

# GY 112L Earth History

## Lab 9

### The Paleozoic: Part Three

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Fifth Edition: August 2009©

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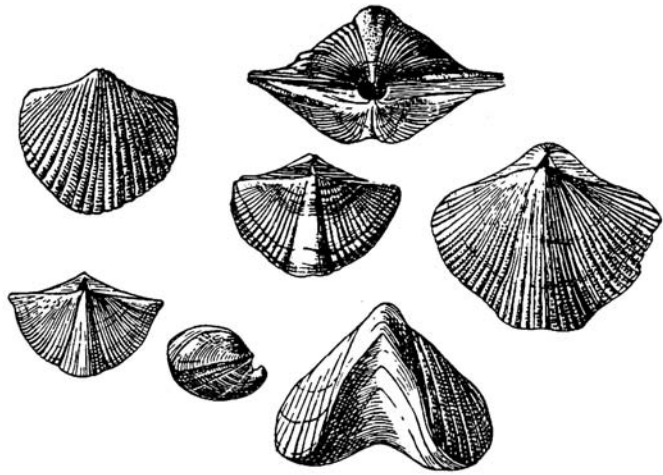
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The recipes that are included in some sections are intended to prove that you can eat anything as long as you serve it with plenty of ketchup. Neither Haywick, nor the Connors are responsible for any food poisoning that might occur if you actually try them.

<http://www.southalabama.edu/geology/haywick>



## Lab Nine

### The Paleozoic, Part Three: Brachiopods, Mollusca (Bivalves, Gastropods) and Alabama Stratigraphy

**Background:** This is the last of the Paleozoic labs in GY 112L (hold your applause; we start the Mesozoic next week!). You will have a chance to examine some Alabama rocks, consider geological maps and look at some new fossil beasts. Today you will look at two phyla, (1) **Brachiopoda** (the brachiopods) and (2) **Mollusca** (just bivalves and gastropods). As in previous labs, you will be asked to draw several of the specimens. Part of your mark will be based upon the quality of your drawings. Some of you have been doing very well. Keep it up! Some need to put a bit more effort into their sketches - you know who you are!

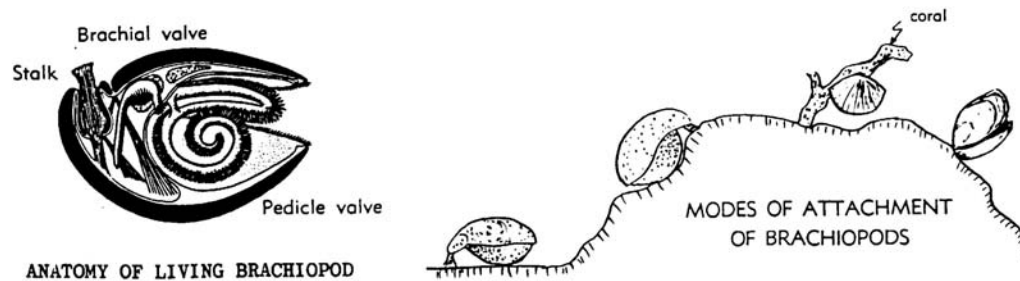
#### REMEMBER TO PUT SCALES ON YOUR DIAGRAMS

The rock suite consists of important Paleozoic rocks of Alabama. They are not presented in any particular stratigraphic order. Some are from the Birmingham area, others are from Huntsville or Decatur. One of the questions in today's lab asks you to identify the distribution of these Paleozoic rock units on an Alabama map sheet.



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Figure shows common Paleozoic articulate brachiopods. From Moore R.C., Lalicker, C.G. and Fischer, A.G., 1952. *Invertebrate Fossils.*, McGraw-Hill, New York.



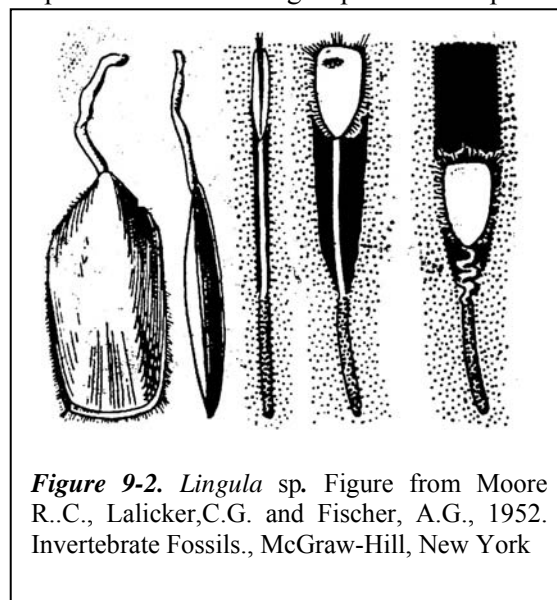
**Figure 9-1:** Cross section of a living brachiopod and a diagram illustrating their common modes of attachment to rocky substrates. From Brice, J. 1960. *Workbook in Historical Geology*. Wm. C. Brown Co. Publishers, Dubuque, Iowa 170p

### Phylum Brachiopoda

Brachiopods (Greek words *brachio* for arm and *podos* for foot) are bi-valved organisms, but they are NOT bivalves. Brachiopods contain two valves that are **bilaterally symmetrical** (symmetrical *across* the valves). The two valves are termed **brachial** and **pedicle** (Figure 9-1) and are distinguished from one another according to the type of soft tissue components that are attached to them. The pedicle valve is the attachment point of the **pedicle**, a fleshy stalk that protrudes from the brachiopod that the organism uses to attach itself to the sea floor (Figure 9-1). Brachiopods contain a lot of internal components including a digestive gland, an intestine, a mouth, a lophophore and a genital gland. Fine fibers called **septae** at the opening of the valves are used to create currents bringing food into the mouth of the brachiopods.

There are two main groups (classes) of brachiopods. **Inarticulate brachiopods** (Class: **Inarticulata**) have very similar pedicle and brachial valves (they are often hard to distinguish) that are held together without **hingement**. They are simpler and more primitive constructions than the other class, are often made of **chiton**, and usually have shells that are circular to rectangular in shape. The classic representative of this group of brachiopods is *Lingula* (Figure 9-2). This beastie holds the record for the longest lived animal genus. *Lingula* first evolved in the Cambrian and is still around today. In fact, it really hasn't changed all that much in over 500 million years.

The second class of brachiopods are called **articulates** (Class: **Articulata**). They are more advanced than their inarticulate cousins. The two valves are attached at the **posterior** (back) end of the brachiopod by a **hinge**. The **anterior** (front) end of the shell commonly contains **teeth** and **socket joints** that fit together greatly increasing the strength of the valve bond should the brachiopod be threatened by a predator.

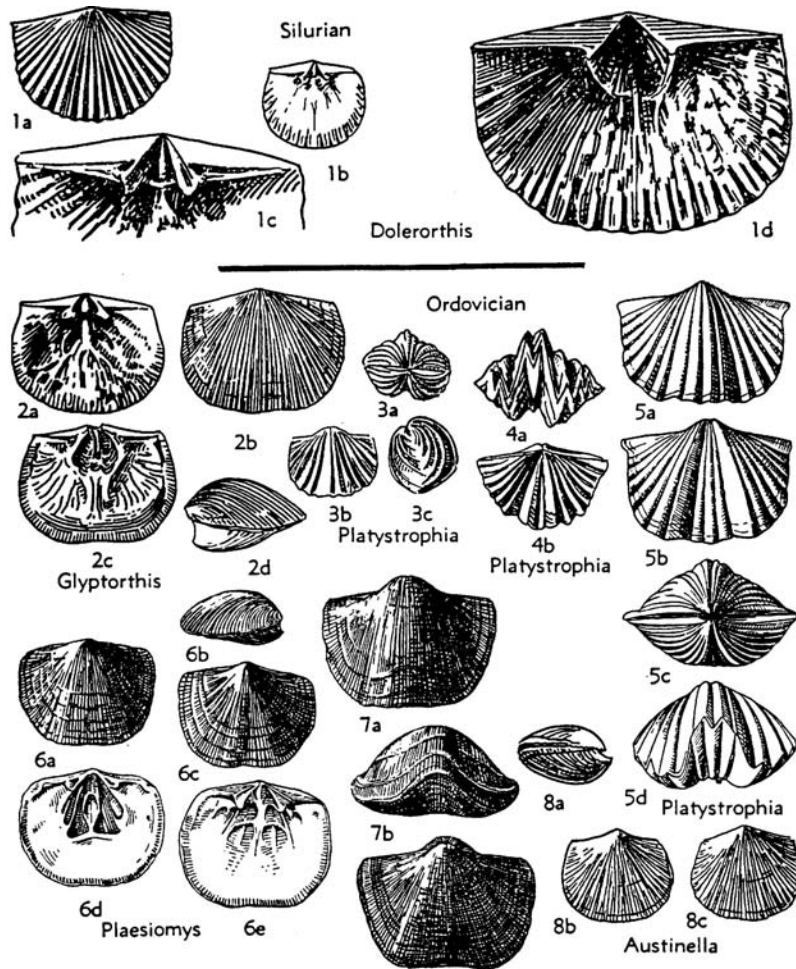


**Figure 9-2.** *Lingula* sp. Figure from Moore R.C., Lalicker, C.G. and Fischer, A.G., 1952. *Invertebrate Fossils*, McGraw-Hill, New York

Articulate brachiopods are among the most varied of all of the beasts that you will see in the rock record. Moreover, they are among the most ornamental of the shells. Many articulate brachiopods have concentric markings associated with growth called **growth bands**. They also commonly have radial ribs called **striae**. Some even had vertical **spines** much like sea urchins (in the Phylum Echinodermata). All in all, they are pretty impressive beasts. It is rather unfortunate that brachiopods are not as abundant or as varied today as they were in the past. During their hey day in the Paleozoic, they were in every marine niche imaginable. Today they are much less widespread and consequently, few scientists presently study them.

**Phylum Mollusca**

Every week your humble instructors have explained that each phylum comprises hundreds or thousands of individual genera and species. You usually do not need to know the fossils at these levels so we can get away with simply classifying the beasts as sponges, or foraminifera, or stromatolites etc. However, some phyla do have some divisions that you need to know (e.g., the 3 sub-classes of Anthozoans, or the two classes of brachiopods). The



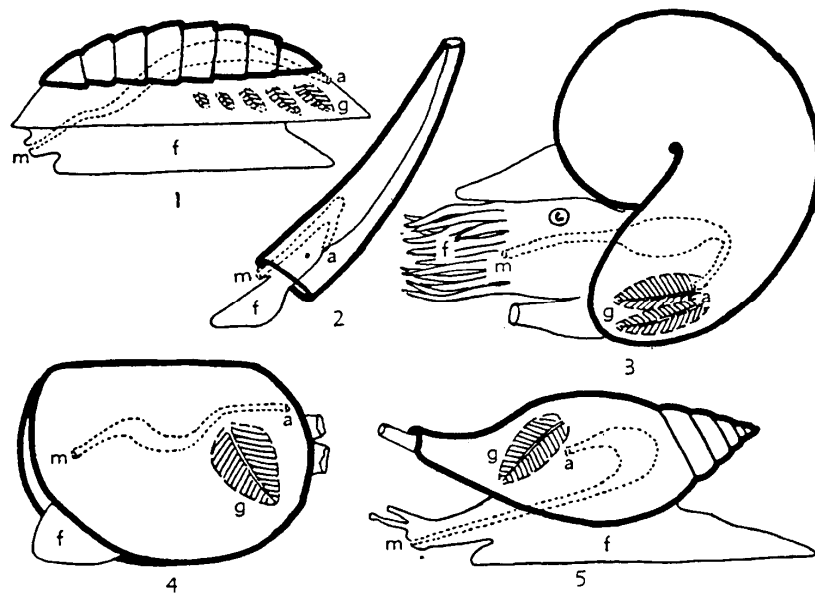
*Figure 9-3: Some of the many Paleozoic articulate brachiopods. From Moore R.C., Lalicker, C.G. and Fischer, A.G., 1952. Invertebrate Fossils., McGraw-Hill, New York.*

Mollusca are so important that we have no choice but to require you to have a more intimate understanding of their taxonomy. Hence Table 9-1:

Class	Order	Age Range	Common Beasties
Amphineura		Ordovician - Recent	Chitons
<b>Gastropoda</b>		<b>Cambrian - Recent</b>	<b>snails</b>
<b>Bivalvia (Pelecypoda)</b>		<b>Cambrian - Recent</b>	<b>clams, oysters, etc</b>
Cephalopoda	Nautiloidea	Cambrian - Modern	nautiloids
	Ammonoidea	Devonian-Cretaceous	ammonites
	Belemnoidea	Mississippian-Tertiary	belemnites
	Scaphopoda	Silurian - Recent	tusk shells
	Teuthoidea	Jurassic - Recent	squids
	Octopoda	Cretaceous - Recent	octopus

It is frankly amazing that so many different animals are classified in the same phylum. But there are common characteristics that warrant this grouping. Most of the geologically significant molluscs (those that leave a hard body part; Figure 9-4) contain a single shell. The lone exceptions are the bivalves. They contain two shells that are usually symmetrical between the valves; however, some bivalve shells are decisively non-symmetrical (e.g., *Ostrea* sp. – a type of oyster).

The material that you need to know in order to distinguish the molluscs is diverse and well beyond the space restrictions of this lab. For today, we would like you to focus in on 2 of the major groups of molluscs; 1) bivalves and 2) gastropods. We'll save the cephalopods for a future lab.



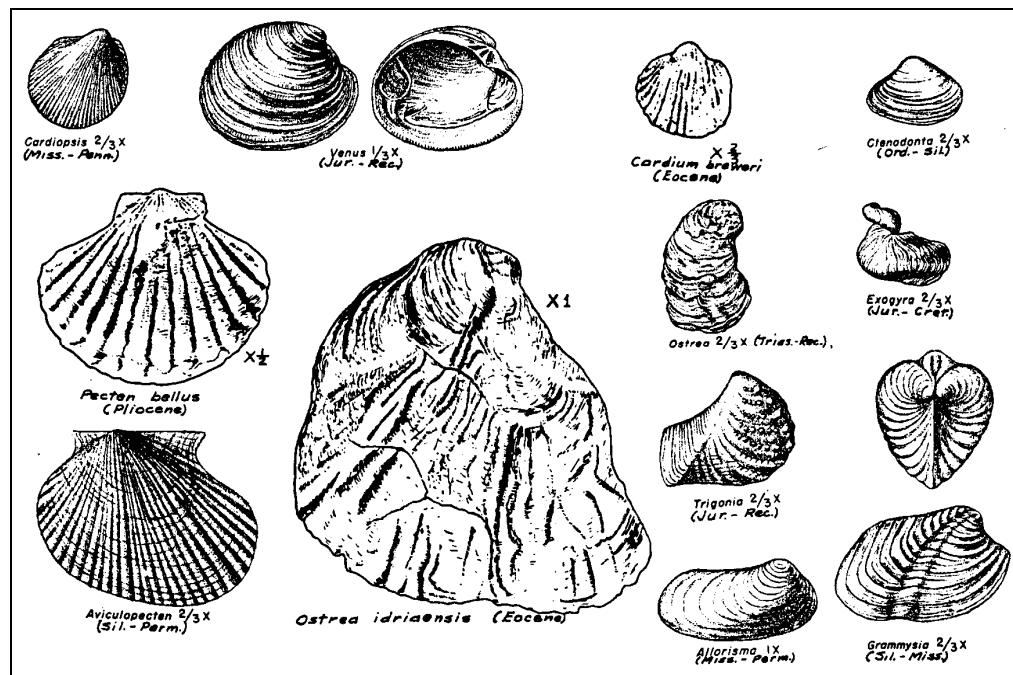
**Figure 9-4:** Diagrams of some geologically significant molluscs. 1: chiton; 2: tusk shell; 3: nautiloid; 4: bivalve; 5: gastropod. (a: anus; f: foot; g: gill; m: mouth) Moore R.C., Lalicker, C.G. and Fischer, A.G., 1952. *Invertebrate Fossils.*, McGraw-Hill, New York.

The following is provided here for review purposes:

**Bivalves:** The name bivalve is fairly new. They used to be called **Pelecypods** which is derived from the Greek words *pelekys* (hatchet) and *podos* (foot). "Hatchet-foot" referred to the shape of the muscular **foot** that extends out of the base of the shell. Most modern bivalves are composed of the mineral aragonite, but some prefer calcite (e.g., scallops, oysters). Most bivalves are marine (they primarily inhabit shallow marine environments), but some (e.g., a few clams and mussels) dwell in freshwater. Many fine recipes have been devised that feature bivalves. Pua, abalone, mussels, oysters and scallops feature prominently in many of the finest restaurants.

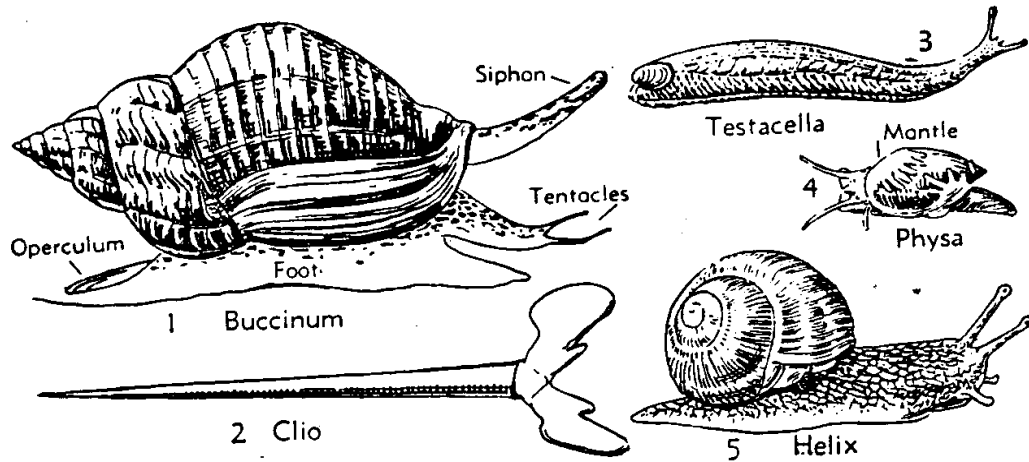
Bivalve shells are frequently externally **ribbed**. The insides of the valves are generally smoother (recall our lab discussing differences between internal and external molds of bivalves). Relatively unaltered bivalves commonly display **muscle scars** on the interior surfaces of the valves and **teeth** along the **hinge** where the two valves are attached (anterior side). The thickness of bivalve shells is highly variable. Species that live in **high energy** or turbulent waters along the beach may have thick and heavy shells. Those that live in deeper (**lower energy**) environments usually possess thin and friable shells.

**Gastropods:** When I think of gastropods, I picture escargot smothered in garlic butter or Florida Keys conch fritters. However, most paleontologists picture them as spectacularly beautiful coiled shells. Snails live in just about every environment. They are dominantly marine, but they also populate estuarine and freshwater environments, and even live on land. My mother used to constantly battle them in the family garden (Mom versus the Snail - makes a catchy movie title doesn't it?). All but a few gastropods crawl around on a fleshy **foot**. One of the exceptions is *Clio* sp. – it swims.

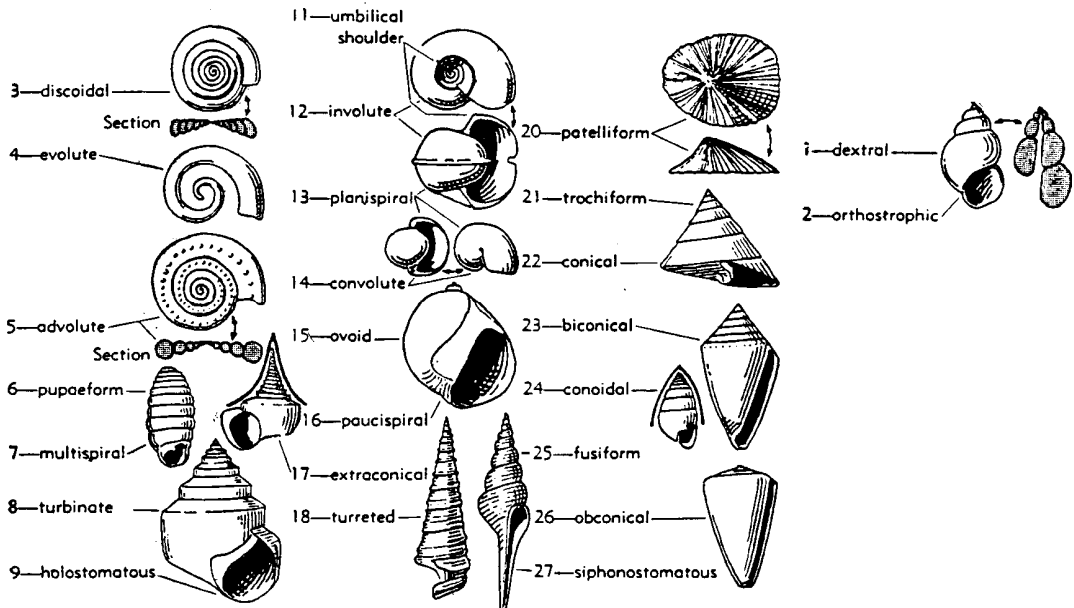


**Figure 9-5:** Diagrams of fossil bivalves. From, Brice, J. 1960. Workbook in Historical Geology. Wm. C. Brown Co. Publishers, Dubuque, Iowa 170p.

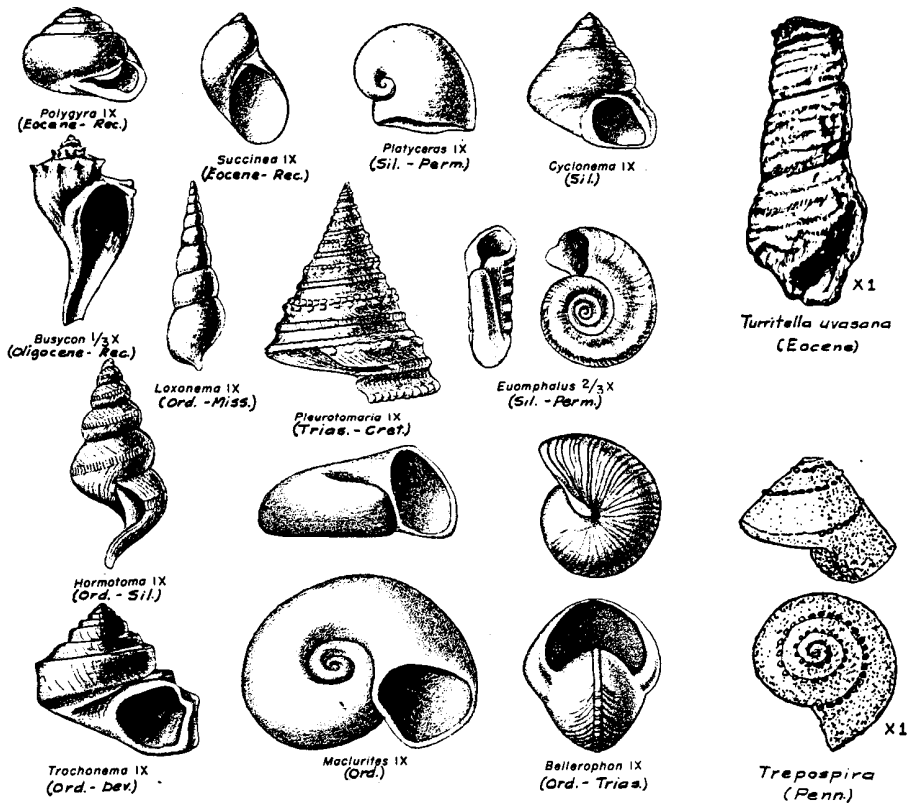
Gastropods can be **coiled** or **non-coiled**, **spired** or **non-spired**, **straight** or **spiral**. The classification of these beasts is done in part on the basis of the fleshy components (e.g., some snails have gills, others are air breathers) and in part on shell morphology. Luckily for us, we do not have to know the difference between all of the orders and families of the gastropods in this class, but it is a good idea to have an idea of some of the terminology that has been used to describe shell morphology (see Figures 9-7 and 9-8).



*Figure 9-6: Diagrams of some living gastropods. From Moore R..C., Lalicker, C.G. and Fischer, A.G., 1952. Invertebrate Fossils., McGraw-Hill, New York.*



*Figure 9-7: Gastropod forms and morphologies. From Moore R..C., Lalicker, C.G. and Fischer, A.G., 1952. Invertebrate Fossils., McGraw-Hill, New York.*



*Figure 9-8: Diagrams of fossil gastropods. From, Brice, J. 1960. Workbook in Historical Geology. Wm. C. Brown Co. Publishers, Dubuque, Iowa 170p.*



Notes and doodle space

### Doug's Cenozoic Mollusca surprise (AKA Coquille St. Jacques)

Serves four

½ pound large scallops (North Atlantic are best)  
1 large onion  
1 cup heavy cream  
4 large potatoes (red or Yukon gold)  
2 tbs butter or margarine  
1 tbs corn flour  
¼ cup sour cream (non fat preferred)  
1/3 cup shredded old cheddar cheese  
salt and pepper to taste  
1 chilled bottle of Sauvignon Blanc wine (Australia, New Zealand or Oregon)  
4 large scallop shells (Cenozoic ones are preferred)

Clean the scallop shells and put aside to dry. Open the bottle of chilled wine. Have a sip. Is it good? Is it cold enough? Have another sip to be sure. Peel and cube the potatoes. Place in a medium pot with water and boil under medium-high heat until cooked. Meanwhile, peel and dice the onion. Place the onion and the butter in a large skillet. Cook at medium-high heat until the onions turn golden. Have a drink of wine. Then add the scallops to the onion mixture. If the scallops were really large, you might want to half or quarter them before cooking them. Add about a ¼ cup of the Sauvignon Blanc wine to the scallop-onion mixture and poach until cooked (about 3-5 minutes). Taste the mixture. Is it good? If so, have a drink of wine to celebrate. If it isn't, add salt and pepper and have a drink of wine anyway. When the potatoes have cooked, drain the water from them and coarsely mash them. Add the sour cream and grated cheese and re-mash until the cheese has melted and the mixture is smooth. Have a drink of wine. Check the scallops. Are they done? If so, reduce heat and add the ¼ of the cream to the skillet. Mix the corn flour with the remaining cream and then add this to the skillet. Heat until the mixture thickens.

Arrange the scallop shells on 4 separate plates. Fill each of the shells with as much scallop mixture as you can. Spoon the potato mixture around the edge of the shell as a barrier/frame for the scallops. Pour some wine for yourself and 3 friends. Serve the scallops shells immediately after pouring the wine, but before you eat them, explain that all scallops shells, even those from the Cenozoic whose remains you are eating off of, are bilaterally symmetrical between the shells. Explain how this differs from the brachiopods which are bilaterally symmetrical across the shells. This is fascinating stuff and in order to prevent your friends' brains from overheating from their contemplation of your symmetry lecture, pour them some more wine.