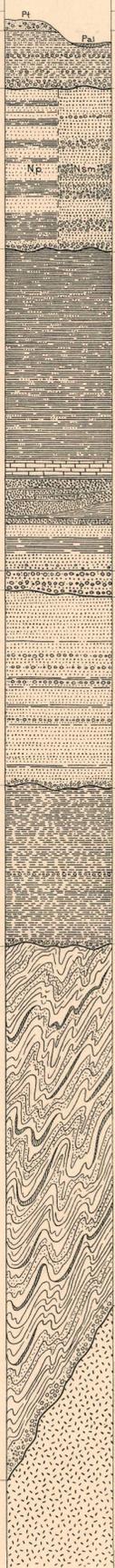


COLUMNAR SECTION

COLUMNAR SECTION OF THE SEDIMENTARY ROCKS OF THE SAN LUIS QUADRANGLE.						
SCALE: 1 INCH = 2000 FEET.						
PERIOD.	FORMATION NAME.	SYMBOL.	COLUMNAR SECTION.	THICKNESS IN FEET.	CHARACTER OF ROCKS.	
PLEISTOCENE	Alluvium and stream gravel.	Pal		1-100	Clay and gravel.	
	Terrace deposits and dune sand.	Pt		10-400±	Sand and gravel.	
NEOCENE	PLIOCENE	Paso Robles formation.	Npr	1000+	Sandy and marly clay, with pebbly conglomerates; thick conglomerate at the bottom, formed of fragments of Monterey shale.	
	UNCONFORMITY.					
	MIOCENE? (SAN PABLO)	Pismo formation (in the southern portion).	Np	3000±	Sandstone and conglomerate at the bottom, followed above by siliceous shale, diatomaceous earth, and thick beds of soft sandstone.	
		Santa Margarita formation (in the northern portion).	Nsm	1500±	Alternations of conglomerates with soft sandstone, containing several strata of diatomaceous earth and pumice.	
	UNCONFORMITY.					
	MIOCENE	Monterey shale.	Nm	5000-7000	Thinly stratified bituminous shale, largely siliceous, with diatomaceous earth in places. The shales are the source of the oil and asphaltum; sulphur springs also issue from them. Thin-bedded limestone. Volcanic ash of varying thickness, in places separated into thin beds by layers of shale. Sandstone at the bottom.	
Vaquero sandstone.		Nv	0-500	Sandstone and conglomerate.		
UNCONFORMITY.						
CRETACEOUS	CHICO	Atascadero formation.	Kat	3000-4000	Thick- and thin-bedded sandstone, with small amount of conglomerate and shale.	
		UNCONFORMITY.				
	KNOXVILLE	Toro formation.	Kt	3000±	Dark, thin-bedded clay shale, with thin irregular layers of conglomerate at the bottom and near the middle.	
UNCONFORMITY.						
JURATRIAS?	JURASSIC? (FRANCOISAN)	San Luis formation.	Jsl	1000±	Usually an earthy sandstone, but in places there is a considerable thickness of dark shale, very similar to the Toro formation. Contains numerous radiolarian jasper lentils and some contact-metamorphic schist.	
		UNCONFORMITY.				
PRE-JURATRIAS	Granite.	gr			Biotite-granite with some quartz-monzonite, cut by dikes of aplite.	

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FIG. 1.—QUATERNARY TERRACE DEPOSITS RESTING UNCONFORMABLY ON ERODED EDGES OF MONTEREY SHALE, ON THE COAST BETWEEN PISMO AND PORT HARFORD.
The contact is a wave-cut plain. Rain sculpture is well shown in the soft terrace gravels.



FIG. 2.—MORRO BAY FROM THE SOUTH.
The barrier beach between the bay and the ocean was formed during the last sinking of the land, and it has been made higher and broader by the formation of sand dunes. Morro Rock is shown beyond the northern end of the barrier.



FIG. 3.—CONTORTED MONTEREY SHALE NEAR POINT BUCHON.
This isolated rock shows the characteristic crumpling to which the shale has been subjected in many places. The thin layers of hard shale are separated by partings of softer material, which has favored crumpling rather than crushing under pressure.

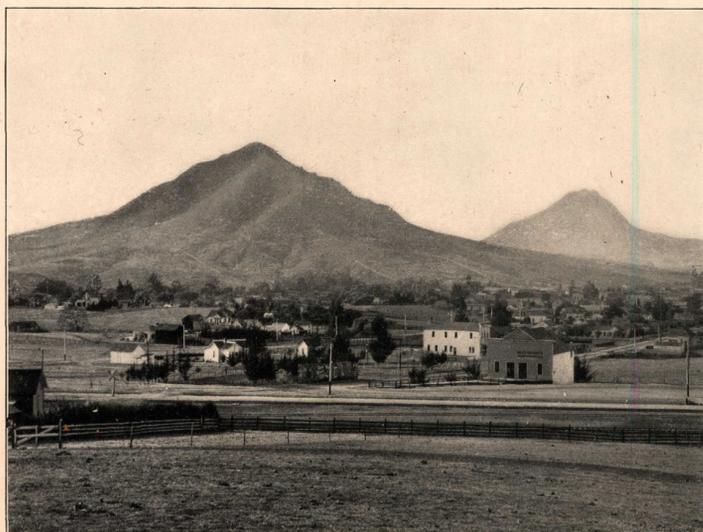


FIG. 4.—PROMINENT BUTTES NORTHWEST OF SAN LUIS OBISPO.
These are the southernmost of the chain of lofty buttes extending from San Luis Obispo to Morro Bay.

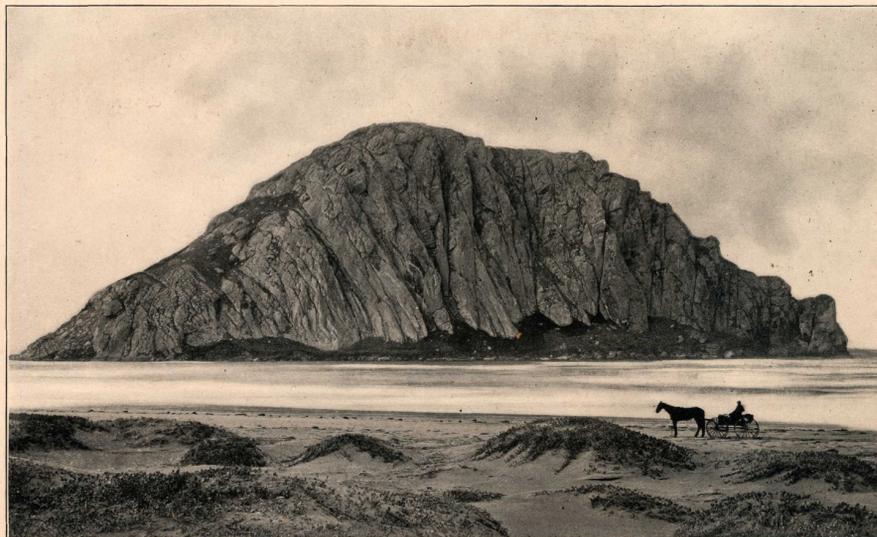


FIG. 5.—MORRO ROCK FROM THE EAST.
This is the northernmost of the chain of buttes extending to San Luis Obispo. The steep, rugged slopes are due to the resistant nature of the igneous rock of which the butte is composed.



FIG. 6.—OUTCROP OF A LENTICULAR BED OF JASPER ON THE COAST NORTH OF PORT HARFORD. The jasper masses stand vertical and weather out in jagged points that rise above the flat surface of the Quaternary terrace gravels which partly bury them.



FIG. 7.—TIDAL LAGOON FORMED BY SAND SPIT AT MOUTH OF SAN LUIS OBISPO CREEK. In the foreground is an ox-bow cut-off, and in the distance, beyond the wharf at Port Harford, is San Luis Hill, leveled off at a height of 700 feet by marine planation during the last great submergence of the coast.

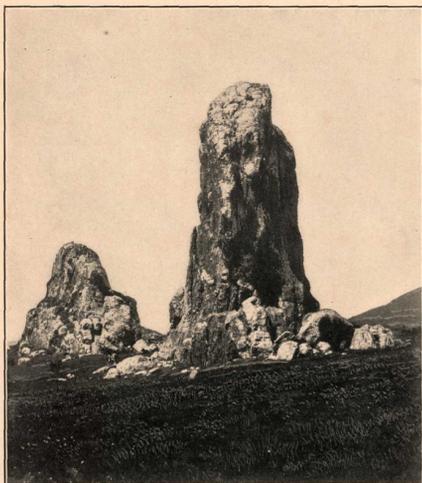


FIG. 8.—NEAR VIEW OF ONE OF THE LENTICULAR MASSES OF JASPER SHOWN IN FIG. 6. Looking approximately along the strike.

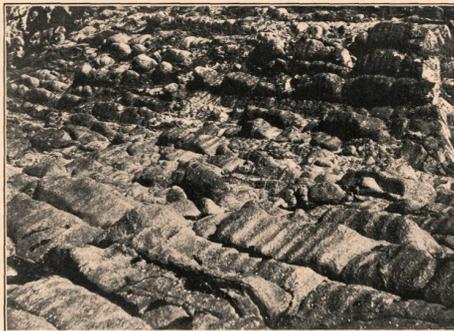


FIG. 9.—NEAR VIEW OF A PORTION OF A TESCHENITE DIKE IN MONTEREY SHALE SOUTH OF POINT BUCHON. The dike is vertical and shows columnar structure. The columns lie horizontal and are perpendicular to the walls of the dike. The altered analcite is arranged in bands parallel to the dike wall and weathers easily, causing the surface to appear ribbed at right angles to the columns.

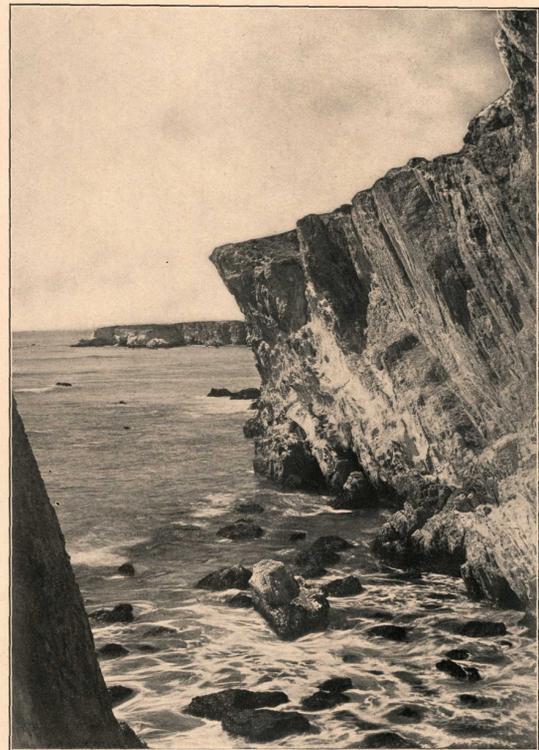


FIG. 10.—OVERHANGING CLIFFS ON THE COAST NEAR PISMO. The character of the cliff is due to the attitude of the bedding. The rocks are the basal portion of the Monterey shale.



FIG. 11.—WAVE-CUT TERRACES AT MALLAGH LANDING. The terraces are cut in the volcanic ash at the base of the Monterey shale. The upper bench is 100 feet above sea level; the middle one, 60 feet; and the lower one, 10 feet.

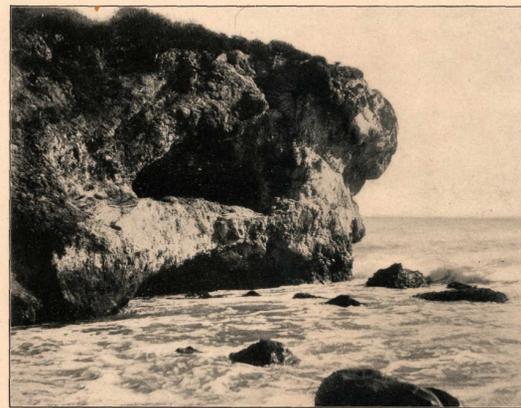


FIG. 12.—SEA CAVES NORTH OF MALLAGH LANDING. The upper cave was cut out by the waves when the land stood 10 feet lower, with reference to sea level. The volcanic ash, in which it has been cut, is only slightly affected by atmospheric agencies, so that the waves undermine it. The lower cave is being formed by present wave action.