Navigating the guts of an ancient submarine canyon

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Over the years, as part of his regular teaching regimen, Stanford Earth geologist Stephan Graham has taken hundreds of undergraduate and graduate students on field expeditions to Point Lobos State Natural Reserve, located about 1.5 hours south of campus near Monterey, Calif. Tourists flock to Point Lobos for its breathtaking coastal views and glimpses of the sea otters and other marine mammals that can be found among its waters.

But geologists like Graham and his colleague Donald Lowe are attracted to Point Lobos for another reason: The weathered rock cropping and loose gravel that line its shores are the remains of an ancient, uplifted submarine canyon that served as a mighty conduit for sediments flowing from beaches and rivers into the deep ocean 55 million years ago. "We can actually walk down inside the guts of the fill of this ancient submarine canyon," said Graham, the Welton Joseph and Maud L'Anphere Crook Professor at the Stanford School of Earth, Energy & Environmental Sciences. "The students love it. The geology there is first class, really textbook kinds of features. And with the scenery and the marine mammals—it's incomparable."

A careful study of the composition of the rocks and the way they're layered provides students with insights into the powerful but cryptic geologic processes that help shape the Earth's seafloor. Some are registered for undergraduate courses like Sedimentary Geology and Depositional Systems; others are graduate students examining how natural resources form and can best be managed.

"If you use your geologic record carefully, you can put together a pretty nice history," said Lowe, who is the Max Steineke Professor in Earth Sciences at Stanford.

Graham and Lowe also give continuing education tours of Point Lobos to members of professional organizations such as the American Association of Petroleum Geologists (AAPG) and representatives from energy companies. The ancient submarine canyons of Point Lobos provide a rare opportunity to study geologic circumstances that enable that transformation of organic matter, produced millions of years ago, to oil and gas.

Graham and Lowe often bundle the Stanford students and professionals together into a week-long, looping tour that starts in San Mateo, meanders down to Point Lobos, the Santa Lucia Range near Los Padres National Forest, the Diablo Range near the town of Coalinga, and Lake Berryessa in the Sacramento Valley, before ending in Cache Creek. "Cache Creek is familiar to people because of the casino there, but we're looking at the rocks," Graham said.

The section of Point Lobos that Graham and Lowe have been taking their young researchers to was closed in 2016 to protect wildlife, but the pair have created a classroom video and tutorial of the site's unique rock features so that future students will still benefit from observing the valuable knowledge contained there. "Point Lobos holds a special place in our heart as geologists from Stanford," Graham said.

Provided by Stanford University

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