

Lecture 6

PHYLUM BRACHIOPODA

CLASSIFICATION

Class **Articulata** b. Class **Inarticulata**

Order **Orthida**

Order **Strophomenida**

Order **Pentamerida**

Order **Rhynchonellida**

Order **Spiriferida**

Order **Terebratulida**

PHYLUM BRACHIOPODA (brachiopods or lamp) Oshells)

Name: Name means "arm" (brachio) + "foot" (pod).

Chief characteristics: Bivalved (two shells), each with bilateral symmetry. The plane of symmetry passes through the center of each shell or valve. The two valves differ in size and shape in most. Sometimes the larger valve will have an opening near the hinge line through which the pedicle extended in life.

Geologic range: Lower Cambrian to Recent.

Mode of life: Inhabitants of shallow marine environments; they generally live attached in a fixed position on the sea floor.

A. CLASS INARTICULATA

Primitive brachiopods with phosphatic or chitinous valves; no hinge. Valves held together with muscles and soft parts.

Lingula is a well known inarticulate brachiopod.

Geologic range: Lower Cambrian to Recent



Inarticulate brachiopod, *Lingula cuneata*, from the Silurian Medina Sandstone, Medina, New York.



Inarticulate brachiopod, Rome, GA.

B. CLASS ARTICULATA

Brachiopods with calcareous valves attached together with a hinge.

Some of the more common articulate brachiopods are Pentamerus, Rafinesquina, Atrypa, Leptaena, and Spirifer.

Geologic range: Lower Cambrian to Recent

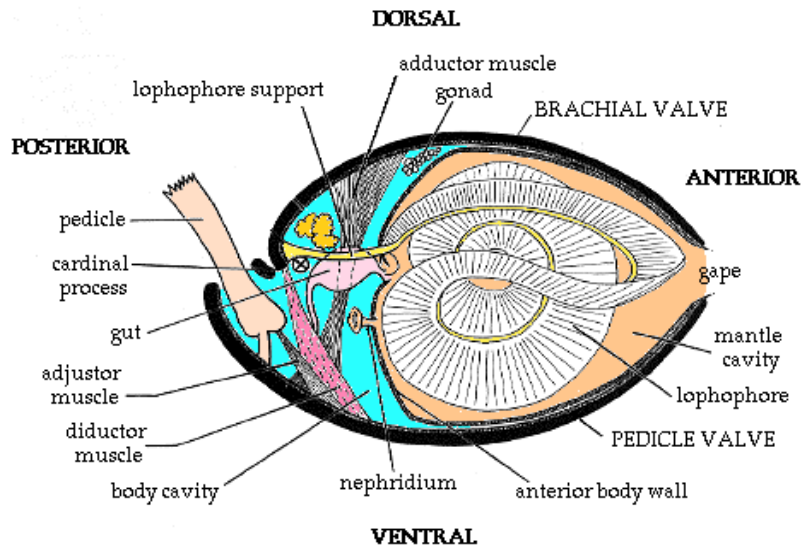


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Articulate brachiopod fossils



Brachiopod Internal Morphology

Morphology

Brachiopods have been separated into two classes, the **ARTICULATA** and the **INARTICULATA** but there are enough similarities in their general morphology to consider them together.

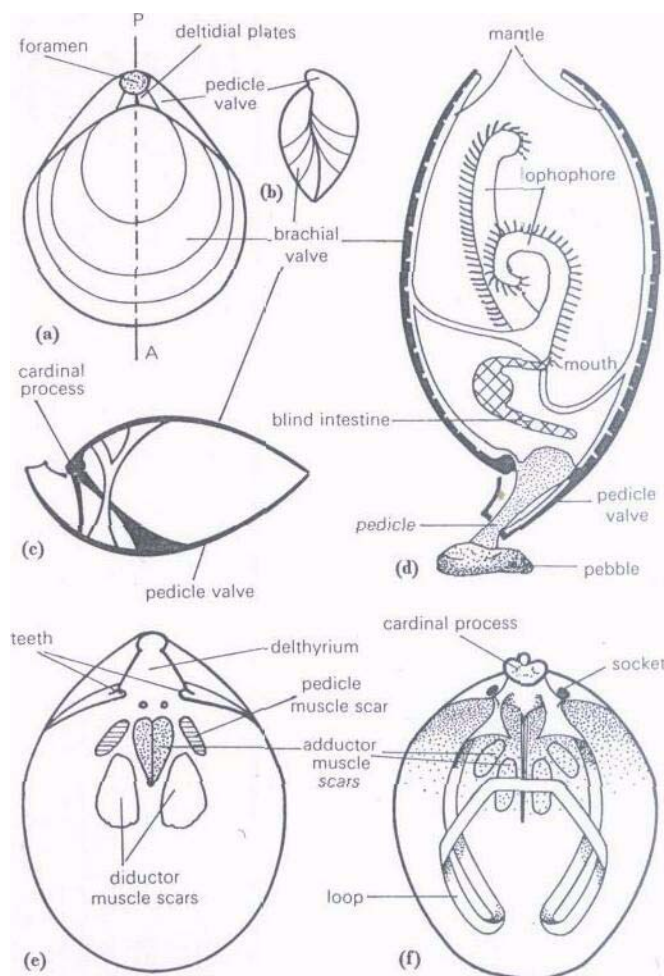
The **brachiopod** shell encloses the body except for the pedicle (fig.89 d). The valve on the **VENTRAL** side of the body is known as the **PEDICLE** valve, since the pedicle commonly emerges through it, while the valve on the **DORSAL** side is the **BRACHIAL** valve, and takes its name from the **brachia**, arm-like projections, which make up the **lophophore**. Commonly the pedicle valve is the larger, projecting at its posterior end beyond the **brachial** valve. The pedicle emerges from the shell at its **POSTERIOR** margin and the opposite margin is **ANTERIOR**. The valves open slightly along the anterior margin during feeding (fig.90 e), but remain in contact along the posterior margin by means of a **HINGE** in the **Articulata** and by a system of muscles in the **Inarticulata**. **SOFT BODY**. The body and mantle line the shell and in some cases the soft tissue extends by minute tubules into the shell wall. The main part of the body is small, and much of the mantle cavity is taken up by the **lophophore** (fig.89d). This may be a **lobed** disc or two coiled or folded arms called **BRACHIA** each of which has a groove leading back to the mouth and fringed with ciliated tentacles. These maintain currents of water along three paths, a median outgoing **flow**, and an **incurrent** flow on either side. Minute organisms, frequently diatoms, are filtered from the incurrent water and passed along the lophophore grooves to the mouth and thence to the digestive tract. The intestine ends blindly in living articulate **brachiopods**, but opens in an anus in **inarticulates**.

Most brachiopods are attached by a **PEDICLE** (fig.89d) which typically is a stout fleshy stalk attached to the pedicle valve by muscles. Its distal end is fixed to a rock or shell, or may

diverge into rootlets to secure a hold in soft sediment. In some forms the pedicle may be absent, in which case the shell is usually cemented to a firm surface (fig.9id). Some extinct forms appear to have been anchored in soft sediment by spines (fig. 92!).

The opening and closing of the valves is controlled by a system of muscles which are attached to the inner surface of the valves towards the posterior end where they may leave MUSCLE SCARS. The muscle system is simplest in the articulate brachiopods (fig. 890), consisting commonly of a pair of ADDUCTOR muscles, which run across the shell cavity from the interior of the pedicle valve to the interior of the brachial valve, and of two pairs of DIDUCTOR muscles which run obliquely from the pedicle valve to a projection, the CARDINAL PROCESS, from the hinge line of the brachial valve. Both sets of muscles

work by contracting. The hinge line acts as a fulcrum, and the cardinal process as a lever so that, as the diductor muscles contract, they pull down the cardinal process and the valves open. As the diductor muscles relax, the adductor muscles contract and pull the valves together.



pedicle (ventral) valve

brachial (dorsal) valve

89 Morphology of an articulate brachiopod.

a, dorsal view (A, anterior; P, posterior; line A-P, plane of bilateral symmetry), b, side view. c, section to show the disposition of the adductor muscles (unshaded) and the diductor muscles (black), d, simplified section to show the general relationship of the soft part to the shell. e, interior of the pedicle valve, f, interior of the brachial valve.

There are additional muscles in **inarticulate-brachiopods** which control lateral movement of the valves relative to one another.

SHELL. In most **INARTICULATE brachiopods** the shell has a horny appearance and is composed of alternate layers of **chitin** and calcium phosphate, but in a few forms it is calcareous. In **ARTICULATE brachiopods** the shell is calcareous. A thin **chitinous** layer (**periostracum**) overlies the shelly part which is made up of an inner and outer layer of **calcite** fibres. The inner layer thickens with growth.

The shape of the shell may show some correlation with the arrangement of the **lophophore** and the feeding currents, and markings on the inner surface may provide information about the disposition of the muscles, the lophophore and canals in the mantle in a number of extinct forms. In inarticulate brachiopods the shell is approximately oval or circular in outline with gently convex valves. In the articulate forms the shell may be ovate (fig.89a), tapering slightly at the posterior end and with a short curved hinge line, or it may be semicircular in outline with a straight wide hinge line. The pedicle valve is typically larger than the **brachial** valve.

The **brachiopod** shell grows by increments to the margin which typically are greater along the anterior and lateral margins and which form concentric growth lines on the outer surface. Thus the initial shell remains at or near the posterior margin and may form the tip of a pointed **BEAK**. The surface of the shell may be smooth, or may be marked by concentric or radial **hues** or ribs' and tubercles or spines may be developed. This surface ornament is useful in distinguishing species.

The opening through which the **PEDICLE** emerges in inarticulate brachiopods is usually a gape, but may be a groove or a slit in the . pedicle valve. In the articulate brachiopods the pedicle opening, the **DELTHYRIUM**, is a triangular gap in the posterior margin-of the pedicle valve (fig. 89), and commonly is constricted by a pair of **DELTIDIAL PLATES** (fig. Spa), or by a single plate, the **DELTIDIUM** leaving a circular hole, the **FORAMEN** for the passage of the pedicle (fig. 89a). The hinge apparatus consists of **TWO TEETH** in the pedicle valve (fig.89e) which fit into **TWO SOCKETS** in the **brachial** valve (fig.89f). The teeth are short projections from the hinge line, one on each side of the **delthyrium** and they may be supported in some genera by **DENTAL PLATES** projecting from the floor of the pedicle valve. The sockets lie, one on each side of a small projection, the **CARDINAL PROCESS**, to which the **diductor** (or opening) muscles are attached (fig.89f).

In most articulate **brachiopods** there are distinct **SCARS** left on the floor of the valves by muscles. The degree to which they are defined and their relative positions, however, may vary in different genera. In the pedicle valve, the pedicle and **diductor** muscle scars are grouped round two close-set adductor muscle scars (fig. 89). In the **brachial** valve, four adductor muscle scars are grouped on the floor of the valve, and the diductor muscle scars

