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:

- Summarize the capabilities of remotely operated vehicles (ROVs) as JASON, ABE, REMUS.

- Compare and contrast the ROVs with manned submersibles.

- Create a new type of ROV for exploring the ocean depths based on knowledge of current ROVs.

- Differentiate between the uses of side scan sonar, multi beam sonar, and magnetometers.

- Identify careers that are associated with underwater technology/exploration.

Technology/Exploration Lesson

1. Maps of the hidden world at the bottom of the ocean are helpful to scientists and others as they work to understand the ocean floor. These maps guide scientists to places where they might want to sample the water and sediments.

2. Using data collected over many years, satellite maps have been created that show us that our ocean is not flat. There are many high points, ridges, mountain ranges and deep trenches along with sunken vessels. One problem with these maps is that they are not very accurate. With the coming of new technology, scientists can make maps that are many times more detailed and accurate than the satellite maps.

3. Some of these new maps are made with sound waves. Attached to the bottom of the ship is something called a transducer. The transducer sends out a sound signal every second. The signal is called a "ping" because of what it sounds like. The pinging sound travels down to the bottom of the ocean where it bounces back to the ship like an echo.

4. A computer on the ship records each ping. It also times each ping as it goes from the ship down to the ocean bottom and then back. The time each ping travels is determined by the depth of the water.

5. As each ping is heard, it produces a point of data for the map. Maps of even small areas can consist of millions of data points. This means that the ship must travel back and forth along a specific course many times gathering data. It is sort of like mowing the grass.

6. The computer then takes all of these points and puts them into a very accurate topographic map. This shows what the bottom of the ocean looks like and also anything that might be resting there.

7. 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 sonar's are towed behind ships.

8. 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.

9. 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.

        1) **ABE** – autonomous benthic explorer –need to monitor an area over long periods of time - true robot able to move on it's own without a pilot or tether to a ship designed to perform a predetermined set of maneuvers to take photographs and collect data samples within an area about the size of a city block. It will then go back to sleep, conserving power to repeat these tasks for months at a time. currently follows predetermined information placed in it's 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.
        2) **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 it's 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? Europa (moon of Jupiter) NASA.