

# Time Capsules

## Overview

Students will receive 5 bags of human-made items, representing 5 different time periods. They will arrange the bags in chronological order from oldest to newest, thus simulating the role of fossils in the study of Earth's history.

## Background

When early geologists collected fossils and made detailed notes about the rock layers they came from, they noticed that certain fossils only appeared in specific rock layers (or horizons). Together with an existing understanding of the *law of superposition* (which states that in an undisturbed sequence of sedimentary rocks, the oldest layers are on the bottom and the youngest are on top), this showed that some fossils could be used as indicators of the relative age of the rock that contained them. First discussed by a British surveyor, William Smith, the *principle of fossil succession* is based on this observation. The fossils that are useful for comparing the age of rocks at different locations, even if those locations are on different continents, have become known as *index fossils*. A good index fossil comes from an organism that had hard-parts that could be easily preserved and identified, had a wide geographical distribution, and existed during a short span of geologic time.

This activity uses human-made objects instead of fossils to develop an understanding of the role played by index fossils. It should be noted that *biological evolution* is different from human-generated *technological evolution*. Things change over time in both processes, but biological evolution has no 'directed purpose.' *Random* genetic changes persist or disappear through natural selection. On the other hand, when humans purposefully set out to design something, they may discover new methods to achieve their goals. These *intentionally* developed new methods often are improvements or refinements on existing methods; thus the notion of technological evolution.

## Materials

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

### Materials for the whole class

- Transparency of capsule bag contents (black line master below)

### Materials for small groups

- One set of 5 different time capsule bags for each pair of students (see list of contents below)

### Materials for individual students

- \*Science notebook

## Procedure

- Start by telling students that a worker at the Perplexed Paleontology Plant mixed up some science materials. Students will receive 5 bags of items, representing 5 different time periods. The contents of the bags are correct, but the worker lost the information about the ages of the bags. The students need to arrange the bags in chronological order from oldest to newest. They should inspect and analyze the items in the bags to provide evidence for their order. The items in each bag are items that could be found in that time period. Tell students to take only *one* time capsule bag at a time and record a detailed inventory of the items in that bag. They should then list what clues each item provides as to the relative time period of that entire bag with respect to the other bags. Once they have processed each individual time capsule bag, they should then place the bags in order based on relative time period as determined by the clues in each bag. They should be prepared to back up their order with clear evidence and reasoning.
- After students have put the bags in order, ask them for their supporting evidence. Ask them to explain the traits that made an item helpful or not helpful. If the job seems too easy, ask them which items should be removed from the bag to make the task more difficult.
- After students have completed the assignment, show them an overhead of the black line master below, and have them return the appropriate items to each bag.

## Reflection/Discussion

Use the discussion of the human-made items to begin a discussion of index fossils. The overhead of the capsule bag contents can be used to aid the discussion. Be sure to include a comparison between biological and technological evolution as described in the **Background** section above.

## Assessment

Have students pick ten different items that should be put in a time capsule that would help paleontologists a thousand years from now understand life in the early 21<sup>st</sup> century. Ask them to justify each selection with emphasis on how their selection might be different from a related item in the future.

## Contents of Time Capsule Bags

<b>Capsule H91</b>	<b>Capsule A622</b>	<b>Capsule X435</b>	<b>Capsule R183</b>	<b>Capsule F77</b>
wooden match	wooden match	wooden match	wooden match	wooden match
leather shoelace			black shoelace	
wooden button			plastic button	plastic button
	metal zipper	metal zipper	plastic zipper	Velcro strip
		45 RPM record	cassette tape	CD
fabric samples w/blue flannel	fabric samples w/blue striped cotton	fabric samples w/green check pattern	fabric samples w/3 pieces	fabric samples w/fleece material
quill pen	pencil	pencil	pencil	pencil
metal spoon w/intricate design	metal spoon w/intricate design	metal spoon w/intricate design	metal spoon w/simple design	metal spoon w/simple design
		white plastic spoon	white plastic spoon	colored plastic spoon