Sediment Deposition Lab

by John J. Gara

Objectives:

1. All students will use a stream table to observe sediment deposition in the laboratory, record data on where various sizes of sediments settle and draw conclusions as to what kind of sedimentary rock will form in what locations.
2. All students will use given data on several layers of the Helderberg Escarpment of Albany County, New York, the Earth Science reference tables for sedimentary rock identification and particle transport stream velocities, and their own conclusions to predict relative shore proximity for the given strata.

Materials:

1. Stream tables, 1ft. x 3ft. set up at angle of 20 degrees.
2. Soil of mixed particle size to fill two-thirds of the table.
3. 5 ft. tubing to fit faucet jets.
4. Hand shovels.
5. Dissecting microscopes.
6. Compound microscopes.
7. Eye droppers.
8. Tweezers.
9. Petri dish.
10. Microscope slide.
11. NYS Regents Reference Tables (specifically a diagram showing the relationship of transported particle size to water velocity, and a scheme for sedimentary rock identification).

Note: These directions suggest one stream table per student group, and each stream table needs a sink. If only one table is available, this exercise can also be done as a demonstration, or by successive groups of students.

Student Briefing:

Today, we are going to discover a relationship between moving water's ability to carry soil particles of various sizes and the types of sedimentary rocks that can be found being formed, and where.

For this lab, each group will need to use the directions to set up a stream table, observe the erosion and deposition taking place in your experiment, use the microscopes to make comparisons of the sizes of the particles and, then, use your data, reference tables and your knowledge of sedimentary rocks to draw conclusions about how certain rocks were formed in the Helderbergs in your report.

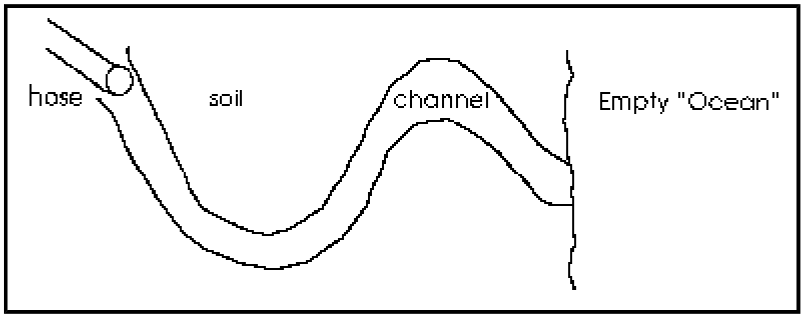
Student handout:

Name________________________

Read directions carefully:

1. Use the shovels to arrange and smooth the soil in your stream tables so that the bottom third of the table is empty and clear of all particles and the top two-thirds is level with the incline of the table.

2. Now excavate a meandering stream channel through the soil as pictured below. Only dig down half the depth of the soil at most.



3. Secure the hose (the "source" of the stream) at the top of the channel and start the water **VERY, VERY GENTLY!** Watch the stream gradually fill with water as the water table in the soil gradually fills up. You may increase the water pressure in **SMALL** increments if it is too slow. Let the water run for several minutes at a medium speed. Study the formation of a **DELTA** as the water washes the soil into your "ocean." Make a drawing of your stream, delta and ocean below:

4. How does the delta's slope change as the stream continues to flow into your ocean?

5. After your delta has grown into about half of your ocean, take a sample of the water near, **but not on**, the bottom of the ocean on the side furthest from the delta. Place the drop on a microscope slide and observe it at LOWEST scanning power (4x on the objective). Are there particles present? If so, how would you describe their size?

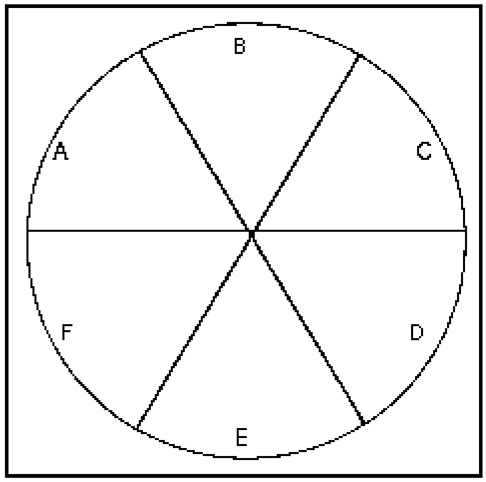
6. Turn off the water and allow the water level to drain from the channel. Observe the general sizes of the particles remaining near the source of your stream, the middle and at the delta. What comparisons can you make?

7. Take a pair of tweezers and take small samples of the soil from the following places and arrange them on a petri dish clockwise for observation.

   a. At the water source
   b. At the end of the stream before the delta
   c. At the center of the delta
   d. At the tip of the delta

e. At the middle of the ocean bottom
f. at the far end of the ocean bottom

Place the dish under the dissecting microscope and draw the relative particle sizes observed in the circle below:



8. From smallest to largest, rank the locations of where the deposits are found in this drainage basin using the location names in question 7.

Smallest ________________________

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____

____

Largest ________________________

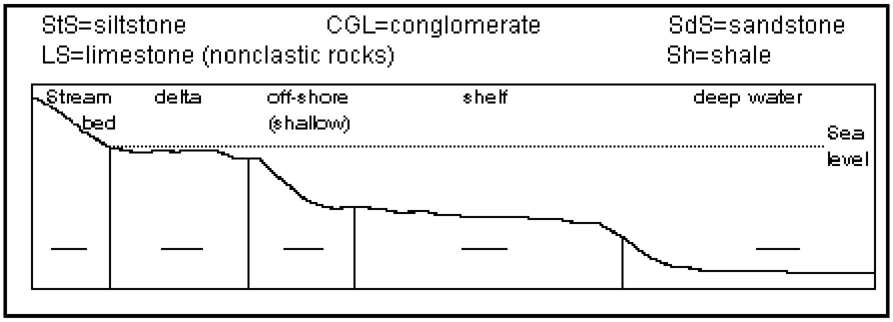
9. Where was the speed of the water the fastest?__________________
Where was the speed of the water the slowest?__________________

10. Where would you think the suspended particles found in question 5 would finally settle out?

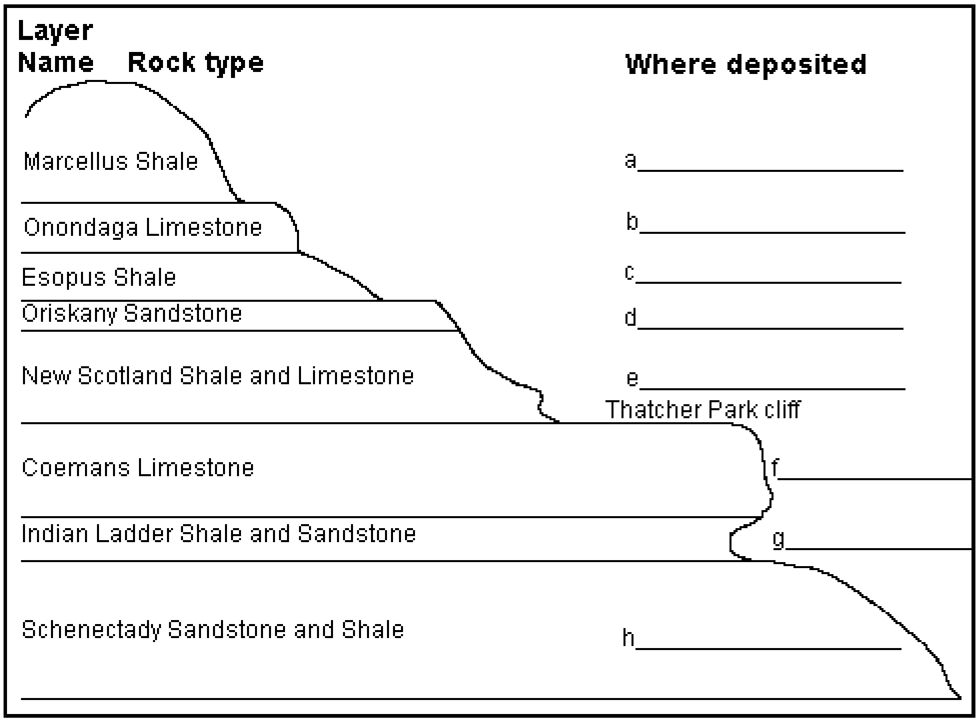
11. What about DISSOLVED minerals like sodium chloride and calcium carbonate ... where would you find them crystallizing.

12. If your stream was life size, the particles remaining at the forceful source are comparable to boulders in a fast stream. Look at two charts in your Earth Science Reference Table: "Scheme for Sedimentary Rock Identification" and "Relationship of Transported Particle Size to Water Velocity." Clastic rocks are mostly from visible particles. Nonclastic rocks, like limestone, are from chemicals that have precipitated out of the water, mixed with particles.

Based on the information in the tables and relative particle sizes, look at the profile below of a stream entering an ocean and predict where the following rock types would most likely form and label the zone with the appropriate abbreviation. For simplicity use only one rock type per zone.



13. Look at the diagram below of the cliff at Thatcher Park, the Helderberg Escarpment. The cliff is the edge of the Catskill Plateau that was underwater 360 million years ago. Note the different kinds of rock in the layers that make up the escarpment. Label each layer with the part(s) of the drainage basin in question 12 that may have been responsible for making the layer.



14. In a paragraph, explain what you think was happening, in the 10 million years it took to build these sediments, to either the depth of the sea and/or the distance to the shore for these 8 layers, from oldest to youngest.

Information on the Internet

- Stream table kit
- Stream table exercise, instructions and plans

Science labs web page
Pedagogy web page

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