EXTENSION

If you had to choose, what kinds of things would you like to put in a time capsule that would be representative of the time you now live in? Which items would last the longest? Why?

Every period in the Earth's history appears to have had its own characteristic collection of life forms. The fossils of these organisms provide important clues to finding the relative and absolute ages of rock layers. One of many such examples is the fossil known as *Olenellus*. *Olenellus* was a marine animal known as a trilobite, a many-legged relative of modern crabs, lobsters, and insects. *Olenellus* lived within a fairly narrow range of geologic time, first appearing in that form about 550 million years ago. It became **extinct**, or died out, about 450 million years ago. During that 100 million-year period, it was abundant and spread widely in many oceans. Like the modern crab, *Olenellus* made its living crawling on the sea floor scavenging for food. So *Olenellus* was likely to be buried by new sediment when it died. Its hard, armoured shell, which was shed as the animal grew, was more resistant to decay than soft body parts, and was more likely to be preserved as a fossil than for example, a jellyfish.

Olenellus is an example of an **index fossil**, a fossil that is useful for indicating the period of geological time when a sediment was deposited. A **paleontologist** is a scientist who studies ancient life forms. By knowing how to recognize index fossils, paleontologists have learned how to determine the relative age of rocks, and to estimate their approximate absolute age.

ACTIVITY 12E A Matching Puzzle

Here is an opportunity to apply the same principles that paleontologists use in solving a relative age problem.

Sedimentary rocks containing fossils are located in many parts of the Earth. Unfortunately, there is no single place where all strata are found together, complete, and stacked neatly in order. To put all these layers in relative order we need to assemble many separate pieces. It is like sorting out a puzzle. Index fossils are valuable tools for allowing us to fit the pieces together.

The illustrations in Figure 12.14 show cross-sections of layered sedimentary rock from different locations. At least one index fossil was found in each layer. The key in Figure 12.15 gives the type of each index fossil as well as the name of the period of geological time during which it lived. The fossils in the key are arranged in random order.

PROCEDURE

1. You will be provided with a photocopy of the cross-sections from Figure 12.14. Cut out each of the six columns (do not separate the layers—it is important to know their relative ages).
2. Apply what you know about the law of superposition and index fossils. Arrange the columns side by side on your desk so that the fossils are in the order of their relative ages (see Figure 12.15).
3. Using additional information provided in the key, list the geologic periods in order. List the most recent period at the top and the oldest at the bottom.

DISCUSSION

1. (a) Describe in your own words how index fossils found in rock layers from two widely separated locations can be used to find out the relative age of the layers.
   (b) What information do you need to know beforehand?
   (c) What would you look for in other rock layers to find out which fossil is older?
2. In this activity, you may have noticed that some rock layers appeared to be missing from a sequence. What may have happened in nature to cause this? (HINT: What could have caused the rough and uneven surfaces where the missing layers should be?)

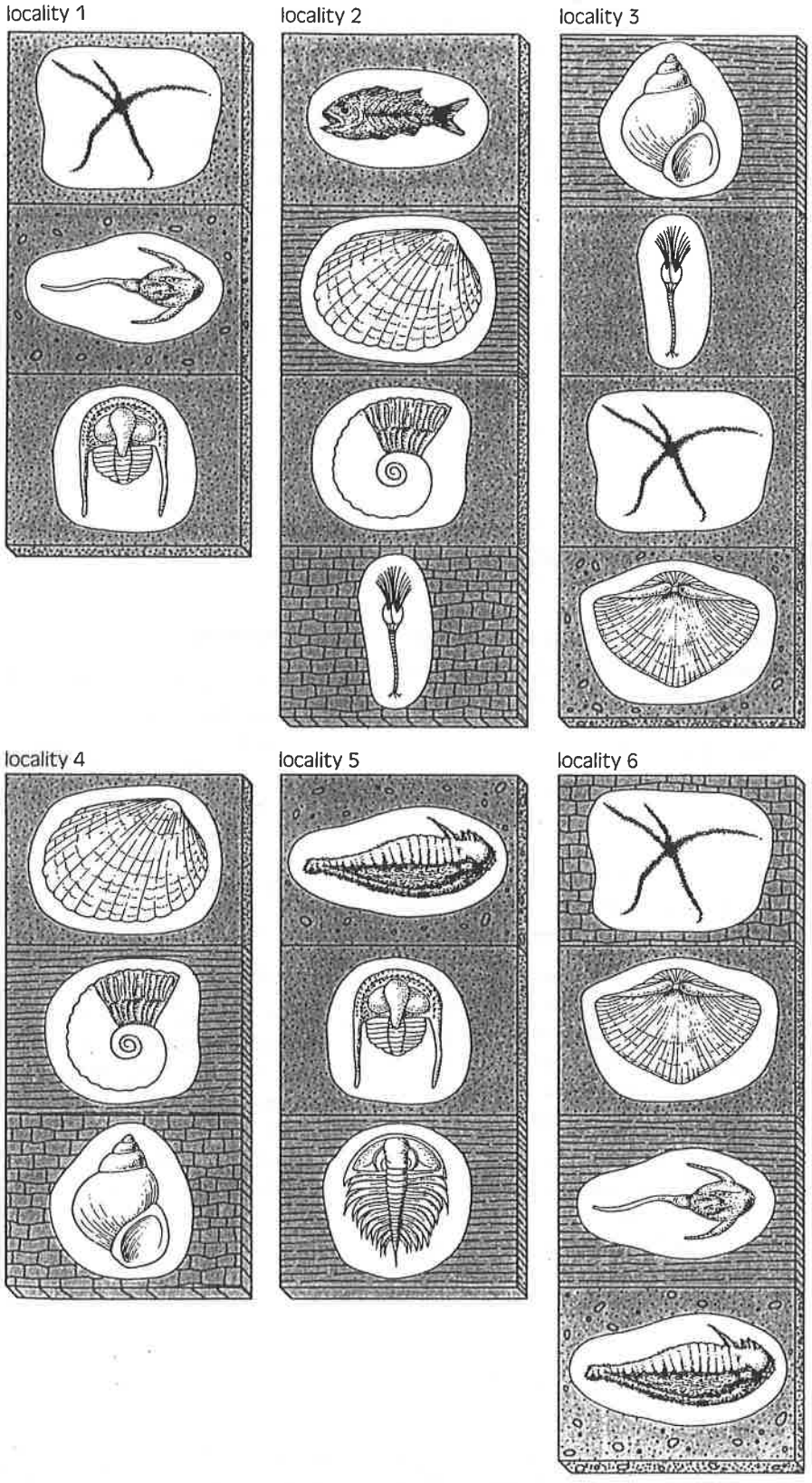

Figure 12.14
Geological cross-sections representing sedimentary rocks from six localities.

Key

Fossil	Type and period
	crinoid, Permian
	trilobite (*Olenellus*), Cambrian
	jawless fish, Devonian
	starfish, Pennsylvanian
	trilobite, Ordovician
	snail, Triassic
	eurypterid, Silurian
	ammonite, Jurassic
	brachiopod, Mississippian
	bony fish, Cenozoic
	clam, Cretaceous

Figure 12.15
Align the columns in Figure 12.14 so that layers of similar age are matched.