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

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Volcanoes in and Around the Pacific

Mount Fuji, which last erupted in 1707, as we entered the port of Kobe, Japan.

Ten days in the middle of the ocean with no land in sight, in fact with no nothing but water in sight, is not something most of us normally experience. No matter that you are on a ship with 750 or so other people, there is still no solid land mass around to provide stability and comfort when you need it most.

Although images of cruise ships in tropical blue waters tend to lull us into a sense of complacency and calm, the wind and sea can conditions can change quickly in the mid-Pacific and erase that image. While we started our voyage (we try to remind students that this is a voyage of discovery and not a luxury cruise) in reasonably calm conditions, we had several days of rough seas and high winds, and even a 600-foot ship moves around enough to make you wish you were back on land.

After passing over the six-mile deep Japan Trench, the site of the magnitude 9.0 earthquake of March 11, 2011, we docked in Yokohama, Japan, on January 29. Japan lies between latitudes 30 and 45° North, comparable to the stretch along the west coast from Ensenada, Mexico to about Portland, Oregon. Its winter here

though and it was cold, a surprising change from the tropical weather we briefly enjoyed in the Hawaiian Islands.

Entering Tokyo Bay and the harbor, Mount Fuji displayed a coating of snow and nearly perfectly symmetry and added a feeling of geological unrest to the horizon. Looking from the sea, the massive cone of Mt. Rainier, framing the skyline of Seattle, presents an almost identical image. Rainer last came to life in the 1840s while Mt. Fuji has lain dormant since 1707. Both will erupt again, however.

The perfect photograph taken at the ideal time of day, which rarely occurs, often shapes our images of so many famous natural landmarks and buildings. Fujiyama is no exception, and we were fortunate to have the entire mountain framed in the window of our cabin as we approached Japan. Minutes later the fog rolled in and it was gone for the remainder of our stay.

But the steep-sided, classic cone shape of Mt. Fuji was a striking contrast to the low shield shape of the Hawaiian volcanoes. In fact, nearly all of my students were surprised to see that Mauna Kea, Mauna Loa and Kilauea, the volcanoes that make up most of the big island of Hawaii, didn't look at all as they had imagined.

The Hawaiian volcanoes were formed of basaltic lava that came to the Earth's surface directly from the mantle and are nearly all black or very dark grey in color. Their low-relief shield shape stems from their chemical composition, one very low in silica, which yields a very fluid lava that can flow long distances but that doesn't form steep slopes. While these lava flows can and do destroy homes and farm land, they move slow enough such that they rarely are a hazard to people. Where they meet the sea the flows are also gradually expanding the land area of Hawaii. In time, lots will be sold and homes will be built.

The Cascade volcanoes, on the other hand, extending from Mt. Lassen in California to southern British Columbia (and include the well-known peaks Mt. Shasta, Mt. Mazama or Crater Lake, Mt. Jefferson, Mt. Hood, Mt. Saint Helens and Mt. Rainier) all fit our ideal image of steep-sided, cone shaped peaks.

These mountains, as well as the other volcanoes that form the Ring of Fire around the Pacific, were created from magma that passed through continental crust that was higher in silica on its way to the surface. This additional silica produces very sticky or viscous magma that doesn't allow the volatiles or gases to escape and as a result, commonly produces explosive eruptions and very steep sided cones. The

sticky lava flows combined with fragments of rock and ash blow out under pressure solidify quickly to form the steep slopes and statovolcanoes.

When you read this we will have sailed the 750 miles from Kobe, Japan to Shanghai, China and started some new adventures.