



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute  
2010 Volume III: Geomicrobiology: How Microbes Shape Our Planet

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## **Ecosystems Beneath the Surface**

Guide for Curriculum Unit 10.03.04  
by Deborah James

The purpose of this unit is to provide information about unfamiliar organisms to fellow teachers of science of ecosystems. There are ecosystems that do not rely on a "predator-prey" relationship, but rather a community of organisms existing on metabolic byproducts and chemicals released by other organisms. Not all food chains begin from the energy source of the sun directly; some receive the sun's energy indirectly, or not at all. All of this information opens up the dynamic world of geomicrobiology. Teachers will then, in turn, use this information to create meaningful activities for their students through hands-on experimentation in the classroom.

The unit includes background information on how microorganisms convert various forms of energy into ATP in order to create biomass. This energy conversion or electron flow is essential to all living things, and although there will be differences in the energy/electron donors and acceptors of aerobic versus anaerobic organisms, the ultimate requirement for the survival of all organisms is that electrons must flow for ATP to be created and for energy to be used by cells.

Sample lessons are outlined as hands-on classroom activities that include growing microbial mats, and the important role that each layer in the mat plays for the survival of the whole community. There are interactive lessons that students will engage in via the Internet from NASA's Web site, with a computer slide presentation the culminating activity. Students will also participate by playing the three cycle game: oxygen, carbon dioxide, and sulfur. All students will keep an interactive science journal which will focus on what they learn, questions that arise, and a summary of the lesson, followed by homework that is meaningful to the lesson. New vocabulary words will be maintained in a creative fashion through the use of foldable matchbooks to help with retention of meaning.

(Recommended for Science, grade 6)

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