

DANA TALK—GEOLOGY OF CENTRAL COAST 9/11/2021 by Wayne Mills

We live in a beautiful and geologically diverse area that contains all three basic rock forms (**Igneous**, **Sedimentary** and **Metamorphic**). The Central Coast has a relatively short, but fascinating geological history as well. Rocks on the Central Coast go back about 250 million years to the Jurassic Era in the middle of the Age of Dinosaurs, although the older rocks are of marine, rather than terrestrial origin (so, sorry, no dinosaurs here)..

What is today the San Andreas Fault, was formerly a plate boundary/Spreading Center in the Middle of the Pacific Ocean. Being a point of weakness in the crust of the Earth, it allowed molten material (magma) to come from the mantle of the earth to the ocean bottom/seawater interface where it began to cool. This cooling process allowed “magmatic differentiation” where the denser (more iron rich) minerals (clinopyroxenites and gabbros) crystallize out at the bottom of the column that could be up to ten miles in thickness. At the top of the column, **radiolarian cherts** (sedimentary rocks) and **pillow basalts** (igneous rocks) are deposited. A great example of ancient pillow lavas can be seen at the western end of Port San Luis. Chert is found in both the **Monterey** (18-15 mya) and **Franciscan Formations** (250--65 mya).

The congealing of rock materials at the spreading center pushed the older parts of the two oceanic plates away from the contact point, forcing the leading edge on the western plate below the American Continental Plate where it was eventually consumed at depth by melting. Oceanic plates are primarily underlain by basalt which is denser than the granite crust that underlies the Continental masses, therefore the (denser) oceanic plates are dragged underneath the continents--scraping off any land or island masses that lie on top of the plate, and occasionally entire thicknesses of the oceanic plate called “**ophiolites**”. There are well preserved **ophiolites** at Point Sal, and on Cuesta Grade north of San Luis Obispo. Eventually, perhaps 30 mya, the spreading center itself was pushed under the continent to its current location under the American Plate. The entire plate still rotating, caused a fracture marking the remaining plate boundary to reflect to the surface, separating the western portion of the American plate to “go for a ride” on the edge of the oceanic plate at a rate of about 5 centimeters (2.5 inches) per year to the north west, relative to the rest of America that lies to the east of the current fault. It has been estimated that at this rate of movement, Los Angeles and San Francisco will be “Sister Cities” in another 50 million or so years. Read about the creation of the western part of California in John McPhee’s **Assembling California**.

One of my favorite geologic features of our county is the chain of intrusive igneous mountain peaks (formed from Dacite) that we now call “The Seven Sisters”. These were formed about 24 mya along a plane of weakness caused by a transform fault (one perpendicular to the former spreading center (now the San Andreas) that sliced into the continental crust as the former spreading center was being consumed. These peaks were formed under the Earth, and have been uplifted and eroded in the intervening 24 or so million years. An amazing fact is that these peaks were formed about the latitude of the Salton Sea, and have been moved about 235 miles northward since their creation. Mary Francis Strong has written a book about this process called **Mountains of Fire**..

On its journey northward, our side of the San Andreas, sometimes referred to as the Salinian Block, has acquired some interesting terranes of its own. The **Monterey Formation** is represented in Lompoc by deep-water diatomaceous shales with fish, whale and dolphin fossils. The diatomite deposits in Lompoc are the largest in the world. At Lake Lopez the **Monterey Formation** is represented by shallower depth porcelanite shales containing **crabs**, **scallops** and smaller fish. At

Buellton, one can find fossils of pipefish in **Monterey Shale**. The 5-8 mya **Santa Margarita Formation** also contains a (fossilized) marine fauna including large scallops, agatized murexes and barnacles. At Fulger Point on the way to Sisquoc, one can collect fossil barnacles dated at about 3-4 mya. Near Jalama Beach where the **Monterey Formation** (18-15 mya) has yielded whale bones, can also be found **Cretaceous marine** fossil deposits that preexisted the subduction of the spreading center by about 25-30 mya. One fossil that came from these deposits is an **ammonite** (relative of a squid and octopus) that swam in an ocean about 70 mya. This was prior to the Cretaceous extinctions that saw the end of the dinosaurs and about 80% of all species on the Earth (65 mya).

THREE BASIC ROCK TYPES

The three basic kinds of rocks are:

Igneous rocks that solidify from a liquid. There are **extrusive igneous** rocks that form from **lava** outside the Earth including: basalt, andesite, obsidian, pumice and tuff, and **intrusive igneous** rocks that form from **magma** inside the earth. **Granite** is one of these, as is **Dacite** (of the 7-Sisters), **diorite, diabase and gabbro** (as found in ophiolites are other intrusive igneous rocks).

Sedimentary rocks are formed from **sediments** (Sedimentary Dear Watson) or by precipitation, and are compressed and then cemented together often by calcium carbonate (calcite) or silica. Examples of sedimentary rocks are **chert, conglomerate, sandstone, siltstone, jasper, agate and limestone**.

Metamorphic rocks have undergone change (like caterpillars to butterflies) due to being subject to varying degrees of heat and pressure. **Limestone** becomes **marble**, sandstone becomes **quartzite**, and **shale** becomes **slate, schist and gneiss** depending on the degree of metamorphism. Other metamorphic rocks include: actinolite, tremolite, **serpentine, soapstone** and jade these rocks are often green because they come from the **Greenschist** Facies of low temperature, low pressure metamorphism. The next higher grade of metamorphism is the Blueschist facies. Represented on the Central Coast by ... **blueschist**.

WHAT ROCKS CAN BE FOUND ON THE CENTRAL COAST

Scott's Valley, Santa Cruz County near Lockhart Gulch. There are sandy exposures that have yielded fossil Shark teeth and *Astrodrapsis sp.* sand dollars.

Clear Creek Management Area near Idria in San Benito County has a wide variety of materials including: jade, serpentine, chrysoprase (plasma agate), benitoite, (fee dig area), and several other rare minerals.

Near Templeton (hospital) and in Paso Robles off Highways 46 and 101, San Luis Obispo County. In roadcuts and unfenced fields (if any) are the occasional biconoid, mushroom rhyolite, geodes, and occasional concretions containing Miocene aged whale bone.

West of Atascadero on Highway 41 about PM 5.0 San Luis Obispo County. Phosphorescent aragonite has been reported.

Cayucos Beach off Highway 1 in Cayucos San Luis Obispo County. Chert, brecciated jasper and other wave- rounded rocks.

Moonstone Beach in Cambria, San Luis Obispo County has river and ocean tumbled chalcedonies, NOT moonstone (which is a feldspar). Also found are small, rounded agates and jaspers and wave smoothed wood.

San Simeon State Beach and Creek off Highway 1. Mushroom rhyolite, chert, brecciated jasper and rarely sagenite agate may be found here.

Willow Creek Beach off Highway 1, Monterey County. Jade, chert, serpentine and even gold can be found here.

Jade Cove, Highway 1, Monterey County. On the beautiful Big Sur Coast, the drive is worth it even if you don't find any jade. Serpentine (our State Rock), chert and soapstone can also be found here.

Behind the TV Towers off Cuesta grade, San Luis Obispo County. Small quartz crystals have been found, but it is a tough trip!

Nipomo off Highway 101, San Luis Obispo County. In many local creeks and fields, Sagenite agate, marcasite agate, beanfield agate, chert and bone can be found. Most property owners here DO NOT like rockhounds because of trespassing in past years. Find a friendly landowner...Nipomo is the only location in San Luis Obispo County mentioned in [California Gem Trails](#) (3rd Edition).

Behind Lake Lopez, San Luis Obispo County. Off High Mountain Road near Pozo, you can find Upper Miocene age shells (Santa Margarita Formation). Closer to the Lake you can find Pecten discus (scallop) shells from the Middle Miocene (Monterey Formation).

Figueroa Mountain Road off Highway 154, Santa Barbara County. Take Figueroa Mountain Road north to the top of the Mountain. Pass Michael Jackson's former Neverland Ranch on the way. In the little valley next to the southern continuation of Catway Road (before you get to the campground) you can hunt for a variety of **jaspers and chert**. I found no soapstone (but a lot of **serpentine**) on Soapstone Hill there. Out on Davey Jones Road there is a geode patch wway down in the valley, but is hard to get to (ask Ralph Bishop). [Gem Trails in California](#) shows **cinnabar** near the old Red Rock Mine, and **soapstone** in many roadcuts on the eastern limb of the loop back to 154. This is Happy Canyon Road to Armor Ranch Road. The soapstone is about 11 miles from 154. The entire loop appears to be about 49 miles. The mountain is a beautiful place to camp and explore in the Spring—wildflowers and lupines galore (assuming normal rainfall).

Jalama Beach off Highway 101 Santa Barbara County. Go north up the beach about 2 miles to find brown travertine just before the cliffs appear to cut off beach access. There is (was?) a cool rock near here that you can crawl into. Go south (of the campground) down the beach and you can find fossil whalebone (Monterey Formation) at certain times of the year.

Gaviota and Refugio Beaches off Highway 101 Santa Barbra County. Here can be found fossil whalebone. The occasional fish fossil in the shales, brecciated jasper, beach agate and tan limestone concretions containing fossilized wood and bone.

Gold in California

There are reports that Native Americans were mining gold near San Miguel in 1805

An early discovery was made —Francisquito Canyon in LA Co., 3/9/1842.

The treaty of Guadalupe Hidalgo that ended the Spanish –American War was signed **2/2/1848**. This treaty gave the California Territory to the United States.

Gold was discovered at Sutter’s Fort near Sacramento **3/9/1848** starting the Gold Rush.

Gold has been mined in the Mountains west of Paso Robles where there is an aptly named peak called **Gold Butte** on the Jack Ranch.

Gold has also been mined in the La Panza area of SLO County since the late 1800’s.