

Expedition Objectives

- Learn about the seafloor
- Remember to answer the questions below and take notes
- Homework - post one multiple choice question on seafloor imaging and a second multiple-choice question on a seafloor feature in your Expedition 6 Learning Group Discussion in Canvas,

Part I of Expedition - Creating images of the seafloor:

1. View Lecture at: Expedition 6 - Bottom of the Ocean

<http://youtu.be/eYGaYb5tktg>

Heezen and Tharp map - a classic view with a large amount of artist license

2. Smith and Sandwell Seafloor Topography

3. Expedition Outline

4. What is Echo Sounding?

5. What is an Echo Profiler Record?

6. How is Two-Way Traveltime Measured from an Echo Profiler Record?

7. How is the Traveltime Used to Calculate Water Depth?

8. Water Depth Calculation

9. Short Cut - Write Water Depth Calculation - Be able to do this on Quiz

10. What is satellite altimetry? *GeoSAT*

11. *Topex/Poseidon* and other Satellites

12. Altimetry Basics

What is the sensor used in satellite altimetry?

What does this sensor measure?

What is the relationship of sea surface change to the change in water depth?

13. *Marine Gravity Map* - Yes, there are small changes in the Earth's gravity field related to the distribution of mass in the Earth

14. Predicted Bathymetry

What is bathymetry?

15. Oblique View of Seafloor in Western Pacific

16. Watch "Sea 3-D: Charting the Ocean Floor" (6 minutes-long)

<http://science.kqed.org/quest/video/sea-3-d-charting-the-ocean-floor/>

What is sonar?"

What is the objective of using this technique?

What is multibeam sonar (or multibeam echo-profiling?)

How is a knowledge of the seafloor being used by scientists?

Scientists "See" Ocean Floor via Sonar (5 minutes-long) at:

<http://youtu.be/-fAAxEIFeLU>

In addition to the seafloor, what else about the ocean are these scientists studying with multibeam sonar?

17. Move on to Part II of expedition lecture, which reviews of use of multibeam sonar at:

<http://youtu.be/68zgAtSCFT0>

18. Transmitting and Receiving Transducer Arrays - Do You Understand the Multibeams?



19. Mid-Ocean Ridge Seafloor Image

20. Folded Sediments off Oregon and Washington

21. Gulf of Mexico

22. Golden Gate Fly-through - Seafloor Fly-Over Animation

23. Voyage Across Atlantic - New York to Lisbon

Part II of Expedition - Voyage to Study Seafloor Features at:

24. Let's Begin Our Expedition Across the Atlantic - You will need to download and install [Apple's free Quicktime Player plug-in for your browser at http://www.apple.com/quicktime/download/](http://www.apple.com/quicktime/download/)

Go to: http://oceansjsu.com/105d/exped_mapping/11.html

We will only need to use multibeam sonar in this expedition and mainly sonar beam (vertical, straight down and back beam) at the center of the swath to make our profile along the traverse. We will archive the rest of the data for potential use in future studies.

We will travel a distance of **more than 3,300 miles across the Atlantic Ocean or 5600 kilometers over a period of 13 days** to accomplish this survey.

On the next page is an image of a seafloor profile, created with a single-beam echo profiler, along which we will examine with multibeam sonar on our voyage.

Notice the extreme vertical exaggeration (stretching of the vertical scale and compressing the horizontal scale).

You will now analyze areas along this profile, with multibeam sonar, in order to find information about specific features by clicking on the appropriate label on the seafloor profile.

Take special note, in the areas listed below, of the range of **water depths** of each feature (if provided) and **how the feature is formed**



What is the nearshore?

What is the continental shelf?

What is the shelf break?

What is the continental slope?

What is the continental rise?

What is the abyssal plain?

What are abyssal hills?

What is a seamount?

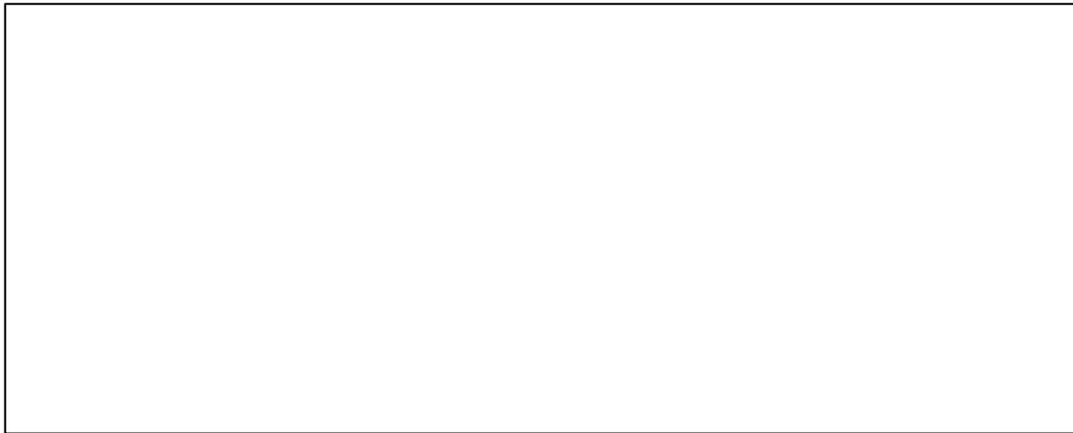
What is a mid-ocean ridge?

What is the rift valley?

What is a transform?

What is a fracture zone?

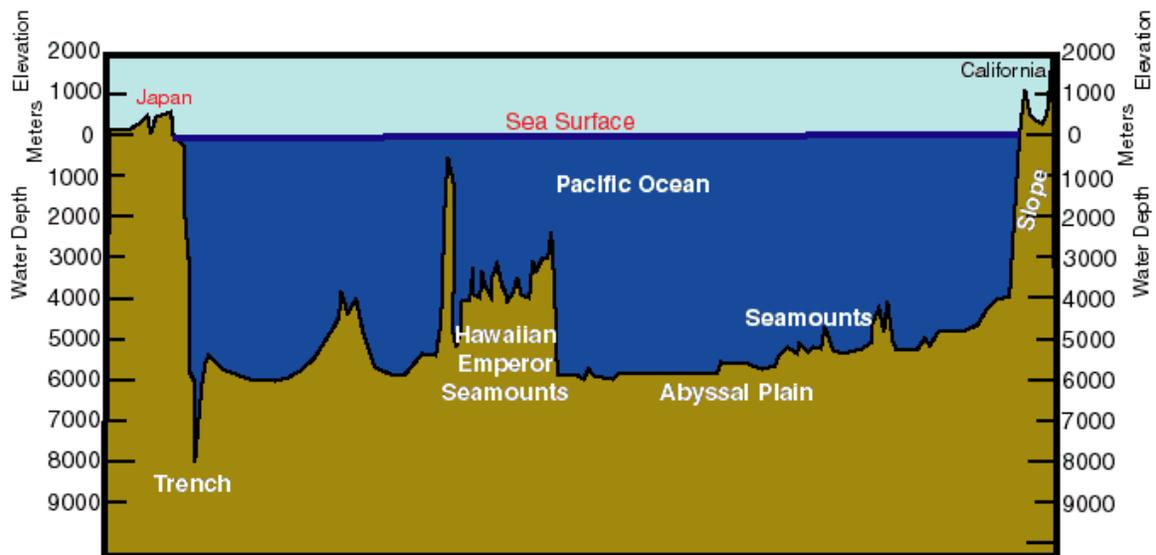
Sketch a picture showing the relationship, as if you are looking down on a map, between orientations of the rift valley, transforms, and fracture zones.



25. On to the Pacific Ocean - Leg 2 of Our Voyage - A Crossing of the Pacific Ocean - Creating a Seafloor Profile

We will now depart the ship in Lisbon and fly to San Francisco to board the R/V Melville of the Scripps Institution of Oceanography. You can rest in San Jose for a day before returning to sea for our traverse across the Pacific to Tokyo.

This distance between San Francisco and Tokyo is 5200 miles or 8700 kilometers and will take 19 days to complete on the R/V Melville. As you can see, the Pacific is a much larger ocean than the Atlantic and will take longer to cross on an oceanographic ship.



What are the Hawaiian Islands?

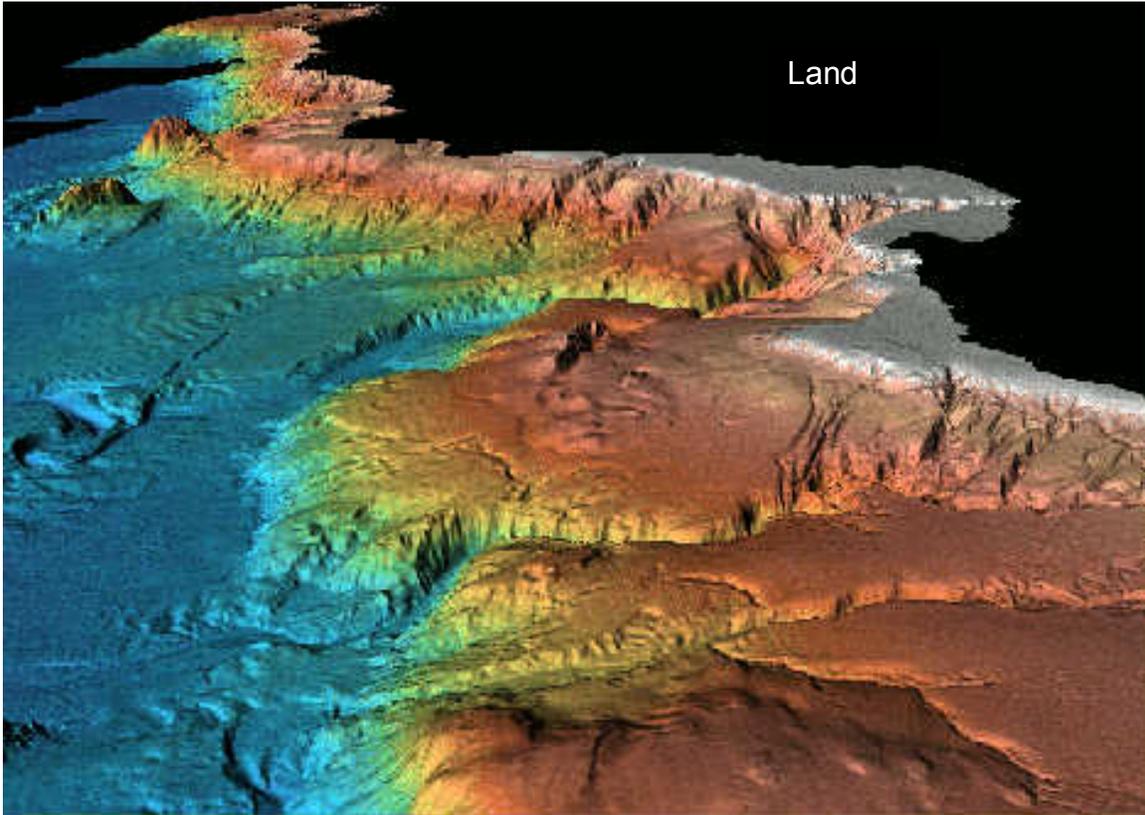
What is a trench (also called a deep-sea trench)?

26. Differences between the Atlantic and Pacific Seafloor

Now that we have completed both transects, let's do some science.

Describe how the profile of the seafloor in the North Atlantic is different from that in the North Pacificyou should be able to draw these seafloor profiles if asked.

27. Can You Identify Seafloor Features off California



Modified from Original map by Lincoln Pratsen

Identify and label each of the following features on the map above:

- a) the nearshore,
- b) continental shelf,
- c) shelf break,
- d) continental slope,
- e) abyssal plain,
- f) seamounts, and
- g) Monterey submarine canyon

Check Canvas for any required reading assignments for this expedition that are posted online

Homework assignment: - post in your expedition 6 learning group two multiple choice questions with answers (e.g. a, b, c, d, and e); the first multiple choice question should relate to seafloor imaging and the second multiple-choice question focus on a seafloor feature

You will also be asked to peer review the posted questions of other students in your learning group.