Fossils

Overview

All students examine fossil ammonites and speculate on their natural history as if they were the first people to see one. The students then repeat this exercise with another fossil of their own choosing.

Background

Fossils are the mineralized remains or other evidence of previous life. The term comes from the Latin, *fossus*, which means literally, "having been dug up." Fossils range in size from micro (such as bacteria and other small organisms) to macro (such as dinosaur bones). The oldest fossils are stromatolites which first show up in the fossil record around 2.1 billion years ago. The exact age is a current hot topic of debate within paleontology circles, some scientists claiming they are 3.5 billion years old. Fossils are found for the most part in sedimentary rocks and can be formed in many ways, depending on the type of organism that is being preserved and environmental conditions. Fossilization is a relatively rare occurrence, which means that the fossil record has many gaps.

This lesson is intended as a simple introduction to fossils. All of the fossils in the activity are real fossils recovered from fossil bearing strata of rocks. The idea is just to have the students look at the fossils and start to speculate about the organisms involved and the conditions they lived under. This is much like the first people who found fossil remains in rocks that looked like organisms and wondered how they got there and what they were. Seashells on a mountain top? How could that be?

Materials

*Materials marked with an asterisk must be supplied by the teacher or the students.

Materials for the whole class

- Overhead of an ammonite (black line master below)
- Overhead of various other fossils (black line master below)

Materials for pairs of students

- Colored pencils
- 1 ammonite fossil per pair of students
- 1 'other fossil' chosen from the collection by each pair of students
- 1 hand lens

Materials for individual students

- *Paper
- *Science notebook

Procedure

- Start with the general question to students of what they have heard about fossils and then have an introductory discussion based on what they say.
- Pass out the ammonite fossil samples, one for each pair, and ask the students to make some detailed observations and drawings of their sample. Don't take too long for this part of the activity.
- Ask students to speculate on the organism that left this fossil. Have them sketch their *imaginary* view of the organism's habitat and write some notes about its possible life history, predators, food source, present day relatives, and other things they might think are important. This is what early scientists did, often with very comical results (when viewed with current understanding).
- Discuss with the class the results of their speculations and probe a bit as to why they thought one thing or another. Accept humorous suggestions, but gently probe for more serious ideas as well. Ask for the evidence they used to make their speculations.
- Present the class with an overhead of the ammonite picture and tell them some or all of the following information:
    - These fossils came from Germany.
    - They date back the Mesozoic Era, about 150 million years ago.
    - Ammonites are cephalopod mollusks, related to octopuses, squid, and cuttlefish.
    - Their bodies occupied the largest section of their shell. The smaller sections were filled with a gas that helped them maintain buoyancy in the water.
    - They lived in the open ocean as predators, using their tentacles and rasping beaks to feed on small fish and crustaceans (shrimp, etc.).
    - They were probably preyed upon by marine reptiles, sharks, and other larger fish.
- Now that the stage is set, it is a good time to ask, "How do we know what I just told you?" Ask them what kind of information they would need to gather to know or find out things about fossils. This is the time to start the general conversation about how scientists collect and generate information on events that nobody was around to see.
- Have each pair of students pick a new fossil sample. Have them observe and sketch this new fossil and speculate and draw as before. Have groups with similar fossils meet to share their speculations and drawings.
- Hold a brief class discussion to go over the groups' speculations and evidence and present information on what is currently known about these fossils. (See **Fossil Guide** below.)

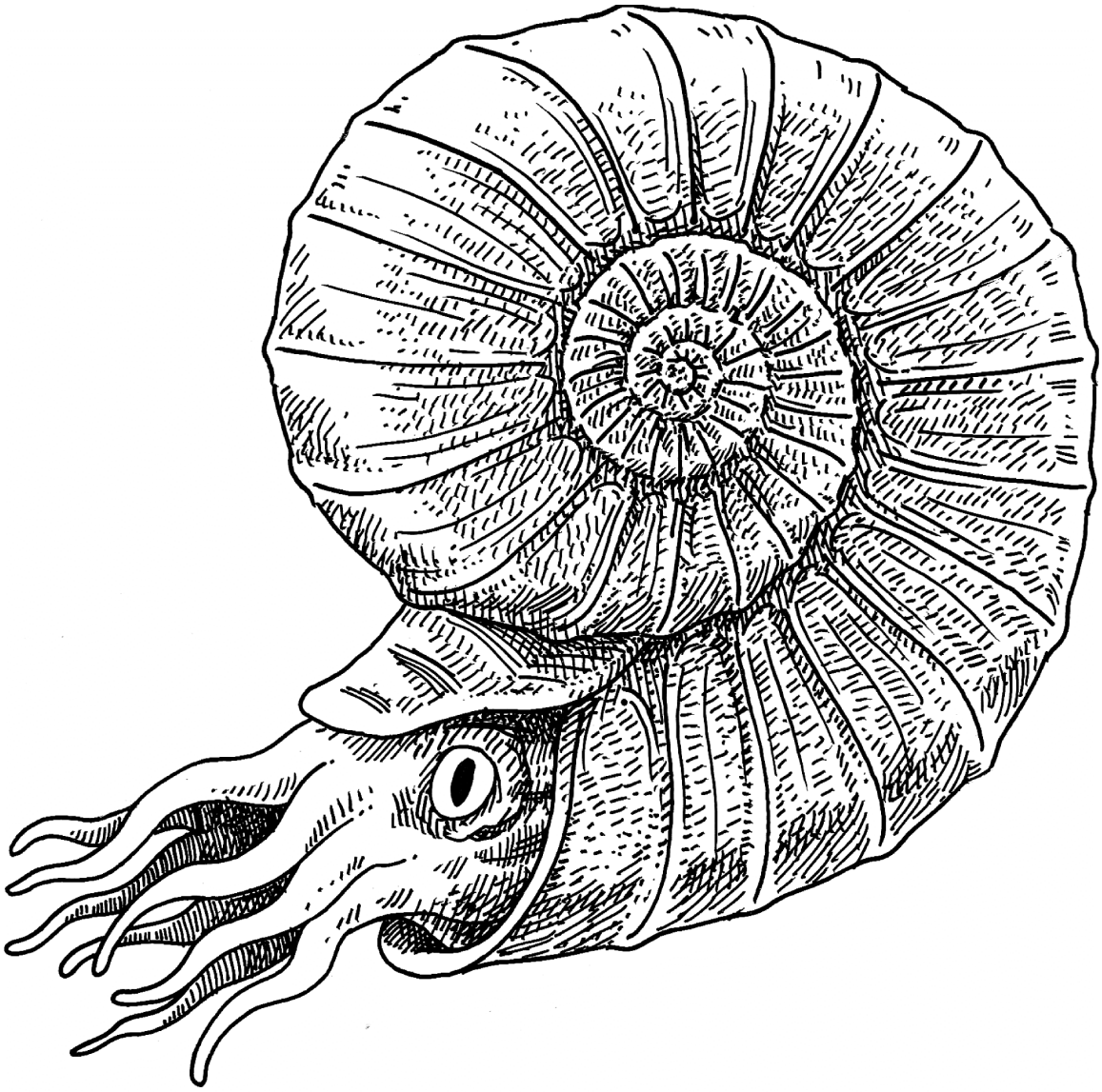
Reflection/Discussion

Ask students to compile their ideas of how one gathers evidence to explain events that one has not seen.

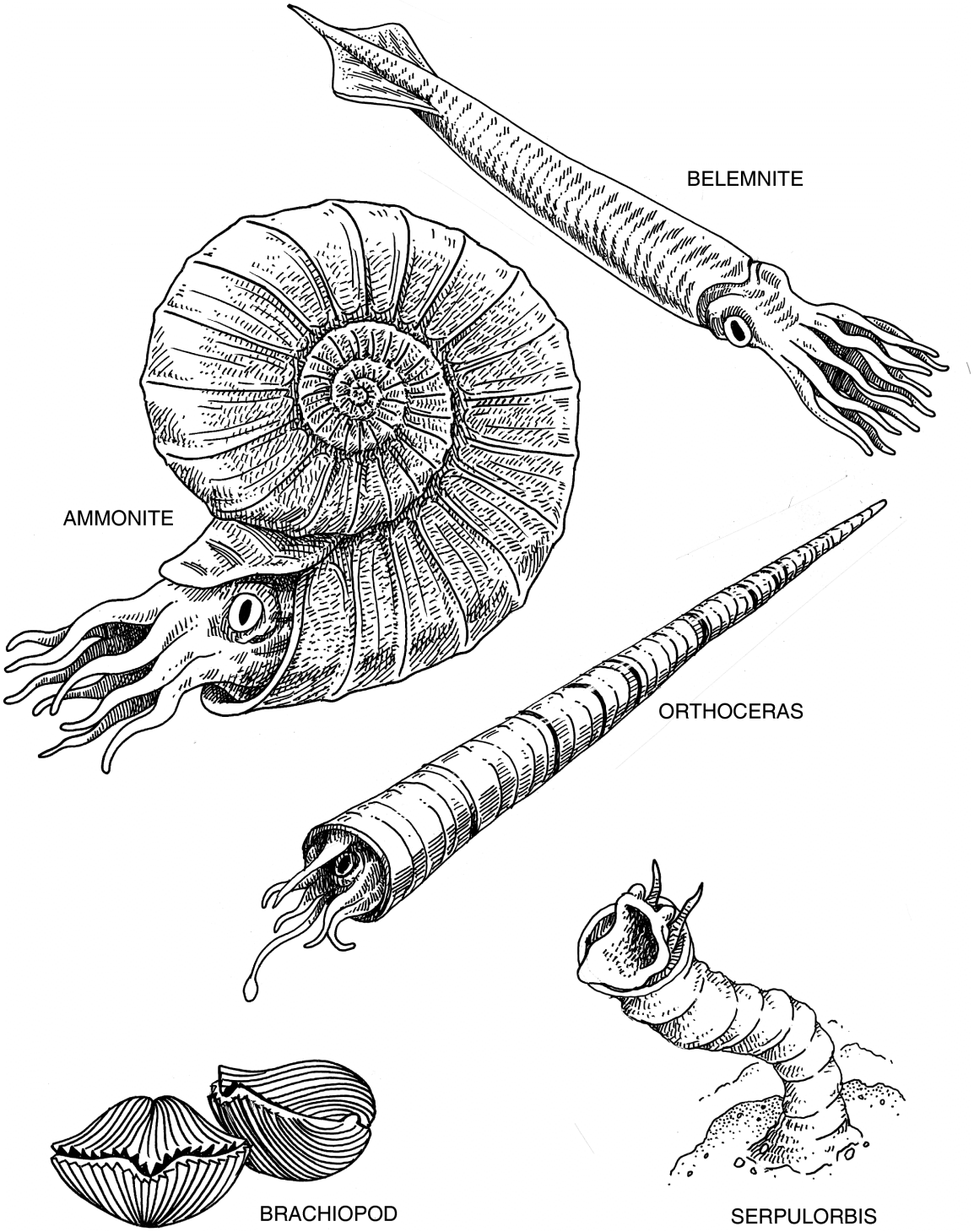
Fossil Guide

Each materials package will have some combination of the following fossils in labeled bags. They will be located in the cardboard box labeled *Assorted Fossils*.

1. Belemnites: These samples are from Jurassic Period deposits in Germany. The fossils resemble twigs or sticks with a hole in the middle. They are smooth, and some samples are tapered at one end. They are an internal part of an ancient cephalopod organism distantly related to modern day squid and cuttlefish.
2. *Serpulorbis*: These fossils that look like white worm tubes are actually the remnants of a gastropod (snail). They date from the Pliocene/Pleistocene Epochs or about 1.6 million years ago and were recovered from deposits in North Carolina. Modern day *Serpulorbis* look like a snail crammed in a tube instead of a shell. They are sedentary and catch their food by putting out a mucus net that traps plankton and detritus.
3. Shark Teeth: These samples are from Cretaceous Period deposits in North Carolina. The fossil record of sharks extends back 450 million years, with modern-type sharks appearing about 100 million years ago. Sharks produce thousands of teeth during their lives, replacing lost ones continually. The teeth are easily fossilized since they are composed of minerals to begin with. This explains the abundance of fossilized sharks' teeth. The shark species can sometimes be determined by the shape and size of the teeth.
4. Brachiopods: These are common fossils. Brachiopods can be found in rocks as old as the Cambrian Period and were a dominant life form throughout the Paleozoic Era. They resemble clams but are not related to mollusks; they belong in their own phylum. There are still living genera that generally live in cold water or deeper water "fringe" environments. Brachiopods have a distinctive appendage that they stretch out into the water to catch plankton or detritus. Their two shells are unequal in size and shape, and they attach themselves to the substrate with an organ called a pedicle.
5. Dinosaur Bone: These are fossilized pieces of bone from the Cretaceous rocks of Wyoming. It is not possible to determine the species, but students can let their imagination run free on this one. Students should note that the samples have some smooth surfaces and also what appear to be holes, much like the inside of a chicken bone.
6. Fish Vertebrae: These samples resemble beads with a hole in the middle. They are from Pliocene/Pleistocene age marine deposits in North Carolina. They are from species that resemble modern day fish.
7. *Orthoceras*: These organisms are related to the ammonites that were the first sample investigated in this activity. They are from the Jurassic. They are a cephalopod organism (related to squid and octopus) with a straight external shell.



AMMONITE


BELEMNITE
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ORTHOCERAS
BRACHIOPOD
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