



Technology/Exploration

INTRODUCTION

The Oceanographic Technology lesson will introduce the student to exploration of the sea floor.

OBJECTIVES

By the end of this lesson the student will be able to do the following:

1. Summarize the capabilities of remotely operated vehicles (ROVs) as JASON, ABE, REMUS
2. Compare and contrast the ROVs with manned submersibles.
3. Create a new type of ROV for exploring the ocean depths based on knowledge of current ROVs.
4. Differentiate between the uses of side scan sonar, multi beam sonar, and magnetometers.
5. Identify careers that are associated with underwater technology/exploration.

Technology/Exploration Lesson

1. Maps of the ocean floor help scientists understand the hidden world of the ocean's depths.
2. Data that has been collected from satellites have helped scientists to create maps of the ocean floor that reveal the ocean floor is not a flat wasteland as once thought. These maps reveal that the ocean floor contains mountains taller than the tallest mountain on land, troughs, ridges, deep trenches, and the location of sunken ships. As high tech as all of this sounds, these maps aren't very accurate. Scientists are constantly developing new technology to assist them in exploring the vast ocean floor.
3. Some of these new maps are made with sound waves. A ship has a device attached to the bottom of its hull called a transducer which sends out an audible sound called a ping once every second. The transducer calculates the time it takes for the ping to be produced and for it to return to the ship.
4. When a ping returns, it is turned into data for the construction of a map of the ocean floor. These maps are made up of millions of data points. The ships with transducers travel in a grid like pattern over a specific area to obtain enough data to produce an accurate map.
5. The computer then takes the data from the transducer and creates a topographic map of the ocean floor and anything else that might be there, like a sunken vessel.
6. Another way used to map the ocean bottom is the side scanning sonar. This method also uses sound to

measure distance. This method uses the strength of the returning echo, not the time traveled, to map the ocean floor. These sonars are towed behind ships.

7. Side scan sonar is very sensitive and can measure features on the ocean floor smaller than 1 centimeter. Side scan sonar is often used to find objects like shipwrecks on the seafloor.
8. Underwater research vessels are also used to search and explore the ocean floor. Some types of these vessels include:
 - a. ROV (remote operated vehicle). This is a submersible vehicle that is tethered to a ship on the surface by a long cable and is operated by the ship on the surface. The Titanic was documented using an ROV named Jason.
 - b. Alvin - (3 man sub) typical 8 hour dive, 2 scientists and a pilot, 2 hour descent time, 2 hour ascent time, 4 hours bottom time - photography, sampling, experiments using 3 twelve inch view ports - 3 video cameras 2 still cameras that can take up to 800 frames, 12 lights to illuminate the depths, 2 hydraulic arms mainly used for geology and biology - dive to 14, 764 feet - most famous for locating lost Hydrogen bomb in Mediterranean in 1966, discovery of hydrothermal vents in 1977, 12 dives to HMS TITANIC.
 - c. ABE and REMUS - autonomous underwater vehicles.
 - i. ABE - autonomous benthic explorer. Used when scientists need to monitor an area over long periods of time. It is a robot that moves on its own without a pilot or and untethered to a ship. It is programmed to carryout maneuvers, take photographs and collect data within a large area roughly the size of a city block. It will then go back to sleep, conserving power to repeat these tasks for months at a time. It currently follows predetermined information placed in its memory before deployment and data is recovered after ABE is picked up, but scientists hope to soon figure out how to use underwater acoustic transmission to send and receive data.
 - ii. REMUS - explores shallow, coastal waters and returns to underwater docking station to download data and charges its batteries - pre-programmed to collect environmental data or conduct sonar surveys of sea floor - communicates via sound pulses with 3 moored underwater transponders to track its path - battery operated - most recently used to locate and map mines in Iraqi waters during Operation Iraqi Freedom.

Conclusion: We know more about the surface of the moon than we do about the deep ocean. Where do we go from here?

RESOURCES

<http://tea.armadaproject.org/klinkhammer/5.27.2000.html>

http://www.whoi.edu/institutes/doei/facilities/deep_submergence.htm

© 2006 Nauticus | One Waterside Drive | Norfolk, VA 23510 | (757) 664-1000

www.nauticus.org