The Shallow Sea: Coral Reefs

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Coral Reefs: Exploring the Environment

Coral are ancient animals that evolved into reef building forms over the last 25 million years. Coral reefs are among the most biologically diverse regions on Earth. They are often called the "rainforests of the sea."

The **coral reef** is an entire living system, a structure built by colonies of tiny coral animals over millions of years. Teeming with as much **biodiversity** as **terrestrial** rainforests, coral reefs are one of Earth's most important ecosystems, with their extraordinary beauty, bright palette of colors, and oddly patterned inhabitants.

The biodiversity of the reef system supports a vast interdependent **food web**, from microscopic plants and animals to humans.

We are learning how the coral reef **ecosystem** is dependent on the complex interactions of its inhabitants. From the microscopic plants that live within the tissues of the corals to the diversity of invertebrates and fishes that find food and shelter within the colorful caves and crevices, the reef system's millions of species also provide important food sources for sharks, sea turtles and dolphins.

Millions of people throughout the world depend directly on the reefs for their livelihood. The corals that form the structure of a coral reef are living animals that feed, fight, reproduce and grow. Corals are **invertebrates**, animals without a backbone, belonging to the class **Anthozoa** (An-Tho-Zoa) and the phylum **Cnidaria** (NI-DARIA).

Corals, like other anthozoans, have a simple body structure that has only one body opening, the mouth. They are closely related to other cnidarians such as jellyfish, which float through the water, and anemones that , like corals, attach themselves to a hard surface. The individual coral animal body unit is called a "**polyp**".

Each polyp has a mouth surrounding by a ring of tentacles leading to the stomach. Coral polyps are connected to otherpolyps in a colony. A **colony** is formed of millions of polyps which grew from one original larva that by dividing and **budding**, and in some cases **fusing**, became a group of interconnected organism. As the coral grows, new polyps are formed.

MOST*

VOCABULARY

Anthozoans
Biodiversity
Budding
Cnidarians
Colony
Coral reef
Ecosystem
Food web
Fusing
Invertebrates
Nematocysts
Polyp
Terrestrial
Symbiosis
Zooxanthellae

Inside This Packet

New York State Standards

Middle School Activity

Standard 4: Physical Setting
Key Idea1: 1.1a, 1.1b, 1.1e, 1.1g
1.2a, 1.2b, 1.2g
Key Idea 3: 3.2a, 3.2b
Key Idea 5: 5.1a, 5.1b

Information pulled from Exploring the Environment: Coral Reefs
created by the Center for Educational Technologies - www.cotf.edu/ete

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Old coral reefs may be over 100 feet thick, but the living part is only a thin veneer of corals and other organisms, perhaps only a few feet thick on the surface.

Coral tentacles are armed with stinging structures called **nematocysts** that the coral uses to capture tiny animals in the ocean water called plankton. The plankton is deposited in the mouth, passes to a cavity where it is digested and nutrients are absorbed. Solid wastes then pass back out through the coral polyps mouth. Food is shared with neighboring polyps in a colony through connections between individuals. Space on a reef is limited and corals will fight with their neighbors, including other plants and animals, to prevent overgrowth.

For a long time coral were a mystery. They were called a plantanimal, animal plant and rock plant. We now know that coral are a complex mix of animal and plant life with microscopic forms of plants called algae living within the coral. The type of algae that lives within the coral are called **zooxanthellae**. The small animals we now know as polyps.

The small zooxanthelae algae perform photosynthesis, using light energy to convert water and carbon dioxide into food. Although coral polyps are carnivorous, they receive much of their energy from this photosynthesis. In return, the algae have a safe place to live within the coral tissue, and the algae use the coral's wastes for growth. This type of arrangement, when both organisms benefit is known as a mutuality **symbiosis**.

Demonstration/Activity: Convection Currents

MATERIALS NEEDED

Large clear jar or beaker

Food coloring
(blue and yellow)

Rubber band

Sharp pencil

Water

Non-latex glove

Students should be able to:

Explain the theory of plate tectonics

Explain the convection cell theory

Describe how density differences drive convection cell theory

Relate heating and colling cycles to density changes

Define a subduction zone

Define a divergence zone

Point out the location of the Mid-Atlantic Ridge

List 4 types of evidence that support the plate tectonics theory

One of the theories behind plate movement is convection currents.

Here's how scientists think it works: Hot molecules move around faster than cool ones. This fast movement causes the molecules to spread further apart and be less densely packed than cooler molecules. When a liquid is heated, it is less dense (lighter) than when it is cool. Lighter, less dense objects tend to float on top of heavier, denser materials. The very hot core of Earth is constantly heating up the material in the mantle closest to the core. This hot liquid rock, being less dense, rises very slowly through the mantle towards the crust. As the liquid rock rises through the mantle, it cools and becomes heavier causing it to slowly sink. This rising and sinking motion creates currents that are said to be one of the factors that slowly move the tectonic plates, what works out to a few inches a year.

What to do:

1. Fill non-latex glove with HOT water. Place yellow food coloring in the glove. Make sure the glove is quite full and rubber band the top to secure. Be very careful and place the glove in the large jar or beaker.

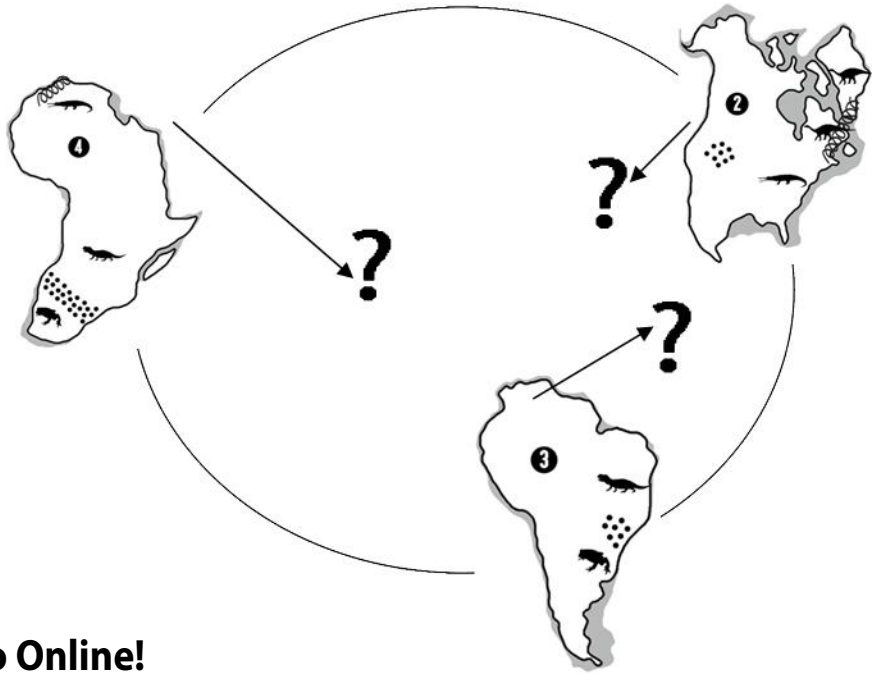
2. Fill the jar with COLD water so that water covers the glove and comes nearly to the top of the jar. Add blue food coloring to the COLD water.

3. Carefully poke a hole in the plastic glove with the pencil. What happens?

What is happening?

The hot yellow water, being less dense, rises through the cooler blue water leaving a green trail as it moves. As the hot water (green trail) reaches the surface of the water it begins to spread. As the hot water cools, it becomes more dense causing it to sink. A convection cell is generated that is visible by the green trail.

Activity: A Plate Tectonic Puzzle



Go Online!

To print this activity, please visit:
http://amnh.org/education/resources/rfl/pdf/dinos_plate_tectonics.pdf

Once you print the activity, cut out the land masses and try to find the right spot to put them on the globe. Examples can be seen above.

After completing the puzzle have student teams share with another team their results and explain their findings.

Solve the puzzle to discover what the Earth looked like 220 million years ago.

1. What's the code?
Use a legend to identify the symbols on each island or continent.

2. Puzzle me this.
Look at the shapes of continents and islands. What landmasses seem to fit together?

3. Let's rock!
Examine the evidence and try to match up landmass boundaries that show similar rock strata, fossilized desert belts, and dinosaur fossils.

4. Hold that Pose.
Look over the arrangement of the continents and islands and decide if the position of any of them should change. When you are satisfied with your map of Pangaea, tape or glue it down on the world map.

This activity is provided by the American Museum of Natural History, New York City.