GEOLOGY

of the

RAVENNA QUADRANGLE

LOS ANGELES COUNTY, CALIFORNIA

by

R. P. Sharp

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LIST OF ILLUSTRATIONS

(numbers under the photos refer to localities on photo index map)

ABSTRACT

In the Ravenna quadrangle, north central Los Angeles County, approximately 8,400 feet of middle Miocene (?) fanglomerates and 3,600 feet of curiously interbedded basalts are exposed. They lie unconformably on a pre-Tertiary basement and unconformably under the Mint Canyon formation (upper Miocene). For this group of rocks the name "Vasquez Series" is suggested to replace the term "Escondido Series" of C. H. Hershey, which is preoccupied.

The fanglomerates of the Vasquez Series are composed of angular fragments of anorthosite, quartz diorite, granite, and gneiss, commonly a foot or two in diameter though larger fragments are abundant. The fragments are embedded in a sparse matrix of sand and gravel cemented by calcite and iron oxides. The rude and irregular strata of the series are typically red, brown, or white in color. These sediments accumulated rapidly under semi-arid conditions in a large canoe-shaped basin and formed a series of coalescing alluvial fans which sloped in general toward the west. The upper part of the series contains local occurrences of fine silty beds of lacustrine origin.

Some of the interbedded basalts exhibit phenomena suggestive of intrusive emplacement, others are clearly extrusive. These lavas range from massive hypohyaline porphyritic rocks to spongy amygdaloidal masses.

Subsequent to deposition, the Vasquez Series was

uplifted and deformed. After an epoch of erosion the basaltic conglomerate of the basal Mint Canyon (middle Miocene (?)) was laid down.

Faulting is greatly predominant over folding in the Ravenna quadrangle. Since upper Miocene time two periods of faulting have occurred. The first, characterized by the Soledad fault, a normal fault, and the second characterized by a series of northeast trending strike slip faults. This last group of faults is clearly due to shearing stresses.

Physiographically the area has a mature topography which was formed by the end of the Pleistocene. This mature topography is now being dissected by headward working streams rejuvenated in Recent time.

INTRODUCTION

LOCATION OF AREA

The Ravenna quadrangle is located in the northwestern San Gabriel Mountains in the north central part of Los Angeles County, California; at 34 degrees and 28 minutes north latitude and 118 degrees and 15 minutes east longtitude. More precisely, the area is located about 18 miles east of Saugus in the vicinity of Soledad Pass, through which the Southern Pacific Railroad follows a route from the Mojave Desert on the north to the Los Angeles Basin on the south.

The Ravenna area is accessible by motor car or train from the Los Angeles region, Ventura County, or Mojave Desert as shown on the accompanying road map. Excellent highways lead to within a short distance of the area, which is then easily reached on well graded dirt roads.

SHAPE AND SIZE OF THE AREA

The mapped area comprises the northern two thirds of the Ravenna quadrangle and the eastern one third of the Lang quadrangle.

A trapezohedral shaped area of about 35 square miles has been mapped.

CALIFORNIA

Counties

Alameda............36
① Oakland
② Alameda
Alpine.............27
Amador.............25
Butte..............12
Calaveras..........26
Colusa.............15
Contra Costa.......35
Del Norte...........1
Eldorado...........20
Fresno.............44
① Fresno
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① Eureka
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① Los Angeles
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ROAD MAP

CULTURE

No large centers of habitation are located in this general region. Ravenna, a small railroad station in Soledad Canyon, and Acton, another railroad station a few miles up Soledad Caenyon from Ravenna are both small villages inhabited only by a handful of people.

A number of homesteaders have settled in this area, and their shacks and cabins are found wherever a supply of water sufficient for domestic use is obtainable. They maintain a meager existence by raising goats and turkeys. Very little land is farmed chiefly because of the lack of water. However, Soledad Canyon is the site of several farms which raise alfalfa.

METHOD AND CONDITIONS OF WORK

The work was carried on as a part of the general research program of the Department of Geology of the California Institute of Technology, Pasadena, California.

The field work has been done during weekends of the fall, winter, and spring of 1936. The laboratory work and the writing of this thesis have been facilitated by the use of the equipment of the California Institute of Technology.

The purpose of this study has been to record and interpret the geology and structure of this region and to correlate it with work being done in adjoining areas by the students of the California Institute of Technology.

REVIEW OF LITERATURE

A number of papers have been published which deal with parts of the Ravenna quadrangle or areas in the vicinity. Probably the earliest mention of geologic features in this region was made by W. P. Blake in U. S. Explorations and Surveys for a Railroad to the Pacific, vol. V, 1863, pp. 68-73. Blake writes with considerable charm and clarity, and a number of excerps from his paper are included here because of their historical interest.

Blake describes a reconnaissance of Williamson's Pass (Soledad Pass).

"The pass extends from the Great Basin to the Rancho of San Francisquito, which is in one of the valleys of the Pacific slope. Its entrance on the Great Basin is near the meridian of 118 degrees and latitude 34 degrees 30 minutes, and its direction a little south of west; the distance through the mountains from the Great Basin side to the open valley of the Santa Clara river is about 20 miles. The altitude of the summit level is 3,164 feel about the sea."..

"At the summit of the pass the hills on each side are of granite, which is nearly white and of a fine grain. The mass is compact and tough, and has a sub-crystalline, vitrified appearance, as if it has been partly fused."

In Soledad Canyon a bit down stream from the present site of Acton, Blake mentions a copper vein.

"......a vein of copper ore appears on the surface. Its presence is indicated by the green color of the carbonate, and it has been prospected by parties from Los Angeles, who have broken off some of the surface rock, and accumulated several hundred weight of ore."

Concerning the region just down from the canyon from the present site of Ravenna, Blake remarks:

"The mountains on the left of this part of the pass are high rugged peaks, composed of light-colored granite* in which hornblende is seldom present. The decomposition of this granite appears to be rapid, and its surface becomes as white as chalk; so that wherever it is visible between the thick growth of dwarf oaks it looks like patches of snow. When a high wind blows over these hills its raises a cloud of white dust, formed by the disintegrating feldspar. The granite seems to be almost entirely formed of white feldspar or albite; and both quartz and mica in small proportion,.............."

*This rock is now known to be anorthosite.

Blake describes the sediments of this area:

"A short distance below the copper vein, the upraised and uneven edges of stratified sandstones and conglomerates (the Vasquez Series) become visible on the right side of the pass, beyond the low foot-hills of granite. The dark-colored ridge of volcanic rock also shows its summit at several places. These formations appear to extend nearly parallel with the valley, and the intrusive rock comes down to the bed of the stream. Below this the outcrops of upraised strata were nearer to the trail and more distinct, and are seen to be worn into fantastic shapes. A mass of one of the outlying beds on the top of the hill had an outline bearing a close resemblance to the feature of the man. (Haystack Rocks) This is represented in the annexed engraving from a sketch by Mr. Koppel. It was taken from the camp-ground on the border of the creek in the valley of the pass."

"There was not good opportunity to examine the lithological character of these strata; but they had the appearance of being nearly identical in their nature with the sediments seen in the lower parts of the Pass of San Francisquito. The colors presented, were varying shades of gray, red, and brown; and the materials were coarse, and, so far as I observed, were not accompanied by beds of shale."

"The series attains a great thickness, but it could not be determined with accuracy. The uplifts and disturbances appear to be produced by the dyke or ridge of intruded porphyritic rock, which extends from the summit nearly half way down to the plains, but appears to be broken in several places."

Blake writes of the boulders in Soledad Canyon.

....."The rocks thus transported along this creek were mostly granitic and metamorphic, much white granite (anorthosite) being found. I picked up several masses, which had a delicate purple or lilac tint, produced by the feldspar. This, however, was a syenite, no mica being visible, but an abundance of hornblende of olive-green color. The crystals were so disposed throughout the rock that the surface looked as if it had been written upon. The rock in fact is a beautiful graphic syenite. ***** Neither mica nor quartz were observed in the specimens, but in some, garnets and magnetite were abundant. The size of some of the masses of the ore, and the number of the fragments of this peculiar rock, indicated the existence of a very considerable quantities up the valley, and we may expect to discover a valuable bed or iron ore in that region."*

*This material was ilmenite instead of magnetite. Ilmenite is worthless as an iron ore.

Blake writes of the narrows in Soledad Canyon near the site of the present Sulphur Springs camp ground:

"The lower part of the pass is narrow, and bounded on each side by ridges of white granite, the sandstone being beyond. About sixteen miles from the summit, the granite hills become higher, and the stream winds in a circuitous course around projecting points of the ridges. Here the granites no longer have the peculiar whiteness, but are highly laminated and micaceous, becoming gneissose, and have the usual dark color. The planes of lamination are bent and contorted, and veins of feldspar and quartz traverse the rock in various directions. These rocks are in all probability metamorphic, and in appearance they present a great contrast to the white and chalklike granite which forms the hills along a great part of the pass."

These metamorphics rocks are probably part of Miller's San Gabriel formation.

"About 19 miles from the summit (of Soledad Pass) the granitic hills disappear, and the valley is bounded by low hills of sandstone and conglomerate. The country opens, and a view is presented for long distances in various direction." (the lower end of Soledad Canyon where the softer Mint Canyon beds have been eroded out)

Blake also reports a meeting with two bears at a water hole probably somewhere between Saugus and Newhall.

In 1902 Oscar H. Hershey described and named the Escondido series (renamed the Vasquez Series in this paper) and the Mellenia series (now the Mint Canyon formation, Kew, 1924) in the American Geologist, vol 29, pp. 349-372, 1902.

He reports:

"In the valley of the Santa Clara river of the south, about 30 miles north of Los Angeles, there is a basin-shaped depression in the older rocks occupied by the Upper Pliocene strata, and at its extreme eastern end there appear remnants of older Tertiary formations which will be discussed under the names, respectively of the Escondido, and Mellenia series."

Hershey then gives a section of 3,804 feet of the Escondido series in Tick Canyon and designates that as the type locality.

He also states:

"The lava flows were contemporaneous with the sediments and not later intrusion."

Some of the lavas are now believed to be intrusions.

Also:

"The Tertiary formation in this region have the structure of a trough trending northeast to southwest and closed on the northwest end. They dip toward the axis of the trough and curve around the northeast end in a very beautiful and instructive manner."

Hershey gives a second section, 5,900 feet thick, of the Escondido series in Escondido Canyon. He also states:

"The Escondido series was deposited under static water conditions and apparently in the sea."

This view is not held at all at the present time, the series being clearly land-laid.

Writing of the lavas, Hershey states:

"East of the main Escondido Canyon, the lava spreads out to a width in places of several miles and continues east to a valley trending north from Acton. But in this belt of mainly dark reddish brown lava hills, there are irregular areas of granite."

These areas of granite are now known to be interbeds of fanglomerates in the lavas.

Hershey writes of the Mellenia series (Mint Canyon formation) as follows:

"The middle portion of Tick Canyon, about three miles north of Lang station, affords the completest section of the series."

He then gives a section of the Mellenia series in Tick Canyon, and designates it as the type locality.

Hershey reports an unconformity between the Escondido and Mellenia series as follows:

"The non-conformity between the Escondido and Mellenia series is one of the best marked and most easily proved among the Tertiary formations of the state. The conglomerates in the lower series are of granitic debris, while those in the upper series are chiefly of lava derived by erosion from the lower series. Where the two adjoin there is a marked difference in dip. In Tick Canyon the change is from 60 degrees to 30 degrees."

With respect to age, Hershey states:

"......evidence is accumulating that both (Escondido and Mellenia) are Eocene in Age."

In the Am. Geol., vol. 19, pp. 273-290, 1902, Hershey has a paper describing "Some Crystalline Rocks of Southern California." He describes and names the Ravenna

Plutonic series in the western end of the Sierra Madre range in the vicinity of Lang and Ravenna. Hershey submitted some samples of this rock to A. C. Lawson, who reports. "The rock bears the same relation to diorytes that the anorthnosytes do to gabbro."

In 1924, W. S. W. Kew, U. S. G. S. Bull. 753, described the "Escondido series" and referred it questionably to the Sespe formation on the basis of lithologic similarity. Kew corrects Hershey's mistaken idea of the origin of these deposits by pointing out that they have accumulated under semi-arid sub-aerial conditions.

Kew also describes the "Mellenia series" and renames it the Mint Canyon formation to conform to U. S. G. S. usage.

Kew, writing of the Mint Canyon, states:

"They (the beds) lie in a large westward plunging syncline in the upper part of the Santa Clara Valley, extending from Agua Dulce Canyon west as far as Haskell Canyon, where the formation is overlapped by the Modelo(?) and Saugus formation."

A geologic map on a scale of covering the western one third of the Ravenna quadrangle was published in Kew's report.

W. J. Miller, U. of Calif. Pub., Bull Dept. of Geol., vol. 17, no. 6, pp. 193-240, 1928, discussed the structure and geomorphology of the southwestern San Gabriel Mountains. He described three distinct physiographic cycles.

In 1930, J. H. Maxson published a paper, Carnegie Inst. of Wash. Pub. no. 404, pp. 77-112, August 1930, in which he described a mammalian fauna from the Mint Canyon formation and determined that formation to be of upper Miocene age.

W. J. Miller in 1931, Journal of Geology, vol. 39, pp. 331-344, reported on his studies of the anorthosite body in the southwestern San Gabriel Mountains. He attributed the origin of the anorthosite to differentiation from a gabbroid magma.

The same writer in 1934, Pub. of the U. of Calif. at Los Angeles, vol. 1, no. 1, pp. 1-114, touched in a general way on the geology of the eastern half of the Ravenna quandrangle. Very little attention was paid to the sediments, however, most of the work being done on the igneous rocks. A small scale map covering the eastern third of the area is included in the publication. Miller gave the "Escondido series" a middle Miocene age on the basis of the interbedded basalts.

Edward C. Simpson, California Journal of Mines and Geology, vol. 30, no. 4, Oct., 1934, discussed the geology and mineral deposits of the Elizabeth Lake quadrangle, which lies immediately to the northwest of the Ravenna quadrangle.

Writing of the "Escondido series" in Escondido Canyon he states:

"In it (Escondido Canyon) is exposed the magnificient section of the Escondido series, 8,000 feet thick, of which about half is lava flows and the rest conglomerates, sandstone, and shales."

Writing of the age and correlation of the Escondido series, Simpson quotes Clements (G.S.A. Bull., vol. 43, 1932, abstract):

"In the Tejon quadrangle, it (the Escondido series) upon the Martinez formation of the early Eocene age."

He also states:

"It view of this (the lava flows) and of the similarity of the two formations (Escondido and Topango) there is a strong probability that they are age equivalents."

Simpson gives the Escondido middle Miocene age and tentatively correlates the Rosamond formation with it.

ACKNOWLEDGEMENT:

Dr. John H. Maxson, under whose direction this work has been carried out, has aided greatly with both assistance and suggestions throughout the work. Mr. Richard H. Jahns has proved a fine and able field partner. Mr. Bright, Mr. Young, Mr. Leaverton, and Mr. Rodgers have all been very kind in allowing the study to be carried on over their private property. The Southern California Automobile Club has given several road maps to be used as index maps in this paper. Miss Frances Rodapp has most kindly types the manuscript, and Miss Rachel Collins has aided with the illustrations.

Miss Marie Hahn has aided materially in the preparation of this paper.

PHYSICAL FEATURES

TOPOGRAPHY AND GEOGRAPHY

The Ravenna quadrangle lies on the northwest flanks of the San Gabriel Mountains along the southern margin of a large basin in which a number of the branches of the Santa Clara River head. The area is separated from the Mojave Desert to the north by a series of low hills which form the eastern extension of Sierra Pelona Ridge. The ridge and canyon topography, so typical of the larger part of the area, passes toward the west into the open valley of the Santa Clara, which is flanked to the north by a series of low but distinct homoclinal ridges.

To the south, the topography rises with moderate sharpness to the main crest of the western San Gabriel Mountains, which curves northward as it is followed east and forms the east wall of the large basin drained by the headwaters of the Santa Clara River.

Sierra Pelona Valley lies immediately north between the Ravenna area and the low hills south of the Mojave Desert. To the northwest, the Sierra Pelona Ridge separates this general area from the region lying southeast of the junction of the Santa Ynez and Tehachapi ranges.

Elevations range from about 1800 feet to about 4100 feet. Parker Mountain, on the east border of the area, is the highest point. The area as a whole is characterised by a moderately rough topography, in part mature and in part youthful.

DRAINAGE

Soledad Canyon follows an east-west course along the southern border of the area. Tributary canyons branch off nearly at right angles to the north and south. Bee Canyon, Aqua Dulce Canyon, Burke Canyon, China Canyon, and Leaverton Canyon are some of the major canyons draining from the north into Soledad Canyon. Indian Canyon and Bear Canyon are typical streams draining from the south northward into Soledad Canyon. Thus a trellis drainage pattern is evident for the major lines of drainage, and the strike of the sediments on the north side of Soledad Canyon suggest a structural control for the drainage. The northward drainage of the streams in the igneous rock on the south side of Soledad Canyon and their close similarity in character to the streams on the north side of Soledad Canyon suggests that the drainage on the igneous rocks has been superposed from a former sedimentary corner now stripped off. The individual side branches of Soledad Canyon have developed typical dendritic drainage patterns.

The east-west course of Soledad Canyon has been determined in part by zones of fractured rock. No distinct fault is followed by the river in its course, but rather, a number of faults have played a part in producing the east-west shear zone along which the Santa Clara River has carved out Soledad Canyon.

Soledad Canyon is in part a superposed stream as is clearly shown at the narrows about a mile west, of Aqua Dulce Canyon. Here a tortuous gorge has been cut through igneous rocks in spite of the easier path offered by the soft sediments immediately to the north.

The Santa Clara River follows a structural trough nearly due west after leaving Solodad Canyon and empties into the ocean along the coast of Ventura County between Oxnard and Ventura. The Santa Clara River is the trunk stream for all the drainage courses of this general region.

Kashmer Valley and Little Escondido Canyon follow courses out of harmony with the trends of drainage in the rest of the area. The peculiar courses of both these canyons is directly attributed to faulting.

Echo Canyon in the eastern part of the area just north of Ravenna has seemingly been beheaded by a branch of Leaverton Canyon, with the result that the branch of Leaverton Canyon now runs north a bit before turning south ? with the main branch of Leaventon Canyon to join Soledad Canyon. Echo Canyon heads in a notch located almost exactly at the Parker quartz diorite-Vasquez Series contact. Leaverton Canyon heads in a notch on the ridge immediately south of Kashmer Canyon. It has seemingly been beheaded by ? the southeastward flowing Kashmer Creek.

CLIMATE AND VEGETATION

The climate in the Santa Clara Valley is far from pleasant for the greater part of the year. In the spring and early fall the weather is mild and very pleasant, but, in the summer, temperatures above 100 degrees are not at all uncommon. The winter is characterized by very disagreeable cold and windy weather.

The average rainfall amounts to approximately 10 inches per year, which places the Ravenna region in the semi-arid class.

The vegetation is that which would be expected in such an environment. Large green juniper bushes are common. Greasewood, scrub oaks, and manzanita bushes grow on the hill slopes along with various species of sage brush, yucca, and several species of cactus. In the canyons are cottonwood trees, alders, willows, and a few sycamores. Rosebushes and poison oak vines are common in many canyons. In the spring, a few flowers, mostly lupins and poppies, bloom in protected spots. Bunch grass grows in scattered clumps on the hill slopes at all times of the year and serves as feed for flocks of goats which graze over this area.

SEDIMENTARY ROCKS

VASQUEZ SERIES	Middle Miocene (?)	Thickness
		8,400 feet fanglomerates
		3,600 feet lavas
	Total	12,000 feet

The name Vasquez Series is here suggested to replace the name Escondido series suggested by Hershey Hershey, O. H., Tertiary rock formations in Southern California: Vol. 29, American Geologist, pp. 349-37[illegible], 1902. in 1902 for this same series of rocks. The name "Escondido series" is unfortunately pre-occupied.*

*Wilmarth, M. Grace, Names and definitions of the geologic units of California: U. S. G. S. Bull. 826, pp. 25, 1931.

Petrology:

The Vasquez Series is made up of approximately 12,000 feet of fanglomerates and interbedded lavas. These lavas are basalts, in large part at least, and occur both as intrusions and extrusions in the fanglomerates. They will be found more fully discussed in the section of the report dealing with igneous rocks.

The fanglomerates of the Vasquez Series are made up of fragments of the various plutonic rocks outcropping in the immediate vicinity. Large fragments of anorthosite and its gabbroic differentiates, Parker quartz diorite, granodiorite, granite, gneiss, fine grained basic dike rocks, and syenite are most common. No fragments of the Pelona

No. 23

Looking north to head of Echo Canyon. The nubbins on the sky-line are composed of lava. The light colored band cutting obliquely across the picture below the lavas is an interbed of Vasquez fanglomerate below which lies more lava. The reefs in the mid-distance are part of the basal Vasquez fanglomerates lying unconformably on the Parker quartz diorite, which makes up the ridges and slopes in the foreground and mid-foreground.

No. 22

Close up of the above showing two fanglomerate beds, light colored, interbedded in the lavas.

(numbers under photos refer to localities on index map)

schists or of the basalts are found. One small amygdule similar to those occuring in the lavas has been found near the top of the Vasquez Series.

In certain localities the fanglomerate may be made up entirely of the waste products from one type of igneous rock. This is especially true of the basal fanglomerate lying on the Parker quartz diorite just west of Parker Mountain. Here the fanglomerate is made up entirely of fragments of the Parkot quartz diorite. A similar occurrence is found in the northwest part of the Ravenna quadrangle in several branches of Escondido Canyon just south of Kashmer Valley. The fanglomerate at these localities however, is made up entirely of fragments of anorthosite and its gabbroic differentiates and inclusions. The fragments in this anorthosite fanglomerate are very large and angular, and the gabbroic differentiates and inclusions occur in such a relation to the anorthosite fragments as to give the appearance of an anorthosite body in place. The anorthosite fragments have undoubtedly been derived from a very near source, probably immediately underlying the fanglomerate. In one place just east of Little Escondido Canyon some anorthosite basement has been found in place as shown on geologic map, north central part of section 29, T. 4 N., R.13 W.

Another series of fanglomerates composed entirely of one type of rock has been observed just west of the first branch of Escondido Canyon east of Little Escondido Canyon near the center of section 29, T. 4 N., R.13 W.

No. 6

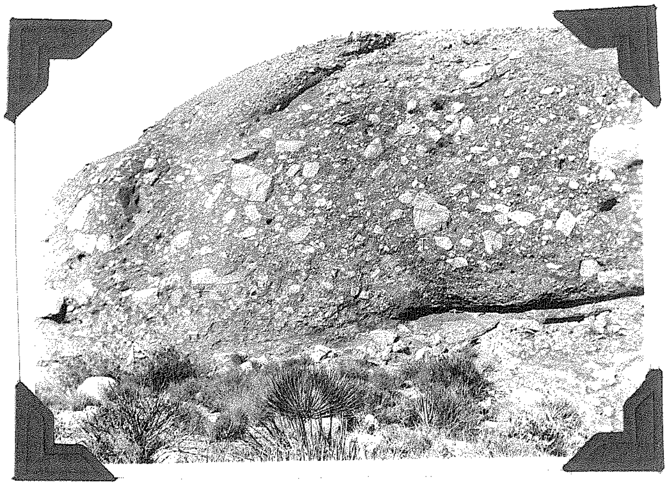
Basal Vasquez fanglomerate as exposed in a branch of Escondido Canyon. White angular fragments are mostly anorthosite embedded in a matrix or sand.

No. 24

Basal Vasquex fanglomerate near Parker Mountain. The large fragments are all Parker quartz diorite.

No. 14

Vasquez fanglomerate composed chiefly of Parker quartz diorite and a few anorthosite fragments.



No. 21

Vasquez fanglomerates lying just north of Soledad Canyon.

The large bounder are three to four feet in diameter.

No. 25

Basal Vasquez fanglomerates near the head of Echo Canyon.

At this locality, a thin bed made up entirely of fragments of quartz syenite occurs between the overlying anorthosite fanglomerate and the underlying quartz syenite basement.

Study of a thin section of a well cemented rather fine grained phase of the fanglomerate from a locality just west of Parker Mountain showed that the rock contains roughly 20% albite, 25% microcline, 10% calcite, 10% quartz, and about 1% magnetite, and traces of chlorite, biotite, and apatite (?). Iron oxide, probably hematite, makes up about 15% of the rock. The calcite and hematite are distinctly secondary minerals derived from the decompositon of the minerals of the original igneous rock which was the Parker quartz diorite. A note of interest is the absence of the hornblende, which is so prominent in the Parker Quarty diorite. Evidently the hornblende was not able to withstand the rigors of transportation, for even a very short distance, and has decomposed. A large part of the iron oxides found in the sediments has come from the decomposition of hornblende. Both calcite and iron oxide act as cementing substances as very clearly shown in the thin section examined.

Size of Fragments:

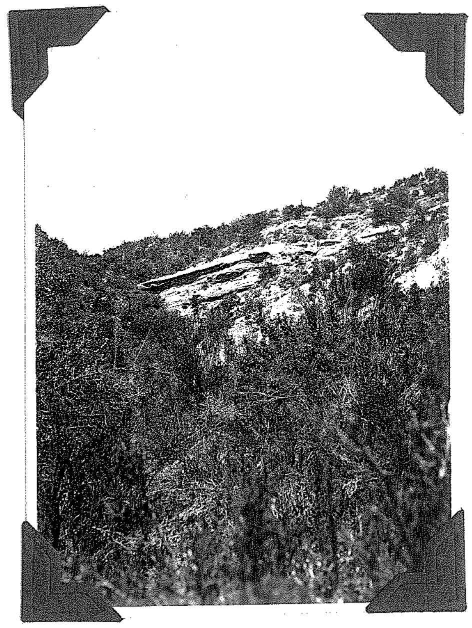
The size of the fragments in the Vasquez fanglomerates ranges from fractions of an inch up to several. feet in diameter. Boulders 3 or 4 feet in diameter are note at all uncommon, and blocks as large as 15 feet in diameter have been observed and have clearly been trans-

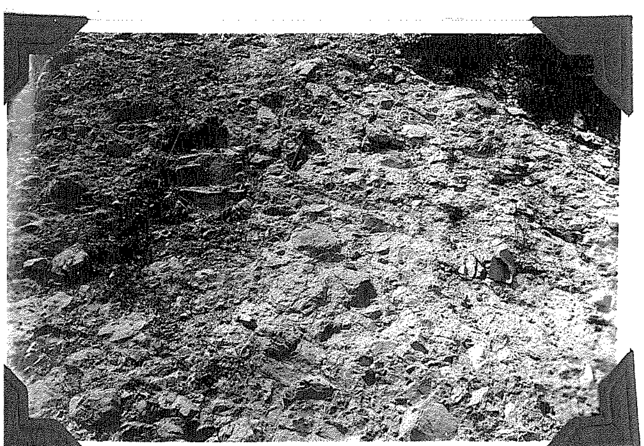
No. 13

Fine grained phase of the upper Vasquez Series in Agua Dulce Canyon.

No. 11

Fine grained phase of upper Vasquez Series in small canyon branching to the east from Agua Dulce Canyon.





No. 5

Anorthosite fanglomerate in branch of upper Escondido Canyon. Boulders are all anorthosite.

ported only a very short distance, probably in some places a few hundred yeards, in other places a matter of a few miles. Toward the west in the vicinity of Aqua Dulce Canyon the Vasquez Series sediments become fine-grained and are made up in large part of siltstone and fine sandstones.

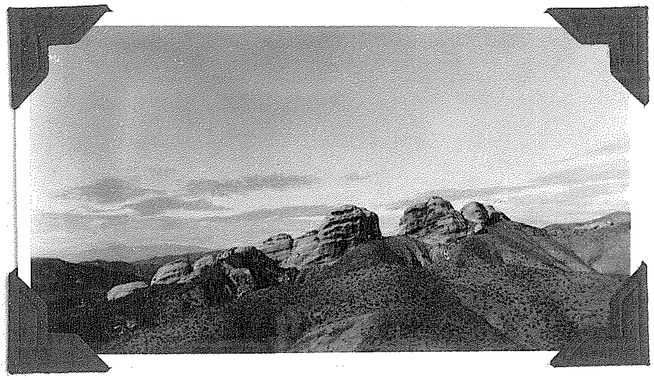
Sorting and Cementation:

The fanglomerates are moderately well consolidated but very poorly sorted. A more or less heterogeneous mixture of boulders, sand, and gravel is most typical. Cementation, however, is very good. Calcite and iron oxides have been the chief cementing substances, though the intermixture of finer material such as sand has also played a part.

Certain parts of the fanglomerate have been much better cemented than others. These well-cemented masses are now preserved as nubbins and reefs. Haystack Rocks on one of the ridges just north of Soledad Canyon in the western part of the Ravenna quadrangle are excellent examples of such features. The cause for these parts being better cemented seems to be directly attributable to a greater amount of fine material intermixed with the coarser material in such proportions, that combined with an abundance of calcite and iron oxide, maximum cementing effects are obtained.

Color:

The color of the Vasquez Series sediments is very striking. Brilliant red colors are very common, not only in the finer sediments but also in the fanglomerates.

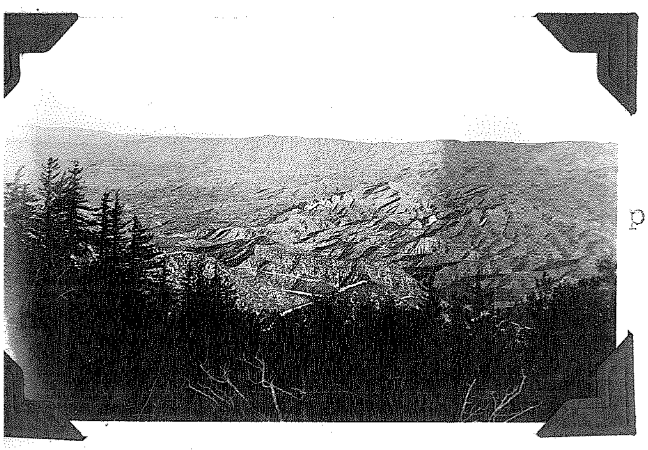


No. 17

Haystack rocks, residual nubbins in the Vasquez fanglomerates.

No. 12

Dip slopes in the Vasquez Series sediments near the mouth of Escondido Canyon. Haystack rocks in the distance.



No. 40

Aerial view of the central part of the Ravenna quadeangle taken from the top of the Santa Clara ridge to the south of Soledad Canyon.

The anorthosite fanglomerates when made up entirely of anorthosite fragments, are strikingly white. Light greens, tans, and browns are less frequent.

Bedding:

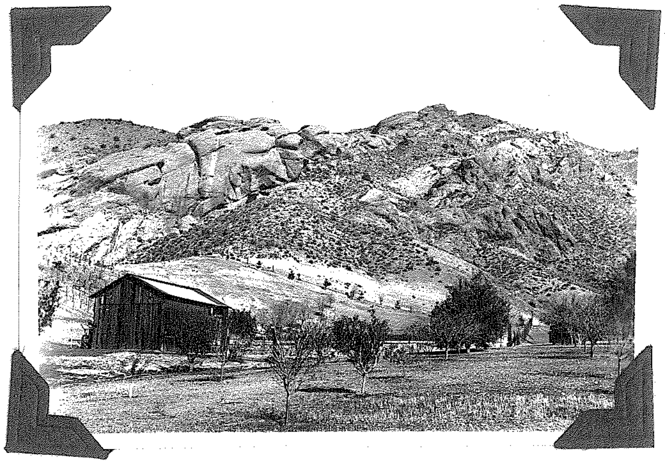
These sediments are very crudely bedded except in the areas of fine detritus where the bedding is distinct. In the fanglomerates, beds are generally many feet, sometimes tens of feet, in thickness, very irregular, and change rapidly along the strike, thickening and thining suddenly. The petrologic composition of a single stratum also changes sharply depending upon the source rock for any particular locality.

Attitude:

The beds dip in general westward at an average angle of about 30 degrees; an average strike is one a few degrees west of north. Near the edges of the basin, however, the beds are distinctly seen to dip southward from the north edge and northward from the south edge, thus indicating the configuration of the original basin in which the deposits were accumulated.

Small Structures:

Sediments as coarse and as rudely composed as these naturally exhibit a number of features such as cross beds and scour channels. In some of the finer sediments mud cracks and ripple marks have been observed which indicate sub-aqueous depositions, probably in small fresh water lakes or playas.



No. 37

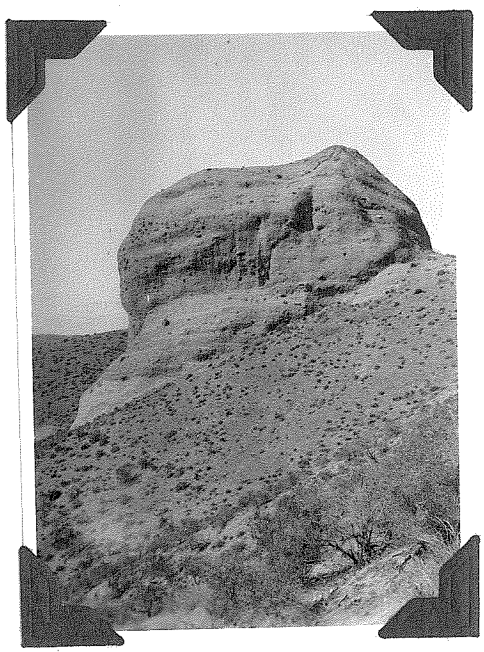
Looking north from Soledad Canyon near Ravenna. Vasquez fanglomerates shown dipping west. White exposure just over the barn is ground-up anorthosite along the Soledad fault, which crosses from left to right in mid-distance.

No. 18

Looking north from the mouth of Indian Canyon. Nubbins of Vasquez fanglomerates on skyline, anorthosite in mid-distance. Soledad fault passes through notch on right center skyline.

No. 15

Close up view of view of Haystack rocks. Large cavities in nubbins in extreme left of the picture caused in part by wind erosion.



No. 19

Large nubbin in Vasquez fanglomerate just north of Soledad Canyon. Such masses are more resistant to erosion because of the greater admixture of fine material in the matrix of the fanglomerate.

Large Structures:

This series of sediments is very competent and lies directly on crystalline basement. Consequently, faulting and fracturing predomin to over folding. In the area mapped no folds have been found other than the one large depositional syncline, which is a reflection of the configuration of the original basin. These rocks were deposited in a large canoe-shaped basin which opened to the west, and the beds laid down around the edge dip toward the axis of the basin, thus giving a synclinal structure to the series as a whole.

Dr. J. H. Maxson reports, however, close folding

Maxson, J. H., oral communication.

in the Mint Canyon and underlying Vasquez Series sediments immediately to the west in the center of the Lang quadrangle.

Relation to Other Rock Units:

The Vasquez Series lies with an erosional unconformity upon igneous basement. This is very clearly exposed near the head of Echo Canyon, just north and east of Ravenna. Here the basal fanglomerates, made up entirely of fragments of Parker quartz diorite, lie directly upon the Parker quartz diorite mass itself. To the northwest the fanglomerates lie in places upon quartz syenite and in one or two places upon basement anorthosite. The contact of the sediments and the anorthosite along the south border of the area, just north of Soledad Canyon, is a fault contact.

The Vasquez Series is overlain by the Mint Canyon formation (upper Miocene) with an angular unconformity. As exposed in the west branch of Agua Dulce Canyon, center of section 3, T. 4 N., R. 14 W., the beds of the Vasquez Series make an angle of about 10 degrees with the overlying Mint Canyon beds. The unconformity is very apparent at this locality as a thick massive sandstone is clearly truncated by the overlying Mint Canyon beds. A sharp change in lithology is also apparent along a large part of the Mint Canyon-Vasquez contact. The Vasquez Series in its upper part is made up largely of thinly bedded sandstones and siltstones and some interbedded fanglomerates. The basal Mint Canyon is a coarse conglomerate containing a great many lava boulders and boulders of the quartz rich phase of the syenite. Fragments of the lava or of the quartz rich phase of the syenite have not been found in the Vasquez sediments. A distinct change in mode of deposition and a change in source rock is clearly shown, preceeded by a period of uplift and erosion.

Fossils:

No fossils have been found in the Vasquez sediments though a diligent search for them has been made. Vertebrate remains should be present somewhere in these sediments, most likely in the finer deposits which represent accumulations in small local basins. The search for fossils should be continued for a definite means of determining the age of these sediments is highly desirable.

Problem of Ages

The problem of the age of these sediments lends itself to speculation. Hershey, in 1902, considered them to be probably Miocene in age.

Hershey, O.H., American Geologist, vol 29, pp. 349-372, 1902.

Kew, in 1924, considered them to be questionably correlative of the Sespe formation on the basis of lithologic similarity and gave them an Oligocene (?) age.

Kew, W.S.W., U.S.G.S. Bull. 753

Miller, 1934, gave them a middle Miocene age chiefly on the basis of the interbedded lavas. Miller based his age upon the fact that Gale has shown the middle Miocene to be the period of maximum lava extrusion in the Western United States.

Miller, W.J., U. of Calif. at Los Angeles Pub., vol 1. no 1., 1934.

Simpson, 1935, gives the series a middle Miocene age. He compares it stratigraphically and lithologically with the Topanga formation (Temblor) of the Santa Monica Mountains, and tentatively correlates the two. He also correlates the Rosamond formation with the Vasquez Series.

Simpson, E.C., Geology of the Elizabeth Lake quadrangle: Calif. Journal of Mines and Geology, vol. 30, no. 4, Oct. 1934.

Correlations and age determinations on the basis of physical features alone are liable to error. Especially, when it is realized that the Vasquez Series in the Ravenna area, at least, is entirely local in origin and represents conditions existing only in a very local basin. Simpson in the paper mentioned above compares the thickness of the Vasquez and Topanga formations and feels that since they are nearly the same that that is a good reason for correlating them. Such an argument is entirely erroneous. The Vasquez Series accumulated under sub-aerial conditions at a very rapid rate. The Topanga formation accumulated under sub-marine conditions at a much slower rate. The similarity in thickness between the Topanga and Vasquez Series is not a logical argument for correlating the two.

The similarity of lithology is also a very poor reason for correlating the two formations, for the Vasquez Series is entirely local in origin.

The interbedded lavas found in both formations is a much better basis for correlation. It must be admitted that data gathered by a number of workers, Gale, Kleinpell, Bonillas, Reed and others, indicate volcanic activity in middle Miocene time and none of an earlier date in southern California. That is a reasonable argument for considering the Vasquez Series to be of middle Miocene age. However, it can also be said that volcanic activity might have occurred at an earlier date, and one would be hard put to give any reasonable answer to repute such a statement. Howver, volcanic activity seems to have the property of occuring over a large area, as is well shown by some of the ash beds in the California marine section. These ash beds occur at the same horizons over a large part of the lower half of California.

Richards, G. L., oral communication

Maxson has shown the Mint Canyon to be upper Miocene in age, though Stirton claims it to be of Pliocene age.

Maxson, J. H., Carnegie Inst. Pub. no. 404, 1930

Stirton, R. A. Am. Jour. of Sci., vol. 26, 5th ser., p. 569, 1933

Woodring reported Astrodapsis tumidus from some marine beds

Woodring, W. P., Geol. Soc. of Am. Bull. vol 41, pp. 155, 1930, abstract.

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overlying the Mint Canyon formation in Haskell Canyon, about 12 miles to the west of the Ravenna quadrangle. He also assigns a Cierbo (upper Miocene) age to these beds. G. L. Richards, however, reports that the astrodapsis is probably

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Richard, G. L., oral communication

Astrodapsis fernandoensis, which would give the beds a possible Piocene age. This in turn tends to put the Mint Canyon near the top of the upper Miocene, though the base of the Mint Canyon contains a fauna which at least hints of an older age.*

*Maxson, J. H., Carnigie Inst. Pub. 404, p. 85, 1930

The unconformity between the Mint Canyon beds and the Vasquez Series represents a distinct break. R. D. Reed has shown that some of the time breaks repre-

Reed, R. D., Statement in G.S.A. meetings, 1935 Cordilleran section

sented by prominent unconformities in the Los Angeles Basin may not represent as great an interval of time as has been supposed in the past. In short, even though the overlying basal Mint Canyon might be middle Miocene, the Vasquez Series also might be middle Miocene. Both the basal Mint Canyon and the Vasquez Series represent very rapid accumulation, and a great thickness of strata does not necessarily represent a great interval of time.

Colemanite deposits in the Vasquez sediments in Tick Canyon and the general character of the sediments indicates accumulation under semi-arid conditions. Mr. Bonilles has attempted to show that the Vasquez Series could not have acqumulated at the same time as the Sespe formation because the fauna of the Sespe series of sediments is typical of humid conditions. However, such an argument is open to criticism on the basis of the local nature of the Vasquez Series. The topography of the Ravenna quadrangle, at the same time when the Vasquez Series was being deposited, was similar to that found in this region today, a basin surrounded by rather high mountains. At the present time, the Ravenna quadrangle has a climate a good deal more arid than that of the region lying to the south of the San Gabriel Mountains or westward toward the coast.

The lower limits of age for the Vasquez Series is thought to be fixed by the fact that these same sediments overlie unconformably the lower Eocene Martinez to the west of this area in the Tejon quadrangle.

Clements, Thomas, G. S. A. Bull., vol. 43, 1930, abstract.

However, Mr. Jack Judson, who has worked immediately to the northwest, in the Le Brun and Mint Canyon quadrangles, states that he has been unable to correlate the various fanglomerates found in that area. Thus, the rocks which Clements describes may not belong to the Vasquez Series, though their general character points to such a relation.

Dr J. H. Maxson has pointed out that the folding and subsequent erosion of the Vasquez Series prior to the deposition of the Mint Canyon formation seems to represent a considerable interval. This time interval along with the possible middle Miocene age of the Lower Mint Canyon throws some doubt upon the possible Middle Miocene age of the Vasquez Series. However, an evaluation of the time involved in folding and erosion is very difficult and entirely a matter of personal judgment.

Mr. Bonillas reports that the lavas of the Ravenna

Bonillas, Ygnacio, oral communication

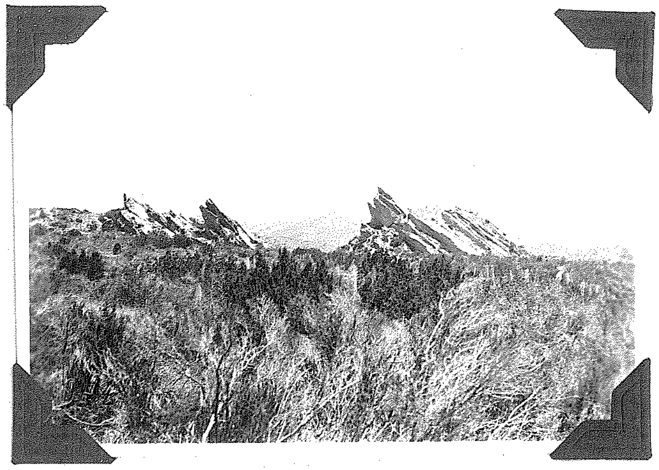
quadrangle are distinctly different mineralogically from those found anywhere else in Los Angeles County. This mineralogic difference might be taken as one reason for considering the lavas of the Vasquez Series older than middle Miocene.

To summarize, no definite age can be assigned to the Vasquez Series. A good many facts can be gathered together to indicate a middle Miocene age for this series. However, to definitely settle the problem a vertebrate fauna is needed, and general conditions indicate that such a fauna may be obtained at some future time. Until such a time, it is useless to speculate upon correlation with other lithologic units. Such correlations tend to add to the general confusion.

Name and Definition:

With these facts firmly in mind, the name Vasquez Series is suggested for this series of sediments and lavas, lying unconformably on a pre-Tertiary crystalline basement and overlain unconformably by the Mint Canyon (upper Miocene) formation. Perhaps, at a future date this series may be correlated with another formation and the name "Vasquez Series" dropped, but until that time it is better to give the formation a local name than to try to correlate it with some formation such as the Sespe. The reference of all land-laid Tertiary beds in southern California to the Sespe formation has rendered that name worse than useless.

The name "Vasquez" is taken from Vasquez Rocks a prominent feature in the Vasquez Series near the northeast corner of the Lang quadrangle. Vasquez Rocks are supposed to have been a hiding place of the early

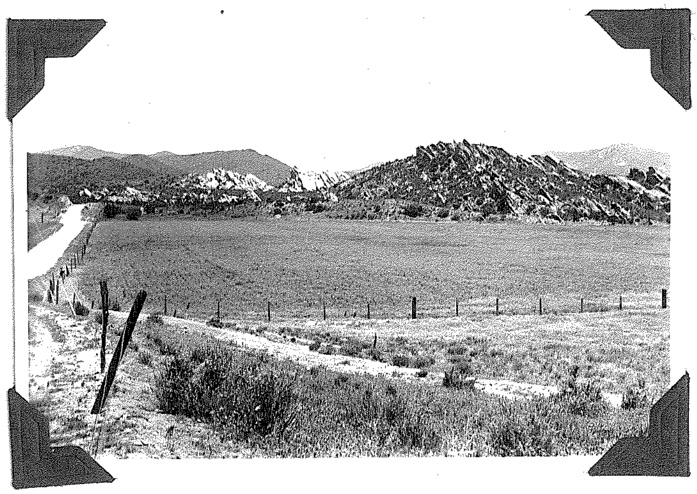


No. 3

Vasquez rocks, the prominent feature from which the Vasquez Series takes its name.

No. 1

Vasquez rocks, showing reefs, dip slopes, and flat-irons developed by the action of erosion on the Vasquez Series sediments.



No. 2

Close up of small reefs in the Vasquez Series near Vasquez rocks.

California bandit, Vasquez.

Type Locality:

Hershey gave Tick Canyon as the type locality

Hershey, O. H., American Geologist, vol. 29, 1902, pp. 349-372.

of his "Escondido Series". However, it is here suggested that Escondido Canyon be taken as the type locality for the Vasquez Series. The section is beautifully exposed in Escondido Canyon.

Origin:

The Vasquez Series has accumulated under arid or semi-arid conditions as a series of alluvial fans sloping in general westward. Various rock masses have acted as source blocks for the different fans and considerable difference in the lithologic composition of the sediments has been the result. On the surface of these fans numerous small basins were formed in which finer material has accumulated. The fans, to the west, seemingly fronted on an open valley occupied by a playa lake in which fine materials were deposited. Lavas flowed out over the surfact of these detrital masses early in the stage of deposition. Some of the lavas were also intruded. Pauses between extrusions were long enough to permit the deposition of thin interbeds of fanglomeratic material

Summary:

The Vasquez Series is composed of about 8,400 feet of sediments, chiefly fanglomerates, and 3,600 feet

~~of sediments, chiefly fanglomerates, and 3,600 feet~~ of interbedded lavas occurring both as intrusions and extrusions. The series lies with and erosional unconformity upon a crystalline basement and is overlain uncormably by the upper Miocene Mint Canyon formation. The fragments in the fanglomerates are detritus derived from the neighboring igneous and metamorphic rocks lying to the south, east, and north. The Vasques Series takes its name from Vasquez Rocks, and its type locality is in Escondido Canyon. The age is indertermineate, though some speculative evidence can be gathered to suggest a middle-Miocene age.

<u>MINT CANYON FORMATION</u> Upper Miocene Thickness 4,000 feet?

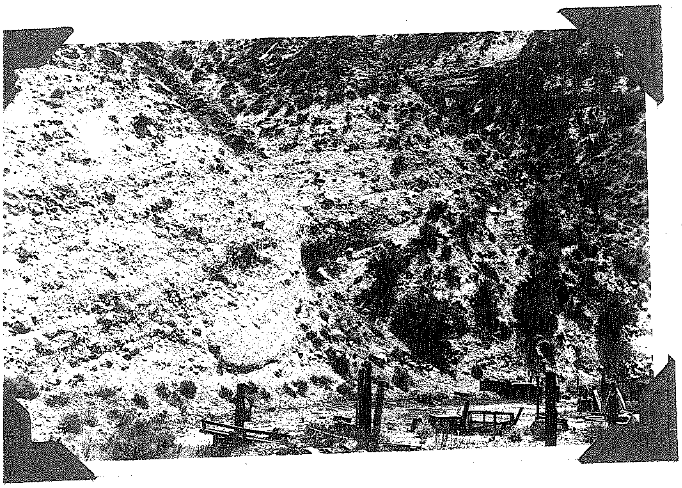
<u>Petrologic character</u>

This series of sediments has been described by Kew as follows:

"The Mint Canyon formations in general may be separated into two parts, a lower part consisting of conglomerate, sandstone, and clays of various colors, such as red, green, and gray, though predominately reddish, and an upper part comprising mainly light-gray to nearly white gravels interbedded with greenish clay or fine sand."

Kew, W. S. W., U.S.G.S Bull., 753, 1924.

Only the basal part of the Mint Canyon formation occurs in the area mapped. The basal Mint Canyon is made up

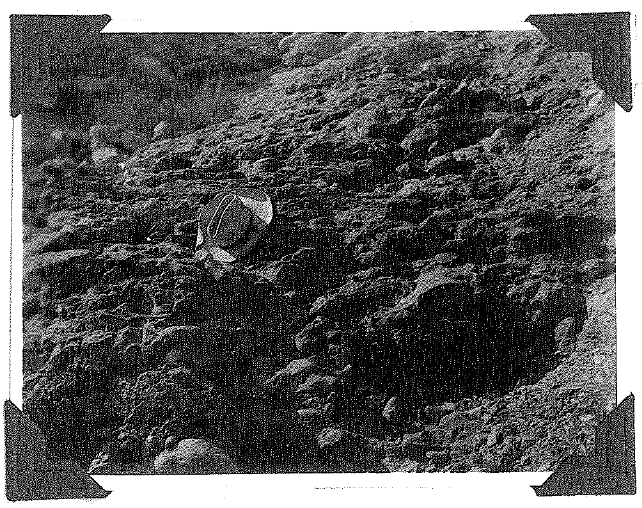


No. 28

Conglomerates of the Mint Canyon formation as exposed in Agua Dulce Canyon.

No. 28

Close up of same Mint Canyon conglomerate as shown in above picture. Boulders of anorthosite are predominant.



No. 14

Bed near base of Mint Canyon formation, just west of Agua Dulce Canyon, made up almost completely of rounded boulders of lava.

of coarse conglomerates of boulders of anorthosite, gneiss, lava, basic igneous rock (both fine and coarse grained), quartz rich syenite, and some boulders of acidic igneous rocks. Near the base of the formation is a conglomerate bed made up entirely of boulders of lava. Just west of Escondido Canyon a thin sheet of lava, evidently a flow, occurs in the basal Mint Canyon. The Mint Canyon formation differs from the Vasquez in greater rounding of fragments and in containing fragments of lava, quartz rich syenite, and coarse grained basic igneous plutonic rock.

Physical Character of the Sediments

The boulders found in the Mint Canyon formation range from an inch or two to a foot or two in diameter. Boulders about one foot in diameter are very common.

On the whole the mass is well cemented. Bedding is irregular and crude. To the west the series becomes finer and the siltstones and clays are common.

Topographic Expression

Erosion of the fine sediments gives rise to dip slopes and badlands in contrast to the rugged and irregular topography of the coarser basal bed.

Type Locality

The type locality of the Mint Canyon formation as originally defined by Hershey is

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Hershey, O. H., American Geologist, vol 29, pp. 349-372, 1902 located in Tick Canyon.

Relation to Other Formations

The Mint Canyon formation overlies the Vasquez Series with an angular unconformity and is overlapped by marine Pliocene or uppermost Miocene sediments.

Age

The Mint Canyon formation has been determined to be of upper Miocene age by Maxson, who has described a vertebrate fauna from the formation.

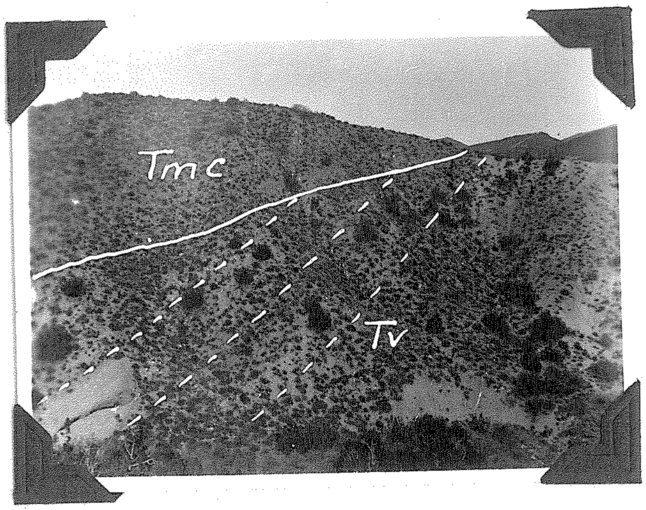
Maxson, J. H., Carnegie Inst. Pub. No. 404, 1930

Origin

These sediments have been laid down under subaerial conditions in a manner similar to the deposition of the Vasquez Series, except that the material making up the Mint Canyon has been transported a greater distance. The Vasquez Series has been a source of part of the detritus found in the Mint Canyon formation.

Summary

The Mint Canyon formation is a series of terrestrial sediments, chiefly conglomerates, sandstones and silts. It overlies unconformably the Vasquez Series and is overlain by Pliocene or Miocene marine sediments. A vertebrate fauna shows it to be of upper Miocene age.

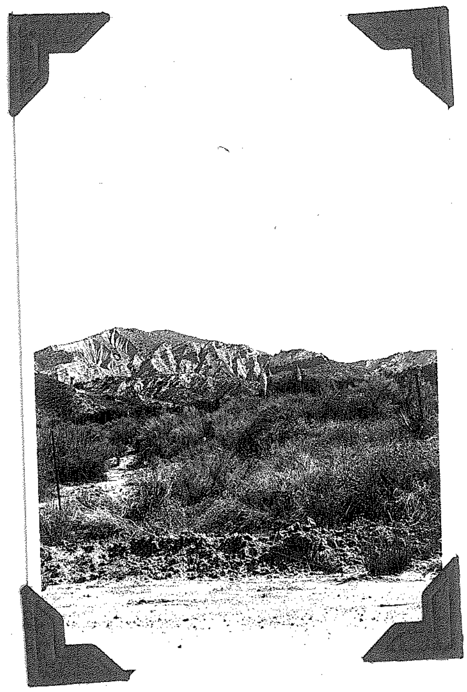


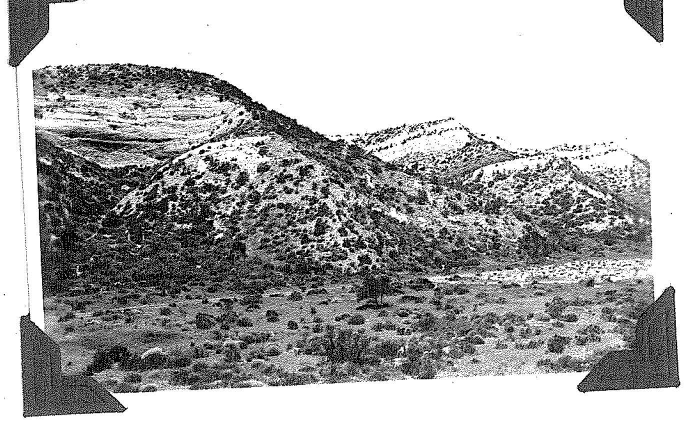
No. 9

View in west branch of Agua Dulce Canyon showing Mint Canyon overlying unconformably the uppermost Vasquez Series.

No. 26

View looking up Bee Canyon showing badlands eroded in fine grained Mint Canyon sediments.





No. 39

View of massive sandstone beds of the Mint Canyon formation in a branch of Soledad Canyon just west of the western edge of the Lang quadrangle.

QUATERNAY DEPOSITS Thickness 10 to 50 feet.

Occurrence

The Quaternary deposits occur as terrace coverings and as fans in Soledad Canyon, Sierra Pelona Valley, the valley just north of Vasques Rocks, and in scattered spots throughout the area.

Petrologic Character

These deposits are in general made up of moderately rounded boulders of anorthosite, Parker quartz diorite, granodiorite, gneiss, lava, and fine grained basic plutonic rocks. The terrace deposits in Sierra Pelona valley and just north of Vasques Rocks are composed largely of schist fragments which have come from Sierra Pelona Ridge to the Northwest. No Pelona schist fragments are found in the other rocks of the area, and evidently the Sierra Pelona Ridge has only come to stand in its present relation to the area in Quaternary time. These deposits all contain a large quantity intermixed sand and gravel.

Physical Character

The Quaternary deposits are loose and poorly cemented. Stratification is rude and irregular.

No. 32

Quaternary terrace deposits along north side of Soledad Canyon.

No. 30

Quaternary terrace deposits (dark upper layer) lying on anorthosite along north side of Soledad Canyon.

IGNEOUS ROCKS

PARKER QUARTZ DIORITE

The Parker quartz diorite has been named and described by W. J. Miller in 1934

Miller, W. J., U. of Calif. at Los Angeles, Pub. Vol. 1, no.1, 1934

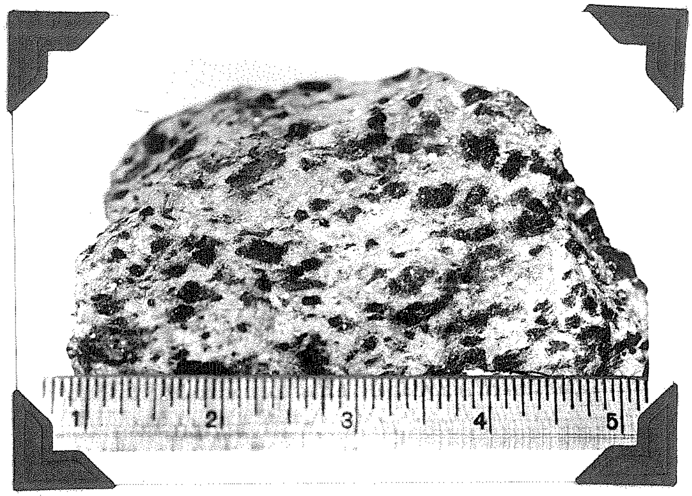
It takes its name from Parker Mountain, a prominent peak in the eastern part of the Ravenna quadrangle.

Petrography

Miller has called this rock a quartz diorite, but two thin sections studied in this work have disclosed the presence of a great deal of untwinned albite, so the rock would more properly be called a sodic quartz diorite on the basis of an orthoclase to plagioclase ratio classification. Some of the albite has a myrmekitic texture, which suggests albitization of the original feldspar.

A generalized composition for this rock as determined from the two slides studied would be about as follows: quartz 10%, albite 60%, Andesine 5%, microcline 15%, hornoblend 5%, biotite 3%, titanite, apatite, and magnetite 2%. These percentages have been merely estimated and may be in error, but the general proportions are approximately correct.

Microscopically the Parker quartz diorite shows some evidence of strain in granulated and fractured crystals. Its general megascopic appearance show a gneissoid texture which substantiates the observation.



Hand specimen, S_{10R}, of the Parker quartz diorite showing gneissoid character of the rock. The black crystals are hornblende.

Hornblende rich differentiate of the Parker quartz diorite.

The Parker quartz diorite is a medium to coarse grained igneous plutonic rock. The hornblende occurs in moderately large prisms, and titanite in well formed crystals is the most common accessory mineral.

Relation to Other Rocks

The mass has been cut by fine grained basic dikes, pegmatite and aplite dikes, and quartz veins. It has intruded a metamorphic series, mostly gneisses, probably part of Miller's San Gabriel formation, remnants of which are to be found in widely separated localities.

The contact between the Parker quartz diorite and the anorthosite as exposed just east of Ravenna is a fault contact. The relations with the quartz syenite lying to the northwest are obscure, and no definite ideas of the relative age or source of these rocks have been obtained.

Age

Miller has though the Parker quartz diorite to be of Jura-Cretaceous age, and no evidence to disprove such a statement has been found in this work.

QUARTZ SYENITE

Occurrence

The quartz syenite outcrops in the northwestern part of the Ravenna area.

Petrography

A study of three thin sections has shown the quartz syenite to be composed chiefly as follows; orthoclase perthite and microcline 70%, quartz 10%, biotite 8%, augite 5%, oligoclase 5%, accessories 2%. A quartz-rich phase containing as much as 20% quartz has been observed closely associated with the body of true quartz syenite. This quartz-rich phase is more accurately classified as a granite.

Physical Character

The quartz syenite is a gneissoid rock, which frequently contains inclusions of various metamorphic rocks, chiefly gneiss and schists, have been found in it. The quartz syenite is easily distinguished from the Parker quartz diortie in the field on the basis of its general appearance, very dark brown color, content of biotite, and absence of hornblende which is the predominate ferromagnesian mineral in the Parker quartz diorite.

Age

Miller though the age of the syenite to be about the same as that of the Parker quartz diorite, Jura-Cretaceous. However, the general appearance of the syenite is that of a very much older rock. Its very marked gneissoid texture, a greater amount of included metamorphic remnants, and higher degree of mineralization in comparison to the Parker quartz diorite are the chief reason for considering the syenite to be older. The syenite might be Pre-Cambrian(?) in age.

ANORTHOSITE

Occurrence

The anorthosite rock is exposed in a large area south of Soledad Canyon and at one small isolated spot 3 miles north of Soledad Canyon in Little Escondido Canyon.

Petrography

The anorthosite body has been described in detail by Miller.

Miller, W. J., U of Calif. at L. A. Publ. no.1 vol. 1, 1934, pp. 16-30

A study of a single thin section showed approximately 93% andesine, 5% muscovite, and 2% augite.

The rock is a well crystalized coarse phaneric mass of nearly pure white color. It is filled with inclusions of various fine grained basic rocks, metamorphics, and basic differentiates of the gabbroid parent magma. Large masses of ilmenite are commonly found associated with the anorthosite.

Physical characteristics

The anorthosite mass is badly fractured throughout and as a whole is not very resistant to weathering and erosion.

Origin

The anorthosite is though to have been derived by differentiation from a gabbroid magma.

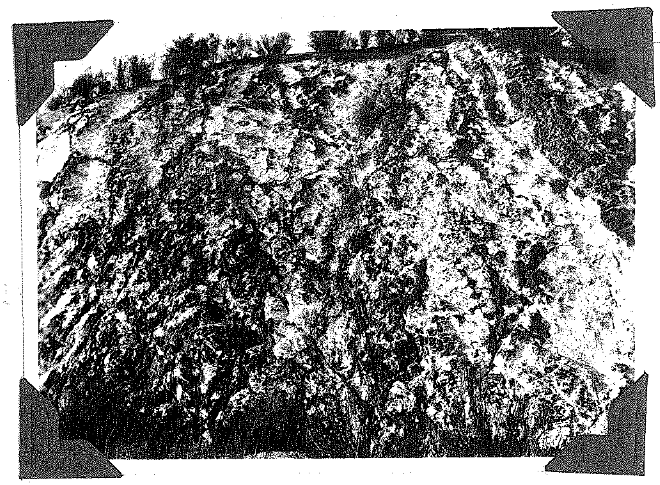
Age

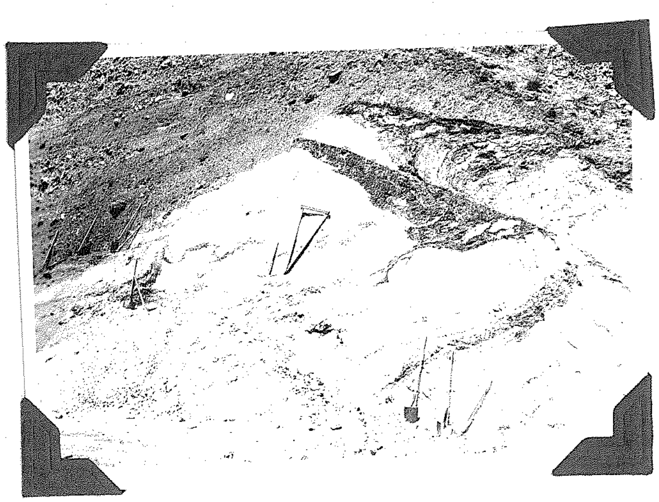
Miller thinks it to be of Pre-Cambrian age.

Hand specimen of quartz syenite. Dark material is largely biotite, white material is orthoclase perthite.

No. 33

Exposure of anorthosite just north of Soledad Canyon showing inclusions of basic differentiates and metamorphic fragments.





No. 27

Severely distorted metamorphic inclusions in anorthosite just north of Soledad Canyon near mouth of Agua Dulce Canyon. Overlying sediments are Quaternary terrace deposits.

TERTIARY LAVAS

Occurrence

The lavas occur interbedded in the Vasquez fanglomerates and combined with those rocks make up the Vasquez Series. The lavas total about 3,600 feet in thickness.

Petrography

A microscopic study of six thin sections of these lavas has been made. They have all been found to be basalts containing labradorite or bytownite, pigeonite, and hypersthene. The mineralogical composition of these lavas is unique compared to the other lavas of southern California in the absence of hornblende and olivine*. The rocks are in

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* Bonillas, Y., Oral Communication

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general porphyritic hypohyaline and range from massive to spongy amygdaloidal masses. The amygdules range from about the size of a pea up to masses 2 or 3 inches in diameter. Quartz and chalcedony are the most common fillings, though some are filled with calcite. Quartz and calcite fill fissures and cracks in the lavas.

Relations to Sediments

Evidence exists which shows that the lavas occur both as intrusions and extrusion. A number of thin interbeds show clearly that there must not only have been a pause in the extrusion of the lavas, but that the lavas must have been erupted onto the surface as flows.

The very spongy amygdaloidal character of the

lava

No. 41

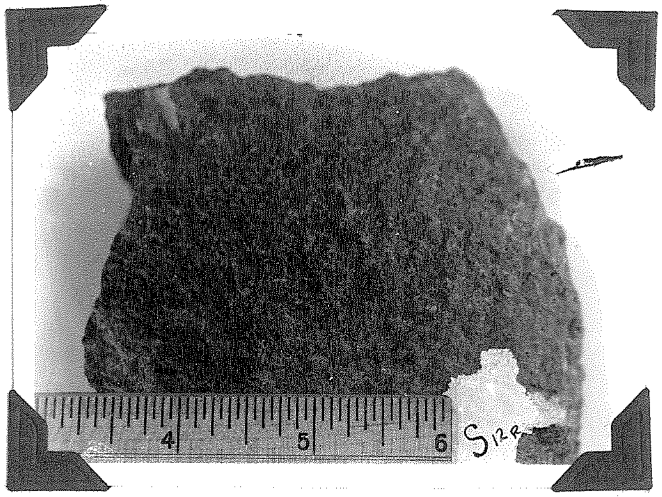
Close up of lavas in west branch of Leaverton Canyon showing spheroidal weathering.

No. 4

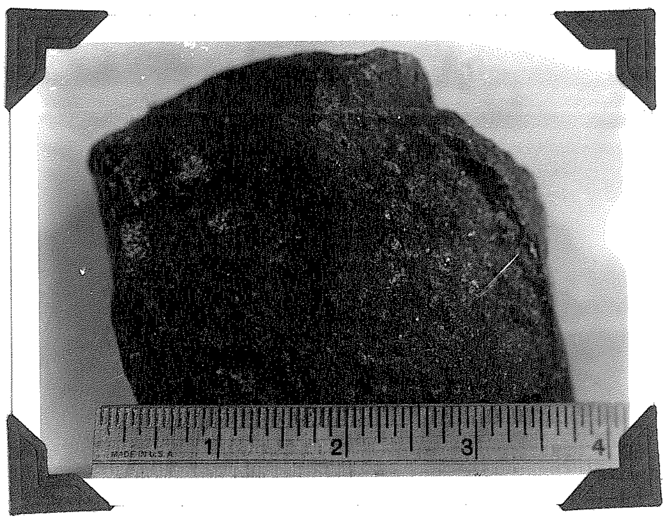
Cooling joints in lavas in branch of Escondido Canyon.

Hand specimen, S 9R, of lava showing amygdules of quartz. Note the zone of altered rock around the amygdules. This outer shell of rock around the amygdules. has been altered by the solutions which deposited the quartz in the cavity.

Hand specimen, S 15R, of massive lava.



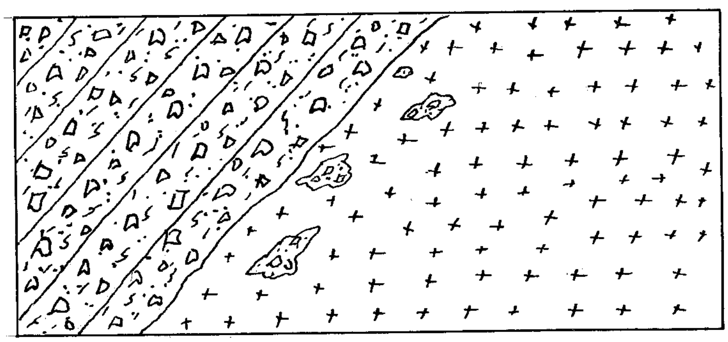
Hand specimen, S 12_R, of massive lava.



Hand specimen, S_{17R}, of lava showing some large eroded phenocrysts of feldspar.

lava., in places its very fragmental character, and in other places its vesicular structure all hint of an extrusive mode of occurrence.

On the other hand, many of the fanglomerates immediately overlying the lavas show baking effects. In a number of places, large blocks of fanglomeratic material baked and altered to a high degree, are found included in the lavas. These blocks are most commonly found in the lava just below a contact with an overlying fanglomerate. Similar blocks have been observed near the base of the lavas but never between the base and the top of a lava series.



The suggestion might be made that these block had been floated up from the bottom of a lava flow, but evidence for such a view is not very good.

A dike of lava cutting the upper part of the Vasquez sediments near the mouth of Escondido Canyon shows clearly that some volcanic activity has occurred subsequent to the deposition of the series. This dike is probably related to the thin flow found in the base of the Mint Canyon formation.

Thus, an intrusive mode of occurrence for parts of the lavas is also shown. These intrusions have occurred as sills along the contact between lavas and fanglomerates and possible in some cases between flows. Stoping and baking effects have been attendant features.

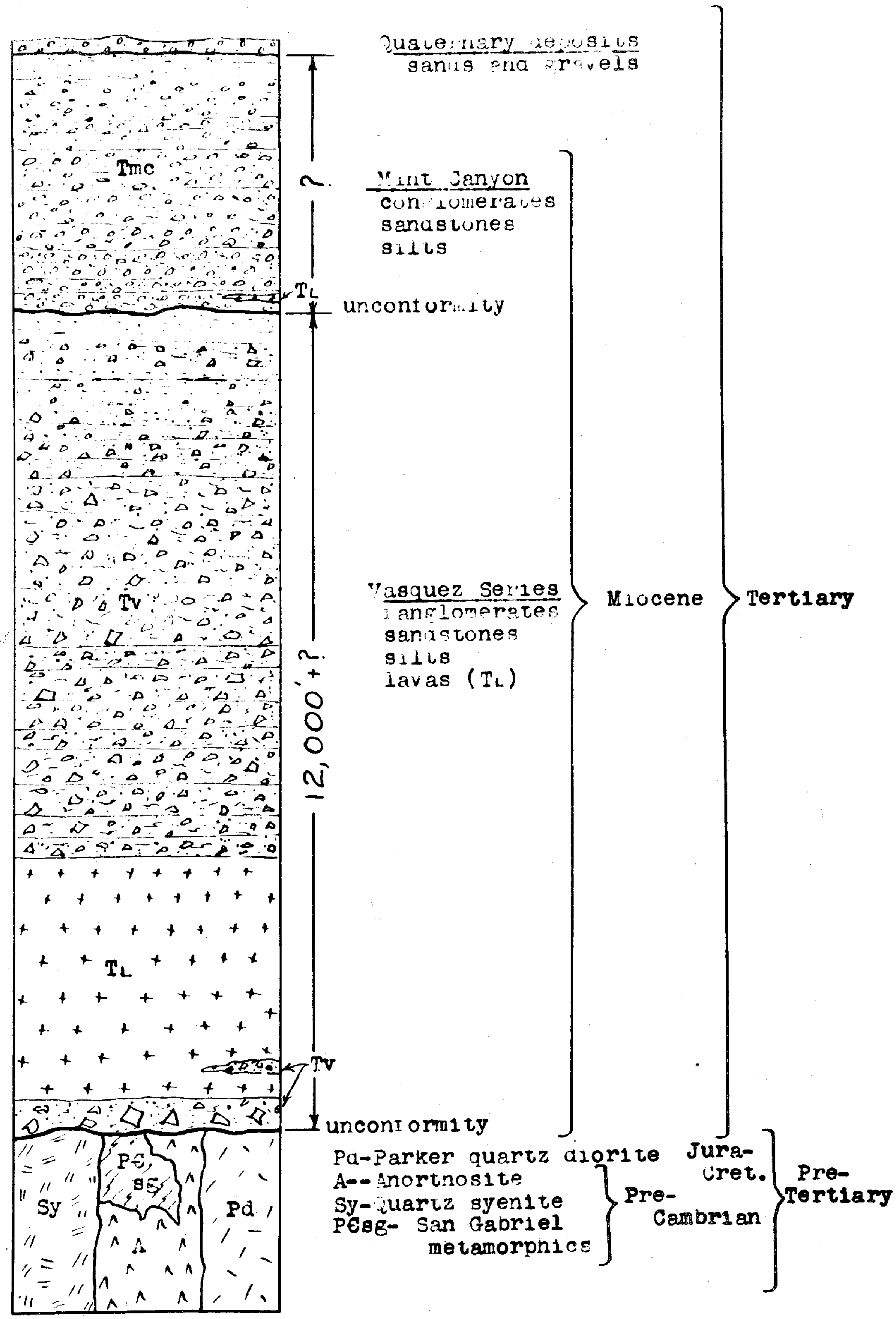
Age.

The age of the lavas is the same as that of the sediments in which they are interbedded. The age of the Vasquez Series, of which these lavas make a part, is discussed in the section dealing with the age of the sedimentary members of the series. Curiously enough, the only fragment of lava found in the Vasquez sediments was a small quartz amygdule found in Escondido Canyon. The overlying basal Mint Canyon, however, contains a great many fragments of lava. The thin lava flow occurring in the basal Mint Canyon formation just west of Escondido Canyon represents the last bit of volcanic activity in this area.

Origin

No pyroclastic material such as that commonly found around volcanic vents has been found in the mapped area. The general appearance of the lavas points to a fissure type of eruption.

COLUMNAR SECTION



STRUCTURE

The sediments of the Ravenna area are made up of massive, thickly bedded very competent rocks. Added to this, they lie upon a crystalline basement. Under such conditions a predominace of faulting over folding is to be expected and is found to be the fact upon investigation.

Folding

Within the Ravenna quadrangle no evidence of folding owing to tectonic activity has been observed. The sediments form a large basin-like syncline which opens to the west and has an east-west axis. However, this fold, if it may be called such, is only a reflection of the structure of the basin in which these deposits were laid down, and as such should probably not be classified as a fold. It represents a depositional syncline.

J. H. Maxson reports close folding in the Vasquez Series and the Mint Canyon formation just to the west of the area mapped. The unconformity between the Mint Canyon and Vasquez Series would lead one to suspect that the uplift giving rise to the erosion represented in this unconformity might cause folding. A series of older sediments may underlie the Vasquez Series and Mint Canyon formation to the west of the Ravenna Quadrangle and thus give rise to conditions more favorable for folding. The sediments in this western area are also much finer and less competent than those of the Ravenna area.

Maxson, J. H., Oral Communication

FAULTING

Faulting, in contrast to folding, is very prominent in the Ravenna area. An inspection of the map brings to attention two chief trends of faults in this area. The first, and older, set is represented by the Soledad fault, and the second, and younger, set is represented by such faults as the Bee Canyon fault, Burke fault, Little Escondido fault, and Leaverton fault.

First System of Faults

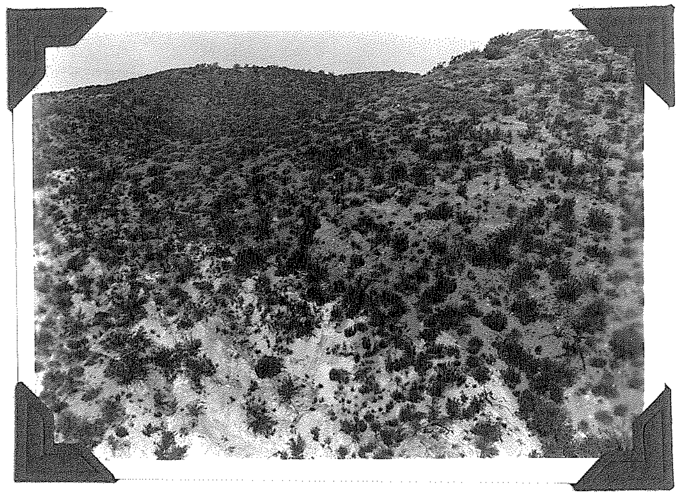
Soledad Fault

The Soledad fault trends roughly east-west along the southern borders of the area. It takes its name from Soledad Canyon. This feature is a normal fault which dips northward at angles ranging from 70 degrees to 80 degrees.

Displacement on Soledad Fault:-The maximum displacement is indeterminable, but the absence of sediments on the south side of Soledad Canyon suggests a displacement amounting to several thousand feet. A rough calculation gives between 1,300 and 1,400 feet as a minimum displacement. The movement has been chiefly vertical; no good evidence of horizontal movement has been found.

The down thrown side of the fault is to the north, so that the Vasques Series and Mint Canyon formation have been brought into juxtapostion with the anorthosite.

Physical Feature of the Soledad Fault:-In places the Soledad fault is a wide zone of brecciation, a few tens of feet wide. In other places scarcely any brecciation has been observed. The anorthosite rock is characteristically

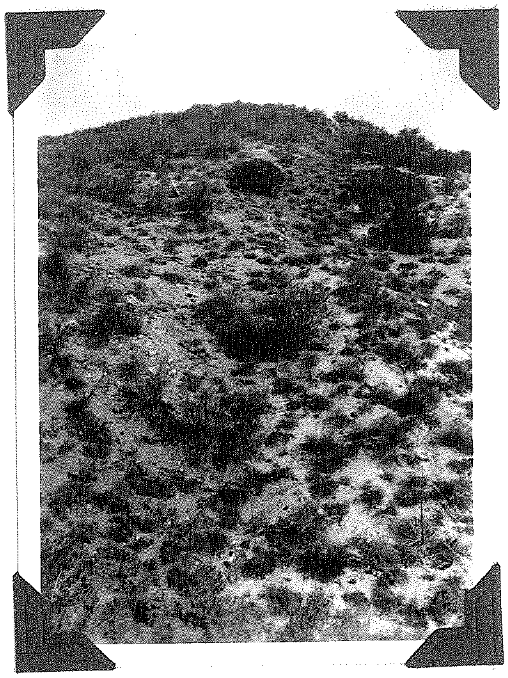


No. 31

Soledad fault in eastern part of Lang quadrangle just north of Soledad Canyon. The white rock is anorthosite which has been faulted up along a normal fault into contact with Vasquez fanglomerates.

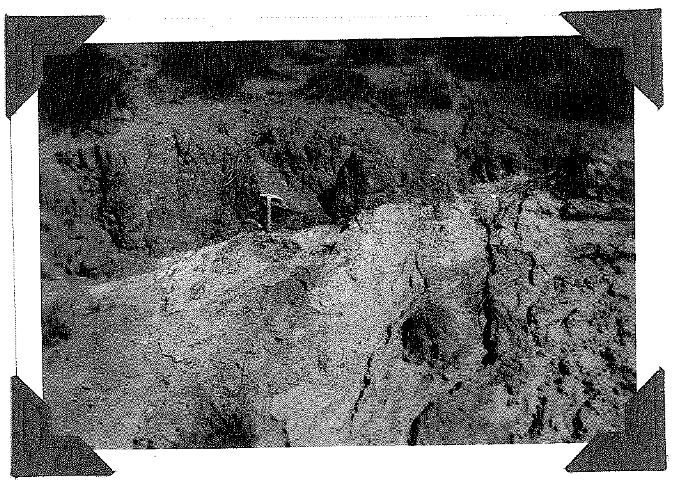
No. 29

Near view of the Soledad fault in Lang quadrangle just north of Soledad Canyon. Vasquez fanglomerates brought into contact with anorthosite containing inclusions oriented parallel to the fault. This contact closely resembles a depositional contact, but close study has shown it to be a fault contact.



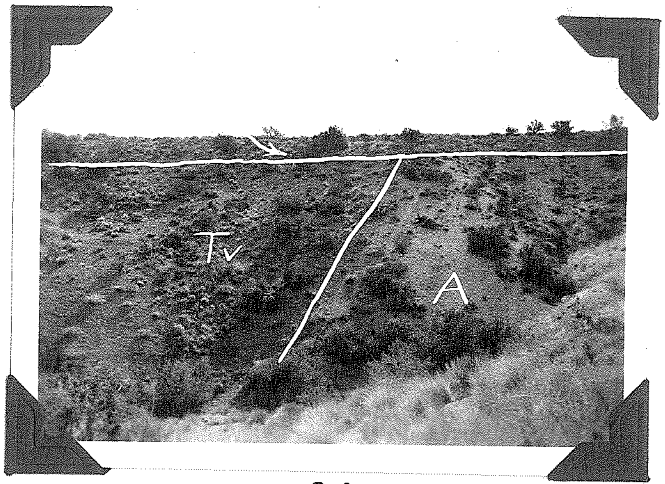
NO. 20

View of the Soledad fault opposite the mouth of Indian Canyon. Vasquez fanglomerates on the left dropped down into contact with anorthosite on the right. The fault dips about 70 degrees north at this locality.



No. 36

Near view of Soledad fault near Ravenna showing dark colored fanglomerates faulted into contact with anorthosite along a normal fault which here dips about 60 degrees north.



No. 34

View of Soledad fault just north of Soledad Canyon showing the fault overlain by Quaternary terrace deposits which are unbroken by the fault. Q. Quaternary, Tv. Vasquez fanglomerate, A. Anorthosite.

No. 38

Soledad fault just north of Ravenna showing the Parker quartz diorite (left) dropped down into contact with anorthosite (right). The prominent outcrop in left center is made up of well cemented fault breccia of fragments of Parker quartz diorite.

fractured and shattered to the south of the fault, but as this shattered rock is found at alrge distances from the Soledad fault it probably has no connection with that feature.

At nearly all locatities the Soledad fault is marked by an obsequent fault line scarp. At the fault zone itself the down thrown side is not topographically higher than the up thrown side, however, as one goes south away from the fault the elevation increases, the land rises topographically and eventually becomes higher than that on the down thrown block.

Age of the Soledad Fault:- The Soledad fault is one of the oldest faults in the area and is clearly displaced by the second series of faults in a number of places. No movement has occurred on the Soledad fault in late Quaternary time as shown by the unbroken terrace deposits which lie across it. The Soledad fault has experienced movement sometime between upper Miocene and late Quaternay time. It may have been in existence before the upper Miocene and may have played a part in blocking out the basin in which the sediments accumulated.

Second System of Faults

The Leaverton fault, Burke fault, Little Escondido fault, and the Bee Canyon fault are the member of this group.

Displacement of the Second System of Faults:-These faults are all high angle faults trending roughly northeastward. The dominant movement has been strike-slip, and evidence of any great amount of vertical displacement has not been observed. Horizontal striations are commonly found on the fault planes of the faults of this group.

The amount of displacement has been about a mile and a half in the case of the Bee Canyon fault and Burke fault and about a quarter of a mile in the case of the Leaverton and Little Escondido faults. The west side of the fault has moved southwestward in each case, giving in total about three and a half miles of southwestward displacement. All these faults are essentially vertical in attitude. They are not characterized by any topographic relief.

The fault shown on the map south of Soledad Canyon may represent an extension of the Leaverton fault. The general relations suggest an off-set of the Leaverton fault, but a more likely suggestion is that the strain has found relief in part along the Soledad fault in that particular locality.

These faults make up a strikingly regular pattern. Faults with a similar trend are found to the west and northwest,* and such faults seem to be characteristic of this region.

Judson, Jack, Oral Communication

Age of the Second System of Faults:-The movement along this system of fractures has been distinctly later than the movement along the Soledad fault. In one locality, some terrace deposits appear to be off-set by one of the faults of this system. If the relations are truly interpreted, a movement in late Quaternary time is shown. Thus, the movements along these faults has most probably taken place since upper Miocene time, and possibly part of the movement may have taken place very recently.

Dr. C. F. Richter, of the Carnegie Seismologial

Richter, C. F., Oral Communication

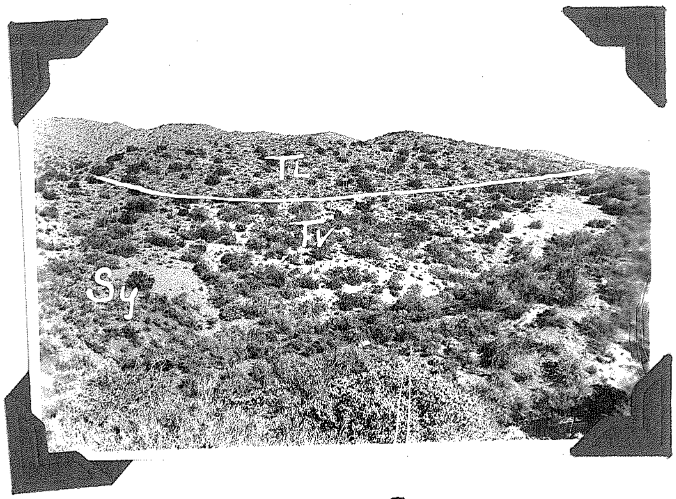
Laboratory in Pasadena, recently stated that no shocks attributable to fault movements have been recorded from the upper Santa Clara Valley region.

OTHER FAULTS

A number of other faults are found in the Ravenna quadrangle mostly minor ones, which might fit into either of the two systems described above. The Kashmer fault, however, is a large fault which is out of keeping with any other fault found in the area.

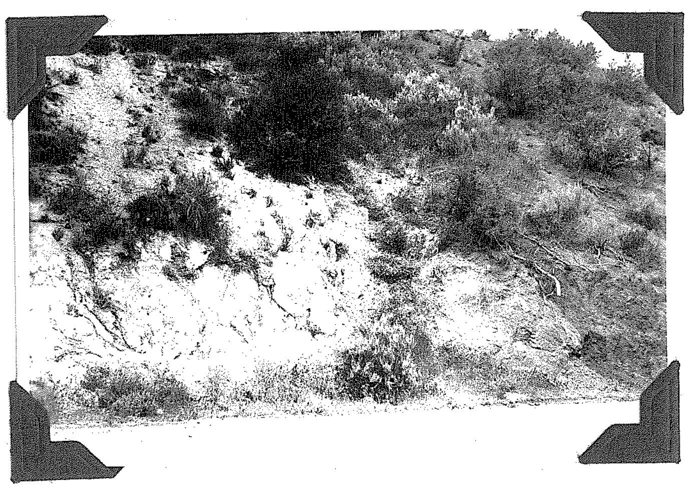
Kashmer Fault

The Kashmer fault runs roughly northwestward across the northeast part of the Ravenna quadrangle. It is a fault about which little is known except that the northeast block has dropped down with respect to the southwest block, though in later times a reversal of movement may have occurred bring up the northeast block. This is suggested by the topographic height of the northeast block with respect to the southwest block, though erosion along the fault zone might well have produced the same relations. The movement along the Kashmer has been chiefly of a vertical nature, no indications of horizontal displacement of any amount have been found. The fault bifurcates at its eastern end, one branch passes out toward Acton through Kashmer Valley, the other branch passes to the east of Parker Mountain and follows



No. 7

The white spot in the mid-distance is a sliver of Vasquez fanglomerate which has been dropped into the fault zone of the Kashmer fault, which crossed the picture from right to left just behind the white spot.



No. 35

Close up view of a small fault in Soledad Canyon. The displacement along the fault has dropped lava, on the right, down into contact with anorthosite, on the left. Note zone of gouge and brecciation in the middle of the picture.

a south-south by east course.

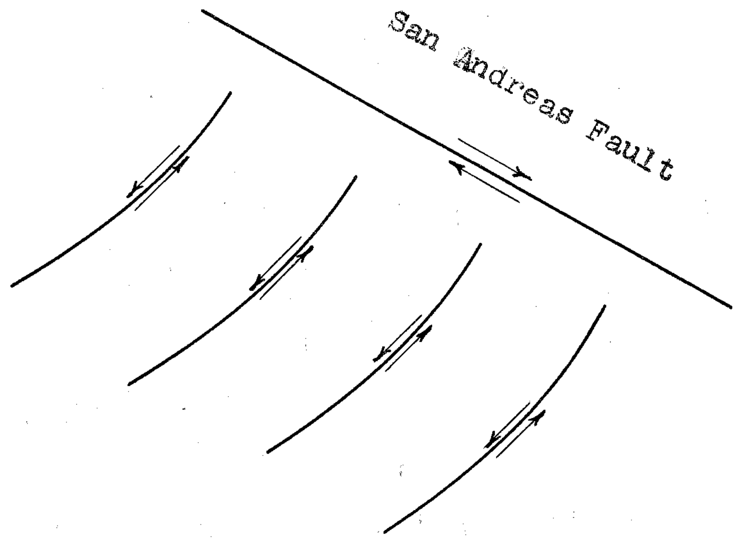
The Kashmer fault has dropped lavas down into juxtaposition with the Parker quartz diorite, quartz syenite, and fanglomerates. Topographically the Kashmer fault is represented by a wide floored valley, Kashmer Valley.

Age of the Kashmer fault:- No evidence of recent movement has been observed along the Kashmer fault. The Kashmer fault terminates against the Little Escondido fault of the strike slip system and is probably of an earlier age than the strike slip faults. At least one of its displacements can be no older than the Vasquez Series, which is involved in the faulting.

FORCES

The upper Santa Clara Valley region has been subjected to two distinct periods of faulting. The first period produced normal faults of which the Soledad fault is the chief example. Whether this faulting represents a tensional fault or a vertical up-push is difficult to say.

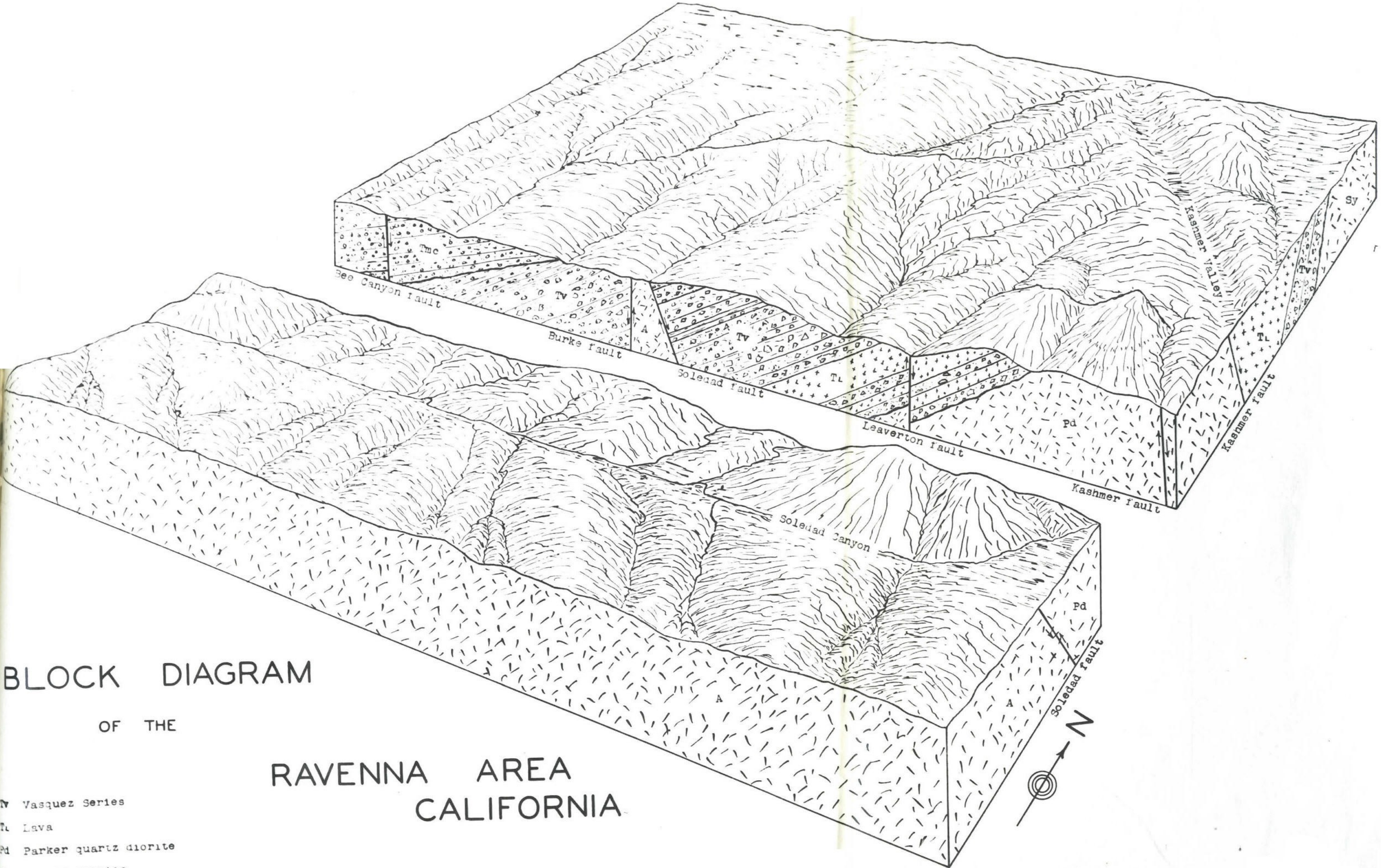
The second period of faulting is characterized by the second system of faults and was a period in which shearing predominated. A shearing couple acting in a northeast-southwest direction could produce a series of fractures such as those of the second set. The close geographic relations of the San Andreas fault (10 miles to the northeast) suggest that some relation between these shears and the San Andreas fault should be found.



If these faults were traced farther to the northeast a drag-fracture relation to the San Andreas might be found. However, with the data in hand, it is very difficult to imagine relations between these strike slip faults of the Ravenna quadrangle and the San Andreas fault.

The San Gabriel fault, which passes a number of miles to the south of the Ravenna area, and which is apparently a branch of the San Andreas fault, may play a part in these curious relations. The Ravenna quadrangle may be part of a wedge which has been twisted and distorted between the San Gabriel and San Andreas faults.

Whatever the cause of the second system of faults may be, it is clear that they represent shearing in a northeast-southwest direction.



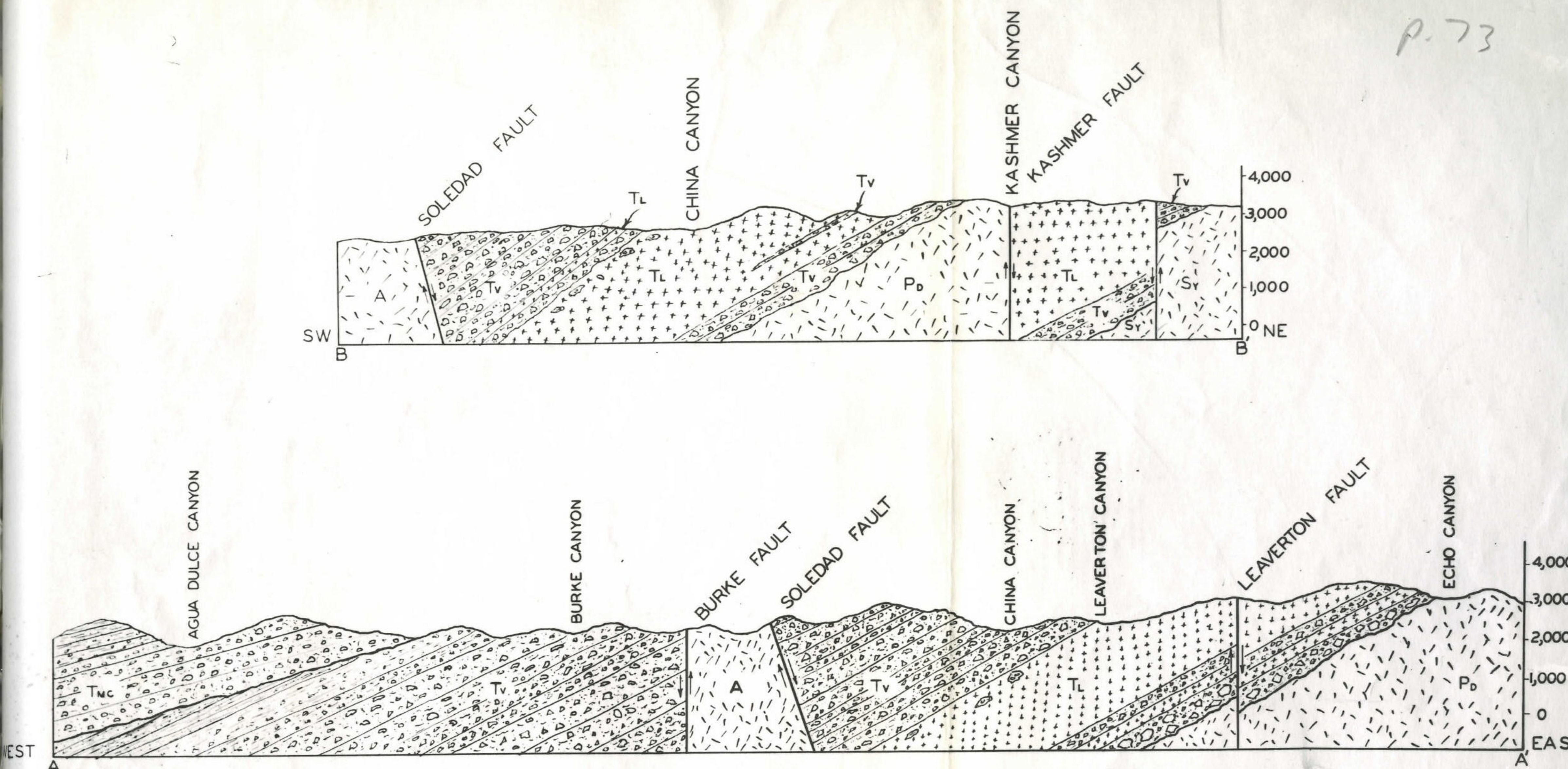
BLOCK DIAGRAM

OF THE

RAVENNA AREA CALIFORNIA

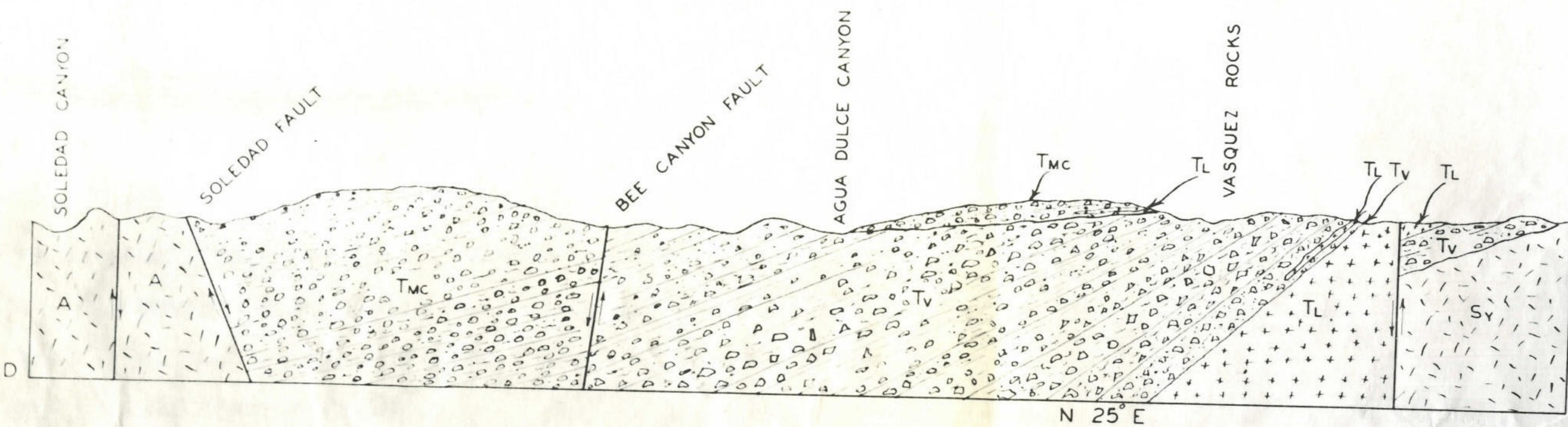
Tv Vasquez Series
Tl Lava
Pd Parker quartz diorite
Sy Quartz syenite
A Anorthosite

p. 73



CROSS SECTIONS
RAVENNA QUADRANGLE
CALIFORNIA

SCALE 1" = 2,000'


SOLEDAD CANYON
SOLEDAD FAULT
BEE CANYON FAULT
AGUA DULCE CANYON
VASQUEZ ROCKS
TMC
TL
TL TV
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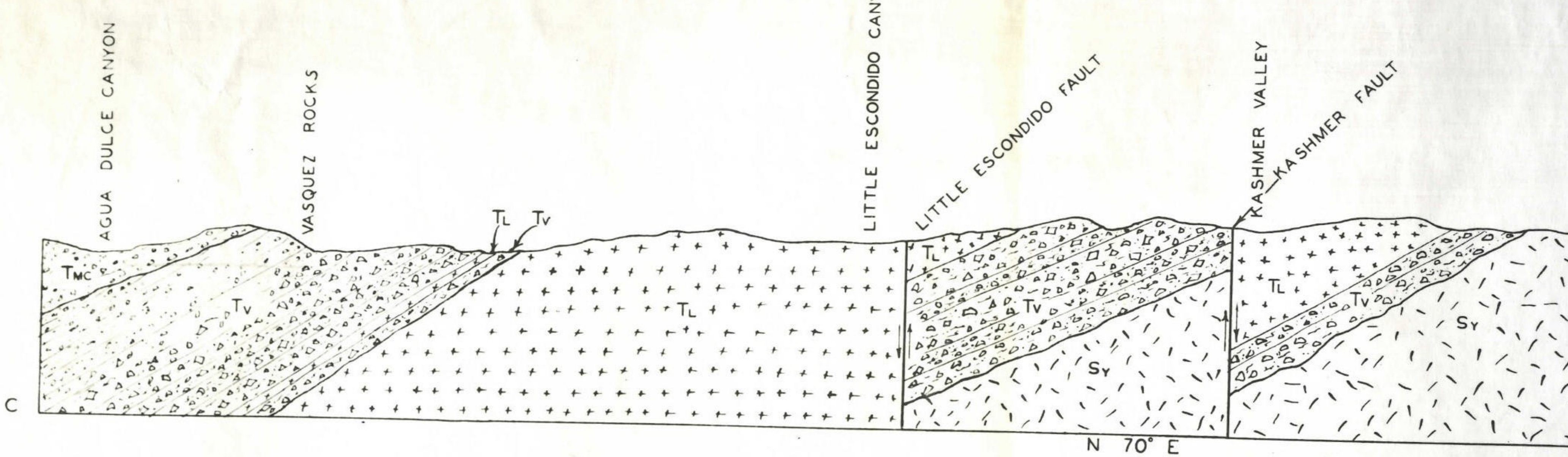
AGUA DULCE CANYON
VASQUEZ ROCKS
LITTLE ESCONDIDO CANYON
LITTLE ESCONDIDO FAULT
KASHMER VALLEY
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LANDSLIDING

Landsliding is not an important phenomenon in the Ravenna area. This is due, to be sure, to the competent nature of the rocks of the area. Several slides have occurred just north of Soledad Canyon in the center of the Ravenna quadrangle, where fanglomerates are underlain by a rather weak lava bed which weathers out rapidly and undersaps the overlying beds of fanglomeratic material. Several slides have occurred just south of the northwestern part of Kashmer Valley.

A thick bed of jumbled and distorted rocks occurs interbedded in the Vasquez sediments near the mouth of Escondido Canyon. This material probably represents a landslide of Vasquez age.

PHYSIOGRAPHY

The upper Santa Clara Valley region is characterized topographically by a series of broad open valleys separated by moderately high, moderately rounded ridges; and by narrow canyons which are working headward into these broad valleys.

In short, in Pleistocene time a mature broad valley topography was developed in this region. Sierra Pelona Valley, the upper part of Little Escondido Canyon, and the valley just west of Vasques rocks represent remnants of this former topography. Subsequent uplift has rejuvenated the streams which are now working headward destroying the Pleistocene open valley topography.

Remnants of this topography are seen on some of the interstream ridges where the headward working streams have already cut deep canyons. This is particularly true in the vicinity of the junction of Escondido Canyon, Agua Dulce Canyon, and the west branch of Agua Dulce Canyon. Some of the higher terraces along Soledad Canyon probably mark the Pleistocene topographic level. The low terraces in Soledad Canyon are more recent features and owe their existence to small uplift or some variation in stream erosion. The Pleistocene topographic stage in the Ravenna quadrangle might be correlated with some of the high terraces along the Santa Clara River in lower Mint Canyon.

ECONOMIC GEOLOGY

One gold mine is being operated at the present time in the area mapped. This is a small mine located on a quartz vein found in the quartz syenite about three miles northwest of Acton. A large quartz vein near the head of Escondido Canyon, northwest ¼ of section 33, T. 5 N., R. 13 W., has been mined on a small scale at some past time but from all appearances is barren of any valuable minerals. The homesteaders in this region have a story about a fabulous amount of gold which was supposed to have been taken from this vein, but the working indicate that the attempted exploitation was unsuccessful.

Attempts have been made to mine copper veins which occur in the Parker quartz diorite. The exact nature of the copper minerals is not clear. They appear to be oxides and carbonates for the most part and represent supergene alteration of sulphide copper minerals in irregular and shattered quartz veins. The copper mineralization has occurred and has been related to the igneous activity associated with the lavas. The country rock in the vicinity of these veins is badly altered, a good deal of epidotization is noted. All attempts to exploit these copper deposits have ended in failure, and there seems to be no good reason why they should ever be of any great economic importance.

The Southern Pacific Railroad Company obtained a large amount of ballast rock for its tracks from a large quarry just to the west of Acton. Lava was the rock excavated.

Mineral collectors have found the amygdules and geodes from the Ravenna quadrangle of interest, and some very beautiful stones have been taken from this area.

A large irregular pegmatitic mass in the quartz syenite in the southwest ¼ of section 22, T. 5 N., R. 13 W., has been mined on a small scale , probably for the quartz and orthoclase which occur in very large crystals. Some of the orthoclase crystals are a foot or two long. Some large pockets of biotite are also found associated with this mass.

Large masses of ilmenite are found associated with the anorthosite mass, but until some method of obtaining the iron from this type of mineral is found, these masses will not be of any economic importance. They are scattered in location and would be expensive to mine.

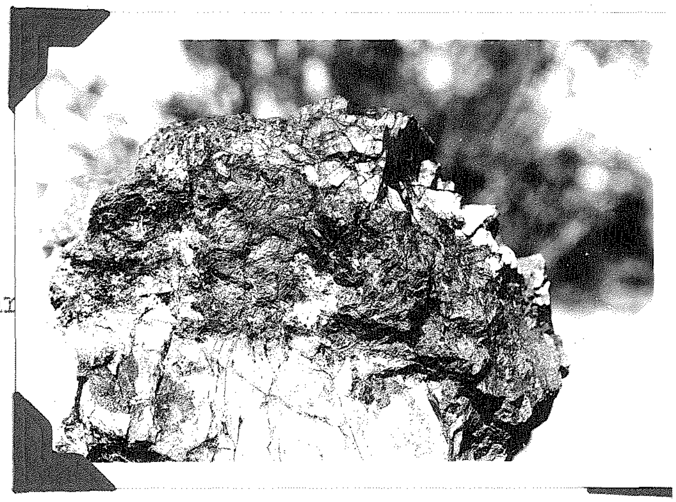
Summary of Economic Geology:- The economic outlook for the Ravenna quadrangle is not particularly encouraging. Small deposits of gold in quartz veins and stringers in the quartz syenite seem to be the only occurrence of material worth working.

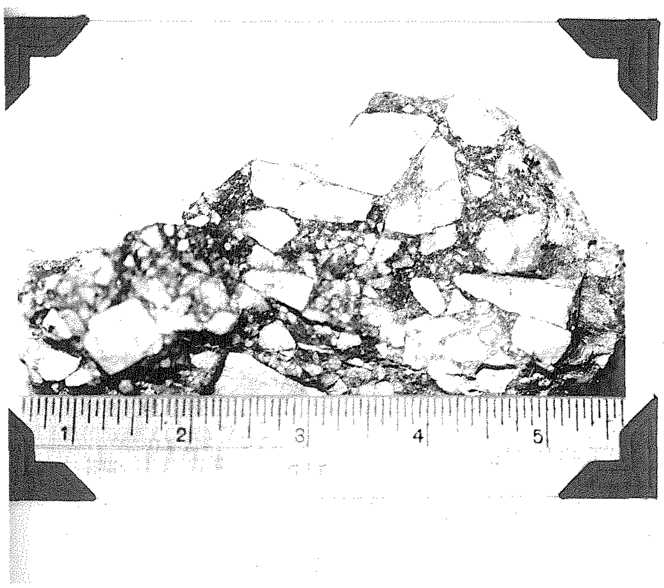
No. 8

Large quartz vein as exposed in branch of Escondido Canyon. Unsuccessful attempts have been made to exploit this vein for its meager gold content.

No. 8

Close up of a large fragment of the vein shown in upper picture. White material is quartz which is cut by an irregular vein of magnetite.





Autoclastic quartz breccia from crushed quartz vein . Fragments of quartz are embedded in a matrix of fine material cemented by iron oxide.

HISTORICAL GEOLOGY

In Pre-Cambrian time a series of sediments was laid down over the site of the upper Santa Clara Valley. Subsequently, these sediments were regionally metamorphosed probably by a mountain making orogeny, accompanied by the intrusion of igneous rocks. The anorthosite and its differentiates and possibly the quartz syenite were intruded at this time.

The mountains built by this orogeny underwent erosion without any interruption from Pre-Cambrian time until the Jurassic-Cretaceous interval, when the Parker quartz diorite was intruded into the Pre- Cambrian complex. Whatever the topographic relief of the Ravenna quadrangle might have been prior to the middle Miocene (?), by that time the region had been worn down to an area of low relief.

In middle Miocene (?) time a canoe-shaped basin in which sediments were to be deposited was formed, probably in large part by faulting. Immediately the basin began to fill up with sediments. The mountains bounding the basin shed fragments into it at a very rapid rate. This detritus was deposited as a series of coalescing alluvial fans sloping in general westward. To the west the fans emptied into an open valley in which finer material accumulated.

The deposition of these coarse fanglomerates had not proceeded for a very long time when a series of lavas was poured out on the surface of the fans. Some lavas were intruded also as sill-like bodies.

Fanglomerates continued to accumulate after this volcanic activity and piled up to a considerable thickness. These fanglomerates and lavas comprise the Vasquez Series.

Between middle Miocene (?) and upper Miocene time a period of uplift and folding took place. This uplift and folding was followed by erosion which planed off part of the Vasquez Series. Across the truncated edges of the Vasquez beds the basal Mint Canyon formation was deposited.

Since Mint Canyon, upper Miocene time, the Ravenna area has been subjected to two periods of faulting. The first period of faulting is represented by movement along the Soledad fault, a normal fault; and the second period is represented by movement along the strike slip faults such as the Burke and Bee Canyong faults.

Prior to Pleistocene time, the area has undergone a general uplift accompanied by erosion which in Pleistocene time produced a mature topography of open valleys and rounded ridges. A late Pleistocene uplift has rejuvenated the streams which are now at work destroying the Pleistocene topographic forms. Such is the Ravenna quadrangle as seen today.