Fossils

Activity 1 is for K – 2nd. Activities I and II are for 3rd – 5th

OVERVIEW
How does a living thing become a fossil? The mysterious processes by which evidence of past life is preserved are explored in these exercises. By thinking about and participating in some simulated processes, children will be able to remove much of the mystery behind fossils and fossilization. These exercises introduce the concept that fossils are remains or traces of ancient living things. They will also begin to think about how rare fossilization is.
Objective: After completing these exercises students will be able to: evaluate the importance of fossils to our knowledge of past life; identify conditions necessary for fossilization; construct a possible scenario for formation of fossils; understand how organisms are adapted to their environments; and understand the relationships of modern and ancient communities with their environments (i.e., ecology and paleoecology).

ACTIVITY I: FOSSILIZATION

Message: Not all parts of animals become fossilized. It may not be possible to know some details of what an ancient animal or plant was like because many parts of the anatomy may not become fossils.
Materials: Drawings of horse and *Stegosaurus* skeletons. (Figures 1 and 2)
Discussion: Fossilization is a rare event. The chances of a given individual being preserved in the fossil record are very small. Some organisms, however, have better chances than others because of the composition of their skeletons or where they lived. This also applies to the various parts of organisms. For example, plants and vertebrates (animals with bones) are made up of different parts that can separate after death. The different parts can be transported by currents to different locations and be preserved separately. A fossil toe bone might be found at one place and a fossil rib at another location. We could assume that they are from different animals when, in fact, they came from the same one.

Much information is lost in the fossilization process. Think, for example, of a vertebrate (such as ourselves). Much of what we consider important about our own biology is in the soft tissues, such as skin, hair, and internal organs. These characteristics would usually be unknown in the fossil state, because most of the time only bones and teeth are preserved (there are exceptional cases where soft parts are preserved). Bones and teeth are not always preserved together. This exercise is designed to get children to think about the quality of information that comes from the fossil record.

Procedures:
1) List facts about a living animal. The skeleton of a horse is used here, but there are many other possibilities (e.g., cow, dog, cat, sheep). The list of facts on the horse might

include, but not be limited to: large size, fast runner, eats grass, has grinding teeth, has long hair for a mane and tail, whinnies, is intelligent, is sociable with other horses, makes a good pet.
2) What would we know if this animal was extinct? Refer to the diagram (Figure 1) and point out an important generalization of fossilization: most of the time, only the hard parts (bones and teeth) are preserved as fossils. Go through the list and ask the class what we would know about the horse if horses were extinct and all we had were fossilized bones and teeth of horses. We would know that it was a large animal and could probably make some good guesses about its weight. We would know that it had grinding teeth and therefore could probably guess that it ate some sort of tough vegetation like grass. The hooves would not be preserved, but the shape of the foot bones would be a good indicator that it had hooves. The skeleton would also be useful to tell us that it was a fast runner. But no details of the hair or skin would be known. Everything about social behavior and vocalization would also have to be guesses.

3) What do we know about fossilized animals? Pass out the diagram of the fossil *Stegosaurus* (Figure 2) and interpret it in light of what we do know. Use the list you made in discussing the living animals. What paleontologists know comes from studying the hard anatomy, in this case bones and teeth. Anything else is a guess, although in most cases it is possible to base the guess on sound biological principles.

4) Use your imagination. As a summary to this exercise, have the class put muscles and skin on the diagram of *Stegosaurus*. Remember, skin color and texture are largely the choice of the artists, since fossil bones are of no help, although some skin impressions have been found.

ACTIVITY I / VARIATION I: Specializations
Both the horse and *Stegosaurus* have some bones that are not shared by the other. That is because each is specialized in some way. The horse is adapted for fast running, and therefore its feet have become specialized for running. They are simpler than those of *Stegosaurus*, with only one toe bone on each foot. Horses also have very specialized grinding teeth, while the teeth of *Stegosaurus* are simple slicing structures. *Stegosaurus*, on the other hand, has some very spectacular specializations in its huge armor plates and tail spikes. Some specializations of *Stegosaurus* are for defense because it was not a fast runner. What other differences between the horse and can you find? Can you think of a possible adaptation for these bones?

ACTIVITY I / VARIATION II: Imaginary Creatures
Draw a picture of a made-up creature with adaptations for a special way of life. Examples: a fast flier that eats leaves from the tops of trees; a burrowing animal that digs holes so fast no other animal can catch it. Describe how this animal is special and how it accomplishes what it does. Could paleontologists find out about this way of life from the fossil record?

ACTIVITY II: THE FOSSILIZATION GAME

Message: It is not easy to become a fossil. Many plants and animals never have the chance to be preserved as fossils.

Materials: Fossilization cards (Figure 3).

Discussion: The fossilization game is a fantasy and role-playing exercise that helps children understand fossilization processes.

Procedures:

1) Choose environment. The game begins with the class or smaller group choosing an environment in which there is a depositional setting such as a lake, pond, stream, river in a forest, or sea floor. The students can use their imaginations to describe this setting in as much detail as they desire.

2) Choose roles. Roles that the participants choose for themselves are possible animal or plant inhabitants of the chosen setting. For example, in the aquatic settings, possible roles include not only snails, clams, fish, salamanders, turtles, alligators, and other aquatic animals, but also horses, deer, monkeys, rabbits, and birds that came there to drink.

3) Begin play. When play begins, the children act out their roles, with each one given a turn to make vocalizations or gestures. For example, a child playing a fish could wiggle his/her body with a fishlike motion and make gulping motions with his/her mouth. A child playing a prairie dog might pretend to dig a burrow and make high-pitched barks. They can also interact with each other as they would in their natural environment. For example, the carnivores could chase the herbivores.

4) "Freeze" and decide the fate of the characters. At a time determined by the teacher, action "freezes" and the time for possible fossilization begins. The students draw cards which tell their fate. Possible cards might be: -You are eaten by scavengers; -You rot away before you can be preserved; -You are swallowed by a crocodile; -You are buried by a mudslide and preserved as a fossil.

— You can make several copies of the page of cards (included with this activity) to use in this. If you make your own, the proportion of "fossilization" cards to "destruction" cards should be small, mimicking the small chance of becoming fossilized in the real world.

5) Discuss the meaning of this exercise. When the entire class has drawn cards, discussion can begin. Have each student discuss his or her role as an organism and what happened to this organism after it died. Make a list of these organisms on the blackboard. Which animals became fossils? Which were destroyed? Remember, the only animals and plants future paleontologists will know anything about are the ones that become fossils. You will become aware of the important question of bias in the fossil record when you compare the list of fossils with the complete list of living animals. Is the list of fossils a good representation of the living community? Why not?

6) If time allows, play the game again with the same animals and plants. How are the results similar or different?

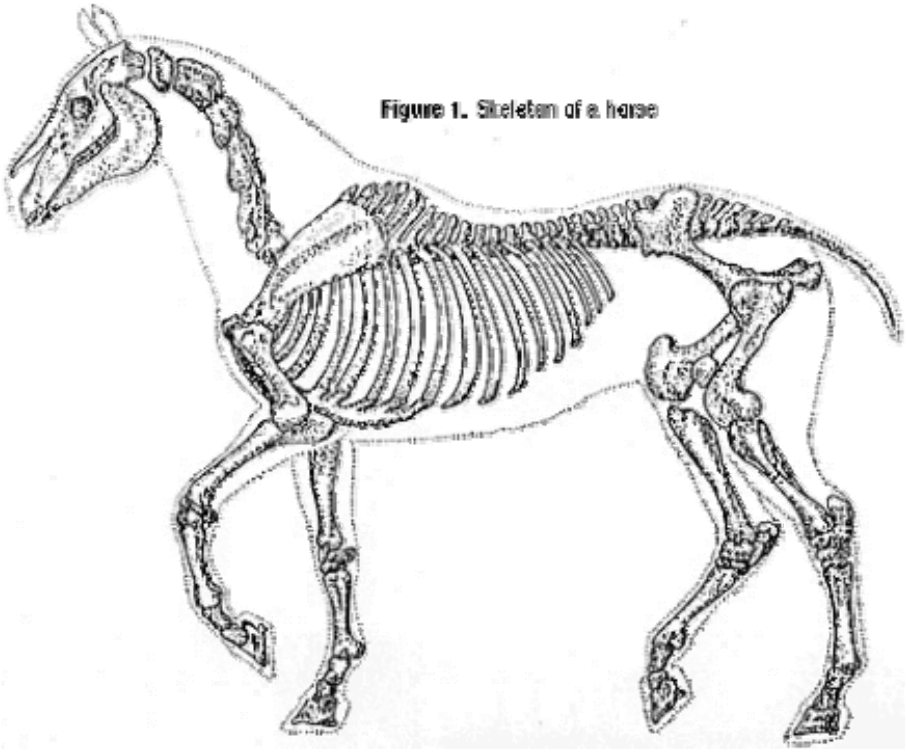

Figure 1. Skeleton of a horse

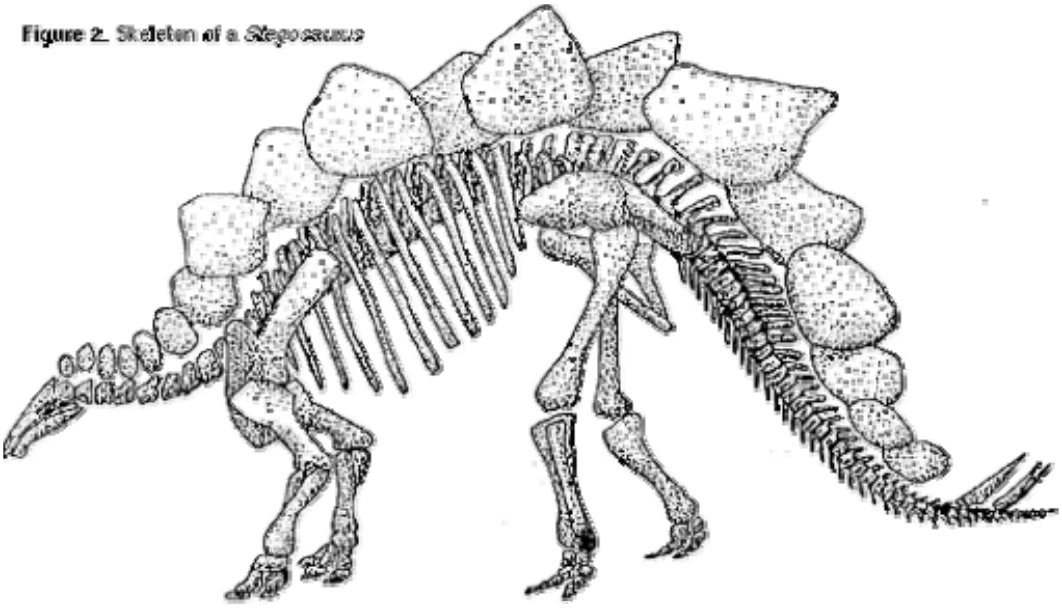

Figure 2. Skeleton of a *Stegosaurus*

Figure 3. Fossilization cards

DRY UP	DRY UP
ROT AWAY	ROT AWAY
ROT AWAY	SWALLOWED BY ALLIGATOR
SWALLOWED BY CROCODILE	SWALLOWED BY CROCODILE
SWALLOWED BY BIG FISH	SWALLOWED BY BIG FISH
EATEN BY SCAVENGERS	EATEN BY SCAVENGERS
BURIED IN SOFT MUD— YOU BECOME A FOSSIL!	BURIED IN MUDSLIDE— YOU BECOME A FOSSIL!
WASHED AWAY BY WAVES	WASHED AWAY BY WAVES
WASHED AWAY BY CURRENT	WASHED AWAY BY CURRENT