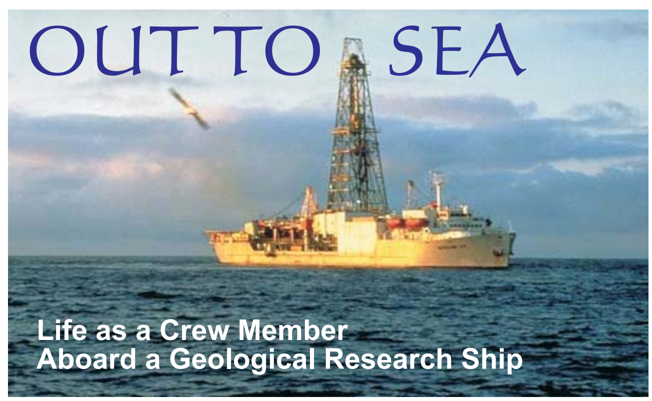
A Teacher's Guide to



An educational video for Middle School Students
running time 19 minutes

Have you ever wondered what it is like to work on a ship at sea? How about a ship that does cutting-edge earth science research?

This video introduces students to the interesting life on board a scientific research ship. In the video, members of the crew discuss their life on board and tell us about some of the fascinating and thought-provoking scientific discoveries made on the *Drilling Vessel JOIDES Resolution*.

About OUT TO SEA

This video was written and produced by **Katie Tauxe**, a teacher and former Marine Technician with the Ocean Drilling Program aboard the research drilling vessel ***JOIDES Resolution***.
Editor: **Nick Bongianni**, Public Access Channel 8, Los Alamos , NM
Narrator: **Tom Anthony Romero**
Funding was provided by:
- **Joint Oceanographic Institutions** (National Science Foundation)
- **Neptune and Company, Inc.** Los Alamos, New Mexico

http://outtosea.tauxe.net

Internet Resources:

Ocean Drilling Program:
http://www-odp.tamu.edu
Integrated Ocean Drilling Program:
http://www.iodp.org
Joint Oceanographic Institutions teaching curricula:
http://www. joiscience.org/usssp/CurrEnr/Curriculum
National Museum of Natural History:
http://www.nmnh.si.edu/paleo/blast
Miscellaneous resources for teaching ocean sciences:
http://www.VIMS.edu/bridge
http://oceanexplorer.noaa.gov/edu
http://www.COSEE.org
http://www.fossweb.com
http://www.sciencenetlinks.com
http://www.marcopolo-education.org

History

Scientific ocean drilling began with project Mohole in 1958. Project Mohole attempted to sample material from the earth's mantle by drilling a hole through the earth's crust to the boundary between the crust and the mantle, called the Mohorovicic Discontinuity (or Moho). Mohole failed to reach the Moho but drilled 200 meters into the earth's crust and demonstrated that ocean drilling was a viable means of obtaining samples of the seafloor sediments and rocks.

In 1968, the Deep Sea Drilling Project (DSDP) began using the drill ship *Glomar Challenger*. The *Glomar Challenger* was the first scientific ship with the capability of sailing the world's oceans and drilling in deep ocean sediments. In 1981, the National Science Foundation created the Ocean Drilling Program (ODP) as the successor to the DSDP. Using a newer drill ship, the *JOIDES Resolution*, scientists were able to drill deeper and in more difficult rock formations. In 2003, the Integrated Ocean Drilling Program (IODP) became the newest venture in scientific ocean drilling. The IODP will use two drill ships, one similar to the *JOIDES Resolution* which will drill in deep ocean environments and a new Japanese ship, the *Chikyu* (meaning *Earth*), capable of drilling on continental shelf areas, which may be prone to dangerous oil and gas deposits.

Learning Objectives:

1. The student will state the purpose of scientific ocean drilling.
2. The student will list one major discovery of the Ocean Drilling Program.
3. The student will list three careers available in scientific ocean drilling.

Some visitors to the JOIDES Resolution

MORE

What is a Core?

As particles of sand, mud and fossils settle out of the water, they form a layer on the bottom of the ocean. This can be demonstrated using several layers of different colored paper with one layer placed atop the next, to show that the youngest sediments are deposited on the older ones. The ocean sediments have been accumulating since the oceans first formed, and the ocean sediments serve as a continuous record of earth's history going back hundreds of millions of years. Scientists can use this sediment to understand the climate and events which occurred in the past. Examples of events recorded in ocean sediments include: a flood on land carrying rich, dark soil to the ocean, desert sands blown into the sea, and melting icebergs dropping stones onto the seafloor. In order to see these ocean sediments we must take a plug (or core) of the seafloor and bring it to the surface to study. It takes a ship dedicated for this special work, and that ship is the *JOIDES Resolution*.

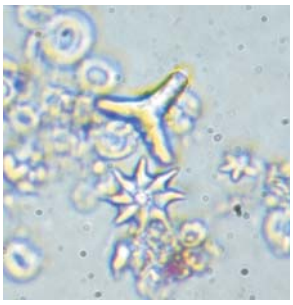
What can we learn from core samples?

Climate change: Sediments on the seafloor record the changes in earth's climate.

Plate tectonics: Determining the ages of different parts of the ocean floor and examining the rocks beneath has helped marine geologists reconstruct the history of movement of the continents and oceans.

Energy resources: On the seafloor and below lie sources of energy, including petroleum and frozen methane deposits.

Evolutionary biology: The microfossil record in the sediments contains vivid examples of the evolution of life on earth.



Heliodiscus

Career Opportunities on Board:

Ship's Crew: **Captain, mate, engineer, boatswain, electrician, mechanic, welder, machinist, deck hand and helmsman (ordinary seaman), radio operator, steward, cook, painter, wiper and oiler (engineer's assistants)**

Drilling Crew: **Rig superintendent, toolpusher, driller, assistant driller, derrickman, roughneck, core technician, downhole tools specialist**

Science Crew: **Chief scientist, staff scientist, marine geologist, geochemist, sedimentologist, paleontologist, marine biologist, laboratory officer, laboratory technician, computer systems manager, secretary (yeoperson), storekeeper**

Some of the crew relaxes with the ship in Guam

Discussion Topics:

1. How is working on the *JOIDES Resolution* different from working on land?

2. Explain some of the positive and negative aspects of working on board a ship like the JOIDES Resolution.

3. Which jobs on board would you like to do? Why?

4. Why do ocean sediments have a more complete record of the past than sediments deposited on land? (*Although this was not covered in the video you can encourage students to think of how sediments deposited in the ocean are not subject to the erosion and weathering which occurs on land.*)

5. How might earth's climate be recorded in marine sediments? Think of how different life forms thrive under different climatic conditions.

6. When earth again gets hit with a meteor or asteroid, how will this affect life on the planet?

7. Marine sediments record only the last 350 million years or so of earth history, since the sea floor is constantly being recycled. Older rocks and earlier records of life are only to be found on land.

Please refer to the poster and CD-ROMs accompanying this video for more classroom instruction ideas.