Oceanography 101
Dash Point Field Trip
Beach Geological Processes

Name____________________

Date: _____________

Time your observations started: ______________ ended: ________________

1) The time of this field trip was chosen to coincide with a low tide. At what time did that low tide occur, and what was the height of the low tide? (instructor will have a tide table, or you can find it online, for example at http://www.dairiki.org/tides/daily.php)

2) How would you characterize the weather and sea conditions? (i.e., light/calm, breezy/choppy, very windy/rough seas, etc.)

3) a. On the upper portion of the foreshore, can you identify the most recent high tide mark? If so, how?

   b. Is there evidence that extreme (storm) high tides and waves ever get higher on this beach? If so, what is that evidence?

4) Look out toward the water offshore. Dash Point faces a part of Puget Sound called East Passage. Can you detect any current flowing in East Passage? If so, which direction (to the right or left) does it seem to be flowing?

5) Pick up a handful of beach material about halfway down the foreshore near the small stream, and examine it closely using a magnifying glass (supplied by instructor). Using the attached info sheet as a guide:

   a. How would you characterize its predominant grain size? (gravel, sand, silt, or clay)

   b. How would you characterize the sphericity and angularity of the grains?

   c. Would you call this beach material "poorly sorted", "moderately sorted", or "well sorted"?

   d. Looking at the color and other characteristics of the various grains, and using the attached table of common rock-forming minerals, make some educated guesses as to what the mineral composition of some of these grains might be.

   e. Would you call this a "high energy" beach or a "low energy beach"? Why?

6) a. As a group, use a shovel to dig a hole about a foot deep in the beach material near the stream. Do you see any layering in the sediment? If so, what processes might have caused it?

   b. Do the same thing at several other spots along the beach, and see if any layering is present. If so, what might have caused it?

7) a. Walk along the beach eastward (to your right if you face the water) toward the foot of the bluff. Is the beach narrower or wider, flatter or steeper than the beach near the stream?

b. Pick up a handful of beach material about halfway down the foreshore in front of the bluff. Examine it using a magnifying glass, and see how it compares in composition and texture to the beach material near the stream (questions 5 & 6). Describe some of the differences (grain size, color, sorting, layering).

8) a. Look at the bluff itself. List any signs of erosion you see, either at the base or higher up on the bluff. What factors and processes might be causing this erosion?

b. What material(s) does the bluff appear to be made of?

c. How does the structure and composition of the bluff relate to the glacial history of Puget Sound?

9) a. Do you think the beach at Dash Point is replenished primarily by stream runoff, by bluff erosion, by longshore transport, or by some combination of these? Explain your reasoning.

b. In what ways might the relative importance of the above processes change seasonally throughout the year? Explain.

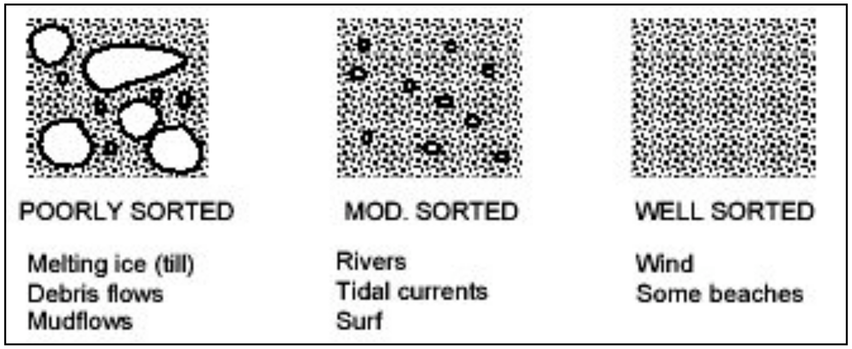
10) During your exploration of the beach, did you see any of the following small-scale beach features? If so, check them off.

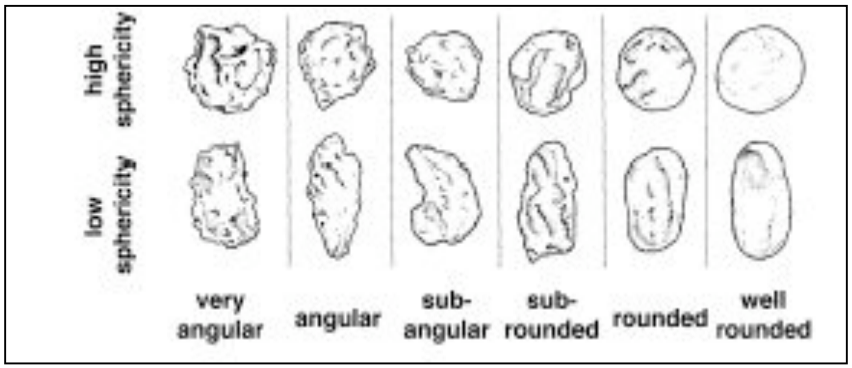
rill marks ________ ripple marks ________ swash marks ________

backwash marks________ signs of animal activity in the sand ________

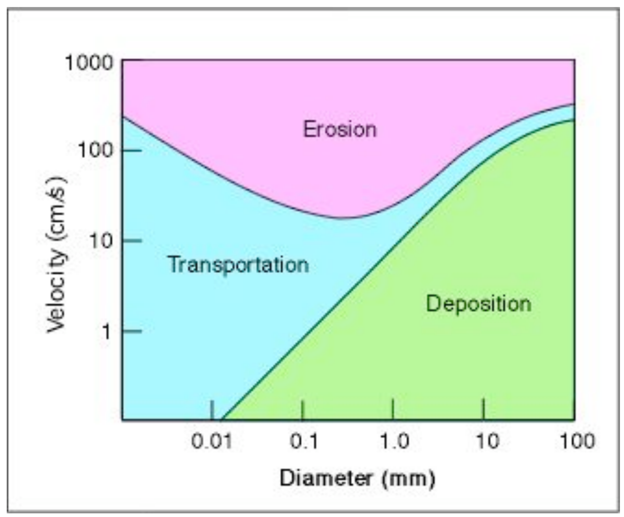
11) Although at this point in the course we are not yet studying marine life, this beach trip gives us a chance to practice finding and identifying some intertidal zone plants and animals. See how many you can find, and list them below by their common name (e.g., sand dollar, surf grass). Also make note of what part of the beach you found them (backshore, upper foreshore, lower foreshore).

Common Name of Animal or Plant	*Where Found?*
______________________________	______________________________
______________________________	______________________________
______________________________	______________________________
______________________________	______________________________
______________________________	______________________________
______________________________	______________________________
______________________________	______________________________



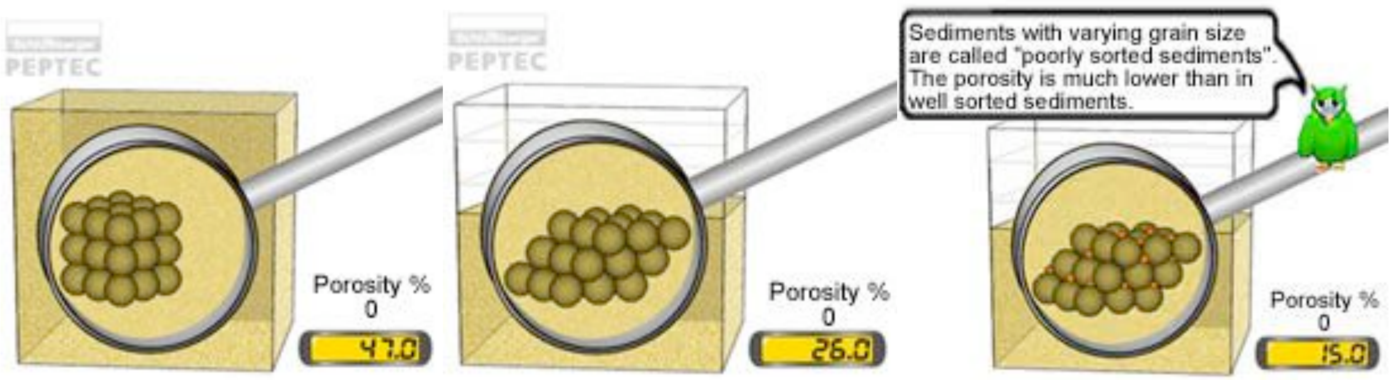


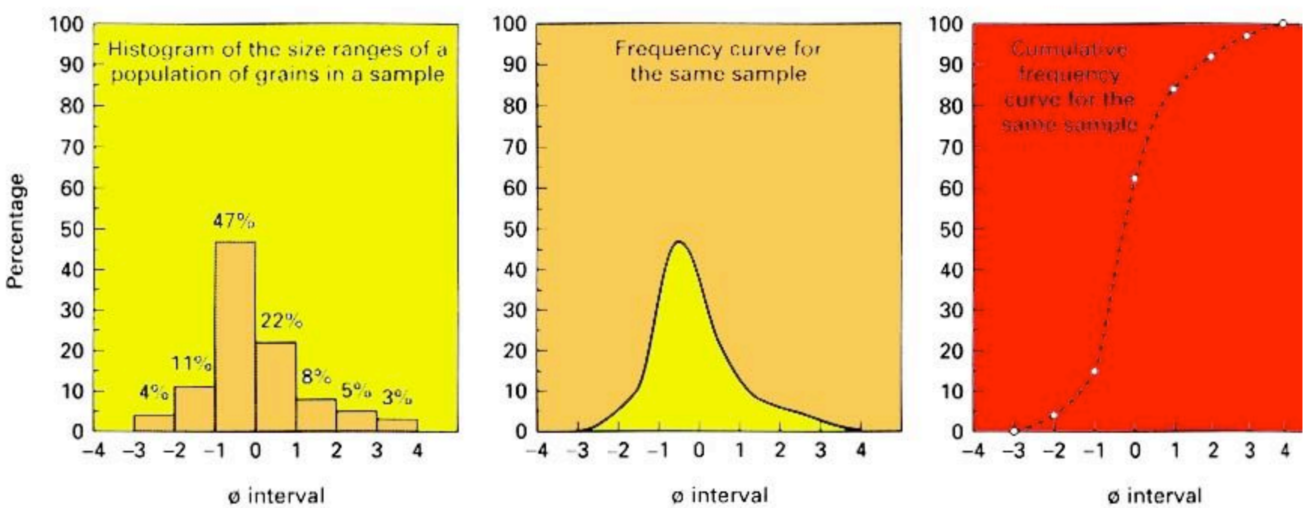
mm	phi	Class terms		Sediment terms	Rocks (within the whole range)
		BOULDERS			
256	-8				
128	-7				
64	-6	COBBLES			
32	-5			gravel	conglomerates and
16	-4	PEBBLES			sedimentary breccias
8	-3				
4	-2				
2	-1	GRANULES			
1	0		coarse		
0.5	1			sand	sandstones
0.25	2	SAND			arenites
0.125	3		fine		
0.062	4		coarse		
0.031	5	SILT		silt	siltstones and
0.016	6				mudstones
0.008	7		fine		
0.004	8	CLAY		clay	claystone



Hjulstrom's Curve

(relationship between *water* velocity and the sediment sizes eroded/ transported/ deposited by the moving water)





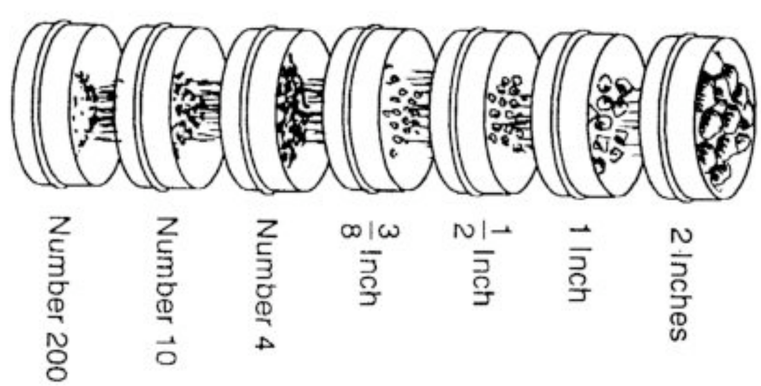
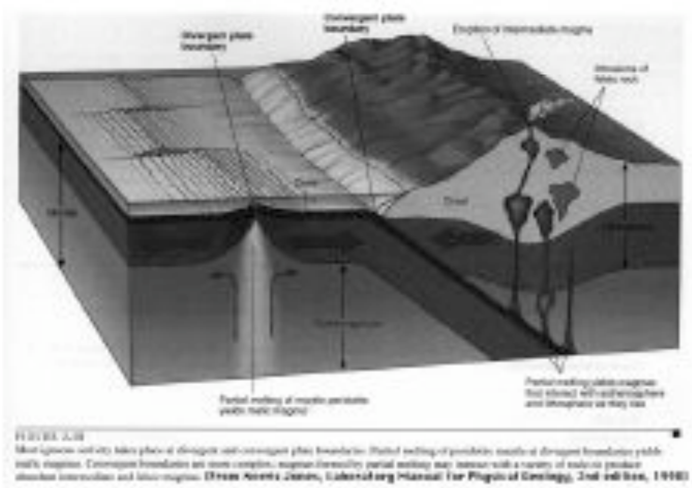


Figure 4-3. Dry sieve analysis.

Igneous, Sedimentary, and Metamorphic Rock ID Charts

Some Common Rock-Forming Minerals

Harder or Softer Than Glass?	Cleavage? (breaks along planes?)	Color	Other Properties	MINERAL NAME
Harder	No	variable	glassy luster; conchoidal fracture (breaks like glass)	**QUARTZ**
Harder	No	olive green	glassy luster; granular; weathers brown/orange	**OLIVINE**
Harder	No	red to brown	twelve-sided or spherical common; glassy luster	**GARNET**
Harder	(Yes)	pistachio green	surface coatings, or massive	**EPIDOTE**
Similar	Yes	peach/pink to white	glassy luster; banding; 2 cleavages at 90° (also called *potassium feldspar*)	**ORTHOCLASE (Pink Feldspar)**
Similar	Yes	white to gray	glassy luster; 2 cleavages at 90°; striations (grooves) possible on cleavage faces (white= *sodium*-rich, dark= *calcium*-rich)	**PLAGIOCLASE (White to Dark Grey Feldspar)**
Similar	Yes	dark green to black	glassy to dull luster; 2 poor cleavages at 90°	**PYROXENE**
Similar	Yes	black to dark green	glassy luster; splintery appearance; 2 cleavages at 120° and 60°	**AMPHIBOLE**
Similar	No	brassy to gold	cubic crystals (with striations [grooves]) common	**PYRITE ("fool's gold")**
Similar	(Yes)	silver to grey to red-brown	brown-red streak (on unglazed porcelain); may be glittery flakes; weakly magnetic	**HEMATITE**
Similar	(Yes)	black to grey	grey-black streak (on unglazed porcelain); may be "rusty"; strongly magnetic	**MAGNETITE**
Softer	Yes	clear to light yellow	glassy luster; perfect cleavage in 1 dir.; forms flexible, transparent, thin sheets	**MUSCOVITE (clear mica)**
Softer	Yes	brown to black	glassy luster; perfect cleavage in 1 direction; forms flexible thin sheets	**BIOTITE (black mica)**
Softer	Yes	white to clear (darker if massive)	reacts with hydrochloric acid (HCl); glassy to dull luster; 3 cleavages not at 90° to each other	**CALCITE**
Softer	Yes	white to clear	salty taste; glassy to dull luster; 3 cleavages at 90° to each other (breaks into cubes)	**HALITE**
Softer	(Yes)	white to pale green	very soft; pearly luster; soapy feel	**TALC**
Softer	Yes	silvery grey	heavy for its size; 3 cleaveage at 90° to each other (breaks into cubes)	**GALENA**



Igneous Rock Names

COMPOSITIONS (Minerals Present) are in columns TEXTURES are in rows	Felsic	Intermediate	Mafic
	Quartz Orthoclase White plagioclase Biotite mica Muscovite mica	White plagioclase Amphibole Biotite mica	Grey plagioclase Pyroxene Olivine
Coarse-grained	**GRANITE**	**DIORITE**	**GABBRO**
Fine-grained	**RHYOLITE**	**ANDESITE**	**BASALT**
Porphyritic (both coarse+fine)	**Porphyritic Rhyolite**	**Porphyritic Andesite**	**Porphyritic Basalt**
Glassy	**Obsidian**		
Vesicular	**Pumice**		**Scoria**
Pyroclastic	**Tuff**		

Sedimentary Rock Names

GRAIN SIZE	OTHER PROPERTIES	ROCK NAME
Coarse-grained (pebble/cobble/boulder)	Rounded grains	**CONGLOMERATE**
	Angular grains	**BRECCIA**
Medium-grained (sand)	"Sand-sized" particles (often of quartz, feldspars, rock fragments)	**SANDSTONE**
Fine-grained (silt)	Feels gritty on teeth or between fingers	**SILTSTONE**
Very fine-grained	Feels smooth, soft, often layered (clay)	**SHALE**
	Denser, fizzes in dilute acid (calcite)	**LIMESTONE**
	Very hard, dense, scratches glass (silica)	**CHERT**
Variable	Black or dark brown, sometimes with plant material visible (carbon)	**COAL**

Metamorphic Rock Names

FOLIATED (LAYERED)?	OTHER PROPERTIES	PROTOLITH (used to be this kind of rock)	ROCK NAME
Yes—slaty cleavage (breaks into flat plates)	Microscopic to very fine-grained; clay minerals common; cleavage surfaces dull to slightly shiny	Shale	**SLATE**
Yes—schistosity (platy foliation of mica grains)	Medium to coarse-grained; mica minerals common; may also contain garnets	Shale, siltstone	**SCHIST**
Yes—gneissic (light and dark) banding	Medium to coarse-grained; mostly non-micas; light and dark layers common	Shale, siltstone, granite	**GNEISS**
Yes—aggregate of long amphiboles	Dark green to black; also may contain black mica, feldpars, and/or garnets	Basalt, gabbro	**AMPHIBOLITE**
No—made of quartz	Fine- to coarse-grained crystalline texture; light-colored; scratches glass	Quartz sandstone	**QUARTZITE**
No—made of calcite	Commonly coarsely crystalline; reacts with acid; usually light-colored; softer than glass	Limestone	**MARBLE**
No—made of rock fragments	Coarse-grained, sometimes deformed, rock fragments; rock breaks through individual clasts	Conglomerate or Breccia	**METACONGLOMERATE or METABRECCIA**