How Much Do You Know About California Geology?

Test Yourself and See!

What is so special about California's landscapes?

Where in the world do California rocks come from?

How much of California is affected by the San Andreas Fault?

How do geologists read rocks?

How old are California rocks compared to the age of the Earth?

When is the next "Big One?"

Why is the UC Davis Department of Earth and Planetary Sciences known worldwide?

The Geology of California

Welcome to the California Rock Garden—

A Geology GATEway Garden

This garden was developed in close partnership with faculty, staff and students from the Department of Earth and Planetary Sciences, the Office of Administrative and Resource Management, the Office of Campus Planning and Community Resources and the UC Davis Arboretum and Public Garden as part of the UC Davis GATEways (Gardens, Arts and The Environment) Project.

The UC Davis GATEways Project is transforming our campus landscapes into physical and programmatic gateways that welcome the public to engage and share in the riches of UC Davis.

For more information about the UC Davis Department of Earth and Planetary Sciences, go to: geology.ucdavis.edu.

For more information about the UC Davis GATEways Project, go to the UC Davis Arboretum and Public Garden website: arboretum.ucdavis.edu.

UC DAVIS ARBORETUM AND PUBLIC GARDEN

UC DAVIS DEPARTMENT OF EARTH AND PLANETARY SCIENCES

California Rock Garden—A Geology GATEway Garden

arboretum.ucdavis.edu

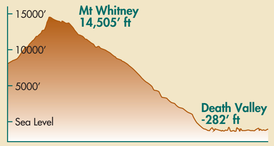
Signs made possible through support from the UC Davis Arboretum and Public Garden, the Department of Earth and Planetary Sciences, and Eldridge and Judith Moores

How Much Do You Know About California Geology?

Test Yourself and See!

California's landscapes are special for many reasons:

- They include both the highest and lowest points in the continental United States. Mount Whitney in the Sierra Nevada is 14,505 feet above sea level, and Badwater Basin Death Valley is 282 feet below sea level.
- They are affected by three major tectonic plates resulting in steep, rapidly rising mountains, abundant landslides, and frequent earthquakes that make noticeable changes to the land.



http://mrs.ucdavis.edu/md/natural/geology/region/region2.htm

Areas affected by the San Andreas Fault include all of California, from its southern margin at the Salton Sea to the northern latitude of Cape Mendocino. Earthquakes on the fault in 1906 (magnitude 8 estimated) and 1989 (magnitude 6.9) shook the loose sediments of the Sacramento Valley, causing minor damage.

- The oldest rocks in California are 1.7 billion year old metamorphic rocks in the Death Valley Region and San Gabriel Mountains. Since the age of the Earth is about 4.56 billion years old, the oldest rocks in California are about 37% as old as the Earth.

Andrew Alden

These gneiss (pronounced "nice") rocks are some of the oldest in California.

- Most rocks in the Sierra Nevada and Klamath Mountains are approximately 500 million years old or younger (about 10% as old as the Earth) and rocks in the Coast Ranges are mostly younger than about 160 million years (about 3-4% as old as the Earth).

The Geology of California

The answer to this question is complicated. Most rocks were formed where they are now found, and some have been moved a certain distance by water, landslides, earthquakes, etc. However, there are some rocks that have come by plate motion from as far away as:

- Australia
- Antarctica
- China
- West Africa
- The Equator in the Pacific Ocean

Eldridge Moores

These rocks in the Sierra Nevada Mountains may have originated in West Africa over 500 million years ago.

Department of Earth and Planetary Sciences

Geologists help us to understand our planet's history and give us clues about its future.

Each rock contains a story about its origin and history. A geologist looks at a rock as if it were a puzzle. The clues it holds (like color, shape, texture, density) are key to reading its story. When geologists look at a lot of rocks in an area, they begin to understand the bigger story the rocks are telling. Some rocks give clues to possible resources. Others may indicate a history of landslides, volcanic eruptions or faults and the possibility of future earthquakes, or how climate has changed over time.

DeGolyer Library, Southern Methodist University, Dallas, Texas

The Great San Francisco Earthquake of 1906 was caused by movement on the San Andreas Fault.

We can't say when the next "big one" will occur. Geologic time, as well as the time between major geologic events—earthquakes, volcanic eruptions, landslides, etc.—is long with respect to a human lifetime. We simply don't have enough records to be able to predict when the next event will occur. Some parts of the San Andreas Fault that moved in 1906 (Northern CA) and 1857 (Southern CA) are currently "stuck" and may produce big earthquakes in the future.

Department of Earth and Planetary Sciences

Eldridge Moores

Greg Chavdarian

Dawn Sumner

Eldridge Moores is a Distinguished Professor Emeritus. Professor Dawn Sumner is a planner for NASA's Curiosity rover, which landed on Mars in August 2012. She helped identify the first environment that could have hosted microbial life.

The Geology Department, as it was known then, was closely involved in the Plate Tectonic Revolution in the late 1960s to early 1970s. Many papers written by members of the Department, including Eldridge Moores, connected plate tectonics to geologic history, with implications for evolution, how sea floors spread, how mountain belts form, and how California was assembled. Professors have also done ground-breaking research in climate change, planetary science, and renewable energy resources.

Welcome to the California Rock Garden—

A Geology GATEway Garden

This garden was developed in close partnership with faculty, staff and students from the Department of Earth and Planetary Sciences, the Office of Administrative and Resource Management, the Office of Campus Planning and Community Resources and the UC Davis Arboretum and Public Garden as part of the UC Davis GATEways (Gardens, Arts and The Environment) Project.

The UC Davis GATEways Project is transforming our campus landscapes into physical and programmatic gateways that welcome the public to engage and share in the riches of UC Davis.

For more information about the UC Davis Department of Earth and Planetary Sciences, go to: geology.ucdavis.edu.

For more information about the UC Davis GATEways Project, go to the UC Davis Arboretum and Public Garden website: arboretum.ucdavis.edu.

UC DAVIS ARBORETUM AND PUBLIC GARDEN

UC DAVIS DEPARTMENT OF EARTH AND PLANETARY SCIENCES

arboretum.ucdavis.edu

Signs made possible through support from the UC Davis Arboretum and Public Garden, the Department of Earth and Planetary Sciences, and Eldridge and Judith Moores

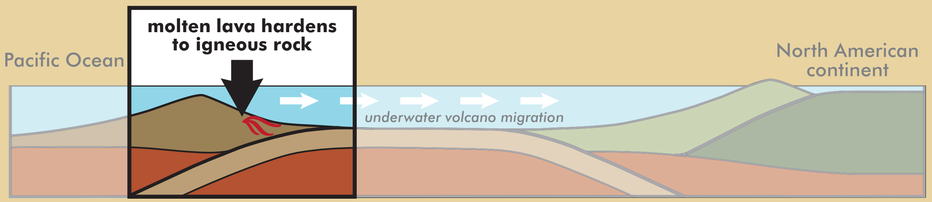
If a rock could talk...

It would tell you its adventures through time!

Read the questions and follow the cross-section illustrations to learn about the "life cycle" of this greenstone (rock #10) as it formed, traveled, and changed over time.

How was I created?

170 million years ago—

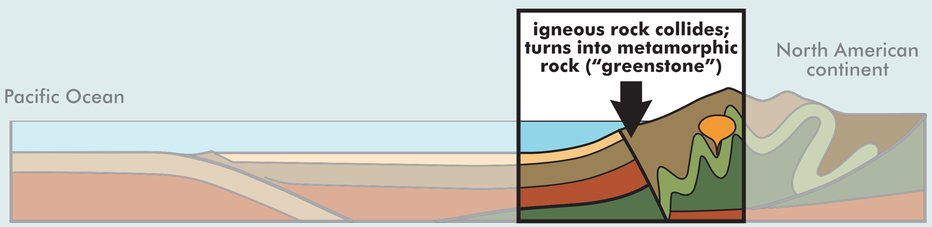


Igneous rock is formed from molten (liquid) material from volcanoes. The word igneous originates from the Latin root *ignis* meaning "fire." This greenstone started its life as an igneous rock.

Department of Earth and Planetary Sciences

What happened when I got to what was then the coast of California?

150 million years ago—



Metamorphic rock is formed after another type of rock is changed by intense pressure, heat, movement, and/or water. This greenstone is currently a metamorphic rock.

Stirm Sapp

How did I get to UC Davis?

Present Day—

Sedimentary rock is formed from other pieces of rock and/or mineral that get cemented together, and may include fragments of organic origin. This greenstone may someday become a sedimentary rock as it weathers.

Dawn Sumner

Department of Earth and Planetary Sciences

Learn More!

This rock (#10) is called a "greenstone," which is another name for a metamorphic rock that started out as an igneous rock and then was changed over time by intense pressure, heat, movement, and/or water.

Notice the three different surfaces on this greenstone. There is a polished side, an unpolished side, and the original river-washed exterior surface. Walk around the greenstone and follow the external features across the three different surfaces.

UC DAVIS ARBORETUM AND PUBLIC GARDEN

UC DAVIS DEPARTMENT OF EARTH AND PLANETARY SCIENCES

California Rock Garden—A Geology GATEway Garden

arboretum.ucdavis.edu

Signs made possible through support from the UC Davis Arboretum and Public Garden, the Department of Earth and Planetary Sciences, and Eldridge and Judith Moores

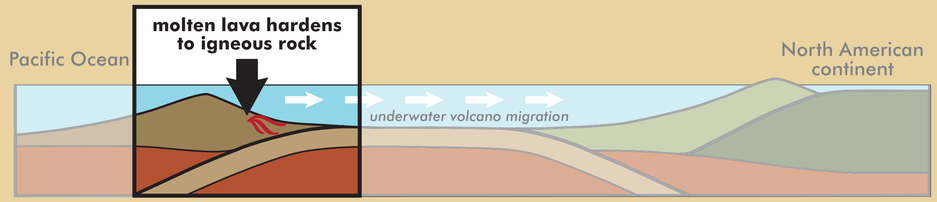
If a rock could talk...

It would tell you its adventures through time!

Read the questions and follow the cross-section illustrations to learn about the "life cycle" of this greenstone (rock #10) as it formed, traveled, and changed over time.

170 million years ago—

I started as a rock that formed out of lava erupted from an underwater volcano, possibly 500 miles or more out in the Pacific Ocean. I was known as an igneous rock. I moved slowly eastward on oceanic plates.

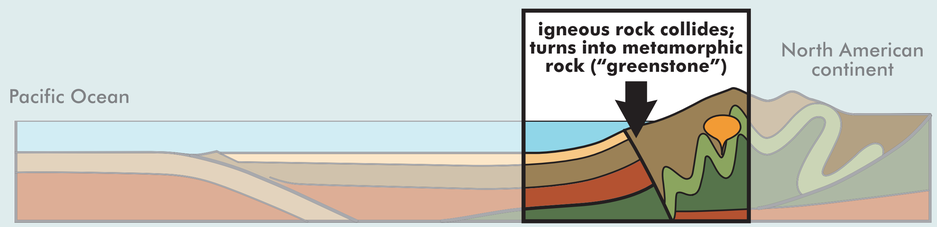


Igneous rock is formed from molten (liquid) material from volcanoes. The word igneous originates from the Latin root *ignis* meaning "fire." This greenstone started its life as an igneous rock.

Department of Earth and Planetary Sciences

150 million years ago—

Buried under layers of other rock, I was then folded, heated, and changed as I collided with the North American continent. I became a "greenstone," which is a type of metamorphic rock.

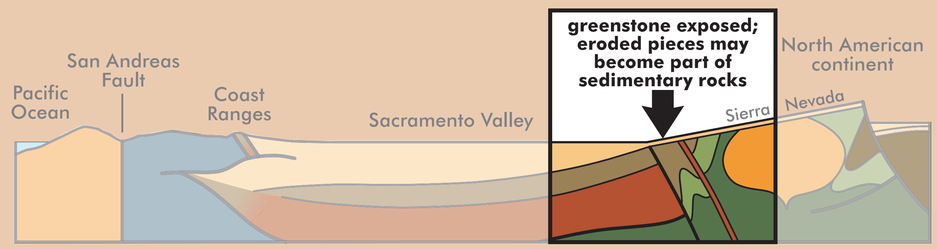


Metamorphic rock is formed after another type of rock is changed by intense pressure, heat, movement, and/or water. This greenstone is currently a metamorphic rock.

Stirm Sapp

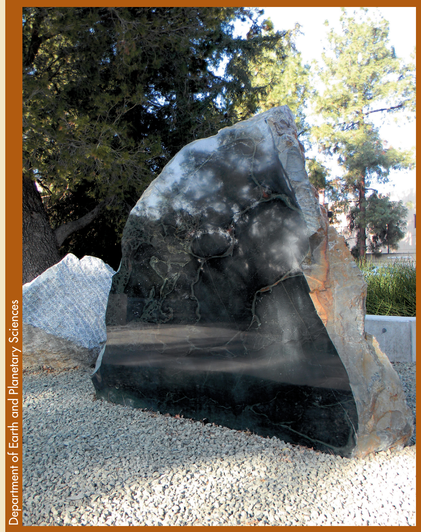
Present Day—

Over millions of years, as I was uplifted to the surface, the rocks above me began to erode. Cracks formed between boulders and, perhaps in a landslide, I fell into the Yuba River, where I was found near Smartville, CA. I was then donated to UC Davis for this exhibit.



Sedimentary rock is formed from other pieces of rock and/or mineral that get cemented together, and may include fragments of organic origin. This greenstone may someday become a sedimentary rock as it weathers.

Dawn Sumner



Department of Earth and Planetary Sciences

Learn More!

This rock (#10) is called a "greenstone," which is another name for a metamorphic rock that started out as an igneous rock and then was changed over time by intense pressure, heat, movement, and/or water.

Notice the three different surfaces on this greenstone. There is a polished side, an unpolished side, and the original river-washed exterior surface. Walk around the greenstone and follow the external features across the three different surfaces.

UC DAVIS ARBORETUM AND PUBLIC GARDEN

UC DAVIS DEPARTMENT OF EARTH AND PLANETARY SCIENCES

California Rock Garden—A Geology GATEway Garden

arboretum.ucdavis.edu

Signs made possible through support from the UC Davis Arboretum and Public Garden, the Department of Earth and Planetary Sciences, and Eldridge and Judith Moores

When is a Rock like a Snake?

When it's "Serpent-inite!"

Serpentinite ("sir-PEN-ti-nite") is a rock whose surface resembles snake skin due to its mottled blue-green pattern. Its green color comes from the mineral serpentine.

Carmia Feldman

Serpentinite is California's official state rock.

Learn more about serpentinite

- **Rare?** Serpentinite is uncommon worldwide, but is widespread in California.
- **Gold?** California miners often found gold deposits near serpentinite outcrops.
- **Asbestos?** Serpentinite can contain asbestos. There may be asbestos in our serpentinite, but if so, it is "locked" in the rock and does not pose a threat to human health.
- **Ocean Plates?** Bands of serpentinite in the Coast Ranges, Klamath Mountains, and Sierra Nevada are remnants of ancient ocean plates now preserved on the North American continent.

Where can I find serpentinite near here?

Serpentinite outcroppings

There are several places to see natural outcroppings of serpentinite and serpentine soils near the Central Valley including: Walker Ridge and Berryessa Snow Mountain Reserve in Colusa County and the UC Davis McLaughlin Reserve in Lake County.

Special soil, special plants

Emily Griswold

Soil that is made from serpentinite is called serpentine soil. About 75% of California's native plants can't grow on this soil because it is deficient in calcium, potassium, and other plant nutrients, and because it contains excessive amounts of magnesium and sometimes also nickel and chromium. Some species, like this serpentine columbine (*Aquilegia eximia*), have evolved to tolerate serpentine soils, perhaps taking advantage of less competition from other plants.

Thank you to the donors who made the California Rock Garden possible through the Earth and Physical Sciences Building Educational Enhancement Fund

Donors of $50,000 or more
Granite Construction, Inc.

Donors of $25,000 - $49,999
Ralph Mullican

Donors of $10,000 - $24,999
Louise Kellogg and Douglas Neuhauser

Donors of $5,000 - $9,999
Donn Ristau and Trinda Bedrossian
Robert Varga and Lori Bettison-Varga
Emgold Mining Corporation
Skyler Phelps
Jim Wood

Donors of $1,000 - $4,999
Homestake Mining Company of California
Eldridge and Judith Moores

Donors up to $999
Chris and Jane Higgins
Howard Spero and Charlene Sailer

Special thanks
Jeff Light, '01 MS Geology
Janice Fong,
Department of Earth and Planetary Sciences

Donor names are current as of 1/1/14

If you would like to contribute to the Rock Garden, please contact the Department of Earth and Planetary Sciences at 530-752-0350.

UC DAVIS ARBORETUM AND PUBLIC GARDEN

UC DAVIS DEPARTMENT OF EARTH AND PLANETARY SCIENCES

***California Rock Garden*—A Geology GATEway Garden**

arboretum.ucdavis.edu

Signs made possible through support from the UC Davis Arboretum and Public Garden, the Department of Earth and Planetary Sciences, and Eldridge and Judith Moores