

# Ancient Shells at the Falls of the Ohio

## Part I: Brachiopods

What would it have been like to be a shell collector during the Devonian period, between 408 and 360 million years ago? Today collector's find shells in a variety of shapes, sizes and colors washed up on a beach. Those are shells of mollusks, usually gastropods (snails) and pelecypods (clams).

The fossil-bearing rocks at the Falls of the Ohio indicate that a Devonian beachcomber would have found mollusks and other types of shells washed up. The most common shell-bearing creature in the Devonian at the Falls is almost never found washed up on a beach today - that is the **brachiopod** (pronounced brak - e - o -pod). They are often called lampshells because some varieties resemble a Roman oil lamp.

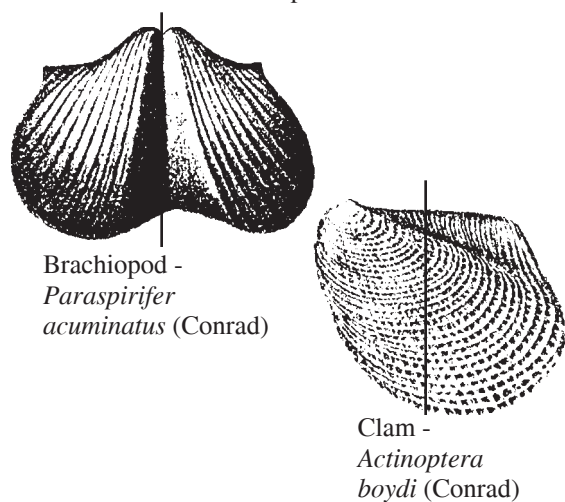


Figure 1: Shell symmetry

### What is a brachiopod?

Brachiopods are **invertebrates** — animals without a back bone — in the phylum Brachiopoda. They have two shells that may be composed of calcium carbonate (the minerals

calcite and aragonite) or a phosphatic mineral (like your teeth). Most brachiopods live on the ocean floor, though some burrow. Fossil records indicate that they have never lived in a freshwater ecosystem (like the Ohio River).

Perhaps the easiest method to differentiate a brachiopod from a clam is by shell symmetry (see figure 1). Each clam shell or **valve** is a mirror image of one another. Brachiopods are symmetrical from side to side, so that the top and bottom shells look different.

The internal anatomy of brachiopod is very different from a clam. Brachiopods have a coiled feeding organ called a **lophophore**. The lophophore may be occasionally preserved in some Devonian brachiopods found at the Falls of the Ohio and elsewhere in the county (see figure 2).

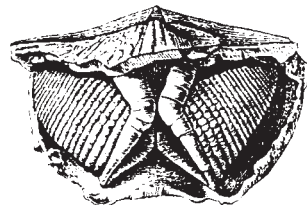


Figure 2: *Orthospirifer fornacula* (Hall) showing lophophores

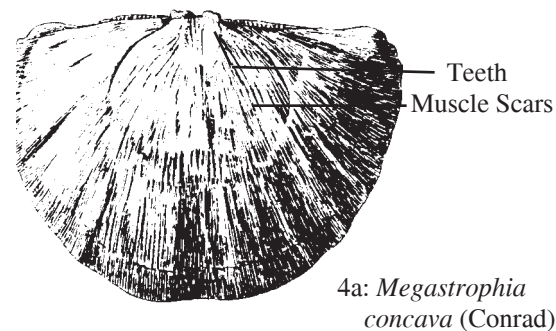
There are two major divisions or classes of brachiopods: inarticulate and articulate. **Inarticulate** brachiopods were the first to develop, and can be found in rocks dating back to the earliest Cambrian period, more than 570 million years ago. These brachiopods are not abundant in the local Devonian rocks. *Petrocrania hamiltonae* (Hall) is perhaps the most common inarticulate brachiopod (see figure 3).



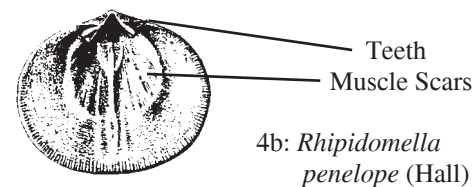
Figure 3: *Petrocrania hamiltonae* (Hall), an articulate brachiopod

Inarticulate brachiopods open and close their valves with muscles and do not rely on sockets and teeth that are a characteristic of articulate brachiopods. Devonian species of this class are often found attached to other organisms — such as another brachiopod shell or horn coral. The bottom **ventral valve** may be cemented to a firm surface, while the upper **dorsal valve** is opened for feeding.

**Articulate** brachiopods have two valves that are different size. The larger shell is called the **pedicle valve**. It contains a hole through which a fleshy stalk called a **pedicle** attaches to a **substrate** (rocks or sediment on the sea floor). The pedicle acts as an anchor which firmly holds the brachiopod in place. (Unlike most clams which can move through sediment, brachiopods are immobile throughout adult life.) The pedicle valve contains projections called **teeth** (see figures 4a & b), that fit into sockets on the opposite **brachial valve**.



4a: *Megastrophia concava* (Conrad)



4b: *Rhipidomella penelope* (Hall)

Figure 4a, b: Brachiopod teeth and muscle scars

The inside of some brachiopod shells contain muscle scar patterns (see figures 4a & b). The placement of these scars help paleontologists determine the placement of important muscles.

Articulate brachiopods come in a variety of shapes. Valves may be convex (bow out), concave (bow inward) or flat. There can be variation in the shape of the brachial and pedical valve. One might be concave, the other flat or convex. The **hinge line** is where the two valves of articulate brachiopods come together. It can be straight (as in figures 4a, 5, 6a) or curved (as in figures 6a, 7a & b, 8a & b). It can be short, relative to the width of the shell (figure 8b), or long (figure 4a).

Brachiopod shells often show interesting external ornamentation. *Brevispirifer gregarius* (Clapp) often shows pronounced growth lines and is strongly ribbed (see figure 5). *Protoleptostrophia perplana* (Conrad) and *Rhipidomella penelope* (Hall) are examples of brachiopods that have **costae**, which are very fine ridges on the outer surface of the shell (see figures 6). *Invertrypa spinosa* and *Productella spinulicosta* Hall are two brachiopods with spines on the external surface of the shell (see figures 7). *Invertrypa* spines are usually not preserved. Spines helped stabilize brachiopods in muddy sediment. Some brachiopods, like *Athyris* and *Cryptonella* are very smooth (see figures 8). Evidence of color patterns on valves are very rare from brachiopods of this age.

### Types of brachiopods at the Falls

There are six types or Orders of articulate and two Orders of inarticulate brachiopods that may be found at the Falls (see table 1). Most brachiopods are found on the “upper fossil beds,” rather than the coral-rich “lower fossil beds.” As a result, this group of fossils is visible for much of the year. Although brachiopods are common in rocks at the Falls, *please remember that fossil collecting here is prohibited.*

**Suggested Reading**

*The Audubon Society Field Guide to North American Fossils*, I. Thompson. Published by Alfred A. Knopf, 1982. Good general fossil book.

*The Devonian Fossils and Stratigraphy of Indiana*, E. M. Kindle, Indiana Dept. of Natural Resources, 1901. Out of print. Identifies most Devonian brachiopods found in Indiana. May be found in college, university and large public libraries.

*Fossil Invertebrates*, edited by R.S. Boardman, A.H. Cheetham, and A.J. Rowell. Published by Blackwell Scientific Publications, 1987. Chapter 16. College level text.

*Kentucky Fossil Shells*, Henry Nettelroth. Kentucky Geological Survey, 1889. Out of print. The first comprehensive, well illustrated book of fossil brachiopods and mollusks from Kentucky. This is a rare book, but may be found in large public or university libraries in the region.

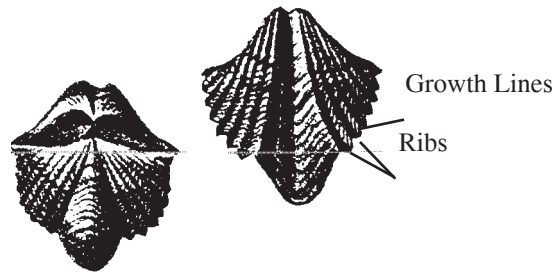


Figure 5: *Brevispirifer gregarius* (Clapp)

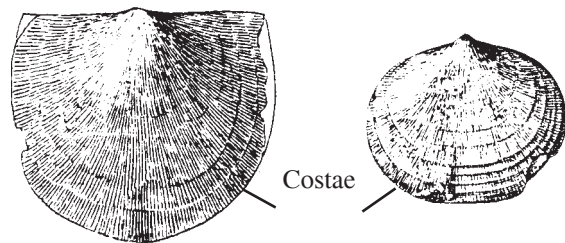


Figure 6a: *Protoleptostrophia perplana* (Conrad) 6b: *Rhipidomella penelope* (Hall)

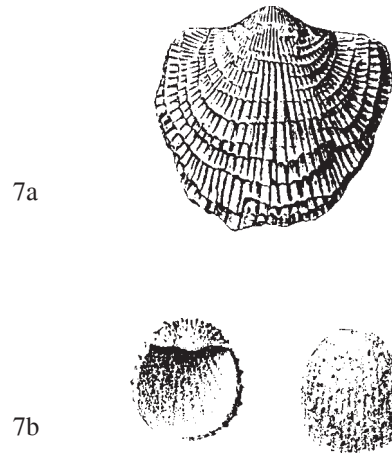


Figure 7: Brachiopods with external spines

7a: *Invertrypa spinosa* (Hall)  
7b: *Productella spinulicosta* (Hall)

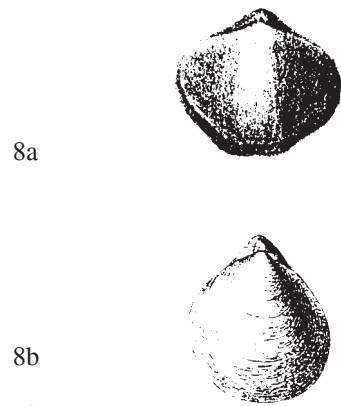


Figure 8: Smooth-shelled brachiopods

8a: *Athyris fultonensis* (Swallow)  
8b: *Cryptonella(?) lens* (Hall)

Illustrations from *The Devonian Fossils and Stratigraphy of Indiana* or *Kentucky Fossil Shells*.

**Table 1 Brachiopods of the Falls area**

- Inarticulate (Class Inarticulata)
  - Acrotretids (Order Acrotretida)
    - Acanthocrania granosa* (Hall and Clarke)
    - Craniella hamiltoniae* (Hall)
    - Craniops* sp.
    - Orbiculidea doria* (Hall)
    - \**O. lodiensis* (Vanuxem)?
    - Petrocrania greenei* (Miller)
    - P. hamiltoniae* (Hall) (see figure 3)
    - P. sheldoni* (White)
    - Philhedra crenistria* (Hall)
    - Roemerella grandis* (Vanuxem)
    - \**Schizobolus concentrica* (Vanuxem)
  - Lingulids (Order Lingulida)
    - Glossina triangulae* (Nettelroth)
    - \**Lingula spatula* Vanuxem
- Articulate (Class Articulata)
  - Orthids (Order Orthida)
    - Rhipidomella penelope* (Hall) (see figure 4b, 6b)
    - Tropidoleptus carinatus* (Conrad)
    - Schizophoria striatula* (Schlotheim)
  - Pentamerids (Order Pentamerida)
    - Pentamerella arata* (Conrad)
    - P. indianaensis* (Kindle)
    - P. pavilionensis* Hall
    - P. thusnelda* (Nettelroth)
  - Rhynchonellid (Order Rhynchonellida)
    - Attribonium gainesi* (Nettelroth)
    - Cupularostrum carolina* (Hall)
    - C. depressa?* (Kindle)
    - C. louisvillensis* (Kindle)
    - C. nitida* (Kindle)
    - C. sappho* (Hall)
    - C. tethys* (Billings)
    - Cyclorhina nobilis* Hall
  - Spiriferids (Order Spiriferida)
    - Acrospirifer duodenaris* (Hall)
    - Ambocoelia umbonata* (Conrad)
    - Athyris fultonensis* (Swallow) (see figure 8a)
    - Atryparia devoniana* (Webster)
    - A. ellipsoidea* (Nettelroth)
    - Brevispirifer (?) davisi* (Nettelroth)
    - Brevispirifer gregarius* (Clapp) (see figure 5)
    - Cyrtina crassa* (Hall)
    - C. hamiltonensis* (Hall)

- C. hamiltonensis* var. *recta* (Hall)
- Elyta fimbriata* (Hall)
- E. wabashensis* (Kindle)
- Emanuella subumbona* (Hall)
- Fimbrispirifer divaricatus* (Hall)
- F. grieri* (Hall)
- Invertrypa spinosa* (Hall) (see figure 7a)
- Mediospirifer audaculus* (Conrad)
- M. (?) manni* (Hall)
- M. (?) segmentum* (Hall)
- Megakoglowskiella raricosta* (Conrad)
- Meristella barrisi* (Hall)
- M. nasuta* (Conrad)
- Nucleospira concinna* (Hall)
- Orthostrophia fornacula* (Hall) (see figure 2)
- Paraspirifer acuminatus* (Conrad) (see figure 1)
- Parazyga hirsuta* (Hall)
- Pentagonia unisulcata* (Conrad)
- Spirifer(?) arctisegmentum* (Hall)
- Spirifer(?) varicosus* (Hall)
- Strophomenids (Order Strophomenida)
  - "Chonetes" *acutiradiatus* (Hall)
  - \**Chonetes lepidus* Hall
  - "C." *subquadratus* (Nettelroth)
  - Devonochonetes coronatus* (Conrad)
  - Eodevonaria arcuata* (Hall)
  - Floweria chemungensis* var. *arctostriatus* (Hall)
  - Leptaena rhomboidalis* (Wilckens)
  - Longirostra mucronatus* (Hall)
  - Megastrophia concava* (Hall) (see figure 4a)
  - Protodouvillina inequistrata* (Conrad)
  - Protoleptostrophia perplana* (Conrad) (see figure 6a)
  - Productella semiglobosa* (Nettelroth)
  - P. spinulicosta* Hall (see figure 7b)
  - Stropheodonta inequistriata* (Conrad)
  - S. demissa* (Conrad)
  - S. plicata* Hall
- Terebratulids (Order Terebratulida)
  - Camarospira eucharis* (Hall)
  - Centronella glansfagea* (Hall)
  - Cranaena (?) jucunda* (Hall)
  - C. harmonia* (Hall)
  - C. lincklaeni* (Hall)
  - C. romingeri* (Hall)
  - Cryptonella(?) lens* (Hall) (see figure 8b)
  - C. ovalis* (Miller)
  - C. (?) sullivananti* (Hall)

\* From the New Albany Shale