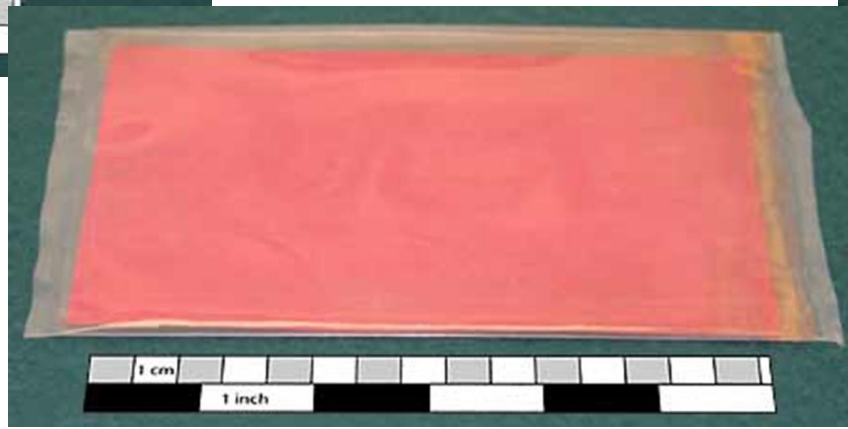


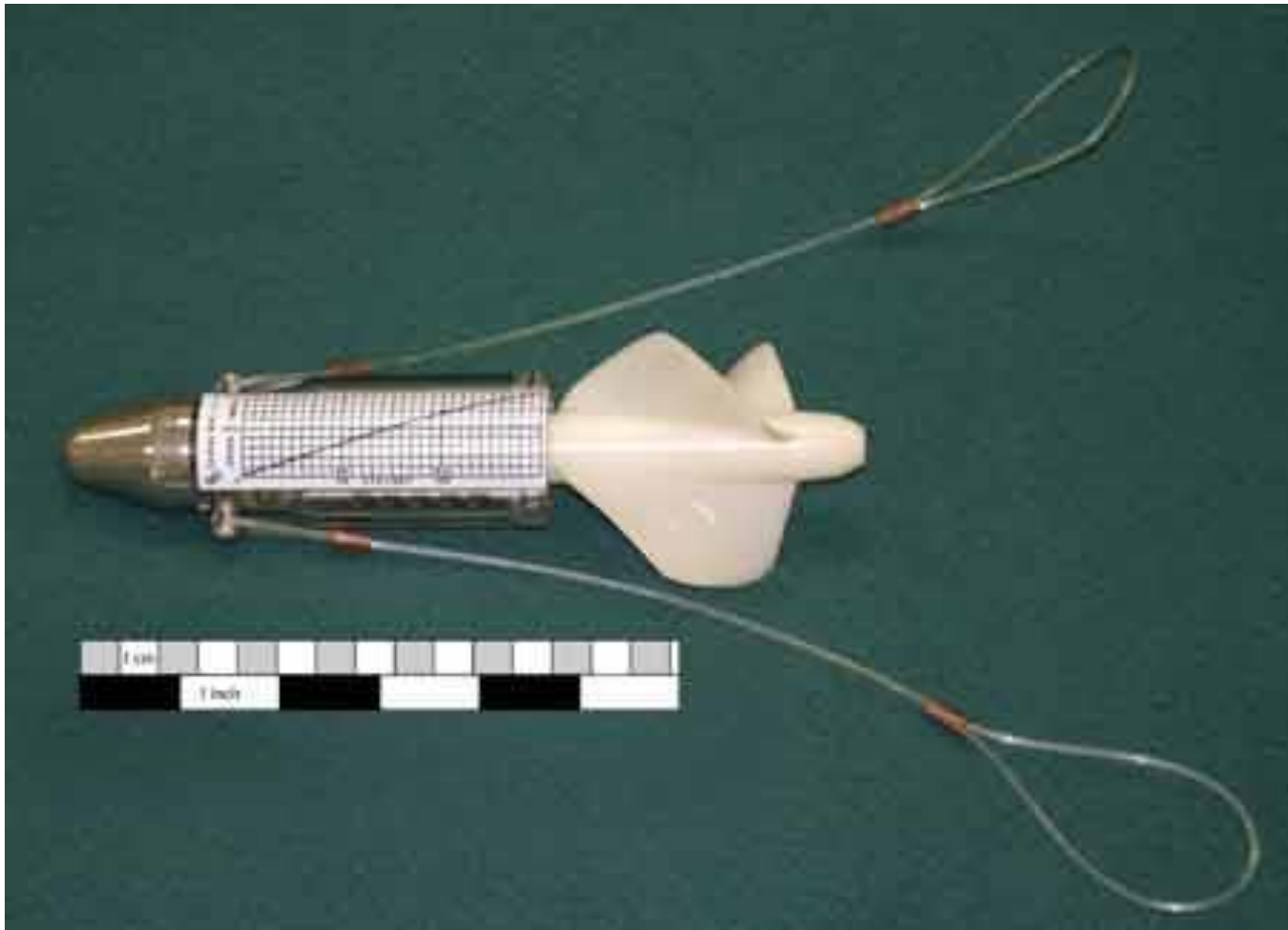
# Tools of Oceanography

## Ocean Currents

- **Drift Bottles and Dyes:** measures speed and direction of ocean currents.



**Ekman Current Meters:** measures speed and direction of currents in deep water.



# Ocean Water Sampling

Measures:

- Temperature
- Salinity
- Productivity (plants and animals)
- Density (specific gravity)

# Nansen Bottle (Niskin Bottle)

**Nansen Bottle:**  
collects  
samples of  
ocean water at  
specific  
depths.



**Salinometer:** Uses electric current to measure how salty ocean water is.

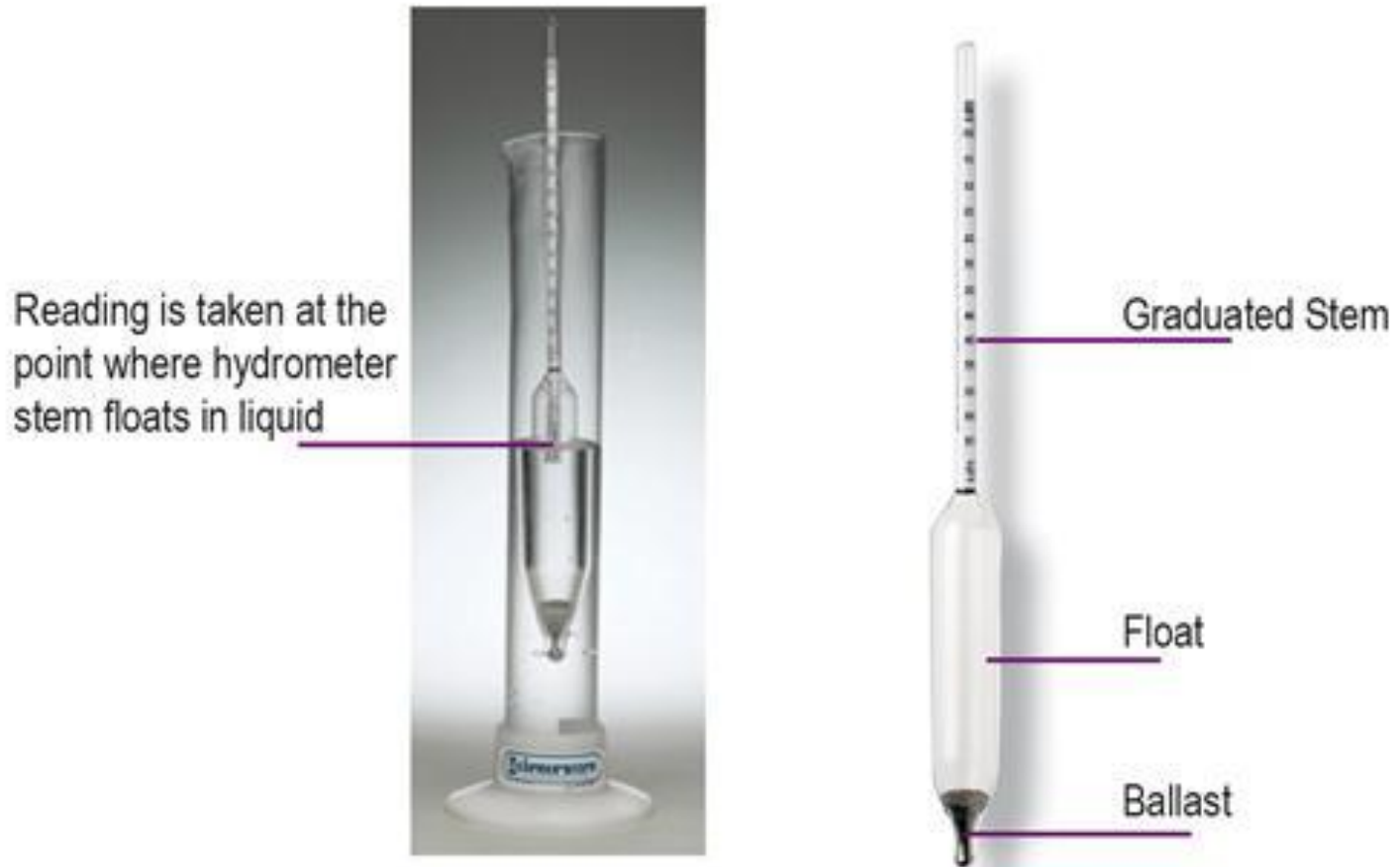


**Bathythermograph:** towed in the water to measure continuous temperatures.



# Hydrometer:

Measures the specific gravity (relative density) of liquids;



# Light Measurement

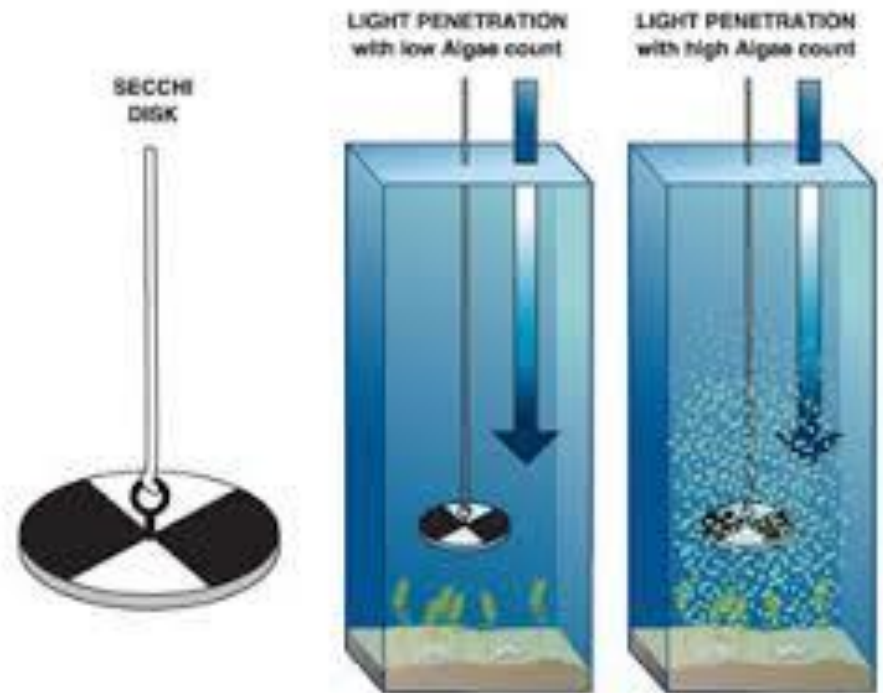
Measures:

- Turbidity (sediments),
- Productivity (phytoplankton, zooplankton)



# SECCHI Disk:

A white and black circular **disk** that is lowered in the water until it disappears and reappears.

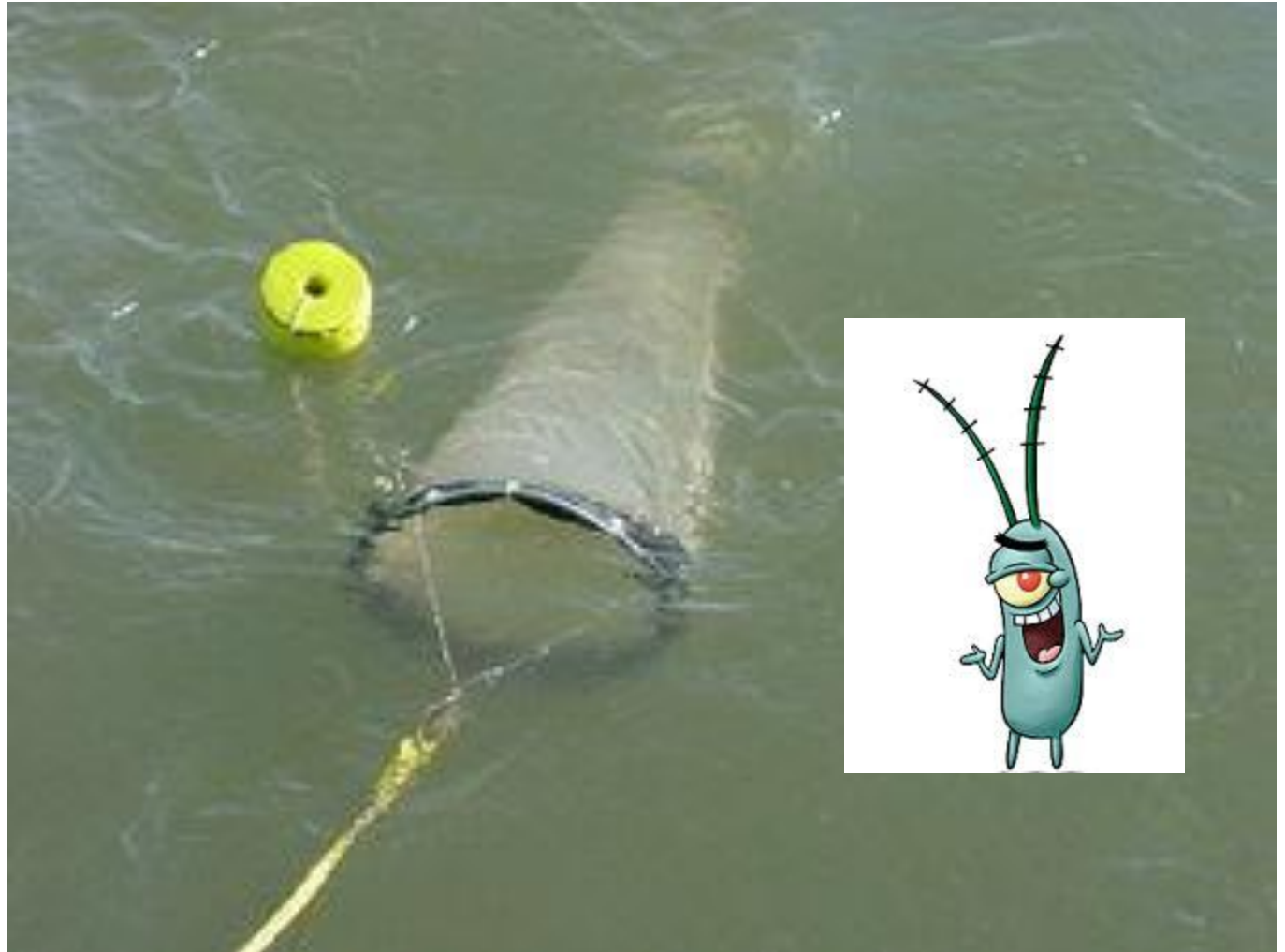


<http://www.youtube.com/watch?v=yGJ5uV4jAPo>

[http://www.youtube.com/watch?v=xuH\\_xLTjmOQ](http://www.youtube.com/watch?v=xuH_xLTjmOQ)

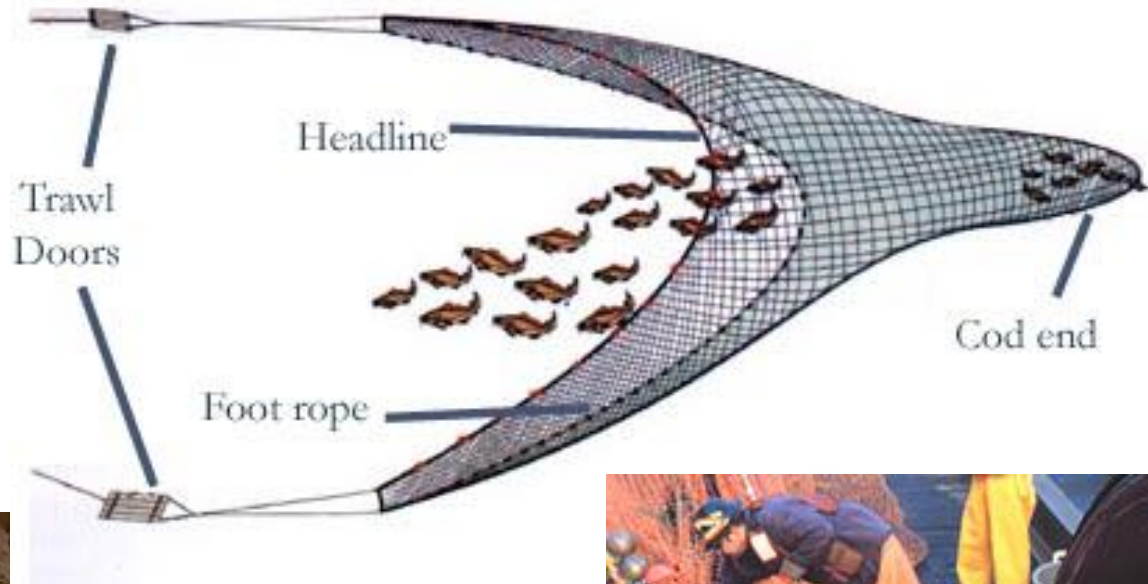
# Ocean Life Sampling

**Plankton Net:** Cone shaped net that traps phytoplankton and zooplankton. Towed along surface.



# Otter Trawl

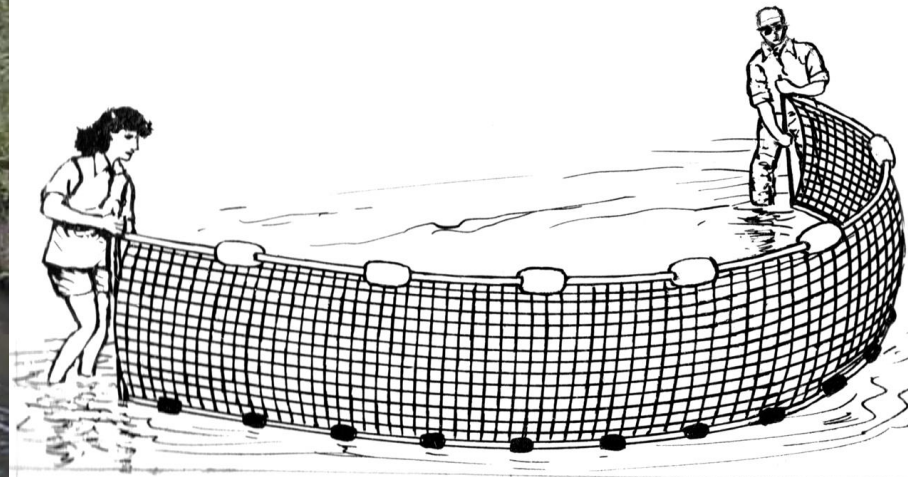
A large underwater net that uses boards and floats to open and collect marine organisms.



**Fishing Dredge:** A large metal or canvas bag that is scraped along the ocean floor to collect seafloor creatures such as oysters, clams, sea cucumbers. It destroys the ocean floor.



**Seine Net:** a long net (**seine** or **dragnet**) attached to two poles used in tidal pools or along the shore to catch marine fish and other organisms.



# Ocean Floor Samples

## Bottom Grabber

Scoops up loose sediment on the ocean floor.



# Corer (Phleger or box)

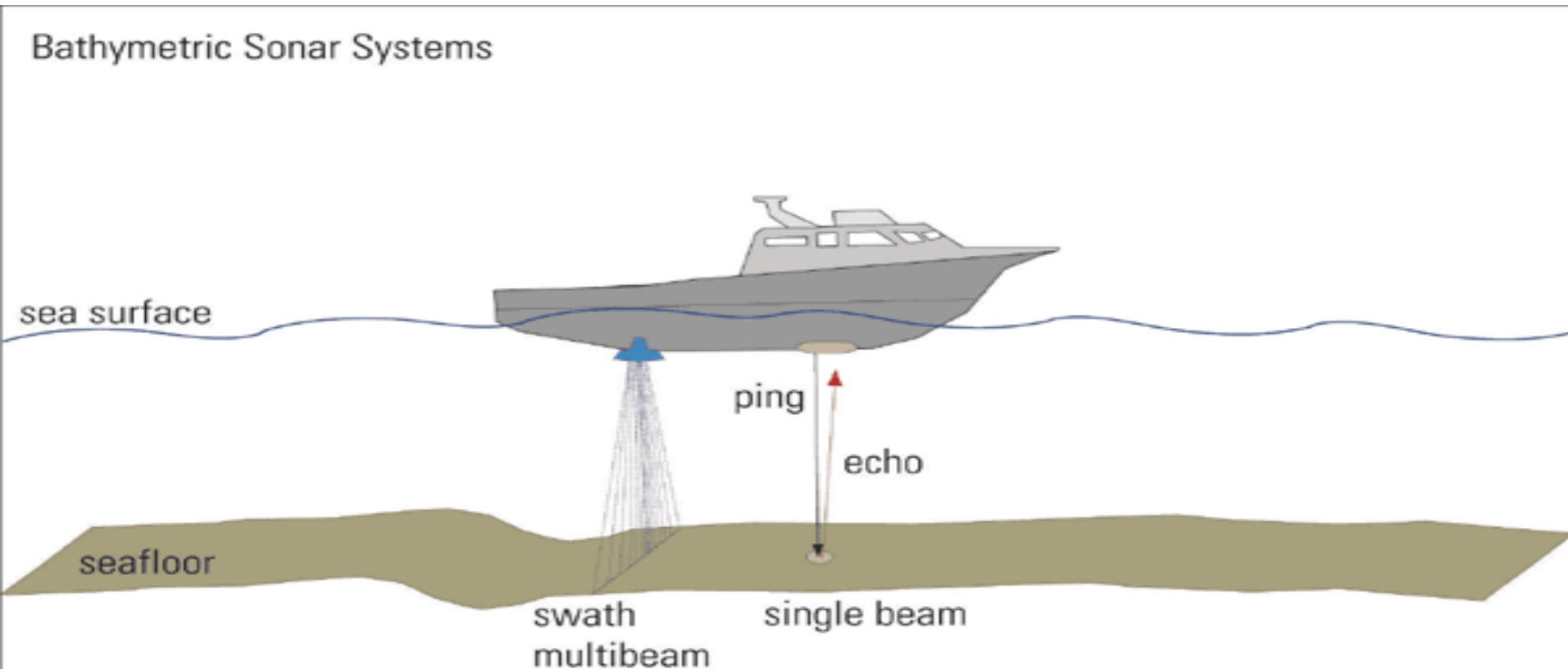
Drilled into the sea floor to extract samples of ocean floor sediments.



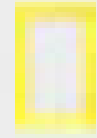
# Depth and Bathymetry

**Echo sounding or 'SONAR':** Use of sound to determine depth and seafloor profile.

**SONAR:** Sound Navigation and Ranging







# Scientists and Sonar

## 2. Sounding (lead line):

Use of rope and weight to find the depths of the ocean floor.



**Echo Sounder (Fathometer)** *transmits and receives soundwaves that are reflected off of the ocean floor and submarine objects. It can sense depth of the ocean, schools of fish, shipwrecks, mudslides, and sea floor features such as submarine canyons and seamounts.*



# Underwater Equipment

**SCUBA:**

**S**elf **C**ontained **U**nderwater **B**reathing **A**pparatus

Invented by Jacques Cousteau (documentarian).

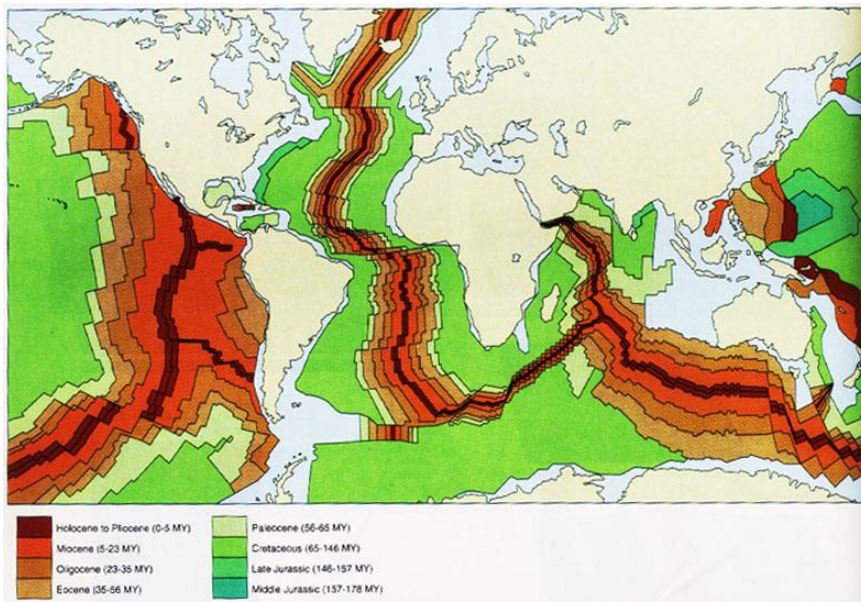


**Atmospheric Diving Suits** used for deep dives. Maintains atmospheric pressure, so, decompression is not needed.

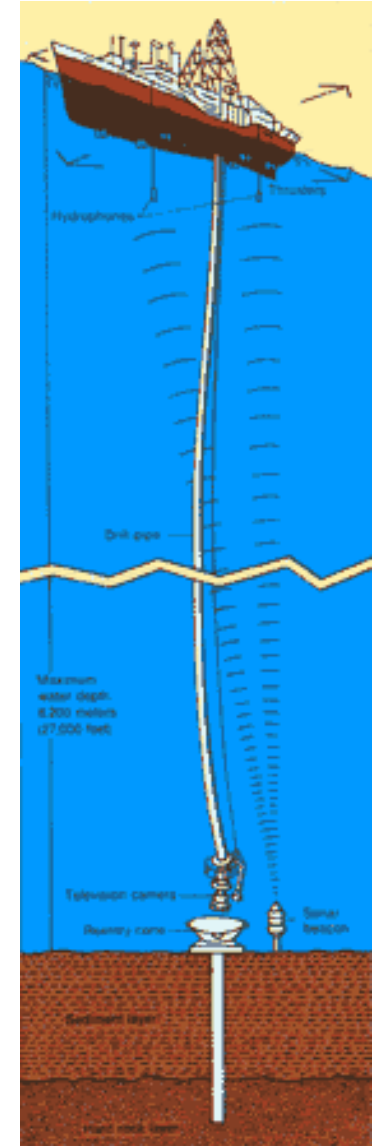


# Research Vessels

**Glomar Challenger-** drilling vessel that collected ocean floor samples used to prove seafloor spreading and plate tectonics.



# Joides Resolution - deep sea drilling vessel used today.



# RV Atlantis II

Carries Alvin. Modern Ocean research vessel. WHOI.



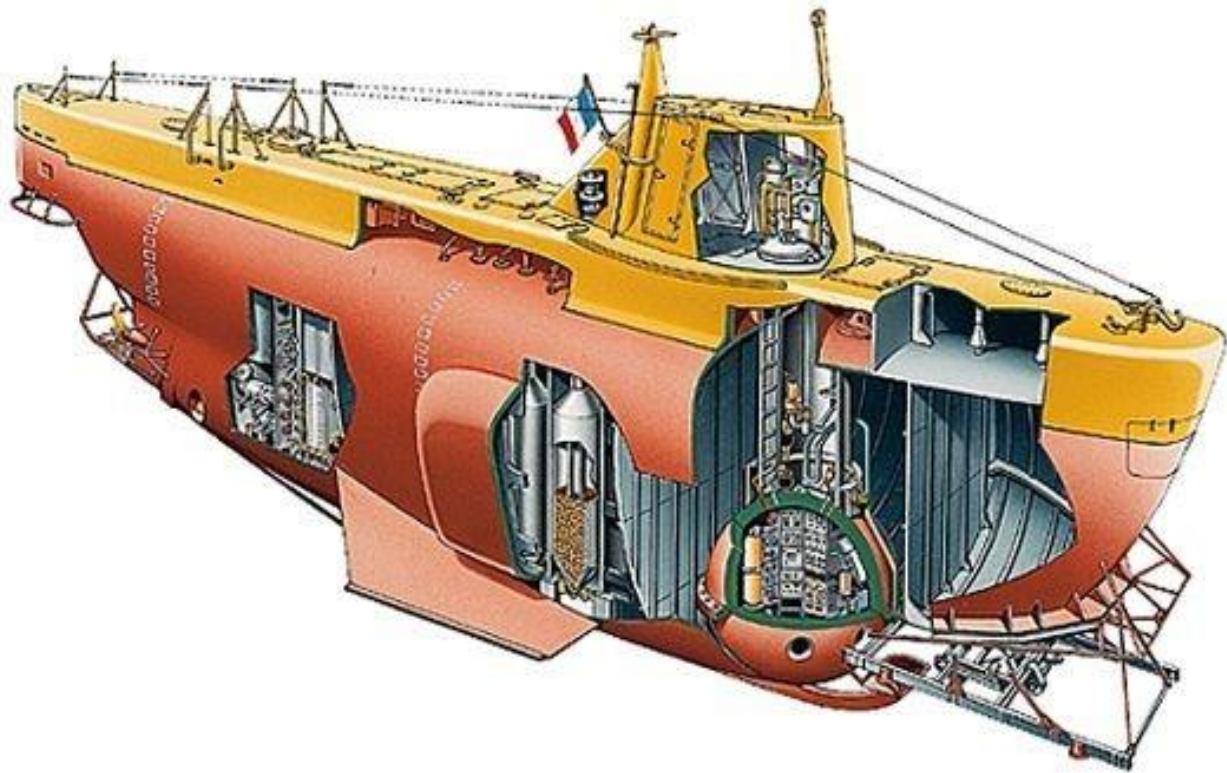


# Underwater Research Vessels (URV's):



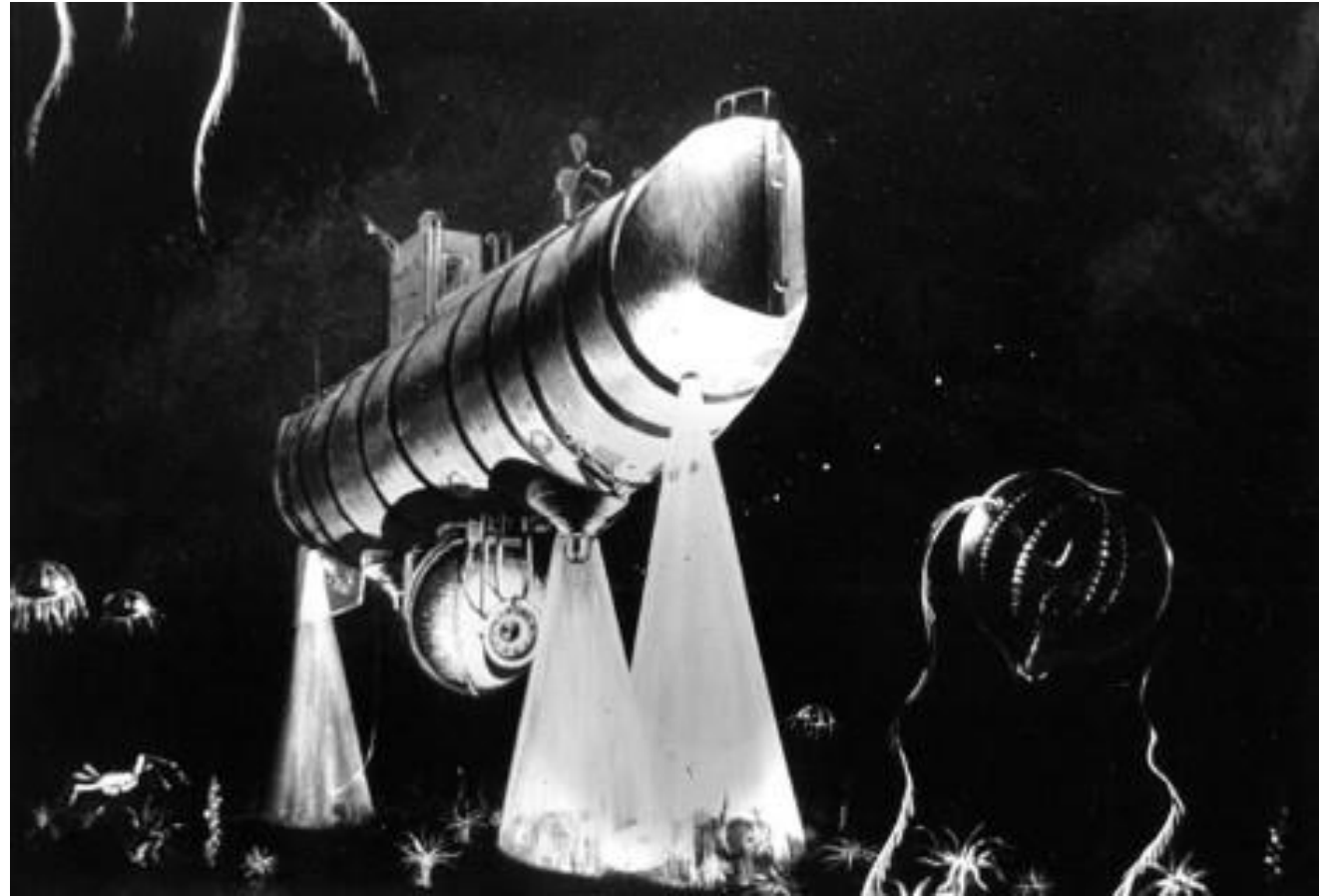
**Bathysphere:** A spherical deep-diving chamber in which persons are lowered by a cable to study the oceans and deep-sea life.

**Bathyscaphe:** A free-diving deep-sea submarine with a crew of 2-3 people. Ex: Alvin and Trieste



# Bathyscaphe: Trieste

The Trieste descended to the bottom of the Challenger Deep in the Marianas Trench in 1960.



# Bathyscaphe: Alvin

This bathyscaphe was used to locate a missing H-bomb in the 1960's and to explore the mid-ocean ridge. Still used today.



# ROV: Remotely Operated Vehicles “drones of the seas”



**Argo-Jason System:** A robot (drone) that explored the Titanic and helped with the “BP oil spill”.

# Remote Sensing: Satellites

- **SEASAT:** A series of satellites used to monitor the oceans and atmosphere. Can measure sea level, productivity, temperature, CO<sub>2</sub>, ice, etc...
- **GPS:** Global Positioning System
- **Trackers and tracers.**
- **Tsunami and Hurricane Alert Systems**



# **Scripps Institution of Oceanography:**

Near San Diego California- west coast of USA.

It is one of the oldest and best institutes for oceanography research and training.



# Institutes of Oceanography

**WHOI:** Woods Hole Oceanographic Institute in New England (Mass.). East coast of USA.

<http://www.whoi.edu/>

