

The Earth

Background Information

Our Earth's history began some four and a half billion years ago, as the planet of molten rock began to cool. Over the course of several million years, a thin outer shell formed. This shell broke apart into continent-sized landmasses. This "crust" is about eighteen miles thick and floats atop a seething, semi-molten rock "mantle" about eighteen hundred miles thick. The next two thousand miles below the mantle are molten rock surrounding the Earth's solid inner iron core. If the Earth were the size of an apple, the crust that supports life would be thinner than the skin of the apple.

The seemingly immovable anchored land masses continuously collide, separate and move, all in response to the molten energy of the mantle on which they float. We are accustomed to thinking of the continents as discrete bodies permanently separated by vast stretches of ocean. In fact, they have come together at least four times in the last two and a half billion years to form giant supercontinents.

As the surface of ancient Earth cooled, water vapor formed, and generated lashing rains that filled the oceans. The planet could not support life, and even rocks do not survive from this period. The next three billion years witnessed the emergence of oxygen-breathing, cellular life forms.

The passage of time in geologic terms is so vast that it is difficult to comprehend its scope. A useful exercise is to have students stretch out their arms. The distance they span represents the passage of time from the formation of the earth to the present. From the right wrist to the tips of the fingers represents most of the history of life on Earth. The tip of the fingernail represents human presence on Earth.

Part I: From Beneath

Objective

By the end of this activity students will be able to:

- demonstrate theories of how Earth's land-masses were formed.
- compose a list of items found on Earth.
- compare listed Earth items with items to be learned about the other planets.

Instruction Time

20 minutes

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Materials

- 1 small aluminum pan per group
- 3-4 spoons per group
- 1 candle (dark color wax)
- Matches
- 1 jug
- Hot water

Procedure

1. Fill the jug with hot water (from a classroom sink or bathroom).
2. Divide students up into groups of 3-4. Give a pan and spoons to each group. Pour some hot water into each pan.
3. Light the candle with a match. As the wax melts, go over to each group and drip some into the pan. Ask students to start stirring the contents in the pan with their spoons together.
4. As you finish, tell them this is what Earth looked like a long, long time ago, before there was any living thing.
5. Ask them to stop stirring, and watch what happens as the water cools off.

Safety Considerations: Do not let students handle the candle and matches. Do not let them touch the hot contents in the pans. Beware of spills.

Part II: What is Special about the Earth?

Instruction Time

15-20 minutes

Materials

- Astronomer Journal page 7
- Crayons

Procedure

1. Ask students to brainstorm a list of characteristics that make Earth the only planet in the solar system able to support a wide variety of living things, for example: mild temperatures, atmosphere, liquid water.
2. Then, have students draw and label some of the items from their list on page 7 of their Astronomers Journals.
3. In later lessons, when studying other planets, refer to these drawings to compare what can be found on Earth compared to other planets.

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Expected Results and Explanations

As the water cools off, the wax should harden and float to the top. This became Earth's crust, or 'ground' we stand on. The hot wax and water mixture represents the earth in its molten, or 'melted', form. Scientists theorize that as the planet cooled the less dense rock floated to the top and hardened, forming the earth's crust. The inner parts of the earth, the mantle and core, are liquid as is the water in this demonstration.