

GS106

Key—lab 4

- 1) Be sure you labeled the entire mid-ocean ridge system. Many times we talk about the mid-Atlantic ridge but this is only one part of the whole ridge system. The ridge continues around the entire world.
- 3) Using the north Atlantic ridge map we can get several readings for the depth of the continental shelf on the East coast of N. America. Some of the values I got were: -69, -13, -26, -37... when I average these I get -36.25 m
- 4) To determine the change in elevation the Mid-Atlantic ridge rises above the surrounding sea floor I took several measurements off of the ridge and off the surrounding floor. I subtracted them and then averaged them. The numbers I found were as follows:

<u>Floor</u>	<u>RIDGE</u>	<u>DIFFERENCE</u>
-5638	-3553	2085 m
-5042	-4316	726 m
-6671	-5301	1370 m
-4131	-2962	1169 m
	Average	1337.5 m

- 5) The depths of the trenches I did the same as the depth of the shelf. The only thing is I found fewer values. They were: 8605, 8064 and 7680. the average was: 8116.3 m
- 6) The continental shelf on the east coast and the Gulf coast of N. America are passive continental shelves. This means there are no active plate boundaries associated with them and so as a result the continental shelves are very wide. The Gulf coast tends to be the widest of the two. The Pacific coast is an active margin with a subduction/transform boundary very near. As a result the shelf is very narrow.
- 7) The abyssal plain is a very flat area. The sediments that cover the plain are mostly muds and they completely cover any of the underlying topography.
- 8) Seamounts are old underwater volcanoes. In the Pacific the main creator of seamounts are hot spots and the east Pacific rise

Part B

To determine how many times the earth's magnetic pole has shifted we have to count each band of color on Figure one. Each color change represents a reversal of the magnetic field. I counted 27 reversals in the past 50 million years

The Brunhes epoch began about 750,000 years ago and 2 million years ago a compass needle would have pointed to the south because it was a reversed period. Whether we are in for a reversal anytime soon is up for debate. If you supported your position using the data I wouldn't mark you wrong.

Rate of ocean spreading:

Using Figure 2, we can compare the spreading in the Atlantic and Pacific. We find the Pacific has spread more in the past 50 mil. Years.

Atlantic: 950km Pacific: 1950 km

Remember, the diagram only represents one side of the ocean basin so to calculate the total distance the ocean has spread you have to double this distance. Therefore:

Atlantic: 1900km → 190,000,000cm Pacific: 390,000,000cm

To calculate the rate of spreading we take these values and divide them by the time it took to move them this far:

$$\text{Atlantic: } \frac{190,000,000\text{cm}}{50,000,000 \text{ yrs}} = 3.8\text{cm/yr} \quad \text{Pacific: } \frac{390,000,000\text{cm}}{50,000,000 \text{ yrs}} = 7.8\text{cm/yr}$$

To Calculate the time it has taken the north and south Atlantic to open up you will use the Atlantic spreading rate of 3.8 cm/yr.

To determine how much the North Atlantic has opened you must measure from N. Carolina to Western Africa (20°N latitude) on the large map at the back of the room. I measured 31 cm with a meter stick. I then must convert this to a real distance (we know that it isn't really 31 cm from NC to W. Africa!). The scale given in the lab is 1:23,230,300. This means that for every cm you measure on the map it is really 23,230,300 cm. Therefore the distance to Africa is:

$$31 \times 23,230,300 = 720,139,300 \text{ cm}$$

To determine how many years it took to open up the **North Atlantic** we divide this distance by our spreading rate;

$$\frac{720,139,300\text{cm}}{3.8\text{cm/yr}} = 189,510,342 \text{ yrs}$$

Now we repeat this procedure for the **South Atlantic**: I measured 21.5 cm on the map...I convert this to a real distance: $21.5 \times 23,230,300 = 499,451,450 \text{ cm}$

Now I divided by the spreading rate for the Atlantic: $\frac{499,451,450\text{cm}}{3.8 \text{ cm/yr}} = 131,434,592 \text{ yrs}$

We can compare the value for the N. Atlantic to the geologic time table and see that the Triassic covers from 180 to 225 million years. The value we came up (189 mil years) falls within this time period so it agrees with the geologic data.

Part C:

Pillow lavas form as basaltic lava erupts under water. The water quickly cools the surface of the lava but because there is so much pressure from the erupting lava, the shell is breached. However, this lava is also cooled...The process continues and ends up creating bulbous type lava structures. These have often been referred to as looking like a bunch of pillows stacked up.

When a geologist sees pillow lavas in a mountainous region we can determine that those rocks formed under water. This suggests that by finding the pillows in the coast range that the rocks found in the range formed under water due to a volcanic eruption and were uplifted to their current elevation.