A Mini Field Guide to Rocks of San Luis Obispo

by Allen Dailey

Introduction

The Three Categories of Rock

Igneous: rock formed directly from magma or lava, e.g. granite.
Sedimentary: rock formed by deposition of layers of sand, silt, etc., e.g. sandstone.
Metamorphic: rock altered by heat and pressure deep within the earth, e.g. schist.

Plate Tectonics

The earth has three layers: the core, mantle, and crust. Relative to the inside of the earth, the crust is as thin as an apple skin. It is made up of interlocking, irregular plates, like pieces of a broken eggshell. Over millions of years, these plates gradually move and grind against or are driven underneath one another. This is called plate tectonics. There are three types of plate boundaries: convergent (one plate is shoved underneath another), divergent (two plates pull apart from each other), and transform (two plates slide against one another). California was the site of a convergent boundary up until 30 million years ago, when the boundary became transform, manifesting as the San Andreas Fault. San Luis Obispo geology has been shaped by these monumental, awe-inspiring forces.

This field guide highlights the most common rocks in SLO and nearby coastal areas. It is a brief introduction; for suggestions for further reading, or to print more copies of this guide, please visit: allenWdailey.weebly.com/geology

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Serpentine

The State Rock of California

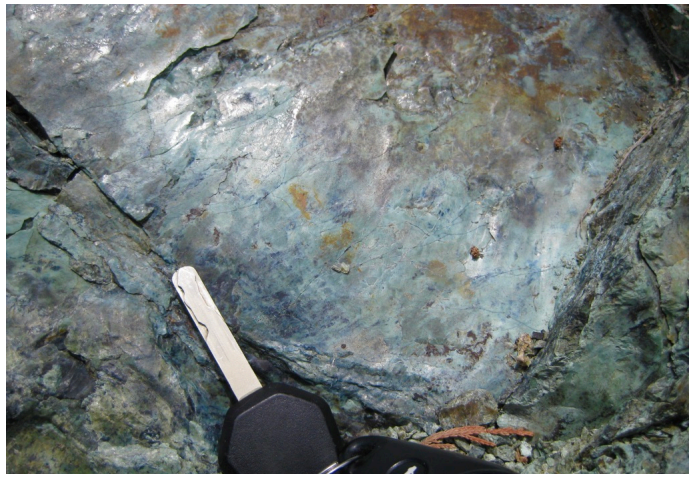
Metamorphic

The metamorphosed version of peridotite, the rock that makes up the earth's mantle. Serpentine forms deep within the earth and was brought here and pushed to the surface by moving tectonic plates.

Green to gray. May look scaly, waxy, or like plastic.
No layering; outcrops look like disorganized shattered swirls.

Brittle, crumbly, may be smooth and shiny

South Hills open space; Irish Hills near Costco; roadcuts on Highway 1 at N. end of Cayucos, 101 at S. end of Cuesta Grade, 101 near South Higuera.



Pillow basalt

- Igneous
- Formed by lava coming out of fissures at mid-ocean ridges (divergent plate boundaries) and being rapidly cooled by water. Pillow basalt in SLO formed in the middle of the Pacific and was brought here and smeared onto North America by moving tectonic plates.
- Black to gray-green. May have white veins of calcite or white plagioclase feldspar crystals ~3-5 mm. Outcrops like piles of blobs ~1-3 ft.
- Port San Luis west of Hartford Pier, Estero Bluffs, Cayucos beach at southernmost end of Studio Dr.

Chert

- Sedimentary
- Chert is almost pure silica (same mineral as quartz). It forms in layers at the bottom of deep oceans and is made up of microscopic "shells" of plankton called radiolaria. SLO chert formed on top of pillow basalt and was moved here from far away by moving tectonic plates.
- Used by Native Americans to make arrowheads/sharp tools.
- Red, green, yellow, whitish, or brown. Distinct layers several cm. thick. No visible grains. Blocky, rectangular, sharp, hard.
- Estero Bluffs, water tank on Felsman Loop on Bishop Peak, small outcrop on northwest flank of Islay Hill near Spanish Oaks Dr.

Greywacke

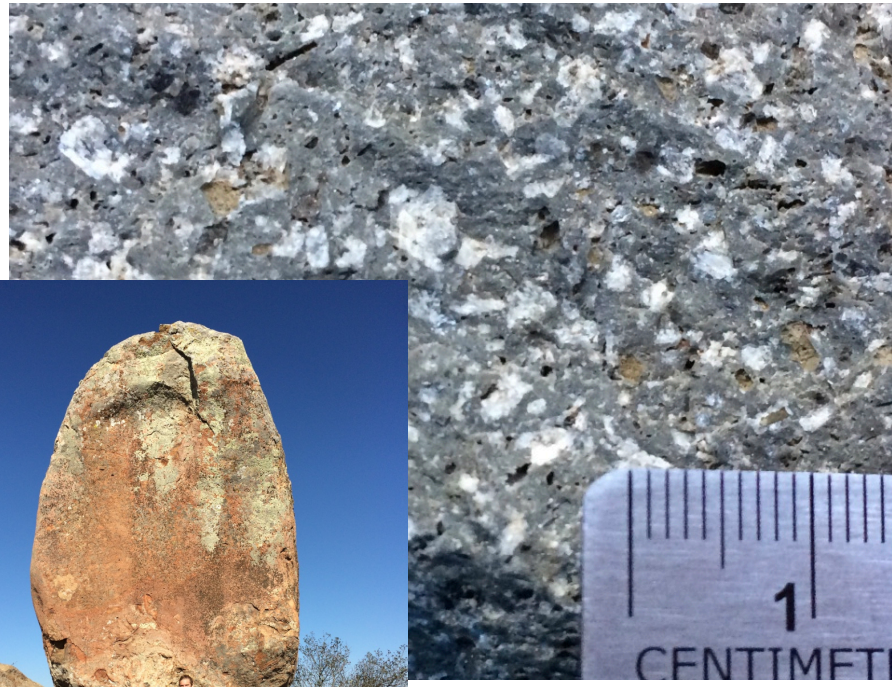
- Sedimentary
- Pronounced "GRAY-wacky"
- Greywacke, a.k.a. "dirty sandstone," consists of sand grains, clay, and other grains. It forms at the ocean bottom from turbidity currents– underwater landslides. Our greywacke formed on top of pillow basalt and chert under the ocean; all these rocks were moved and uplifted by plate tectonics. Greywacke, chert, pillow basalt, and serpentine are all part of the Franciscan Melange, a major California rock formation.
- Gray to tan. No clear layers. Often has linear/angular joints (cracks), sometimes has taphoni weathering (honeycomb-like round divots).
- Cayucos beaches/bluffs, Estero Bluffs, Moonstone Beach in Cambria

Monterey Shale

- Sedimentary
- This is a specific shale formation present on much of the central coast up to Monterey. Shale consists of grains too small to be visible to the naked eye. It forms in semi-deep ocean as fine mud particles sink to the bottom. The Monterey Shale formed more recently than the aforementioned rocks. It was lifted above sea level by plate tectonics.
- White to tan or yellowish. Clear layers ~3-10 cm thick. Almost always tilted, folded, or curved due to tectonic forces.
- Easy to break, dusty, chalky. Not as hard or sharp as chert.
- Montana de Oro State Park, East Cuesta Ridge trail

Dacite

- Igneous
- Pronounced "DAY-sight"
- In SLO, dacite is exclusively present in the Morros, the chain of peaks that includes Islay Hill, Cerro San Luis (Madonna Mtn.), Bishop Peak, Chumash Peak, Cerro Romauldo, Hollister Peak, Cerro Cabrillo, Black Hill, and Morro Rock. These peaks are volcanic necks: they are the cooled magma conduits that used to be at the core of volcanoes. The rest of the volcano surrounding this "neck" has since been eroded away.
- Light to dark gray on fresh faces; grayish, tan, or orange on weathered faces. Gray groundmass with crystals (up to ~0.5 cm) of white plagioclase feldspar, sometimes crystals of black hornblende. May appear to have tiny pockmarks. Outcrops/boulders tend to be rounded.
- Cerro San Luis, Bishop Peak, Morro Rock



Tuff

- Igneous
- Tuff is volcanic ash that falls from the sky after an eruption and is compacted and hardened by its own heat and/or burial pressure and mineral cementation over time. The Obispo Tuff, visible at Pismo and Avila Beaches, is from an unknown volcano; it is not from eruptions of the Morros (see Dacite page). The tuff at White Point, the small rocky hill by the Morro Bay State Park Natural History Museum, is likely from eruptions of the Morros.
- White to yellow. The rock's particles look like volcanic ash. No layers.
- Easy to break, crumbly, chalky
- East end of Avila Beach, north end of Pismo Beach (the tall bluffs)