DESCRIPTION OF THE PORT ORFORD QUADRANGLE.

By J. S. Diller.

TOPOGRAPHY.

Situation and general aspects.—The Port Orford quadrangle lies along the coast of Oregon, on the western slope of the Coast Range, nearly 60 miles north of the California line. It is bounded on the south and north by the parallels 42° 20' and 36° 30', respectively, with the meridian 124° on the coast and the coast on the west, and has an area of about 470 square miles. It is divided into counties, and the mountains are very irregular in contour, but not entirely even.

The special features in the topography of the Port Orford quadrangle may therefore be considered under three heads—coastal plain and higher terraces, river valleys, and Klamath Plateau.

Coastal plain and higher marine terraces.—These features of the coast are well displayed in a profile of the coastal plain which is narrow on the spur north of Cape Blanco. These features of the coast are well displayed in a section along the coast near the ocean. The terraces of the coast, the river valleys, and the plateau are all exposed. They are well marked as far south as Port Orford and beyond, and near Barklow Mountain.

The coastal plain, having a width of from 1 to 3 miles, borders the coast, but has a larger width along its eastern or inner border than next the coast. It attains its highest point, 225 feet, in Cape Blanco. Much of the soil is sandy, in places it is a dark loam, and the plain affords the largest agricultural tracts of the region. Swamps prevail in many places, and ridges of sand are common near the coast, where the smaller streams are bounded by sand and forming lagunes. The Coos, Coquille, and Elk rivers, as well as the prominent Eocene rocks, are good examples. The Coos and Elk rivers are strong streams and maintain an open channel across their bars, but the smaller Coos and Elk streams are narrow.

The Elk River, like the one next below it, has its greatest development near the northern border of the quadrangle and in the neighborhood of Elk and Siskiyou Rivers.

Fourteen formations have been recognized in the Port Orford quadrangle and outlined on the General Geologic Map. Nine of these are of sedimentary origin, and the remainder are igneous. They record the geological history of the region, and to facilitate their consideration in detail we may note briefly the general series of events.

One of the earlier formations is the Klamath Plateau, which is the oldest and the most important. It is of great thickness and extends far beyond the limits of the quadrangle, but the surface is preserved. In Iron Mountain the plain is of unprecedented elevation on the ridge between Edon Creek and the Siskiyou Mountains. The terraces of the coastal plain, the river valleys, and the plateau are all exposed. They are well marked as far south as Port Orford and beyond, and near Barklow Mountain.
The earlier valley epoch was brought to a close, development of small terraces along the coast or more, with halts at intervals, permitting the level. The absence of this plain along the coast at Cape Blanco than to a particularly long halt at the later history of the Klamath Mountains. but have not been discovered in this quadrangle, the adjacent streams. Among the sediments, too, largely predominates over the sericite which their deposition the Oregon coast was farther sea­ least 200 feet above its present level. The latest the land must once have occupied a position at northwest and west, with a vertical dip. On the schistose structure varies a great deal in relatively thin-bedded sandstone, and although the planes of bedding and render it extremely difficult in most parts of the field to work out the associated rocks are highly metamorphosed have much fine silky mica. On the summit of Brushy Bald Mountain afford fine exposures. The rocks are vast and the schists are highly crumpled, giving the cleavage a decidedly wavy profile. The rocks contain a large amount of dark car­ soil.

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tends to show that the original rock from which basalts are so intermingled with sandstones and shales of the Myrtle formation is on Woodward Creek over a mile above its mouth, in sec. 6, T. 31 S., R. 11 W. The area is one of the largest and contains numerous prominent ledges, in which there is great variation in many essential and chemical composition.

These rocks may be divided according to their characteristic composition into gabbro-schists, amphibole-schists, epidote-schists, and muscovite types, each of which is on a different level. Gabbro-schist is the most abundant. Much of it is composed of green, almost fresh olivine and pyroxene, with some serpentine and epidote, and any one of the first four of these minerals may become almost as abundant as gabbro, giving rise to epidote-gabbro-schists, quartz-gabbro-schists, etc. The epidote and gabbro-schist are occasionally altered in alternating bands, giving the rock a foliated structure, but generally the minerals are intermingled with apparent uniformity.

Intensely associated with the gabbro-schist is the various forms of altered basalt, and on some ledges, is amphibole-schist, which is distinctly green in color. When best developed the bladed, almost parallel arrangement of the deep green amphiboles in the amphibole-schist parallels the general structure of the rock, and the bedding is generally parallel to the line of the amphibole bands.

The origin of these felspathic rocks and others associated with them has long been a matter of interest. Their structure and relations along the contact between igneous and sedimentary rocks has the view that they result from contact metasomatism, and a closer study of them microscopically and chemically tends to show that the original rock from which they are derived is igneous in some cases and sedimentary in others.

By far the larger part of the glaucophane-schist in the Port Orford region is derived from the alteration of granitic rocks. In places these rocks have been changed, as already noted, to plagioclase-hornblende rocks, and they are intermingled with amphibole and muscovite, and in such cases the gabbro is usually less abundant than the amphibolite. Coarse-grained granites from picrite or chromite are common, and magnetite is always abundant, especially where the alteration of the rock is well advanced.

The age of the serpentine is not very closely determined. It closely resembles the Myrtle schist, and is therefore later than the lower Cretaceous. This relation is further established by the fact that no serpentinite pebbles were found in the conglomerates of the Myrtle formation, even in the vicinity of large outcrops. On the other hand, the serpentines not intermingled with altered basalt, is distinctly from the gabbros, and is therefore later than the Port Orford formation, of Eocene age, and the intrusion therefore occurred some time during the later portion of the Cretaceous.

The Aragon formation is the most abundant. The sandstone of the new is very common and is almost as abundant as the gabbro, giving rise to epidote-gabbro-schists, quartz-gabbro-schists, etc. The epidote and gabbro-schist are occasionally altered in alternating bands, giving the rock a foliated structure, but generally the minerals are intermingled with apparent uniformity.

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The rock differs from the normal type in containing much less feldspar, and therefore a larger percentage of pyroxene or hornblende, according to the close correspondence of analyses of C. 86 and S 3217 is it possible that C. 86 belongs to this type.

The dacite-porphyry is perhaps most commonly associated with the serpentine which it penetrates. The occurrence of numerous small areas as do the gabbros and the basalt, and in eruption, so far as the outcrops of the Port Orford quadrangle are concerned, it is between the Myrtle and Argo formations. It is found in the northwestern part of the area, as the name implies, in the southern part of the Argo quadrangle, and the small pebbles which belong with the dacite-porphyry. The rocks from which these pebbles were derived must be older than the Cretaceous rocks of the Port Orford quadrangle.

ECONOMIC GEOLOGY.

Coal.

Coal has been found among the Argo beds at a number of points within the Port Orford quadrangle, but generally in quantities so small as to attract but little attention. However, in the Eddy region and on South beyond Creek some what extensive prospects have been made, and are even yet in progress at the most promising locality a few miles southwest of Eddy.

The development of coal prospcts in the Eddy region and the analysis of samples from the localities of Mr. Holmes’s many openings afford to the writer a closer study of the occurrence of coal in the area. Within the Argo formation of the Eddy area coal is known only close to its base, where it comes in contact with the Myrtle formation, and the most important outcrops of such coal within the area. Some of these are near the mouth of the Albert Fork of the Sixes, and 2 miles nearly west of Eddy on the eastern slope of Slaughter Mountain.

Near the southern line of sec. 14, T. 32 S., R. 15 W., a number of turnouts and open cuts have been run in various directions into a mass of coal and coaly shale that varies greatly in structure and composition. Much of it is crushed and slickensid ed, but other portions appear to be good coal, with bright lustre on fresh fracture.

Exposures are few and the position of the coal bed has to be determined largely from the openings, where the strata are much disturbed. The greatest extent of the coal is approximately east and west, parallel to its contact with the older rocks a short distance to the south. The coal is underlain by a thin bed of shale, nearly 100 feet thick, consisting of coal and coaly shale, which rests directly upon the older igneous and sedimentary rocks of Cretaceous age at the northern edge of the Eddy region. The coal strikes east and west, with dip of 5° to the north, as would be expected near the contact, but it is very irregular, and has the character of shales.

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The underlaying older rocks. Here the coal-bearing beds at the base of the series have a thickness of 200 feet and are overlain by nearly 100 feet of sandstone. The coal-bearing beds are shale and sandstone of nearly 300 feet in thickness, with the two beds of coal, one of which is so much crushed that its thickness (said to be 20 feet) cannot be definitely measured. Near it are a few feet of vertical sandstones and shales, and then a few feet of the lower looking coal seen in the region. An analysis of this coal (No. 393) is given below.

Marine Eocene shells occur close to the coal beds, so there can be no question concerning their age.

A number of other outcrops occur on the small stream tributary to the main stream flowing through section 35 and along the North Fork within a mile below Eckley, but the best coal could not be identified at any of them.

The occurrence of coal at many points along the border of the Arago beds from Sugarloaf Mountain to the Middle Fork of the Sixes suggests that the Eckley area of the Arago beds represents a coal basin and that coal occurs under other conditions than those shown in the examples given. Aside from the difficulties of transportation, it is not believed that there is sufficient coal in that region to warrant the expectation of profitable mines.

Analyses of coals in Eckley region, with notes, by W. F. Hillebrand, March 31, 1897.

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<tr>
<th>No.</th>
<th>Analyses of Shasta Costa and Riverton coals.</th>
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<tr>
<td>Moisture in vacuum</td>
<td>Volatile matter</td>
<td>Fixed carbon</td>
</tr>
<tr>
<td>1</td>
<td>7.18</td>
<td>44.18</td>
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<td>2</td>
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<td>3</td>
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<tr>
<td>4</td>
<td>6.17</td>
<td>44.61</td>
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<tr>
<td>5</td>
<td>6.20</td>
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Calcite in beds slightly altered and non-carboniferous.

The sulphur, at least in 1897, appears to be almost wholly in argillaceous and secondary forms. The ash of the coal, being white and, in its fresh, even, but little lime, there are a few grains of the most original kind. A small amount of iron ore appears in the form of small and adherent pellets.

The total product from the quadrangle since 1852 amounts to nearly 1000 miles, or 20000 feet.
serpentine. The ore is pyritiferous iron-stained quartz, which occurs in veins up to 3 inches thick, between walls of gabbro. Among the iron pyrites there is a trace of those bearing copper. Other prospects have been opened up within the drainage of Poverty Gulch and Sucker creeks, but none have proved to be promising. Throughout the region there is considerable low-grade ore, which in course of time renders the stream gravels rich enough to pay for mining, but the quantity of gold is not sufficient to encourage the hope of finding vein deposits that can at present be worked profitably. A short distance southwest of the Salmon Mountain placer mine a quartz mine was opened by several tunnels running in a southerly direction into the hill. One of these showed a 3-inch quartz vein, with smaller veinites, containing besides some pyrite occasional visible traces of free gold. Veins of this sort are found in the pegmatites of Creataceous sandstones which occur in the adjacent Rincon conglomerate, so that the formation of the veins belongs near the close of the Cretaceous.

Greater success has attended the efforts of prospectors on Rusty Butte, where the Harrisons and others have discovered some promising but small ore bodies, which occur partly in sedimentary but mostly in igneous rocks. The first discovery was made at St. Patrick, nearly 1000 feet below the summit of Rusty Butte, on the southern slope, in slaty rocks, but not far below the contact with the overlying igneous rock which has altered the slates. Both walls are of slate, and strike N. 45° E., with a dip of 45° NW. The ore is in the small irregular vein which is quartz full of pyrite, which by its decomposition liberates the free gold, stains the rock with oxide of iron, and softens the mass. Other portions contain calcite instead of pyrite, and associated with the pyrite are small quantities of bluish-gray mineral which from its cubical cleavage is regarded as galena. Talcum is said to be present, but a test by Dr. W. F. Hillebrand for that element in the most promising specimens the writer obtained at the mine showed no trace of it. Instead, however, Dr. Hillebrand found considerable arsenic and some lead, indicating that part of what looks like pyrite is arsenopyrite and that the gray mineral is galena.

The Golden Fleece and other openings near the summit of Rusty Butte are wholly within igneous rock, which where best developed is an altered gabbro composed of plagioclase feldspar and greenish hornblende. In places near the mines the rock is decidedly pyritiferous with dark crystals of angular which are changing to hornblende. Quartz is not one of the original constituents of the rock here, but it is permeated with small veinlets of quartz of secondary origin.

The first step in mine development is the separation of gold from quartz sand. This is done by the placer miner who runs his sand through a hair screen and concentrates the heavier minerals. The writer obtained at the mine showed no trace of the element in the most promising specimens, but the gangue of the quartz sand, or the gold, was valued at 93 cents a ton. A sample of sand from the St. Patrick mine showed the gold to amount to 1 cent per ton, while the gold was valued at 12 cents a ton. The relation of the two is about the same as that at the Blanco mine, but judging from samples from the Sirex mine examined by Dr. B. T. Day the average value of the platinum per ton was as much as 12 cents, and this averages about 18 per cent of the value of the gold.

In order to get a clue to the source of the platinum, as much concentrates were obtained from the placer miners at several points along the Sixes. Ascending the river, the first was obtained from Mr. N. C. DeVilbiss's mine on the left bank of the stream about three-fourths of a mile above the mouth of Dry Creek. The sample submitted contained the concentrates from a clean-up after removing the gold. It weighed about 23.37 grams, of which 5.16 grams (about 22 per cent) were separated by the magnet. Platinum scales were found rather abundant, and non-magnetic, so that they remained in the non-magnetic portion. The scales generally were very small, but one well rounded by attrition weighed .30 gram. The scales are generally metallic and sectile and of steel-gray color, distinguishable from the nearly white and almost brittle scales of iridium, which are about one-third as abundant as those of platinum. In the estimates given below, the platinum and iridium scales are counted together. The residue was passed through a series of sieves ranging in size from 60 to 100 mesh per inch, separating it into six lots, which were then weighed out. Nearly all the platinum was caught in the 60, 80, and 100 mesh. The total yield was .384 gram—about .018 per cent of the whole sample examined. A ton of such sand containing the same proportion would have about $7,500 worth of platinum alone. This material is highly concentrated and there is no means of determining how many cubic yards of original gravel it represents, so that the value of the platinum per ton of gravel is unknown. Besides magnetite, the other minerals are chiefly chromite and ilmenite, with much zircon, epidote, garnet and a trace of spinel.

Another sample of concentrates from the same mine, weighing 60 ounces, contained platinum at the rate of about 817 a ton, and the gold was about seven times as abundant as the platinum, but in this case it amounts to the amount of gravel represented by three concentrates is unknown.

In order to get an idea of the relative values contained in the gravel of the mines, the concentrates from two pans of gravel near the bed rock were obtained from Mr. N. C. DeVilbiss. They contained 235 cents of gold, but no platinum was found. Two pans of gravel from 25 feet above the bed rock contained 8 cents in gold and no platinum.

On the right bank of the Sixes about a mile above the mouth of Dry Creek, nearly opposite Mr. N. C. DeVilbiss's mine, is a placer operated by Mr. W. O. Cuchin, who informed the writer that he was not able to sell $11 worth of platinum from his washings. He sent 44 ounces of sand from the mine, which was sieved and washed; it yielded .176 gram of gold, less than one-hundredth part as much iridium, and no platinum. The relation of the concentrates to the gravel being unknown, the value of the gravel per ton can not be given.

From one of the Guerra Brothers who works a placer along the South Fork of the Sixes, the writer obtained about 8 ounces of concentrates, to examine for platinum. Nearly 85 per cent of the concentrates was magnetic and the remainder was chiefly ilmenite or chromite. Numerous scales of gold were present, but no platinum or iridium was found.

So little is known of the distribution of platinum in the placer mines that no definite indication is furnished as to its source. Where it has been traced to its source in other regions, however, it has been found in serpentine, and in Oregon it probably has the same association. Prospectors should carefully search for platinum, following the streams which cut masses of serpentine. A particularly large mass of serpentine occurs along the Illinois River, and platinum should be looked for along that stream.

December, 1909.