

Seafloor Ages Lesson Plan
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(1) 90 min period

Summary:

The ages of the seafloor, young towards the center of the oceans and oldest toward the ocean boundaries, are evidence of seafloor spreading. The ages reveal important detail on how continental drift may work. The oldest seafloor crust is <200 Myr old indicating that the seafloor is constantly being created and destroyed. Main points of this presentation are: 1) The ocean is much younger than the continents; 2) Scientists use seafloor drilling and age dating of rocks to figure out the global distribution of seafloor age; 3) The ages of the seafloor form a symmetric (or mirror image or reflection) pattern across the mid-oceanic ridges.

Materials:

Lecture_SeafloorAges.ppt Lecture Slides (including presenters notes contained within the powerpoint)

Activity_SeafloorAges.pdf (1 per student)

Crayons or colored pencils

Documents:

Activity_SeafloorAges.pdf

Lecture_SeafloorAges.ppt

Lesson_Plan_SeafloorAges.pdf

Prep: There is very little preparation required for this lesson. Make sure that materials are ready for students to use.

Lesson Plan & Instructions:

1. Warm up: Start with the pre-lab questions on the Seafloor Ages Activity.
2. Have students discuss the answers to the pre-lab questions as an introduction to the slides.
3. Present the Lecture Slides (annotated in detail on each slide). Have students take notes if you wish.
3. Distribute Activity materials (listed above). Each student gets 1 Seafloor Ages Activity packet (worksheet and coloring page), and crayons.
4. Students will begin by coloring the legend on their maps. Each student needs seven different colors. Use a different color for each age bracket listed on the instruction sheet. The legend (and colors) are the same for both oceans!!
5. Students then use the "rock samples" (listed as a-gg) and ages to color in the map. First locate the letter of the rock sample on the map. Then determine the age of that rock sample and the color corresponding to that age from the legend. Color the entire section of the map containing that rock in the color matching the rock age.

7. Students then finish the worksheet individually.

Seafloor Ages Activity

Name _____ **KEY** _____

Materials:

Seafloor Ages Worksheet
Crayons or Colored Pencils

Introduction/Instructions:

Imagine you are an Ocean Explorer gathering information on the ages of the seafloor in the Pacific and Atlantic Oceans. You and your fellow scientists take the drill ship Resolution to many locations in the oceans and collect rock samples from each sample location on the map lettered 'a-gg'. The ages of each sample are determined in the lab and are listed on the worksheet next to the letter of the rock sample. Now you must color the map based on the ages of the rock samples to see the distribution of seafloor ages.

1. Color the legend on the worksheet with 7 different colors (use a different color for 0-10 Myr, 10-40 Myr, 40-70 Myr, 70-100 Myr, 100-120 Myr, 120-150 Myr, 150-180 Myr). The same legend is for both Pacific and Atlantic oceans.
2. Locate each of the lettered rock samples on the map and determine its age from the list. Color the entire section of the map for that rock sample with the color from the legend matching that rock's age.

Pre-Lab Questions:

What do you think the layout of seafloor ages is? Where do you think the youngest and oldest seafloor is located? Why?

Questions:

1. Where is the oldest seafloor?

Northwest Pacific Ocean – near the coast of Japan

2. Look at the Atlantic Ocean. Where is the *youngest* seafloor in that ocean?

The youngest seafloor is almost exactly in the middle of the Atlantic Ocean. The youngest ages extend the entire length down the center of the ocean basin.

3. What do you notice about the *age pattern* on the seafloor in the Atlantic Ocean (hint: look on each side of the middle)?

The age pattern is symmetric. Youngest ages are at the middle of the pattern (on the oceanic ridges) and the seafloor grows older moving outwards to each side of the middle.

4. Africa and South America used to be joined together in Pangea, but are now separated by the Atlantic Ocean. Something must be happening between these continents to create new seafloor. Notice how the oldest crust is on the outside edges and the youngest crust is in the middle of the seafloor. How do you think an age pattern like this forms?

Youngest seafloor is created in the middle and moves outwards to both sides. As that seafloor ages, new seafloor is created in the center pushing the previous seafloor out to both sides of the center. Seafloor Spreading.

5. Now look at the Pacific Ocean seafloor ages. Where in the Pacific do you notice the same type of pattern as seen in the Atlantic?

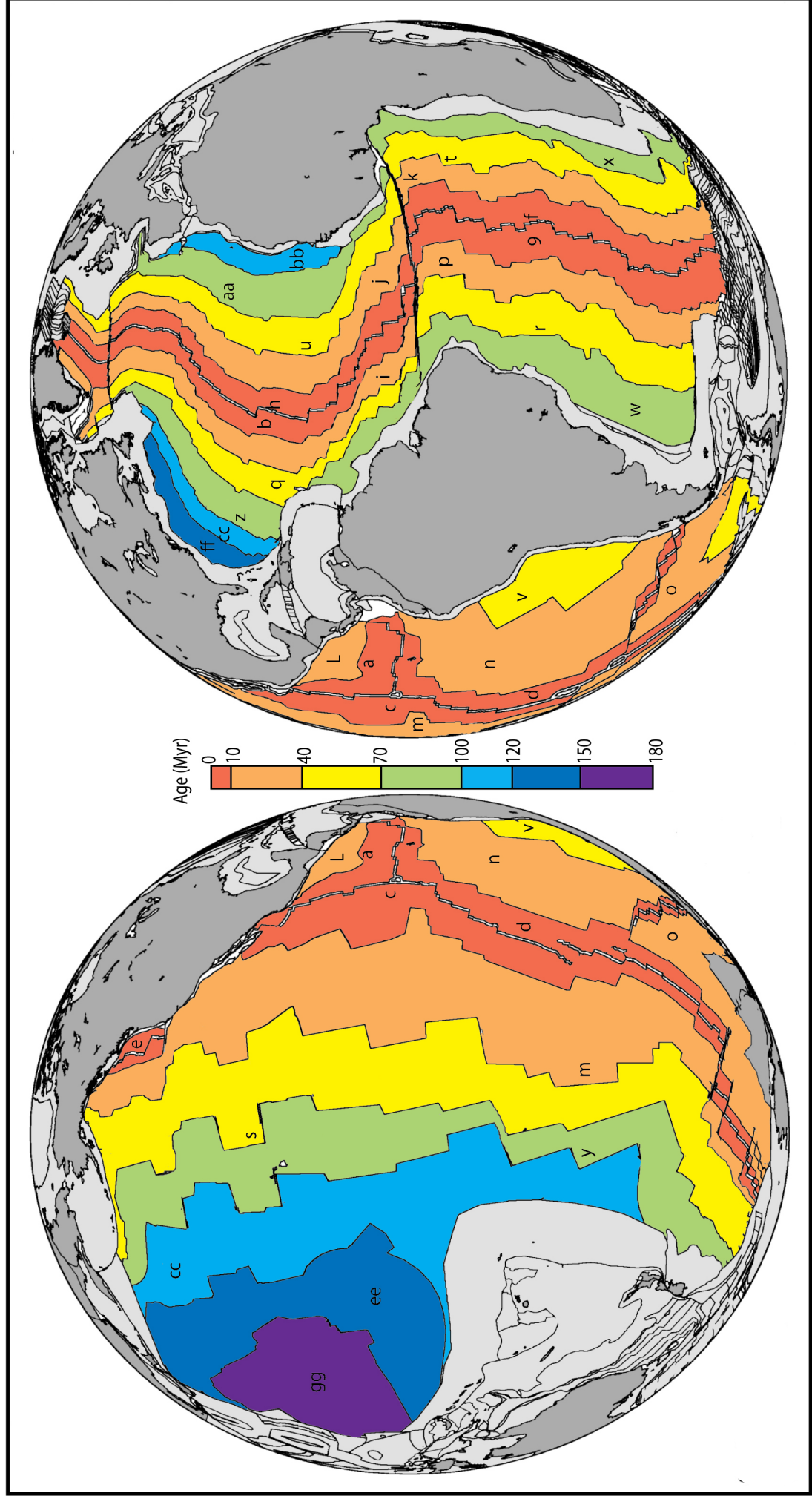
The southern Pacific Ocean has a similar symmetric pattern to the seafloor ages of the Atlantic Ocean.

6. The central and northern Pacific seafloor ages are more complicated. Where are the youngest ages of seafloor in this ocean? Are they in the center of the ocean basin?

The youngest aged seafloor in the Pacific Ocean is still centered in the middle of a symmetric pattern, but the pattern is harder to recognize. This is because the youngest ages are NOT in the center of the Pacific Ocean basin. Instead they are in about the eastern third of the basin.

7. In the Pacific, the seafloor on one side of the youngest crust gets very old, but the seafloor on the other side is much younger. How do you think the *location* of the youngest aged seafloor in the Pacific Ocean contributes to a more complicated age pattern in that ocean (hint: think about the distance of the youngest seafloor from the nearest continents on both sides of the ocean)?

Because the location of the youngest seafloor in the Pacific Ocean is not in the center of the basin (it's more to the east of center), there is less space for older crust to exist in the eastern Pacific. The seafloor in the eastern Pacific Ocean basin is destroyed (beneath the continents by subduction) before it has a chance to age significantly. On the other hand, on the western side of the youngest seafloor ages, the ocean basin extends for a much longer distance before encountering continents. Therefore, the seafloor in the western Pacific has a much greater distance over which to age before it is destroyed (also by subduction as we will see in the following lesson). It is important to note that this still constitutes a symmetric pattern because there is the same progression of aging on both sides of the youngest seafloor. However, the pattern is simply "cut off" to the east, causing the pattern to appear more complicated in the Pacific than in the Atlantic.



Rock Samples:

- a) 5 Myr
- b) 7 Myr
- c) 2 Myr
- d) 4 Myr
- e) 5 Myr
- f) 8 Myr
- g) 10 Myr
- h) 6 Myr
- i) 25 Myr
- j) 27 Myr
- k) 31 Myr
- L) 12 Myr
- m) 20 Myr
- n) 16 Myr
- o) 19 Myr
- p) 31 Myr
- q) 55 Myr
- r) 68 Myr
- s) 43 Myr
- t) 62 Myr
- u) 51 Myr
- v) 41 Myr
- w) 88 Myr
- x) 82 Myr
- y) 96 Myr
- z) 78 Myr
- aa) 71 Myr
- bb) 104 Myr
- cc) 117 Myr
- dd) 113 Myr
- ee) 143 Myr
- ff) 126 Myr
- gg) 175 Myr