Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.

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The colors of beaches

Beach sand can vary widely in color and texture depending upon the minerals it contains.

Sandy Lydon and I did a short beach walk adventure this past weekend, and took 40 people from the main beach in Carmel along the coastline to Monastery Beach, almost to Point Lobos. This was considerably less demanding than our summer hike around Monterey Bay, but equally packed with history and geology. Normally, I try to cover the past 200 million years or so of Earth history on our trips and Sandy covers the last 200 years of human history. It seems like a reasonable distribution of accountability.

One of the most striking things about the main beach in Carmel is the absolutely brilliant white color of the sand. The sand there doesn't seem to move much up or down coast, and as a result, has been worked and reworked many times so that it is almost pure quartz. This is what gives it the distinctive white color. Beaches on the

Santa Cruz side of the bay are not quite so white, but on the other hand, our beaches are almost always much warmer and sunnier. In fact, a century ago, the newspapers in Santa Cruz and on the Monterey Peninsula were in a more or less unspoken competition to attract tourists and their dollars. At that time there was an article in the local paper about the differences in weather on opposite sides of the bay. According to the story on the Santa Cruz side of the bay, when children in Monterey or Carmel turned 10 years old their parents would take them to Santa Cruz to see the sun for the first time. I don't know whether this story attracted more tourists, but it made the folks on the north end of the bay feel a little better about their lack of grand hotels and wealthy visitors.

While most Monterey Bay beaches are on the white or tan side of things, sand can be a lot of different colors. While a graduate student at Oregon State University, I had the opportunity to spend a summer studying the coral reefs of Bermuda, about 600 miles off the Atlantic coast. Bermuda advertises its "pink coral sands" as an attraction to draw tourists. And they are pink, but its not coral that gives them this color. It's actually a less familiar organism, a single cell animal known as a foraminifera, which makes a very small pinkish shell. Although not particularly abundant, the small amount of pink in the otherwise white sand gives a distinct color to the beaches of Bermuda.

Fifty miles south of Santa Cruz at the mouth of the Big Sur River, a picturesque walk from Highway 1 through Andrew Molera State Park, you can find purple beach sand. The purple is from a very hard mineral, garnet, which weathers out of metamorphic rocks high in the Santa Lucia Range. Much of the sand paper you use is coated with garnet because it is a hard and abrasive mineral. Wind and waves have concentrated this purple mineral in interesting patterns along the beach for a considerable distance south of the river mouth.

In the winter months you can find black sand along many of Santa Cruz's beaches. Because these dark minerals are heavier than the clear or lighter colored quartz and feldspar that make up the great bulk of most beach sands, the wave run-up and backwash will typically concentrate these darker minerals into distinct patterns on the beach face.

Three thousand miles west in the Hawaiian Islands, there are really only two things to make beach sand out of, either coral or the shells of other tropical organisms, or volcanic rock. As a result, you either see gleaming white beaches or black sand beaches, often with concentrations of a green mineral, olivine, common in the basaltic lava that makes up Hawaii.