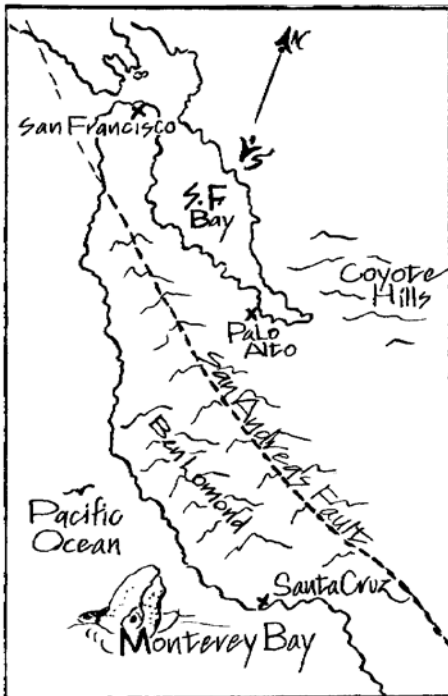




Footfills

Nature Notes

CITY OF PALO ALTO • COMMUNITY SERVICES DEPARTMENT • OPEN SPACE, PARKS AND GOLF DIVISION



Geology of the Santa Cruz Mountains

The shaping of the Grand Canyon or of Yosemite Valley can be both readily explained and visualized. Singularly dramatic geologic events occurred in both instances. This is not the case of the Santa Cruz Mountains, that range of mountains separating San Francisco Bay from the Pacific Ocean and forming the spine of the peninsula from San Francisco to Gilroy. In the shaping of this range many geologic forces — faulting, folding, volcanism, erosion — have interacted in important and complex ways. Rocks laid down by ancient seas and rivers and lava spewed from primeval volcanoes have formed the rocks that record the past.

Dozens of times during the past hundreds of millions of years the site of the present Santa Cruz Mountains has been occupied by ancestral ranges upheaved by folding and faulting — primary forces of mountain building. And dozens of times these ranges have been worn away by the relentless erosive action of wind, river, and sea. The ancient past is thus a story of mountain building, erosion, and inundation, repeated time and again.

The very obscure events of the geologic past begin to come into sharper focus some 15 million years ago during the Miocene Epoch. At that time the Pacific Ocean reached as far eastward as the Central Valley. Sediments and fossils deposited in this ancient sea are commonly exposed in the lower foothills behind

Stanford. Miocene snails and clams protrude as fragile, calcareous fossils from road cuts along Arastradero Road between Page Mill Road and Alpine Road. Fossil Acorn Barnacles are found in the sandstone of Los Trancos Creek near its junction with San Francisquito Creek. Contemporaneous with this ancient sea was a volcano near Stanford which sent lava flows out over a distance of several square miles. The quarry on Old Page Mill Road exposes this lava flow of Miocene basalt, a dark rock overlain by light colored sandstone.

During the close of the Miocene, about 12 million years ago, folding and faulting upheaved the most recent precursor of the present range. It too was eroded away and its site again occupied by the sea which again deposited fossils and sediments characteristics of that time. These Pliocene deposits — sandstone with abundant fossils of clams, snails, and scallops—are well exposed in the sheer, picturesque cliffs on the coast near San Gregorio.

The present range was born during Pleistocene time, the Ice Age, about one million years ago. Great blocks of the earth's crust were pushed upward as the surface was fractured by numerous faults. Some blocks dropped downward relative to others. One such enormous block dropped to form the lowland that is now San Francisco Bay and the Santa Clara Valley. The Coyote Hills near Fremont, alone in the broad lowland, represent a fault block that separated from the main mass. With the rapid mountain building of the Pleistocene, the Sacramento River was nevertheless able to maintain its channel through the Coast Ranges to the sea for at this time San Francisco Bay did not exist. Coastal terraces, broad flat plains which are conspicuous along Highway 1 near Half Moon Bay, represent ancient beaches uplifted during the Pleistocene.

The formation of San Francisco Bay is a relatively recent development which occurred following the release of enormous quantities of water from ice caps and glaciers during the thaw at the end of the last glacial stage. A subsequent rise in sea level accompanied by local down-buckling in the San Francisco area produced the great bay, as lowlands were invaded by the sea. That the bay has continued to rise until very recently is demonstrated by submerged Indian shell mounds at Emeryville and elsewhere. Archaeologists believe the earliest shell mounds were built on dry land about 3,500 years ago.

Notable among the features of the Santa Cruz Mountains is the San Andreas Fault, a basic zone of weakness in the crust of the earth which extends for 600 miles from Point Arena to Mexico. Along this great fault earthquakes have repeatedly occurred, some quite violent such as the one that destroyed San Francisco in 1906, as well as the 1989 Loma Prieta quake that did extensive damage from San Francisco to Santa Cruz and in the East Bay. Movement along this fault is now horizontal; that is, the earth on the west side of the fault is moving northward relative to that on the east. Geologists estimate that total accumulated displacement along the fault may be as much as 350 miles. The shattered and pulverized rocks and gouge along the fault zone have been eroded more readily than the adjacent hills to form the broad valley that is occupied by Crystal Springs Reservoir and Cañada Road. Many other valleys of the Santa Cruz Mountains have resulted from similar stream erosion of crushed and weakened rocks along fault zones. The San Andreas Rift Zone may be seen on Page Mill Road where it crosses the Monte Bello Open Space Preserve near the Santa Clara-San Mateo county line. A tiny lake or sag-pond marks the fault depression.

The rocks of Foothills Park reflect a very ancient sedimentary and volcanic past. Park rocks were formed during the Cretaceous period over 100 million years ago as part of one of the ancestral Santa Cruz Mountain Ranges. Sedimentary beds of sandstone alternate with beds of greenstone basalt, a lava which has been altered by intense heat and pressure in the earth. These interbedded rocks, originally laid down horizontally, have been tilted on end by mountain building and later broken by faulting. Thus the ancient sequence of events is visible to the geologist as he traverses the park across upended beds. Las Trampas and Wildhorse Valleys are undoubtedly fault valleys subsidiary to the San Andreas Rift Zone which follows the canyon of Los Trancos Creek along the park's western boundary. Polished faces of fault gouge rock shimmer in the morning light on the road cut just opposite Boronda Lake dam, indicating the fault through the lake area. Geologists call this rock "slickensides."

The rocks of the park and of the Santa Cruz Mountains are for the most part drab and not particularly interesting. Sedimentary rocks include sandstone, shales, mudstones, limestone, and chert. A ridge with outcrops of limestone and occasional chert occurs in the southernmost portion of the park along the Los Trancos Trail. Volcanic rocks include the dark Miocene basalts near Stanford and the greenstone basalts which are abundant in the foothills. Near Vista Hill occasional rocks of greenstone basalt bear numerous tiny vesicles or holes (gas bubbles when the rock was molten lava). Some vesicles have become filled with white quartz. These filled vesicles are called amygdules, and the rock is thus an amygduloidal basalt.

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