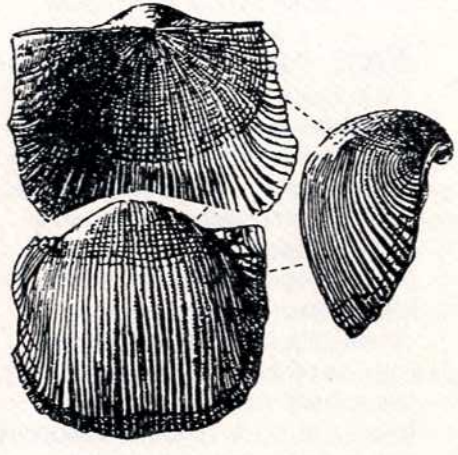
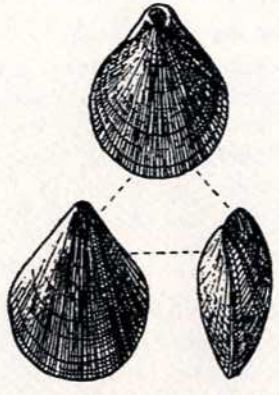
BRACHIOPODS

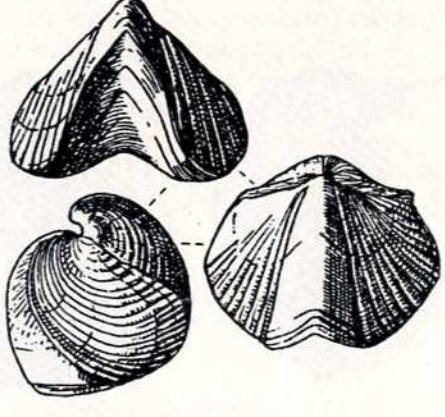
A brochure introducing one of the most abundant groups of marine invertebrate fossils

1 - Strophomenid brachiopod, *Reticulatia*, Pennsylvanian Period, x0.7





2 - Terebratulid brachiopod, *Terebratulina*, Recent - living today, x1



3 - Spiriferid brachiopod, *Paraspirifer*, Devonian Period, x0.7

The Paleontological Society

What is a brachiopod?

Brachiopods belong to the large category of animals without backbones, the invertebrates. They have two shells or valves that are often composed of the mineral calcite (calcium carbonate). Brachiopods have a coiled feeding organ called a lophophore that is protected by its valves.

There are two major divisions (Classes) of brachiopods: the inarticulate brachiopods and the articulate brachiopods.

Some of the oldest shelly invertebrate fossils known are brachiopods. They have a fossil record stretching back to the start of the Cambrian Period, some 570 million years ago (Table 1). Brachiopods are still living in the world's oceans.

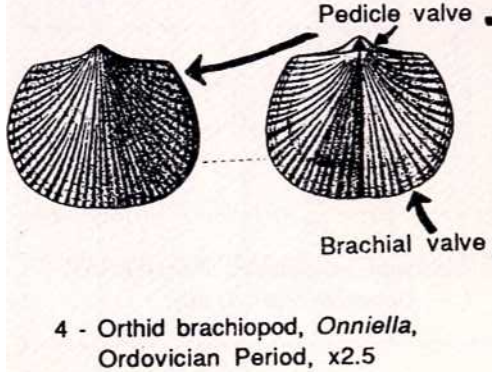
It is the brachiopod valves that are often found fossilized. On the inside surface of some, muscle scars (figure 6) or the support structure for the lophophore may be found (figure 8).

Where do they live?

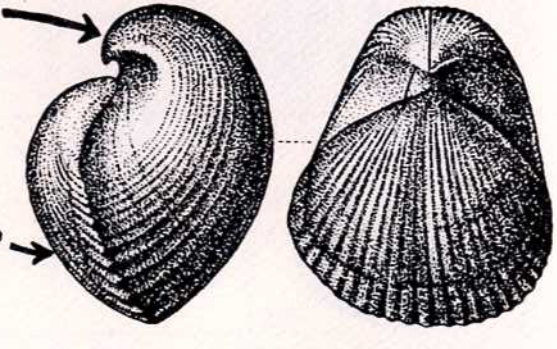
Brachiopods live on the ocean floor. They have been found living in a wide range of water depths from very shallow waters of rocky shorelines to ocean floor three and a half miles beneath the ocean surface. They are known from many places, ranging from the warm tropical waters of the Caribbean to cold Antarctic seas. Fossil brachiopods in sedimentary rocks indicate ancient marine environments.

Many types of brachiopods

There are lots of different shaped brachiopods. When you look at them side-on some are biconvex (figures 3, 5, 10), and some are concavo-convex (figure 1). The valves are joined along the hinge line which can be straight (figures 3, 4, 6) or curved (figures 5, 8, 11). Some have smooth valves (figures 8, 11), others have ridges or costae (figures 5, 7, 9). Many brachiopods have a fold in one of the valves (figures 7, 9, 10, 11).



4 - Orthid brachiopod, *Onniella*, Ordovician Period, x2.5



5 - Pentamerid brachiopod, *Kirkidium*, Silurian Period, x0.75

ARTICULATE BRACHIOPODS

are often the most common fossil brachiopods. They have two valves, the larger is the pedicle valve. The pedicle foramen is a hole towards the end of the pedicle valve (figures 2, 4, 7, 8). The valves articulate by teeth on the pedicle valve that fit into sockets on the brachial valve, giving them the name 'Articulate brachiopods'. There are a number of distinct types, or Orders, mentioned below.

ORTHIDS (figure 4) are usually small with a short straight hinge line. The pedicle foramen is often visible. The gently biconvex valves have many small costae. They are the first group of articulates known.

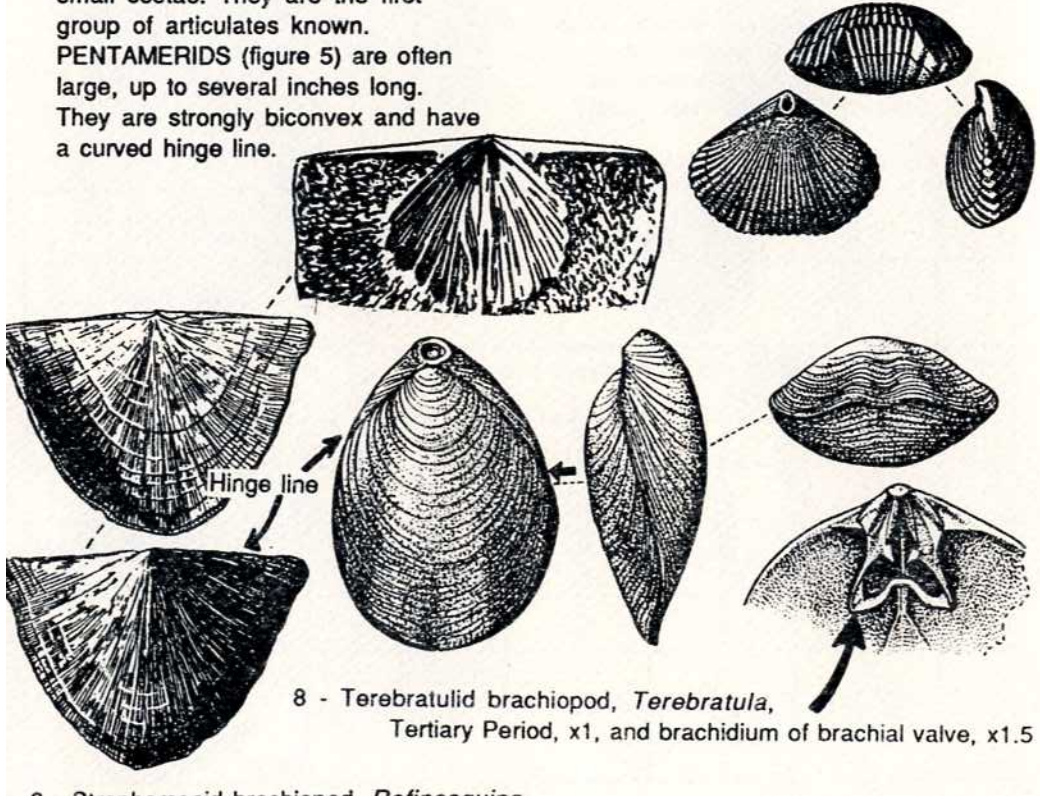
PENTAMERIDS (figure 5) are often large, up to several inches long. They are strongly biconvex and have a curved hinge line.

STROPHOMENIDS (figures 1, 6) have a straight hinge line and the valves are concavo-convex.

RHYNCHONELLIDS (figure 7) are biconvex, often with costae and a pedicle foramen in the pedicle valve.

TEREBRATULIDS (figures 2, 8) often have smooth valves with growth lines and a pedicle foramen. They are biconvex and have a rounded hinge line. A calcareous loop inside the brachial valve supports the lophophore during life (figure 8).

7 - Rhynchonellid brachiopod, *Cyclothyris*, Cretaceous Period, x1



8 - Terebratulid brachiopod, *Terebratula*, Tertiary Period, x1, and brachidium of brachial valve, x1.5

6 - Strophomenid brachiopod, *Rafinesquina*, Ordovician Period, x0.7

tail of muscle scars on pedicle valve interior, x1

The next 3 groups have an ornate spiral support for the lophophore inside the smaller brachial valve. They are biconvex, often with a pedicle foramen.

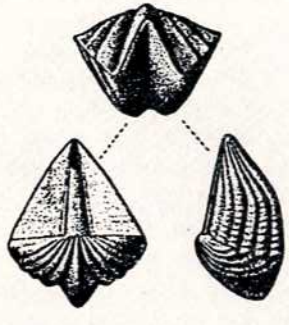
SPIRIFERIDS (figures 3, 9) may be large. They have a straight hinge line and costae on their valves.

ATRYPIDS (figure 10) have a rounded hinge line and often have costae on their valves.

ATHYRIDS (figure 11) have a rounded hinge line and the valves are often smooth.

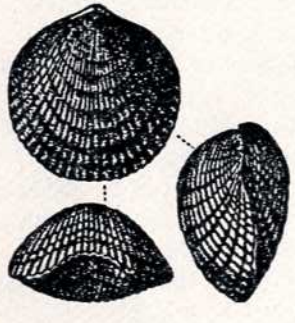
<u>INARTICULATE BRACHIOPODS</u>

have two valves, but do not have teeth and sockets, relying on muscles to hold and move them. *Lingula* (figure 12) is an unusual brachiopod, not only because it has two similar sized valves, but also because it lives in a burrow, attached by a long pedicle. It is found today living in sandy beaches along the coast of Japan.

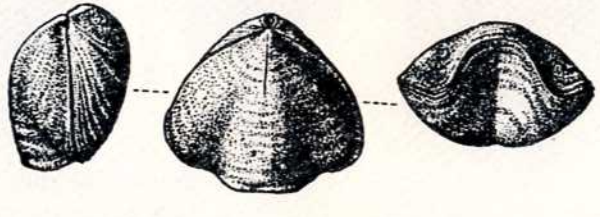


- Spiriferid brachiopod, *Cyrtina*
Devonian Period, x1.5

12 - Inarticulate brachiopod, *Lingula*,
Mississippian Period, x1.5



10 - Atrypid brachiopod, *Atrypa*,
Silurian Period, x1



11 - Athyrid brachiopod, *Composita*,
Mississippian Period, x1

Brachiopod or bivalve?

Brachiopods (or Brachiopoda) are often confused with bivalved mollusks (clams or Bivalvia). However, there are major biological differences between brachiopods and bivalves.

A mirror image or plane of symmetry of a brachiopod cuts the valve in half along its length (figure 13). In bivalves the mirror image runs along the edge of the valves where they close together.

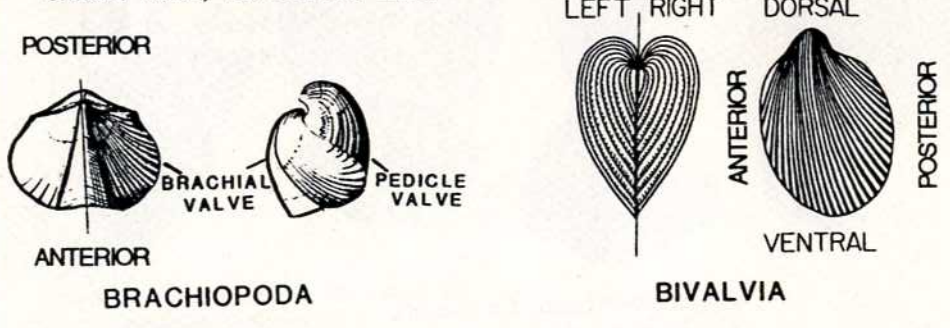
Brachiopods often have one valve larger than the other. The larger valve often has a hole called a pedicle foramen towards its posterior end (figures 2, 4, 7, 8). In life, the pedicle, a fleshy stalk may emerge through this hole. This gives its name to the larger valve, the pedicle valve. The pedicle can be used for attachment and rotation of the brachiopod. Sometimes brachiopods are anchored in seafloor sediment by spines. The smaller valve of a brachiopod contains a coiled feeding organ called a lophophore. This may be supported by a small calcareous skeleton or loop called a brachidium. This structure gives its name to the smaller valve, the brachial valve.

Geologic Time

Paleontologists study fossils from different layers of sediment, or strata. These strata accumulated at various times during geologic time (see Table 1).

Brachiopods are very common as fossils in rocks from certain parts of North America and other continents around the world. The evolution of different brachiopods through time can be useful in identifying the time at which a sedimentary rock containing these fossils formed.

It has long been assumed that brachiopods are now a minor group of animals on their way to extinction. Certainly they were more abundant in the shallow seas of the Paleozoic Era than they are today. However, as more is discovered of their present-day distribution, they appear to be more widespread and successful in today's oceans than previously realized.



13 - Brachiopoda and Bivalvia, differences in symmetry, and valve terminology.

What next?

If you have a brachiopod or other fossil specimen that you cannot identify you should contact a paleontologist at your local museum, university, or state geological survey for assistance.

For detailed information on brachiopods turn to textbooks dealing with invertebrates and paleontology such as:

The Audubon Society Field Guide to North American Fossils, by I. Thompson. Published by Alfred A. Knopf. 1982.

Fossil Invertebrates, edited by R. S. Boardman, A. H. Cheetham, and A. J. Rowell. Published by Blackwell Scientific Publications. 1987.

Treatise on Invertebrate Paleontology, Part H (1 and 2), Brachiopoda, edited by R. C. Moore. Published by the Geological Society of America and University of Kansas Press. 1965.

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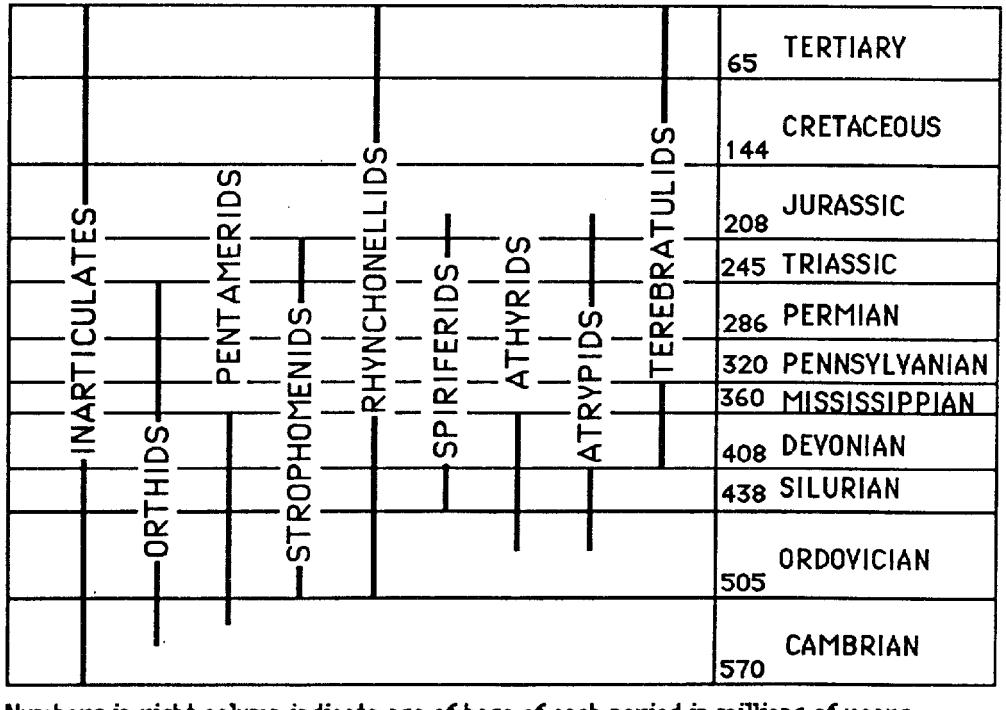
Table 1 RANGES OF BRACHIOPODS THROUGH TIME



Numbers in right column indicate age of base of each period in millions of years