Searching for the Intra-terrestrials:
Microbiology beneath the Seafloor
Tagging A Microbe

Overview

In this activity, students use Lego blocks to learn one method microbiologists use, called Fluorescence In-Situ Hybridization (FISH), to "tag," identify, and study microbial diversity found deep below the sea floor. Students use the Lego pieces to build genetic strands of different bacteria and the probes that will tag them. This activity can be used with very little student background knowledge if pre-activity explanation is simple and vocabulary is kept to a minimum. It can also be used concurrently or after material on RNA base pairing is taught.

Objectives

1. To understand how RNA base pairing allows microbiologists to design fluorescent probes that attach to unknown microbes in a deep sea environment.
2. To learn the role the JOIDES Resolution plays in exploring the deep biosphere.
3. How are the different microbes living and interacting with biotic and abiotic factors below the sea floor?
4. How do the different microbes survive in such extreme environments?
5. The ocean supports a great diversity of life and ecosystems.
6. The ocean is largely unexplored.

Materials

- For each group:
  1. Assemble bag kits for student groups, and expose the green bricks to light so they will glow.
  2. Make a viewing box using a shoebox with a 4" cardboard roll inserted in the top.
  3. Print student page.
  4. Make a viewing box using a shoebox with a 4" cardboard roll inserted in the top.

Advance preparation:

In 1998, Whitman, et al. proposed the idea that 72% of the Earth's prokaryotes (bacteria and archaea) live in the deep ocean sediments. Whitman did not include rocks at and below the ocean floor, but we now know from drilling expeditions on the JOIDES Resolution that there is a substantial number of organisms living in this extreme environment. By some calculations, it is estimated that 1/3 of the Earth's entire biomass lies below the ocean floor. The concept of deep ocean life is largely unexplored.

Alternative: To make larger strands, tape two or more together to make 16X1 bricks and replace the 1X1 bricks listed below with 1X2.

Background

Tagging A Microbe - Teacher Guide

National Science Education Standards

A - Science as Inquiry
1. To understand how RNA base pairing allows microbiologists to design fluorescent probes that attach to unknown microbes in a deep sea environment.

B – Life Science
2. To learn the role the JOIDES Resolution plays in exploring the deep biosphere.
3. How are the different microbes living and interacting with biotic and abiotic factors below the sea floor?
4. How do the different microbes survive in such extreme environments?
5. The ocean supports a great diversity of life and ecosystems.
6. The ocean is largely unexplored.

Ocean Literacy Principles

1. What kind of bacteria are living in the rocks and sediments below the seafloor and how many are there?
2. How are they affecting local and global ocean chemistry and biomass?
3. How do they affect the different microbes living in the sediments and sediments below the sea floor?
4. How do they affect the different microbes living in the sediments and sediments below the sea floor?
5. How do they affect the different microbes living in the sediments and sediments below the sea floor?
6. How do they affect the different microbes living in the sediments and sediments below the sea floor?

Reference materials:

- Advanced Readings-deep biosphere research: earth.usc.edu/~kje/pubs.html
- JR - Expedition 327 Juan de Fuca: joidesresolution.org/node/1154
- JR - Expedition 330 Louisville Seamount: joidesresolution.org/node/1622
- JOIDES Resolution: www.joidesresolution.org
- ThinkQuest Cellupedia: library.thinkquest.org/C004535.3
- The JOIDES Resolution: www.joidesresolution.org
- Science
- Life
- Ocean

Authors:

Kane, Jackie, Science Dept Chair, Physics/Geoscience teacher, St. Ursula Academy, Toledo, OH 34606 - jkane@toledosua.org

To learn more, visit:

www.deepearthacademy.org
www.oceanleadership.org