Geology 101, Spring 2008

Lab 9, part 2: Facies changes or sea level changes preserved in the rock record

Needed: A photocopy of a portion of **the Tom's River, New Jersey, topographic quadrangle map**; lab 9, part one; five sheets of **tracing paper**; a sheet of **graph paper** (handed out); a soft lead **pencil;** and several **coloring pencils**.

Procedure:
1. From part one, recall that each rock has a color. Write a LEGEND, which identifies each R-number with this color.

2. Label a piece of tracing paper "PRESENT". Place the tracing paper over the photocopied topo map and, with a soft lead pencil, mark the outlines of where each rock is going to be. Usually, this will correspond with the different depositional environments. In the case where there are a couple of different rocks in the same depositional environment, use an alternating pattern of colors. Don't worry about following every inlet and headland; you should end up with a set of parallel lines dividing the different environments. After you are satisfied with the outlines, fill in the appropriate areas with the legend color(s). Should the **upland** areas be colored?

Don't forget to include the A-A' line in **all** of the tracing paper maps.

How do you know which areas on the map represent which depositional environments? **Fluvial** environments should be reasonably easy to see; the blue stippled pattern on the map is the **supratidal marsh** environment. The part of Barnegat Bay inside of the New Jersey Inland Waterway is **tidal mudflat**. The green areas of the barrier island represent the **backshore dune** areas, stabilized by vegetation. The **mid-continental shelf** begins two kilometers seaward from the barrier island.

3. Now suppose in 100 years, the shoreline migrates 3 kilometers **landward**. Assume that **all** of the different depositional environments move 3 kilometers landward, and also assume that any high points will be eroded away before seawater covers them. Label a piece of tracing paper "100 YEARS FROM NOW". Place the tracing paper over the topo map and mark the outlines of where each rock will be deposited. Appropriately color the outlined areas. Don't forget to include the A-A' line and, again, you should end up with a set of parallel bands of color. (Hint: Start by moving the shoreline 3 km landward and work your way from there).

4. Suppose a hundred years after that, the shoreline migrates a further 3 km **landward** so that this shoreline is 6 km landward of the original one. Label a piece of tracing paper "200 YEARS FROM NOW". Place the tracing paper over the topo map and mark the outlines of where each rock will be deposited. Appropriately color the outlined areas. Note that an "Outer continental shelf" environment and corresponding rock will occur.

5. Suppose a hundred years after that, the shoreline unexpectedly migrates 9 km **seaward** so that this shoreline is 3 km seaward of the original one. Label a piece of tracing paper "300 YEARS FROM NOW". Place the tracing paper over the topo map and mark the outlines of where each rock will be deposited. Appropriately color the outlined areas.

6. Suppose a hundred years after that, the shoreline migrates a further 3 km **seaward** so that this shoreline is 6 km seaward of the original one. Label a piece of tracing paper "400 YEARS FROM NOW". Place the tracing paper over the topo map and mark the outlines of where each rock will be deposited. Appropriately color the outlined areas.

7. Stack your tracing paper sheets in order from oldest on the bottom to youngest on the top, using the A-A' line to align the sheets. Using the attached graph paper, draw a cross-section of the Tom's River, New Jersey, area thousands of years in the future, along the A-A' line (Imagine a huge backhoe excavating a trench along the A-A' line; the cross-section will look like the side of the trench). Assume that the sea level changes occur abruptly and that, in between changes, 20 meters of sediment deposit (so each of the tracing paper sheets represent 20 meters of rock thickness).

8. During which period of time did a **transgression** occur?

9. How does grain size generally change in younger rocks as the transgression occurs? Demonstrate this by drawing a part of the cross-section (in fact, a stratigraphic column) that shows the change you identified.

10. Are there any exceptions to this general rule of grain size? Due to what depositional environment(s) does the exception occur?

11. During which period of time did a **regression** occur?

12. How does grain size generally change in younger rocks as the regression occurs? Demonstrate this by drawing a part of the cross-section (in fact, a stratigraphic column) that shows the change you identified.

To turn in: Staple together part one, part two (this sheet), the combined cross-section (from step 7) and the five tracing paper maps.