Coastal Geology—Gary Griggs Exhibit

Have you ever noticed that some beaches have large grains of sand while others have very fine sand? Have you noticed that beaches can be different colors? Have you seen beaches with large waves and some with no waves at all?

Why might marine biologists and geologists need to know about the properties of sand on different beaches? The questions below will help you discover the reasons why sand differs so much from place to place.

Part 1: Questions About the Exhibit

1. What happened to the three arches that once stood at Natural Bridges State Beach?

2. What did Gary Griggs discover about how sand travels along the coast of California?

3. How do the waves at Seabright Beach change between the summer months and the winter months?

4. How do the different waves affect both the size and appearance of the beach?
**Part 2: Sand Movement in Water**

If you were to bend down and pick up a large rock, it would take more energy than picking up a small rock. The same thing is true for grains of sand being carried by waves and currents. Large grains of sand take more wave energy to move than small grains; wave energy corresponds to wave speed, so the faster the wave, the more energy it has.

1. If a wave is moving quickly enough to carry both large and small grains of sand, but suddenly slows down due to a decrease in ocean depth, which grains do you think would settle to the bottom first? Why?

2. What type of waves would you see at a beach with large grains of sand? Why do you think this is true?

3. What type of waves would you see at a beach with small grains of sand (remember what has to happen for small grains to settle)? Why do you think this is true?

**Part 3: Describing a Sand Sample**

1. Underneath the counter at the Gary Griggs exhibit are two drawers. Open the right drawer and look at the sand samples. Choose five samples that look interesting to you and write their names in the table below.

<table>
<thead>
<tr>
<th>Sample Name</th>
<th>Color</th>
<th>Size (mm)</th>
<th>Sorting</th>
<th>Roundness</th>
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2. Next read the following descriptions of color, size, sorting and roundness:
   - **Color**: Describe all the colors you see in each sand sample.
   - **Size**: Use the sizing chart (chart 1) to determine the size (in millimeters) of the individual grains in the sample. There will most likely be a wide range of sizes, so either give the average size or give a range. Note that the two pie charts in chart 1 are the same thing just in different colors for easy comparison to your sample.
Sorting: This refers to how well sorted your sample is. Well sorted samples will have grains that are all the same size while poorly sorted samples will have grains of many sizes. Use chart 2 to determine the sorting of each sample.

Roundness: Some individual grains of sand are very round, while others are very coarse or jagged. Refer to chart 3 to estimate the overall roundness of your sample.

3. Fill in the rest of the table. Use the attached sheet and descriptions above to help you determine the size, sorting and roundness of your five chosen samples.

4. Based on the size of the sand samples you examined, put them in order from the one that would settle out of a wave first to the one that would settle out last.

5. Did you see any materials in the sand that may have come from living organisms? If so, list the organisms and what samples contained them.

6. Open the left drawer and look at the rocks. Do you see any of these rocks or colors in the sand samples you examined? If so, list the rocks and what samples contained them.

7. What types of rocks will you find on Santa Cruz beaches?

Part 4: Applying Information
Find the Rocky Reef tank and the Sandy Sea Floor tank. Using what you have learned about sand, fill in the table below.

<table>
<thead>
<tr>
<th>Sand location</th>
<th>Color</th>
<th>Size</th>
<th>Sorting</th>
<th>Sphericity</th>
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<tbody>
<tr>
<td>Rocky Reef</td>
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<td>Sandy Sea Floor</td>
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Part 5: Conclusion
Now that you have learned how to examine a sample of sand in great detail, why do you think this might be an important skill for both a marine biologist AND a geologist? Write a paragraph in response to this question.