exploring the ocean depths

Scientists say we know more about Mars than our oceans.

But it is very difficult for humans to work in the deep ocean.

- **the crushing pressures of the abyssal depths are greater than the human body can withstand**
- **human lungs cannot take in water**
- **most of the deep ocean is too dark for human eyes to penetrate the gloom.**

Using technology is the only way we can explore the ocean.

THE PAST

During the 13th century there was a need to understand water depth so ships could steer through the water without running aground. Navigators used a lead line to help them.

The lead line was simply a rope weighted with lead with markings showing depths. The lead weight was coated with wax to collect samples of the seafloor sediments and was a useful navigation tool. For example, a ship pilot could be instructed to head east until depth is sounded at 50 fathoms in black sand, then head north to 60 fathoms in grey ooze.

TODAY

A number of instruments are used today to gather information from the deep.

Sonar (**SO**und **NA**vigation and **R**anging): Some marine mammals, like whales, navigate by sound. They release a high-energy sound and by interpreting the strength and speed of the echo reply, they can navigate without relying on eyesight. Sonar systems work on the same principle and use computers to translate the sonar signal into pixels (tiny dots) that build a picture of the underwater world.

Side scanning sonar uses a cone-shaped blast of sound and records the return signal from all directions. The angle of reflection sound's can be used to produce a map of the seafloor. A sub-seafloor profiler uses a single beam of sound that is fired directly into the seabed. The sound penetrates the loose sediment on the seafloor and reflects off the harder bedrock underneath. The strength and speed of the return signal can give clues about the nature and thickness of seafloor sediment.

Flotation devices: Floats, or 'drifters' with satellite global positioning systems (GPS) can provide information on the course and speed of the ocean's surface currents.

The most advanced satellite-monitored float is Argo. Argo contains a small ballast tank that allows the float to rise and sink up to 2000 metres below the surface. As the float returns to the surface it measures the temperature and salinity of the water, broadcasting the information to a passing satellite. The float then returns to 2000 metres depth and waits 10 days before beginning the process again. During the delay the float travels with the deeper ocean currents, providing information on the current's speed and direction.

Satellites: The elevated perspective of satellites and their ability to record images in wavelengths that the human eye can't sense makes them an invaluable tool. Satellites can be used to:

- accurately measure changes in the ocean's surface height
- identify ocean currents and the relationships between the ocean and the atmosphere
- measure sea-surface temperatures and the amount of phytoplankton in the water.

Remotely Operated Vehicles: Unmanned submarines, known as ROV's, are operated from the mother ship and are capable of carrying humans deep into the ocean. They have the advantage of not requiring the bulky life support equipment necessary to keep a human crew alive. This reduces their size and increases mobility. They are particularly useful for examining specific objects where a pilot can maneuver the ROV to explore specific features.

THE FUTURE

Some scientists believe that robots will be the way of the future for deep ocean exploration. They are cheaper to build and run, and can operate for longer periods than human-powered submersibles.

TIMELINE

13th century .... lead line used to measure the depth of the ocean

1930 .... William Beebe dives to 1000 metres in a deep-diving steel ball called a bathysphere

1960 .... two men travell to 10, 912 metres in the bathyscaph Trieste

1964 .... the three-person vessel Alvin was built; it has been used to investigate the Titanic

1984 .... Deep Rover, the most advanced ROV, was built

1985 .... Robert D Ballard discovers the wreck of the Titanic

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– TEACHER RESOURCE

MAKING A LEAD LINE

1. You will need a thick rope, a black marker, a ruler and several different sized containers.
2. Using the ruler, mark the rope with 1cm intervals.
3. Fill the different containers with water at different depths.
4. The children can measure the depth of the water in each container by using the rope and plot the results on a graph.

SEA SECRETS

Identify some of the features of Australia's oceans.

Tell students that the deep, flat portions of the ocean floor are called the abyss or abyssal plain. Ask them if any of them saw the movie *The Abyss*.

Tell them that trenches occur where one of the Earth's crustal plates slides under another. The continental slope is the part that slides off the surface of the continents down to the continental shelf – or the underwater edge of the ocean.

Ask the students to name the various parts of Australia's southeast ocean (see the Virtual Tour resource). Explain to them that the map shows what the ocean looks like if all the water was removed.

Ask them what the tallest mountain in Australia is. It is Mt Kosciusko at 2228 metres high. Tell them that the deepest ocean trench, in Australian waters (the Hjort Trench which is 6000 metres deep) could fit two mountains the size of Mt Kosciusko stacked on top of each other. Get them to draw a scale diagram of this.

Ask students to make a model ocean in a small fish tank or aquarium. Have them bury a metallic object at a specific location and challenge other students to find it without disturbing other parts of the ocean floor.

WEBQUEST

Your children can do a webquest on deep sea exploration. Get them to find a photo of William Beebe's bathysphere and Robert D Ballard's ROV that took pictures of the Titanic. Get them to make their own timeline for ocean exploration.

Some sites you can direct them to are:

William Beebe –
hometown.aol.com/chinese6930/merl/beebe.htm

Robert D Ballard's Titanic page –
seawifs.gsfc.nasa.gov/OCEAN_PLANET/HTML/titanic.html

Ocean Exploration timeline –
www.seasky.org/oceanxp/sea5a.html

Argo – www-argo.ucsd.edu/