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named: (1) major minerals, (2) minor minerals, (3) accessory minerals, and (4) alteration minerals. These terms are by no means unique, but it is believed that their use as here defined will do much to unify descriptive procedure and to make rock descriptions more intelligible to student and petrographer alike.

BASINS OF THE SEA FLOOR OFF SOUTHERN CALIFORNIA

BY ROBERT S. DIETZ[3]

The topography of the sea floor off southern California is unique in that an area, 150 miles in width, with great relief, lies between the narrow continental shelf and the continental slope. This region has been termed "continental borderland." If the sea were withdrawn the region would be characterized by interior drainage and eleven major interior drainage basins would be recognized in which the area below the sill depth would vary in size from 150 to nearly 1000 square miles and in total area would occupy about 5500 square miles. These basins have depths, below their sills, from 500 to nearly 3000 feet. In general the basins show the following relations: (1) Their major areas run northwest-southeast and, hence, are parallel to the dominant structural trends of the continental borderland and of southern California. (2) The sills, in at least eight cases, are at the southeast end of the basins, and the basins would drain to the southeast as a consequence of the structural trend. (3) The depths to the sills, which vary from 1500 to 6000 feet, increase only slightly to the southwest (seaward) and greatly to the southeast. (4) The bottoms of the basins are relatively flat, probably as the result of being the site of considerable sedimentation. This flatness is especially marked in those nearest shore.

PERMEABLE CHANNELWAYS IN NON-CLASTIC ROCKS

BY HORACE J. FRASER[4]

The factors controlling the rate of penetration and of flow of solutions through uncemented clastic rocks are well understood and their relative importance evaluated. Much less is known concerning these phenomena in non-clastic rocks, although the effects of such penetration in the form of rock alteration is commonly observed.

This paper, discussing the available channelways, is a report on the first phase of an experimental investigation of the factors controlling the porosity and permeability of non-clastic rocks.

Many of the channelways in rocks can be made visible by saturating the rock with a non-corrosive dye, drying the specimen, and examining it in thin section. By this method, it can be shown that the pattern of penetration is comparable to that in a clastic rock. The relative importance of openings, such as fractures, grain boundaries, cleavages, and other discontinuities such as the zone contacts and twin planes in feldspars, can be evaluated and the influence of grain-size and texture qualitatively illustrated.

NATURE AND ORIGIN OF THE DEPOSITS OF SODIUM BORATE AT KRAMER IN KERN COUNTY, CALIFORNIA

BY HOYT S. GALE

The problems remaining for solution in regard to the origin of the deposits of sodium borate at Kramer, California, are more chemical than geological. These massive tabular bodies of sodium borate were crystallized from solutions as native

[3] Introduced by Francis P. Shepard.

[4] Introduced by J. P. Buwalda.

borax or tincal, essentially free of any other saline substance, but including some sediment, particularly as minor layers of mud and silt. These deposits accumulated in pools, lagoons, or small lakes that existed in Tertiary time. Some of the layers show ripple marks, and an egg, perhaps of a water fowl, was found in the tincal in one of the mines. Kernite, which is a considerable part of the deposits in two of the mines, is a replacement of original deposits of bedded tincal.

The only part left for the geologist to argue about seems to be as to how the boron got to this locality, where the sodium came from, and how it combined to make the tincal. Flows of basaltic lava spread over the surface in the borate area just before the stage in which the borate deposits were formed. Boron is assumed to have issued from depth, with gasses that accompanied or closely followed extrusion of these lavas. The source of the sodium contained in the tincal is not so clear. It may have been abstracted little by little from shallow ground or surface waters, either by direct combination with boric acid from the volcanic vapors, or perhaps through some intermediate base exchange reaction in the clays that accompany these deposits.

EPITHERMAL HÜBNERITE FROM THE MONITOR DISTRICT, ALPINE COUNTY, CALIFORNIA

BY VINCENT P. GIANELLA

Hübnerite, although not unknown in epithermal veins, has rarely been reported from this type of gold-silver veins of the Great Basin region. In the Monitor district, hübnerite is associated with quartz, rhodochrosite, pyrite, galena, sphalerite, argentite, stephanite, tetrahedrite, and other minerals indicating its deposition at low temperature. Here it commonly encrusts late quartz and rhodochrosite, which line cavities in the ore minerals, demonstrating that it was one of the last minerals to be deposited. The hübnerite is low in iron, containing but 2.38 per cent FeO.

The principal ore bodies occur in narrow filled veins, and as irregular replacements along fissures. The veins are largely confined to a glassy rhyolite enclosed in andesite lavas, tuffs, and breccias. Other veins are enclosed wholly within the andesitic rocks. These volcanics were extensively altered by the ore-bearing solutions, and later weathering has resulted in brilliant red and yellow coloring resulting from the oxidation of the contained iron. The older lavas are overlain by relatively fresh, unmineralized, andesites. From the similarity of the rocks and the sequence of geologic events, it is thought that these rocks are the correlatives of the Miocene and Pliocene volcanics of the Comstock region.

WELDED TUFF SOUTHEAST OF MONO LAKE, CALIFORNIA

BY CHARLES M. GILBERT[5]

Welded rhyolite tuff, having an areal extent of 400 square miles and an average thickness of 500 feet, occurs between Bishop and Mono Lake in eastern California. It was erupted between the Sherwin and the Tahoe glacial stages.

In its upper portion, fragments of porphyritic pumice are imbedded in a porous vitric-crystal matrix. In sections several hundred feet thick, there is a textural gradation from top to bottom, wherein, at the base, vitric constituents are compressed, distorted, and aligned in the horizontal plane, and the texture becomes very compact. This is the result of the compression of the basal parts of a heated pyroclastic mass by the weight of overlying material. Also in thick sections, the glassy constituents have crystallized, after emplacement but before cooling, to fibrous aggregates of tridymite and potash feldspar. There is no visible bedding or

[5] Introduced by Charles A. Anderson.

PRELIMINARY REPORT ON CURTZ CONSOLIDATED MINES CO.

H.L.Huston, 6/15/15.

Location.- Alpine Co., 4 mi.SE from Markleeville.

Geology.- CR andesite and tuffs,leached, altered. Ore deposits in series of wide NE shear zones;on surface extensive masses mixed siliceous-kaolinized material;surface samples $1.20 to $3.60 Au. At depth pyrite, copper and silver s ulphs make ore.

Star Lode.-Opened by old 775' tun.driven from W side of mt. to cut lode 140' below OC. Connects witu 280' vert.shaft. Drifts 100' N, 150' south on lode. 220' winze from tu .following rich enargite chimney,stoped years ago. This old work shows Star lode to have ave.width 60' between walls. Enargite chimney occpied 10-15' of this width;was 30' long on tunnel level. This shoot increased in length to 60' at lowest pt. worked. Ore from chimney averaged 1 oz.Au,100 oz.Ag;40% Cu. Lode matter left in these old workings has ave. width 40' all of which will average better than $9 in gold, silver and copper.

West Star Lode.-Recently opened bu 950' X-cut adit plus 1000' drifts and crosscuts. Cuts lode 450' down;incline backs 600'. Ave. width from crosscuts 30'. Whole averages better than $8 in gold, silver and copper.

Assays. J.O.W.Applegren,careful sampling:

Star Lode, 140' level, ave.....$9.32
West Star Lode, 480' level..... 8.80
East Star Lode, 480 ..... 8.35.

Silver at 50 cents, copper 12 cents.

Probable ore, above various tunnels:

Star	above 140' level	200,000 tons	$9.38
West Star	" 480	690,000	8.80
N Ext.Star	" 480	200,000	8.35

REPORT ON THE MOGUL AND MONITOR MINING DISTRICTS,
ALPINE CO.,CALIF.
J.O.W.Applegren,2/18/15.

Location.-E slope S.N.,4 mi.SE Markleeville,28 mi.S of Minden.

Geology.-CR mainly andesite,largely breccias,s.t. tuffaceous. Necks and masses solid andesite penetrate the breccias at many places,probable points of eruption. These flows and tuffs cover an area 30 mi.wide,50 mi. long;section near Silver Mt,shows 3000' thickness. Rocks near the mines extremely altered,now white, yellow,red,kaolin, jasper etc. Here the rocks faulted, folded, sheared. Ore bodies in N-S shear zones. Main properties: Curtz Consol.and Polaris at Mogul; Hercules Consol.,Lincoln and Globe at Monitor.