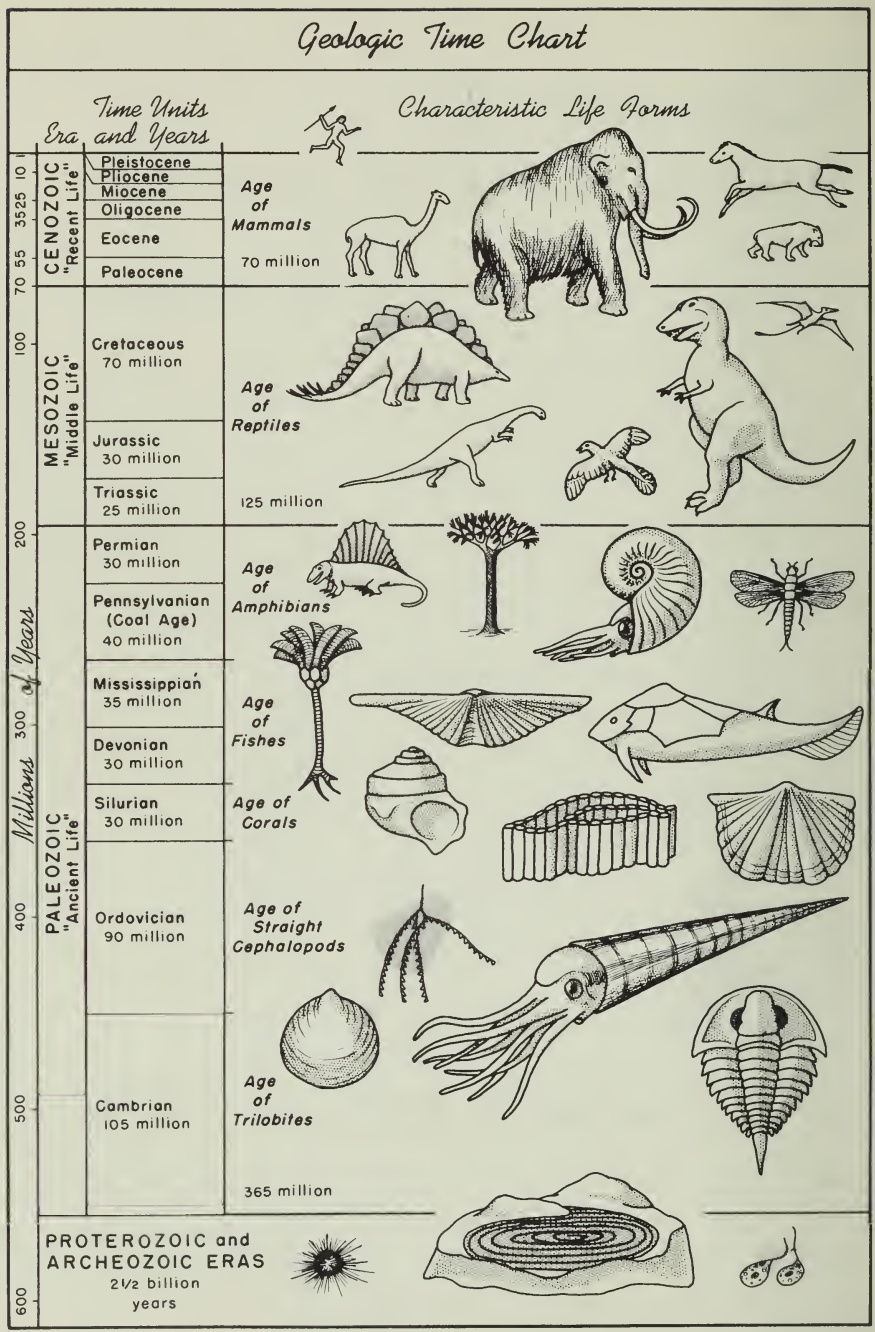
Geologic Time Chart



GUIDE FOR BEGINNING FOSSIL HUNTERS

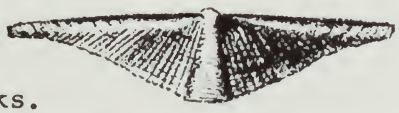
Charles W. Collinson

LONG before your birth, long before your grandfather and grandmother were born, even before there were any men or the Mississippi River existed, there were animals on the earth.

You may ask, "If there were no men around to see them, how do we know that there were animals then?"

That question is pretty easy to answer, for the animals left their marks behind and we call those marks fossils.

Some fossils are just foot tracks or worm holes. Others were made when mud sifted into empty shells and slowly turned to stone. Many bones or shells, even some skin and hair, have been preserved in the rocks for millions of years.



Of course the rocks in which the fossils are encased weren't always rocks. At one time the sediments were just mud or sand on the floor of the sea; some were sand dunes on an ancient land. As time passed the sediments were buried under more sand or mud, and with the passing of more time the sand and mud became rock.

The fossils in the rocks, however, are only a small part of all the life that has existed on our planet. For every fossil we see, millions of animals and plants have lived, died, and been destroyed without leaving a trace. However, by carefully collecting fossils and recording the layers of rocks they came from, we can reconstruct hundreds of generations that have lived on earth at one time or another since the beginning.

Finding and collecting fossils not only helps to write missing chapters of earth history but is also an exciting adventure. It is an animal hunt - a hunt for creatures often more strange than any living on earth today.

Your first fossil discovery will be a thrill. Later you will find that a search through a quarry or a strip mine is an excursion to an ancient seashore or a plunge to the bottom of a long-vanished sea.

You also step into the past when you climb the loess bluffs along our large rivers. You return to the days when a great glacier invaded Illinois and the rivers from the melting ice ran milky with rock flour ground up beneath the scouring ice.

After the rock flour had settled and dried on the river floodplains, it was swept aloft by the winds. Huge dust storms swirling over the bluffs and nearby uplands deposited the rock dust, called loess. Snail shells were preserved in the loess but, except for an occasional bone or tooth of a mammoth, most of the plant and animal remains have disappeared.

In addition to outdoor adventure, a successful hunt provides interesting trophies for your collections. Many of science's most valuable fossil finds have been brought in by amateur hunters.

WHAT ARE FOSSILS?

A fossil is some evidence of a prehistoric animal or plant, preserved in rock, that gives a clue to the characteristics of the organism. The remains of animals or plants that lived during historic time are not considered fossils.

The oldest fossils in Illinois are found in rocks such as sandstone, limestone, or shale. Some are only impressions of the outside of a shell; some are fillings of the inside.

Parts of the original shell may be preserved, but in many fossils the hard parts of the animal have been replaced by a material different from that of the original. Silica and calcium carbonate, which are easily preserved, commonly replace the original shell material.

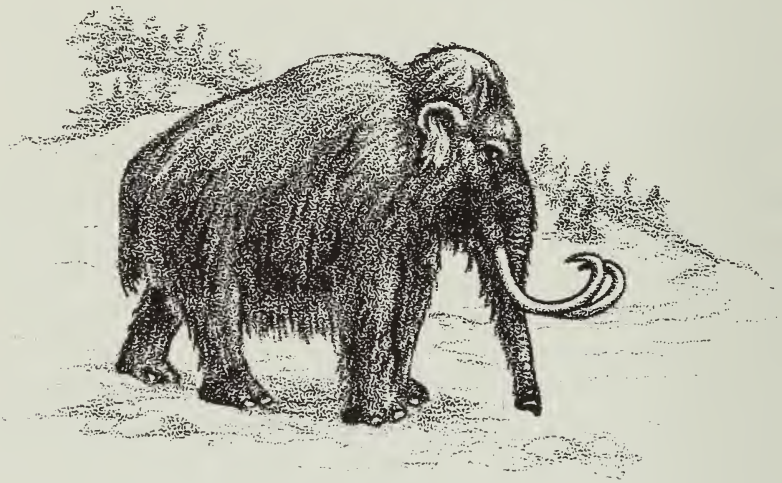
Some fossils were made by marine worms which burrowed in the sand or mud of the sea floor. The worms themselves are rarely found as fossils but their trails and holes are common. The burrows and holes are fossils just as much as the animals themselves would be if they had been preserved.

In many places in Illinois, shells of clams, snails, and brachiopods are preserved with little change and are much as they were the day they were buried on the floor of a now-vanished sea.

The plant-fossil materials that make up the coal beds of Illinois are the remains of primitive trees and plants that lived in swamps during the Coal Age. When the plants died they fell into the water and were preserved as peat that later became coal.

Many fine fossils found in the coal and overlying shales represent the roots, trunks, and leaves of the plants. A few of the insects that lived in the trees also are preserved.

Among the youngest fossils found in Illinois are the teeth and bones of bison, giant beavers, deer, and elephant-like animals called mammoths and mastodons, which lived during the Ice Age. Complete skeletons of the animals are rare, but teeth and tusks are on exhibit in many museums.



Woolly Mammoth
(After drawing by Charles R. Knight)

WHERE TO LOOK FOR FOSSILS

1. Quarries are excellent places to find fossils because so much rock is exposed. Old abandoned quarries are best for collecting because the rocks have been weathered for several years and the fossils generally stand out in relief.

If you plan to collect in a quarry, be sure to get permission to enter it. In that way someone will know where you are in case of accident. In active quarries there is danger from falling rock during blasting. If the quarryman doesn't know you are in the quarry, he cannot warn you when he is going to set off a blast.

2. Some of the best collecting sites in Illinois are in the cliffs and bluffs along our major rivers, the Mississippi, Illinois, Ohio, Wabash, and their tributaries. At these places whole fossils are often weathered out and may be picked up easily.

3. Well-known collecting sites for plant fossils are the coal strip mines of Illinois. Perhaps the most famous is the Mazon Creek area near Braidwood in northeastern Illinois which has supplied beautifully preserved impressions of ferns, tree leaves, and a few insects to museums throughout the world. Many strip mines also yield fine brachiopods, snails, clams, and cephalopods.

4. Highway cuts through bedrock commonly expose beds containing fossils. Be careful along road cuts, especially if there is heavy traffic.

5. Ice Age fossils, such as mammoth and mastodon teeth and tusks, have been found mostly in gravel pits but also in foundation excavations and ditches in all parts of the State.

6. Most of Illinois' major rivers have banks of wind-blown glacial dust called "loess." The shells of air-breathing snails which lived during the Ice Age are common in the loess.

7. Actually you can find fossils almost anywhere, in the gravel or crushed stone of your driveway or in stone walls and foundations. You may see fossils in many places where you can't collect them, such as counter tops in restaurants, utility marble in public buildings, in stone sidewalks in several of our older cities, or in riprap along the shores of Lake Michigan and our major rivers.

TOOLS FOR COLLECTING FOSSILS

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

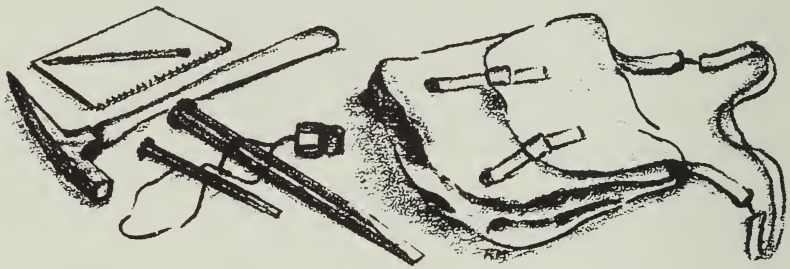
2. One or two cold chisels, preferably one large and one small.

3. Knapsack or basket in which to carry your fossils.

4. Old newspapers or a roll of tissue paper for protecting fragile specimens.

5. Magnifying glass or hand lens, 3 to 10 power.

6. Pencils and paper for labeling the specimens. Much of the value of a particular fossil lies in knowing where it was found and the bed it came from. It is important to keep records of your collecting.



TIPS ON COLLECTING FOSSILS

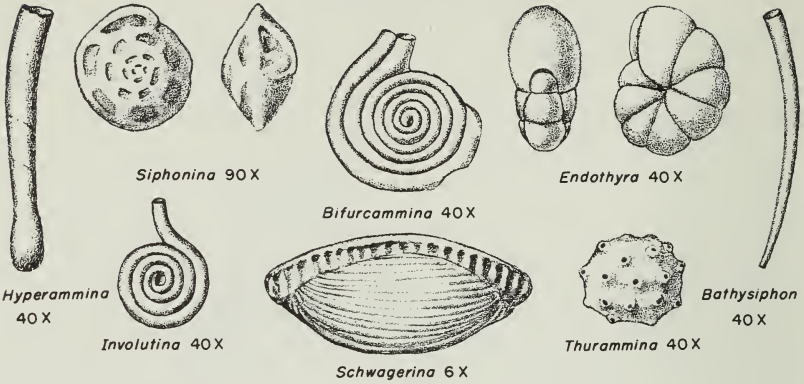
1. When you look for specimens in a quarry or on a shale slope, sit down or get on your hands and knees and look carefully. Spend some time in one spot before you move on to another. Excellent fossils have been found in places that others had passed over many times.

2. If you find a good fossil embedded in rock and you are not certain that you can get it out without breaking or destroying it, don't spoil the fossil. If you leave it, the wind and weather may help loosen the fossil from the rock by your next visit.

3. If you do decide to chisel a fossil from the rock, be patient and take your time. If possible, chisel a narrow trough around the fossil, taking care always to point the chisel away from the specimen. When the trough is as deep as the fossil, or deeper, strike the base of the pillar you have made and the fossil should pop out.

4. Where the rock is very fossiliferous, it may pay you to take small blocks of rock and break them into pieces with your hammer. In the process the rock tends to break around the fossils. If there are enough fossils in the rock, you probably will get some unbroken specimens.

FORAMINIFERA



Siphonina 90X

Bifurcammina 40X

Endothyra 40X

Hyperammina 40X

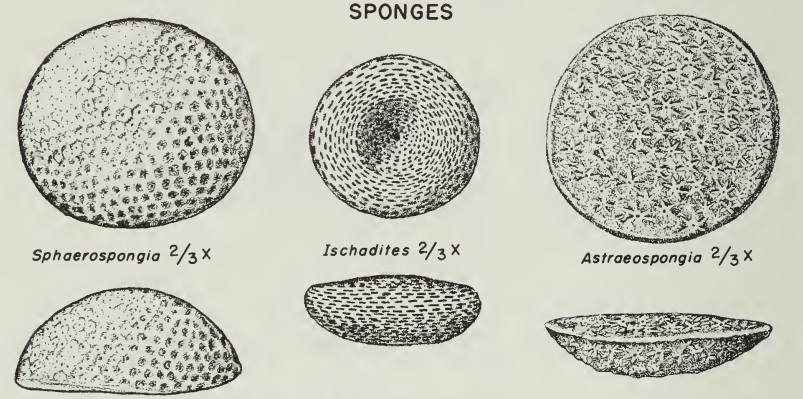
Involutina 40X

Schwagerina 6X

Thurammina 40X

Bathysiphon 40X

SPONGES



Sphaerospongia 2/3X

Ischadites 2/3X

Astraeospongia 2/3X

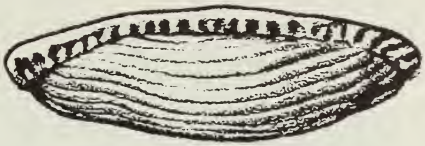
Hindia 1X

Receptaculites 2/3X

Astylospongia 2/3X

Plate 1

FORAMINIFERA (for-am´-i-nif´-er-ah, plate 1). Foraminifera are very small one-celled animals, commonly called "forams." They are important to geologists, who use them to identify oil-bearing rocks.



Fusilina A Foraminifer
Magnified 10 times (10 X)

They are beautifully shaped little shells, but you will be able to see them clearly only with a magnifying glass or hand lens. Some are calcium carbonate, others are made of tiny sand grains cemented together with silica.

Some foraminifera make their shells of parts that come from the skeletons of other animals. Some kinds are so particular about the kind of materials they use that they select only grains of a certain color and size.

Foraminifera live in tremendous numbers in the seas today. They lived as far back as the Ordovician period, more than 400 million years ago (see the Geologic Time Chart, page 2).

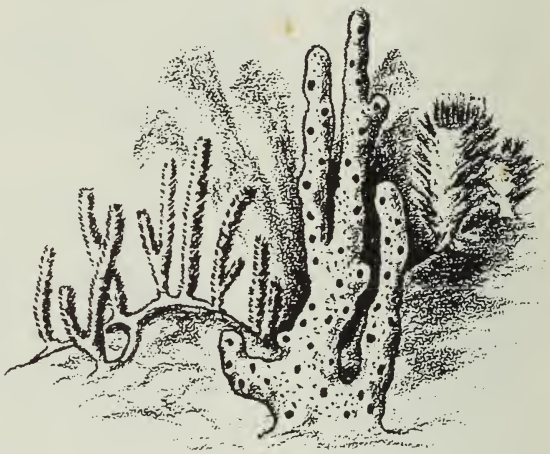
Calcareous foraminifera such as *Endothyra* (en-doh-thy-rah, plate 1) are very abundant in Illinois in the Salem limestone, which occurs in the bluffs of the Mississippi River near the end of McAdams highway northwest of Alton and in the bluffs of Monroe and Randolph counties. The Salem limestone also crops out near Anna and Jonesboro in southern Illinois.

Another kind of calcareous foraminifer, *Fusilina* (few-sil-eye-nah), is very common in rocks of Pennsylvanian age throughout Illinois. The little

fossils look like grains of wheat and are so abundant in some limestones and shales that they can be collected by the thousands.

For a list of localities where foraminifera are abundant, see pages 162-167 of Illinois Geological Survey Bulletin 67.

SPONGES (plate 1). Sponges are mainly marine animals that live attached to the sea floor. Fossil sponges are numerous in some parts of Illinois. They are not the flexible sponges you and I know, of course. Instead they have a hard skeleton of calcium carbonate or silica. The oldest ones are known from Cambrian rocks and are about 550 million years old.

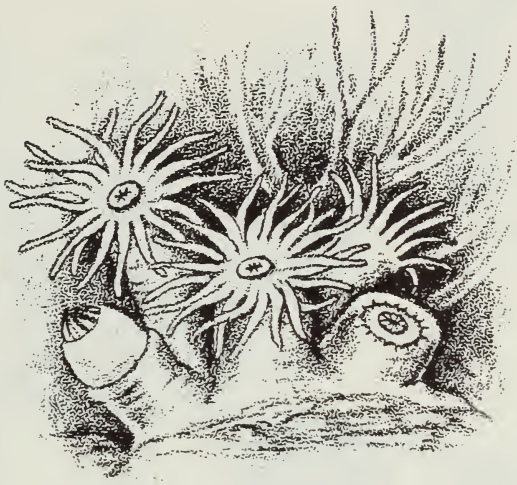


Modern Sponges

One fossil sponge, called the "sunflower coral," is common in the Ordovician rocks of north-central and northwestern Illinois.

Another, called *Hindia*, is found in Silurian rocks exposed in quarries in the Chicago region. It looks like a small round ball but, when broken, is seen to be made of thousands of radiating rods of calcium carbonate.

CORALS (plate 2). Corals are small brightly colored marine animals that look much like flowers. The animal grows an external stony skeleton connected with radial partitions on the inside which divide the body into chambers. The animal itself is called a polyp and the skeleton is called coral.



Modern Corals

Some corals live together in colonies made up of hundreds of individuals, attached to each other by their outer skeletal walls. They sometimes form coral reefs hundreds of miles long.

The skeletons of solitary polyps may be cushion-, horn-, or tube-shaped, each with a depression in the top in which the animal lived. The solitary corals are referred to as horn or cup corals.

In colonial forms the skeletons may be either branching or closely packed and massive. Corals live only where the seas are warm and shallow. They are very numerous in today's tropical seas. The animals have been common throughout geologic time so that it is easy to collect fine specimens.

Fossil corals are most common in limestone, where they sometimes make up a large part of the rock, but they also are found in shale and sandstone.

BRYOZOA

Thamniscus 12X

Fistuliphragma 1X

Archimedes 1X

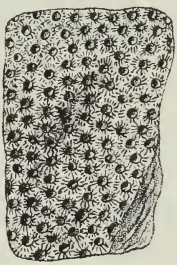
Stomatopora 18X

Fenestrellina 8X

Lioclema 6X

CORALS

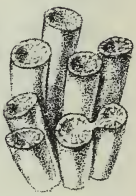
Aulopora 1X



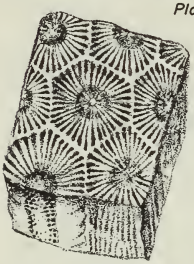
Plasmopora 1X

Palaeacis 1X

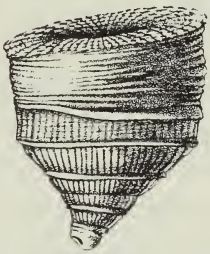
Favosites 2/3X



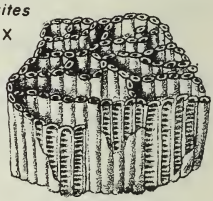
Synaptophyllum 1X



Hexagonaria 1X



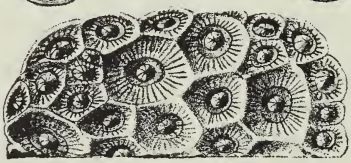
Heliophyllum 1X



Halysites 2/3X

Microcylus 1X

Streptelasma 2/3X

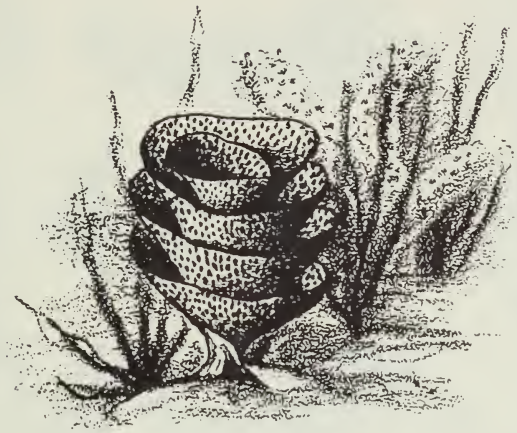


Lithostrotionella 1/2X

Lophophyllum 1X

Plate 2

BRYOZOA (bri´-o-zoh´-ah, plate 2). The tiny colonial animals called bryozoa generally build stony skeletons of calcium carbonate.



Archimedes
A Mississippian Bryozoan
The fronds are commonly called *Fenestella*.

They grow in a variety of shapes and patterns, mound-shaped, lacy, tree-shaped, or even screw-shaped. Each skeleton has numerous tiny holes, each of which is the home of a minute animal. They live attached to the sea floor, to stones, or to other animals.

Bryozoa are very common as fossils. The oldest ones come from Cambrian rocks about 500 million years old, and their descendants live today.

During the Mississippian period bryozoa were so common that their broken skeletons formed entire limestone beds. Fossil bryozoa may be found either in shales or limestones and they occur throughout Illinois.

BRACHIOPODS

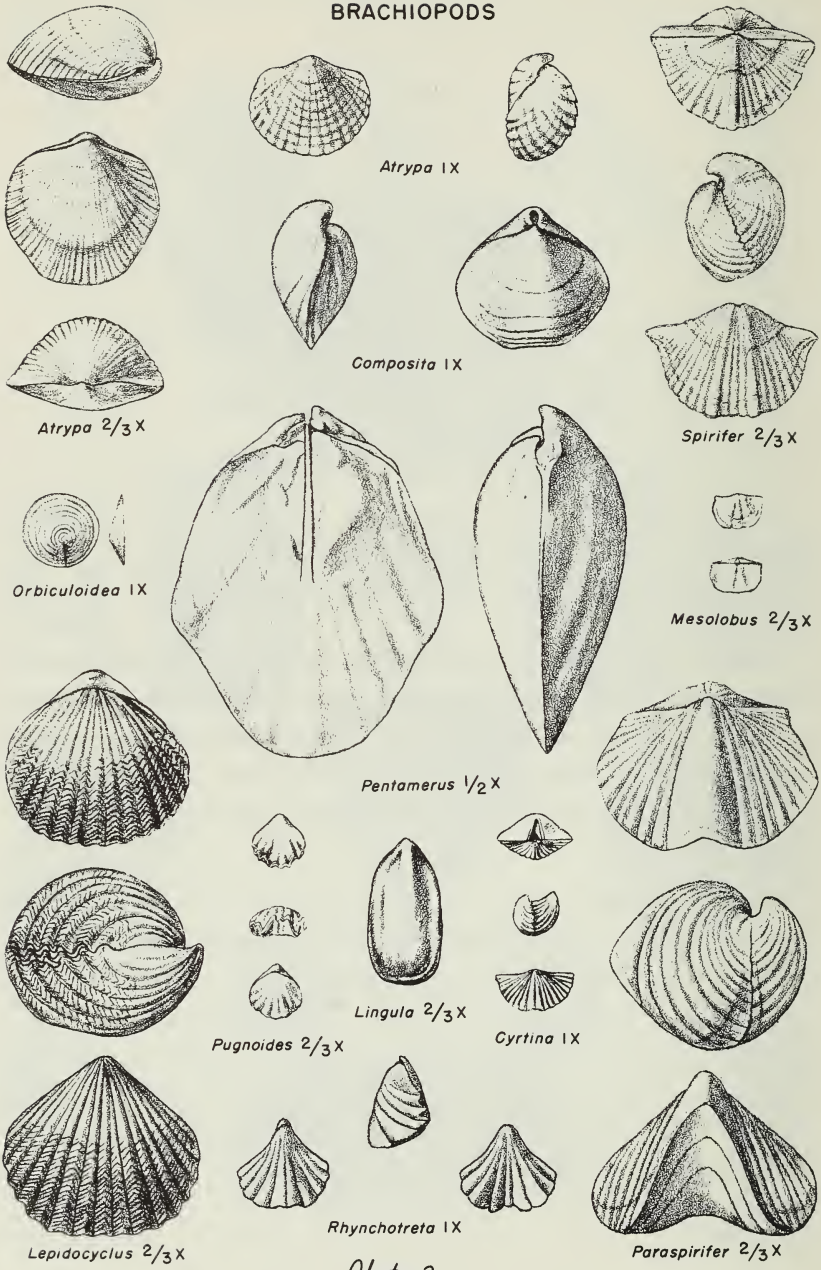
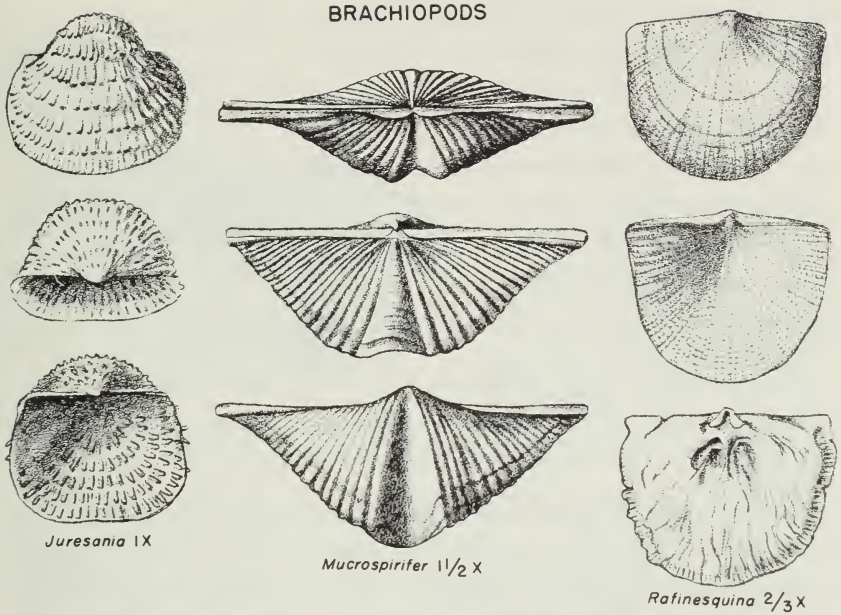


Plate 3

BRACHIOPODS



Juresania 1X

Mucrospirifer 1 1/2 X

Rafinesquina 2/3 X

Strophomena 1X

Enteletes 2/3 X

Sowerbyella 1X

Herbertella 1/2 X

Leptaena 1X

Platystrophia 2/3 X

Plate 4

BRACHIOPODS (brack'-e-o-pods, plates 3 and 4). Brachiopods are marine animals that have two shells, an upper one and a lower one. The right and left halves of each shell are mirror images but the two shells are not exactly alike. The shells may be of lime, phosphate, or a horny substance, and they range in size from less than 1/4 inch to several inches.

Mississippian Brachiopods

Most brachiopods live attached to the sea floor by a fleshy stalk that is an extension of the soft body. Some forms lose the stalk when they become adults and either attach themselves directly to the sea floor or lie loose in the mud or sand. Some have spines that serve as anchors.

Brachiopods are not common in most oceans today, but at times in the past they were the most abundant shellfish and sometimes formed large shell banks much as oysters do today.

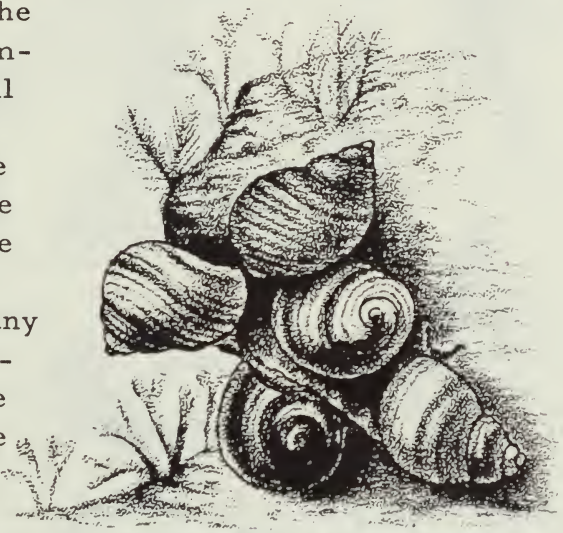
The oldest fossil brachiopods are found in Cambrian rocks which are about 550 million years old. However, the animals became abundant in Ordovician time and remained so throughout the Paleozoic era.

In Illinois, the fossils are especially common and well preserved in the Mississippian limestone and shales of the Ohio and Mississippi river bluffs, but you can find them easily in almost any part of the State.

MARINE WORM JAWS (plate 5). Marine worm jaws are easily preserved and are known in nearly every geologic system. Most of them are composed of chitin (fingernail material). They are black and shiny and have many teeth. Sea worms live today and the fossil record of worm trails goes back to the pre-Cambrian period. The oldest worm jaws are found in Ordovician rocks. They are common in the Silurian rocks of northeastern Illinois.

Marine Worm Jaw
(Greatly magnified)

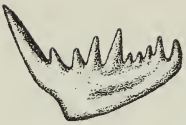
GASTROPODS (gas´-troh-pods, plate 5). Gastropods commonly are called snails. The snail carries its shell on its back and retreats into it whenever danger threatens. As a snail grows larger it expands and lengthens the shell. Most commonly the shell is coiled in a spiral, but some are shaped like a Chinese coolie hat.



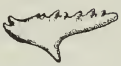
Modern Marine Gastropods

There are many kinds of gastropods. Some live in the sea, some live in rivers, and still others live on land. The ones that live in water have gills like fish, but those that breathe air have simple lungs. Gastropods have a distinct head, feelers, eyes, and a mouth. Some have a rasp-like tongue. The snail uses its tongue for boring into other shellfish which it eats.

WORM JAWS



Oenonites 10X



Ildraites 20X

Ildraites 8X

Arabellites 20X

Lumbriconereites 10X

Oenonites 10X

GASTROPODS

Polygyra 1X

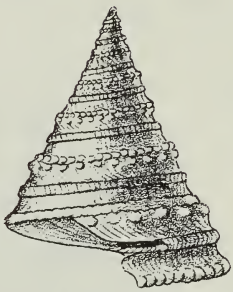
Succinea 1X

Platyceras 1X

Cyclonema 1X

Busycon 1/3X

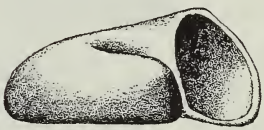
Loxonema 1X

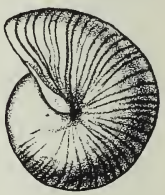


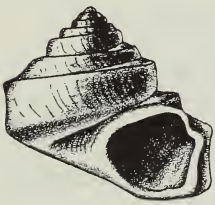
Pleurotomaria 1X

Euomphalus 2/3X

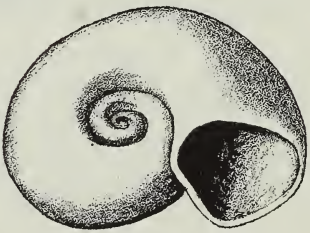
Hormotoma 1X







Trochonema 1X



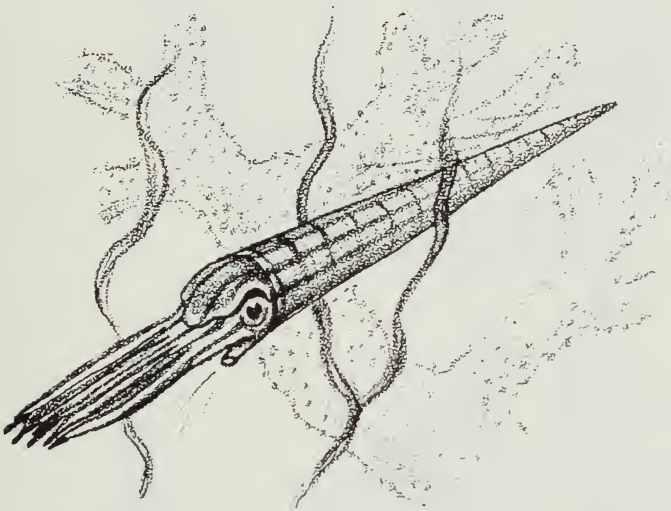
Maclurites 1X

Bellerophon 1X

Plate 5

Snails are common as fossils in the Ordovician and Pennsylvanian rocks of Illinois. Snails that lived during the Ice Age are abundant in the loess in places along the bluffs of the major rivers and may be recovered by washing the loess through a coarse screen.

The oldest snails lived during the Cambrian period, more than 550 million years ago.



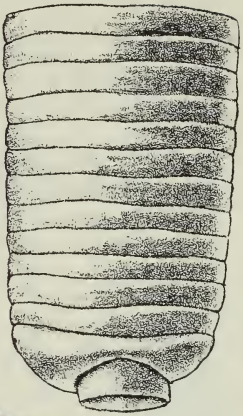
Straight Ordovician Cephalopod

CEPHALOPODS (sef´-a-lo-pods, plate 6). Cephalopods have been found as fossils in rocks of many ages, and many are alive today. Squids, octopuses, cuttlefish, and the pearly nautilus are among the cephalopods presently living in the seas.

Cephalopods are the most advanced of all animals without backbones. They have a highly developed nervous system with eyes much like human eyes.

The cephalopod's mouth is surrounded by long tentacles commonly armed with suckers. Beneath the tentacles is a tube through which the animal can force a jet of water and thus move about by jet propulsion.

CEPHALOPODS



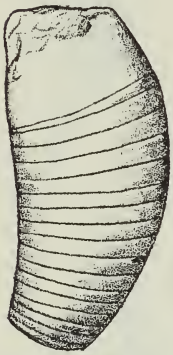
Schistoceras 1X

Eoasianites 2/3X

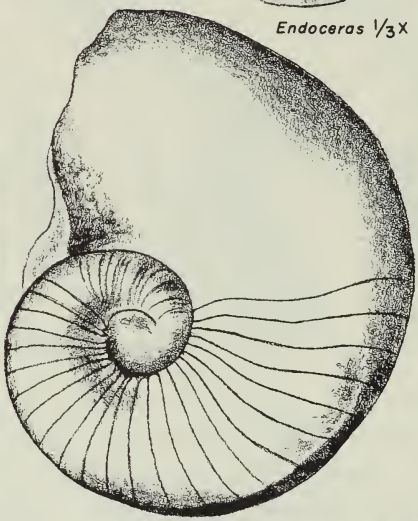
Mooreoceras 2X

Endoceras 1/3X

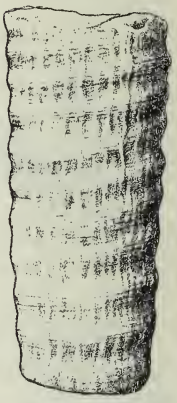
Protocanites 1X



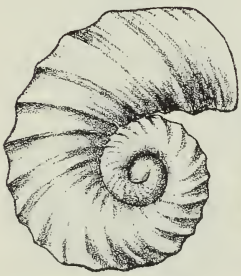
Westonoceras 1X



Charactoceras 2/3X

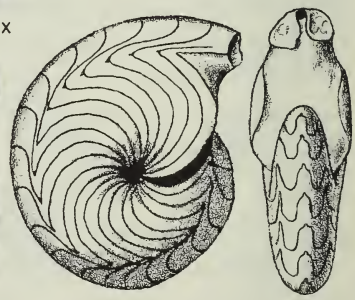


Cyclendoceras 1/3X



Lechritrochoceras 2/3X

Endolobus 2/3X

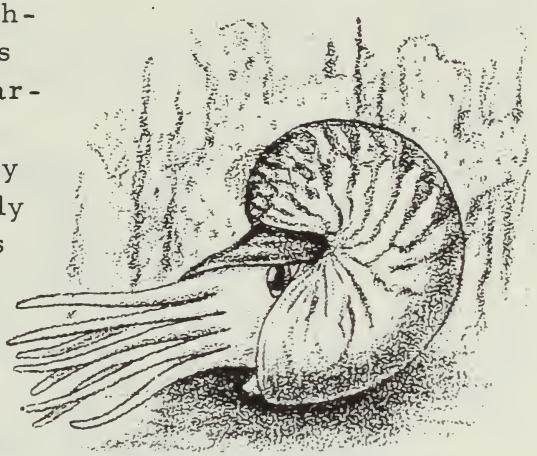


Imitoceras 2/3X

Plate 6

Coiled cephalopods live today only in the South Pacific but in the geologic past they were scattered throughout the world. Modern squids live in shallow coastal waters over much of the globe.

Most of the cephalopods we find as fossils had a calcareous outer shell. Some were loosely coiled, some tightly coiled, and others shaped like a tapered tube.



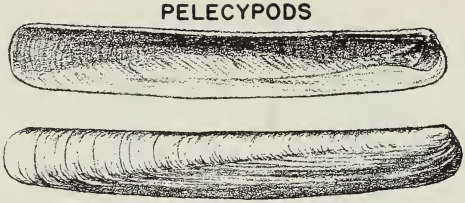
Modern Coiled Cephalopod

As the shelled forms grew, they periodically made new and larger shell chambers to fit their bodies and sealed off the old part of their shells with a wall of pearly calcareous material - hence the name, "chambered nautilus."

During the Ordovician period, about 450 million years ago, some straight cephalopods grew to be as long as 19 feet, although most were much shorter. Straight cephalopods were common in Ordovician and Silurian time; coiled ones became fairly common only by Later Paleozoic times. We find both in the Pennsylvanian rocks of Illinois.

PELECYPODS (pe-les´-i-pods, plate 7). Pelecypods include oysters, clams, mussels, and cockles. They have been found in the oldest marine rocks known and still are very numerous in the seas and rivers today. Many of our pearl buttons are made from Mississippi River clam shells.

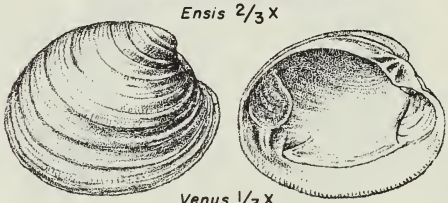
PELECYPODS



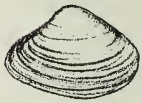
Ensis 2/3X

Exogyra 2/3X

Vanuxemia 2/3X

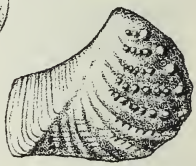


Venus 1/3X



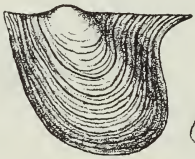
Ctenodonta 2/3X

Cardiopsis 2/3X



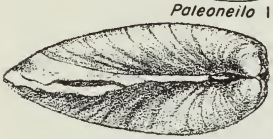
Trigonia 2/3X

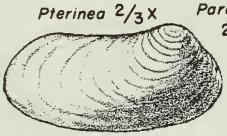
Paleoneilo 1X



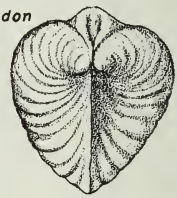
Pterinea 2/3X

Parallelodon 2/3X



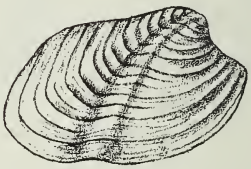


Allorisma 1X



Modiolopsis 1X

Ostrea 2/3X

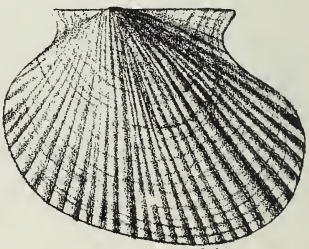


Grammysia 2/3X

Myalina 2/3X

Honeoyea 3X

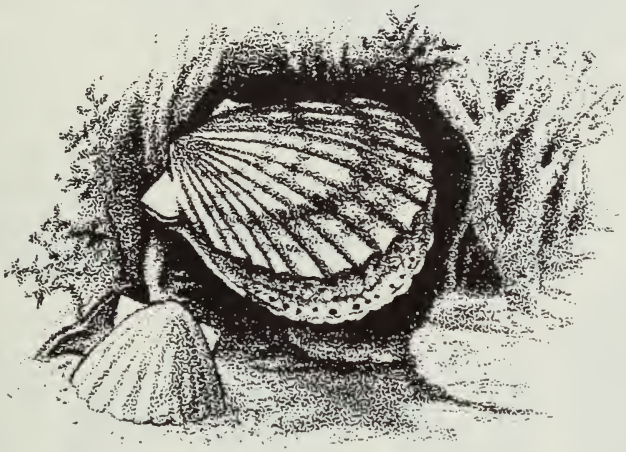
Clionychia 2/3X



Aviculopecten 2/3X

Plate 7

Most pelecypods have two shells which are mirror images of each other, one on the right and one on the left. Each shell has a beak that points forward and represents the spot where the shell began to grow. The top edge of each shell commonly has several teeth and sockets that fit into those of the opposite shell to make a hinge. The outside of the shell generally is ornamented by ribs, spines, and growth lines.



Pecten
A Modern Pelecypod

Most pelecypods form shell banks in the seas or rivers, on sand and mud flats. Many burrow into the mud or sand, and even into wood or rock. Some oysters attach themselves to rocks and others creep about the sea floor by means of a hatchet-shaped foot thrust between the open valves. A few (scallops) move by jet propulsion, opening the two valves slowly and snapping them shut to force the water out in a jet stream.

Fossil clams are common in some Pennsylvanian rock formations in central Illinois and in some Ordovician limestones in northern and western Illinois.

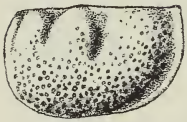
OSTRACODES

Paraechmina 30X

Monoceratina 40X

Zygobolba 10X

Hollinella 26X



Zygobeyrichia 9X

Leperditia 3X

Bollia 18X

Beyrichia 16X

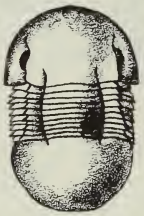
Primitia 12X

Tetradella 20X

TRILOBITES

Flexicalymene 1X

Calymene 1/2X

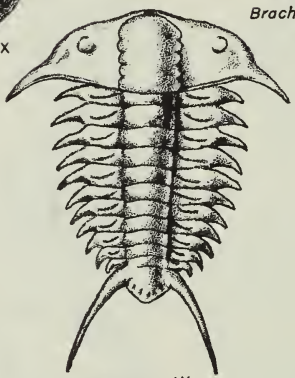


Illaenus 1X

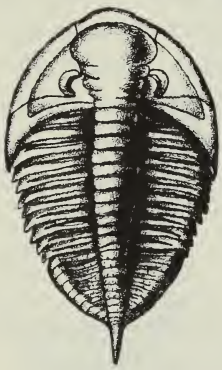
Phacops 2/3X

Brachymetopus 2X

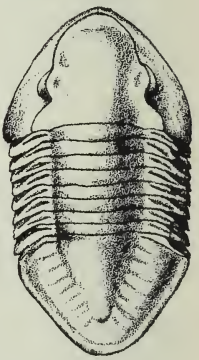
Greenops 1X



Ceraurus 1X



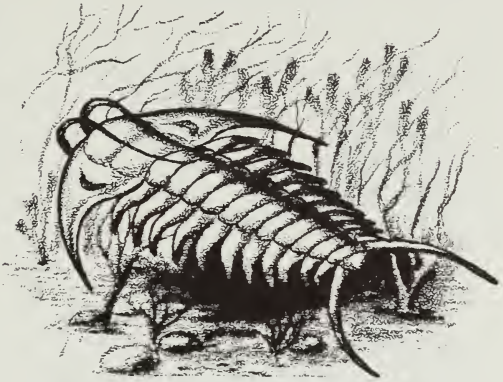
Dalmanites 1/2X



Isotelus 1/3X

Plate 8

TRILOBITES (try'-lo-bites, plate 8). Trilobites have been extinct for more than 200 million years. They often are preserved in great detail and are prized as fossils. Two grooves extending down the back of the animal divide it into three lobes, hence the name "trilobite."



Ordovician Trilobite

Trilobites had a head with eyes and a mouth, a jointed body, and a tail. The animals were cousins of the crabs and lobsters and lived in the sea.

They were covered with a horny armor, jointed so the animal could move. Trilobites shed their armor much as snakes shed their skins, so each animal could have provided several fossils.

Trilobites were abundant in Cambrian, Ordovician, and Silurian times and were among the most important animals then on earth. They became extinct during Permian time.

OSTRACODES (os'-trah-cods, plate 8). Ostracodes are very small animals which are common as fossils but are rarely large enough to be seen by the naked eye.

They have been present on earth since the early part of the Ordovician period, and occur today in great numbers in lakes, rivers, and seas. Ostracodes prefer shallow water and live in vast hordes, crawling over the bottom or swimming near the surface.

They have two shells, one on each side of the body, so that some ostracodes look much like small

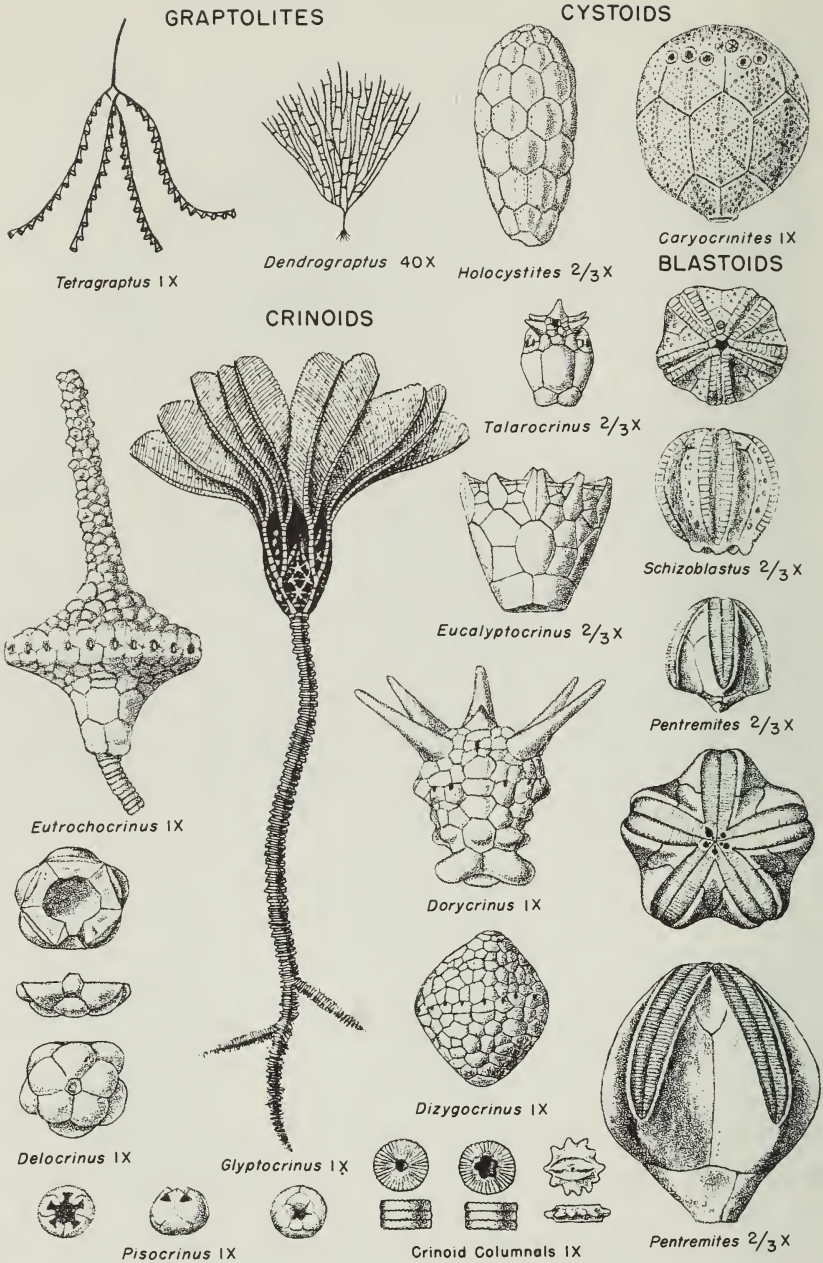
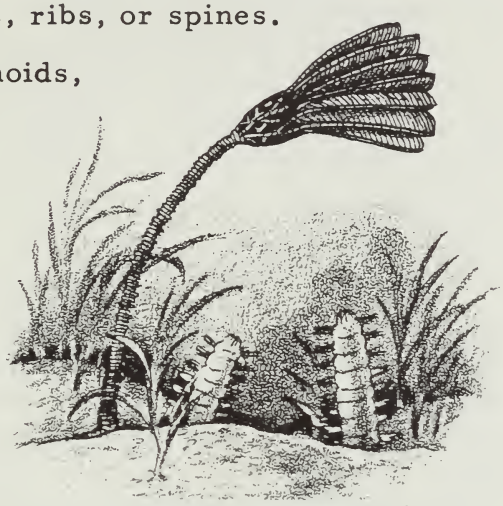

GRAPTOLITES
Tetragraptus 1X
Dendrograptus 40X
CYSTOIDS
Holocystites 2/3X
Caryocrinites 1X
BLASTOIDS
CRINOIDS
Talarocrinus 2/3X
Schizoblastus 2/3X
Eucalyptocrinus 2/3X
Pentremites 2/3X
Eutrochocrinus 1X
Dorycrinus 1X
Dizygocrinus 1X
Delocrinus 1X
Glyptocrinus 1X
Pisocrinus 1X
Crinoid Columnals 1X
Pentremites 2/3X

Plate 9

clams. But the animal inside looks much like a shrimp or an insect with jointed legs and feelers. As the animal grows, it sheds its shells and forms a new pair. The shells may be smooth or ornamented with pits, bumps, ribs, or spines.

CRINOIDS (cry'-noids, plate 9). Crinoids are called "sea lilies," but they are animals rather than plants.



Ordovician Crinoid

They look like plants, however, because the body skeleton or calyx generally is on the end of a stem made of button-like discs and held on the sea floor either by a stony anchor or root-like arms. The mouth, on top of the body, is surrounded by arms which sweep food into the mouth. The body is made of calcareous plates which fit together like irregular bricks.

When the animal dies, the plates and discs tend to fall apart and sink to the sea floor. Many of the limestone beds in Illinois are composed mostly of crinoid plates and discs.

The complete calyx is a highly prized fossil. Good ones are found in the limestone cliffs along the Mississippi River between Burlington and Alton.

Stems or stem discs are common throughout most of Illinois and popularly are called "Indian beads" or "fish bones." The oldest crinoids come from Ordovician rocks. Some crinoids live today, mainly in deep parts of the ocean, but they are not nearly so common as in the past.

BLASTOIDS (blas'-toyds, plate 9). Blastoid fossils commonly are called "sea buds." They are closely related to crinoids but differ from crinoids in that instead of arms they had small hair-like pinnules which swept food into the mouth. The soft pinnules rarely were preserved.

Some blastoids had stems but others did not and were attached directly to the sea floor. Like crinoids, they had a mouth at the top of the body (calyx) surrounded by small round holes that conducted water into the body.

The oldest blastoids, found in Ordovician rocks, lived about 450 million years ago. The animals survived until the Permian period, about 225 million years ago, when they became extinct. Blastoids are beautiful fossils which look much like small hickory nuts.

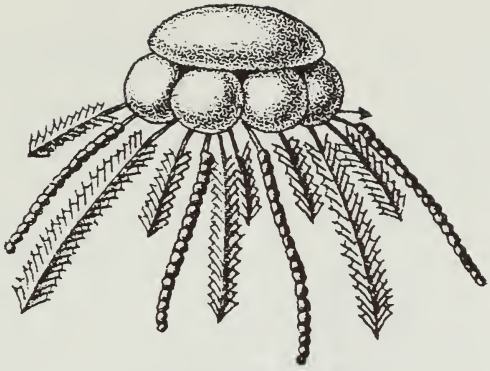
They most commonly are found in the river cliffs and stream banks of western and southwestern Illinois, especially in Randolph County, and in southern Illinois near the Ohio River.

CYSTOIDS (sis'-toyds, plate 9). Cystoids are related to the crinoids and blastoids but are more primitive than either. The body, or calyx, is not nearly so well developed and the arms are irregular and rarely preserved. Nearly all cystoids are stemless and the body plates are quite irregular in arrangement.

The cystoids lived from the Ordovician period, 400 million years ago, until the Mississippian period, 300 million years ago.

Most cystoids found in Illinois come from quarries in the Silurian rocks in the Chicago region and in the Mississippi River bluffs of northwestern Illinois.

GRAPTOLITES (grap'-toe-lites, plate 9). The graptolites were a very simple kind of marine animal that appeared in the Cambrian period. They became abundant in Ordovician and Silurian time but gradually died out. The last ones lived during the Mississippian period.



Ordovician Graptolite

The animals lived in tiny chitinous cups arranged along slender stems. In some forms the stem was attached to a round float, and in others two, three, or four stems might be attached together. Most graptolites floated free in the oceans and were scattered throughout the world.

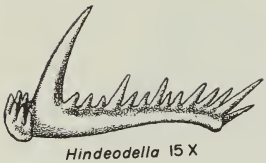
As fossils, they look like little black lines with saw-tooth edges. They are found mainly in shales but also occur in limestones. In Illinois they are most common in Ordovician rocks of the northern part of the State.

Mississippian Conodont (40 X)

CONODONTS (ko'-no-donts, plate 10). Conodonts are small fossils which barely can be seen by the naked eye. Almost nothing is known about the animal these beautiful amber-colored tooth-like little fossils came from.

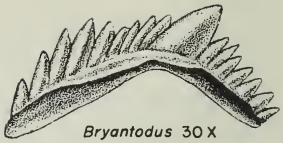
Even though we don't know much about them, conodonts are of value because they help geologists determine the age of the rocks in which they are found.

CONODONTS



Hindeodella 15 X

Palmatolepis 15 X

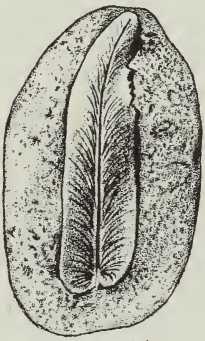


Bryantodus 30 X

Loxodus 30 X

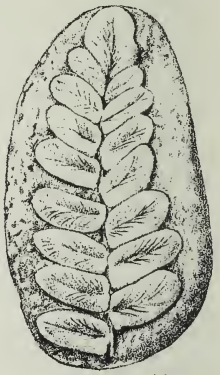
Ligonodina 15 X

Drepanodus 30 X



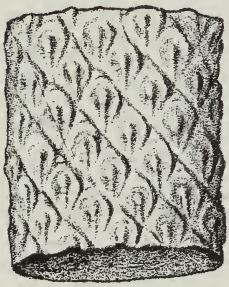
Neuropteris 2/5 X

Icriodus 20 X



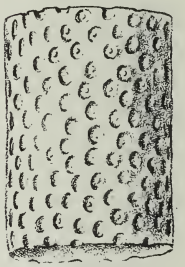
Neuropteris 1/2 X

PLANTS



Lepidodendron 2/5 X

Annularia 2/5 X

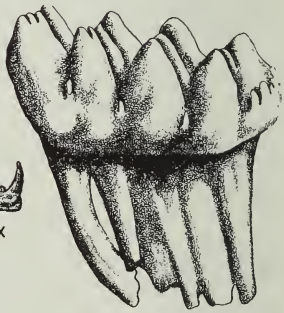


Stigmaria 2/5 X

VERTEBRATE FOSSILS

Mammoth tooth 1/6 X

Shark tooth 2/3 X



Mastodon tooth 1/6 X

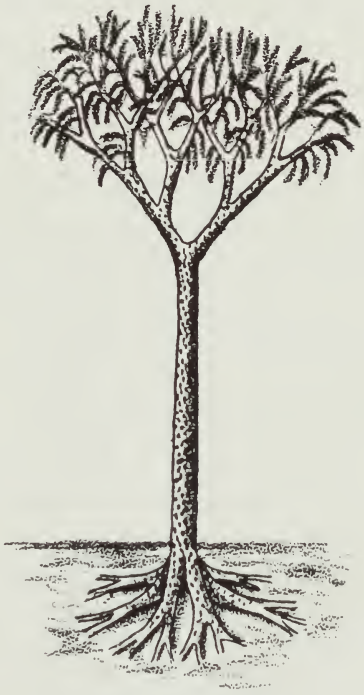
Plate 10

Conodonts of the same type are found over much of the world in rocks of the same age, leading us to believe that the animal was a good swimmer and could cover great distances. Because of this, we think these fossils may be those of an extinct fish.

Conodonts have been found in rocks ranging from the Cambrian to the Triassic. They are found in bedrock formations throughout Illinois.

PLANT FOSSILS (plate 10). Of all the fossils that have been found in Illinois, perhaps none are more famous than the fossil leaves and other plant remains from the world-renowned Mazon Creek area in northeastern Illinois.

In this area, which lies in Grundy and Will counties, iron carbonate nodules containing plant remains are found in the waste piles of strip and underground mines and at places along Mazon Creek.



Lepidodendron
A Pennsylvanian
Scale Tree

The plant fossils are remains of fast-growing ferns and trees. In the damp lowlands and swamps that covered Illinois during the Coal Age, they formed a dense growth and were preserved in our coal beds.

In the jungle-like growth the plants most common were huge ferns that had fronds five or six feet long and grew to a height of more than 50 feet. Along with them were seed ferns, now extinct, and giant

scouring rushes, descendants of which are the small horsetail rushes that live today along our wooded streams. You can recognize scouring rushes by their jointed trunks and the leaf whorls, common in the Mazon Creek nodules.

The most imposing plants of the Coal Age forests were the scale trees, which grew to heights of 100 feet or more. Close-set leaves grew on their trunks and limbs, and when the leaves fell off they left rows of scars that are the identifying marks for the trees. Diagonal rows of scars identify the *Lepidodendron* and vertical rows identify the *Sigillaria*.

VERTEBRATE FOSSILS (plate 10). Animals with backbones are called vertebrates. They include reptiles, amphibians, fish, birds, and mammals.

In many western states, vertebrate fossils, such as skeletons of dinosaurs, camels, and saber-toothed tigers, are common in Mesozoic and Cenozoic rocks (see Geologic Time Chart, page 2).

If Mesozoic and Cenozoic rocks were ever deposited in Illinois, they have been removed by erosion. As a result, the vertebrate fossils found in our State are restricted to Paleozoic and Pleistocene rocks.

The Paleozoic vertebrate fossils are fish teeth, scales, and bony plates, a few lizards, and amphibians. The Pleistocene vertebrates included many forms now extinct, such as mammoth and mastodons, and many forms still living in this region, including man.

BOOKS ABOUT FOSSILS

FIRST BOOK OF PREHISTORIC ANIMALS. Alice Dickinson. Franklin Watts, Inc., New York, 1954.

A beautiful little book for grade school age. Well written and well illustrated.

HOW THE WORLD BEGAN. Edith Heal. Thomas S. Rockwell Co., Chicago, 1930.

The story of the beginning of life on earth. For advanced grades through high school.

THE STORY OF OUR ANCESTORS. May Edel. Little, Brown and Co., Boston, 1955.

Tells how man grew into the strange upright creature that he is with nimble fingers and giant brain. For junior high and high school.

LIFE LONG AGO. Carroll Lane Fenton. The John Day Co., New York, 1937.

One of the very best books for advanced grade and junior high.

STORIES READ FROM THE ROCKS. Bertha Morris Parker. Basic Science Education Series. Row, Peterson and Co., Evanston, Ill., 1942.

Advanced grade and junior high.

ANIMALS OF YESTERDAY. Bertha Morris Parker. Basic Science Education Series. Row, Peterson and Co., Evanston, Ill., 1948.

Advanced grade and junior high.

COMMON FOSSILS OF MISSOURI. A. G. Unklesbay, University of Missouri Bulletin, Handbook 4, Columbia, Mo., 1955.

OHIO FOSSILS. A. LaRocque and M. F. Marple. Ohio Division of Geological Survey Bulletin 54, Columbus, Ohio, 1955.

A popular account of fossils written especially for the amateur. It has several keys for identification of fossils.

LIFE OF THE PAST. G. G. Simpson. Yale University Press, New Haven, Conn., 1953.

A broad and very readable introduction to the study of fossils.

PREHISTORIC ANIMALS. William E. Scheele. World Publishing Co., Cleveland, Ohio, 1954.

A beautifully illustrated book for all ages.

THE WORLD WE LIVE IN. Time, Inc. (distributed by Simon and Schuster, Inc., New York), 1955.

A superb general survey of the world of nature. Two chapters are devoted to life of the past.

DINOSAUR BOOK. E. H. Colbert, American Museum of Natural History, New York, 1945.

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HANDBOOK OF PALEONTOLOGY FOR BEGINNERS AND AMATEURS Winifred Goldring. New York State Museum, Albany, N. Y., 1929.

A summary of paleontology for adults.

FIELDBOOK OF ILLINOIS LAND SNAILS. Frank Collins Baker. Il-

linois Natural History Survey Manual 2, Urbana, Ill., 1934.

A beautifully illustrated booklet that will aid in identifying most Pleistocene snails.

INTRODUCTION TO HISTORICAL GEOLOGY. R. C. Moore, McGraw-Hill Book Co., New York, 1949.

A general account of earth history and organic evolution. Adult level.

AN INTRODUCTION TO PALEONTOLOGY. A. Morley Davis. Thomas Murby and Co., London, 1947.

A somewhat simplified outline of the major fossil groups.

MAN AND THE VERTEBRATES. A. S. Roemer, University of Chicago Press, Chicago, 1941.

A well illustrated introduction to living and fossil vertebrates.

ANCIENT PLANTS AND THE WORLD THEY LIVE IN. H. N. Andrews. Comstock Publishing Co., Ithaca, N. Y., 1947.

College level.

PRINCIPLES OF INVERTEBRATE PALEONTOLOGY. R. R. Shrock and W. H. Twenhofel. McGraw-Hill Book Co., New York, 1953.

Technical college-level textbook.

INVERTEBRATE FOSSILS. R. C. Moore, Cecil Lalicker, and A. Fischer. McGraw-Hill Book Co., New York, 1953.

College text. Well illustrated.

INDEX FOSSILS OF NORTH AMERICA. H. H. Shimer and R. R. Shrock. John Wiley and Sons, New York, 1945.

Useful for the identification of most invertebrate fossils.

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