Black Sand Properties

Curry County

Whales Head Beach Tract (Dec. 1922)
12 mi N. of Brookings, 3 mi W. of Highway 101.
Whale's Head Beach is 200 yards offshore. Whale's Head Bay is 2 mi. stretched 3, 400, R14 W. - 2 mi. in length.
Washed out. Whale's Creek - 8%. Chromite

Watt Place

Parts Sec. 1, 2, 3 NW 1/4 sec. 11, T15S R15W - at 800 ft.
Ellen below. Crystal Creek + Sixes R. about 3 mi.
E of Sixes - 2 - Old莱茵河bank.
Bedrock 
- Amphiboles, 
The 
light minerals 25
Chrome 11
Garnet 2
Magnetite 6
Chrome

2 million yrs. exposed
5
assumed
A VANADIUM-BEARING MAGNETITE SANDSTONE IN SOUTHWEST OREGON

JOHN ELIOT ALLEN AND WILLACE D. LOWRY

ABSTRACT

A fossil "black-sand" deposit, composed of titeniferous magnetite highly concentrated, which contains vanadium in the order of four to eight tenths of one percent along with two to five percent chromium as chromite, occurs as a lens 600 feet long and 100 feet wide in central Curry county, southwest Oregon. This magnetite sandstone deposit is possibly Cretaceous in age, and represents a beach or offshore concentration of minerals derived from Jurassic basic and ultrabasic rocks of the region, in a manner analogous to the origin of the "black-sands" formed along the Oregon coast-line in during the Pleistocene and recent.
INTRODUCTION

Early in March of 1942 a small piece of indurated magnetite sandstone was brought in to the laboratory of the State Department of Geology and Mineral Industries. In the routine spectrographic analysis given all unusual-appearing samples, it was determined to contain appreciable amounts of vanadium. Accordingly, several visits were made to the deposit during the summer of 1942, and it was examined, mapped, and sampled by the authors. Samples were analyzed and studied in the laboratory during the winter of 1943.

Dr. H. C. Harrison, spectroscopist of the Department, made the original discovery and quantitative spectrographic analyses, on the 3-meter Baird grating spectrograph.

The property had been previously known as an "iron deposit", but was so inaccessible that little work had ever been done upon it.

LOCATION OF THE DEPOSIT

The deposit is located at an elevation of about 3000 feet, about 20 miles inland from the coast, close to the geographic center of Curry County, in the extreme southwest corner of the state. (See figure 1). This portion of Oregon, because of its high relief, steep canyons, and lack of roads, is one of the least

1. Butts, C.M. and Mitchell, C.L. see p. 3
populated and most difficult of access remaining in the state. The population of the county, nearly all concentrated along the coastal highway, totals only 2000 souls.

The area adjacent to the deposit has not been surveyed, but it lies near the west edge of section 17, T. 36 S., R. 11. W. of the Willamette Meridian.

The deposit is usually reached by way of Agness, a hamlet on the Rogue River, located 35 miles from the mouth of the river. Agness is served by a daily boat from the town of Gold Beach on the coast, or by way of a fair-weather forest road 35 miles from the end of the railroad at Powers, to the north.

From Agness, the deposit lies about 10 miles by trail up the Illinois River to the south. The last 2 miles of trail are steep and rugged that it would be very hard to get a horse over it.

GENERAL GEOLGY

The east of the ridge immediately to the north of the deposit is made up of a dense, fine-grained, silicified meta-igneous rock termed "greenstone" by Butler and Mitchell. It is in part a meta-andesite or meta-diorite, in part an altered tuff,
north-south trending sand of serpentine cuts across the ridge just west of the deposit, and a small outcrop of similar basic rock appears adjacent to it on the east. Peridotites are also present over large areas further to the north and west.

The northeast-southwest trending ridge to the south of the deposit is largely composed of conglomerate, which is found in large discontinuous lenses in the lower part of the Myrtle formation of southwest Oregon. A number of the higher prominences in central Curry County, such as Horseshoe Butte (on the same ridge as the deposit, two miles to the southwest) Pebble Hill, Seven-mile Hill, and the point northwest of Agness, are composed of the conglomerate, the pebbles of which vary greatly in size and relative abundance. These conglomerates and sandy beds are usually deformed and tilted at angles up to 50°. Small discontinuous concentrations of black-sand, a few mm. thick and a few cm. long, are not uncommon in the sandstones. The conglomerate was determined by Diller as being upper Knoxville in age, on the basis of fossils found in Butte Creek, about three miles southwest of the deposit. According to Butler and Mitchell both Aucella crassicolis and Aucella piochii are found there in sandy layers in the conglomerate. More recent work in southern Oregon by Taliaferro indicates that the Myrtle is at least in part Jurassic in age.
DESCRIPTION OF THE DEPOSIT

The magnetite sandstone lies across a small saddle in the ridge, at a point about 2 miles northeast of a prominence on the same ridge known as Horse-sign Butte. Its axis is roughly north-south, and the sandstone extends about 150 feet down the south slope of the ridge, a total length of about 650 feet. Its width averages about 100 feet, although it pinches out gradually to the south. It may either unconformably upon the greenstone which borders it upon both sides; (See fig. 3-A) be faulted down into the greenstone by a fault along its western border (fig. 3-B); be a sedimentary lens within the greenstone series (fig. 3-C).

Internal structures are obscure so that the thickness is unknown, although it is probably of the order of 40 feet or more. A 3-inch pebble layer in cut No. 3 (see fig. 2) strikes about N. 55° W. and dips 45° to the southwest.

The magnetite sandstone has a specific gravity of 3.2. It is a greenish-brown color, streaked with irregular dark gray to black "veinlets", which appear to be secondary along fractures.
Screen analysis of the sandstone gave results as follows:

<table>
<thead>
<tr>
<th>Size</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;100 mesh</td>
<td>8.1</td>
</tr>
<tr>
<td>&lt;100 = 150 mesh</td>
<td>37.5</td>
</tr>
<tr>
<td>&lt;150 = 200 mesh</td>
<td>22.0</td>
</tr>
<tr>
<td>&lt;200 mesh</td>
<td>32.4</td>
</tr>
</tbody>
</table>

Thin sections indicate that the size range of the particles varied from less than .003 mm. to over 1 mm.; the average, however, being around .25 mm. in diameter.

The magnetite is largely subhedral, the finer sizes frequently occurring as almost euhedral octahedrons. Magnetic separations indicate that the material is about 96% magnetic. The interstitial material is mostly a fine cryptocrystalline aggregate.

A few zircon crystals with peculiar "sawfish" terminations were present, indicating (according to Butterfield) some secondary solution and redeposition.

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6 Butterfield, J. A. "Outgrowths on Zircon": Geol. Mag. 73, 1936, p. 511.
CHEMICAL AND SPECTROGRAPHIC ANALYSES

Samples were taken from each of the open cuts (1 to 6) and a grab sample was taken of float across the 100 foot width of the deposit on the crest of the ridge. Chemical analysis of composites gave:

<table>
<thead>
<tr>
<th>Element</th>
<th>Percent</th>
<th>B%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>54.94</td>
<td></td>
</tr>
<tr>
<td>Titania</td>
<td>2.70</td>
<td></td>
</tr>
<tr>
<td>Vanadium</td>
<td>0.37</td>
<td>0.43</td>
</tr>
<tr>
<td>Sulfur</td>
<td>0.114</td>
<td></td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.004</td>
<td></td>
</tr>
</tbody>
</table>

Spectrographic analyses of these composites indicated that vanadium was present in amounts between 1/10 and 1 percent, and other elements present were:

iron, titanium, zircon.

Spectrographic analyses of the original composites as compared with the magnetic separates are as follows:

<table>
<thead>
<tr>
<th>Element</th>
<th>Composite %</th>
<th>Magnetic separate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>iron</td>
<td>over 10</td>
<td>over 10 (est.)</td>
</tr>
<tr>
<td>titania</td>
<td>1-5</td>
<td>1-5 (est.)</td>
</tr>
<tr>
<td>vanadium</td>
<td>0.1-1.0</td>
<td>0.1-1.0 (est.)</td>
</tr>
<tr>
<td>chromium</td>
<td></td>
<td>2.0-5.0 (est.)</td>
</tr>
<tr>
<td>aluminum</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>silicon</td>
<td></td>
<td>Tr.</td>
</tr>
<tr>
<td>phosphorus</td>
<td></td>
<td>Tr.</td>
</tr>
<tr>
<td>arsenic</td>
<td></td>
<td>Tr.</td>
</tr>
<tr>
<td>calcium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>magnesium</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7 Lerch Brothers, Hibbing, Minnesota
8 John Beede, Portland
Spectrographic analysis is the various size separates indicated that the vanadium content did not appreciably vary with the size of the grain. Analysis of the non-magnetic portion of the sample showed it to contain almost no vanadium or titanium. No vanadium minerals were identified by microscopic methods.

AGE AND ORIGIN OF THE DEPOSIT

The presence in the sandstone of an appreciable amount of chromite which could only be derived from the late Jurassic serpentines and peridotites of the area, indicate that the age of the deposit is post-Jurassic. The Klamath Mountains of southwest Oregon apparently were, during Upper Cretaceous and lower Tertiary times, a positive block undergoing erosion which lasted into the Miocene, with sediments being deposited around its flanks. The period of erosion resulted in the so-called "Klamath Peneplain", which over large areas is underlain by ultra-basic rocks.

The relatively small amounts of chromite in the sandstone, in proportion to large amounts of titaniferous magnetite (the ratio is in places almost reversed in the present beach deposits) suggests that the sandstone was laid down early in the erosion cycle, before appreciable areas of ultra-basic chromite-bearing rocks had been exposed. The age of the sandstone is thus tentatively assigned to the Cretaceous(?).

Diller, J. S. "Topographic development of the Klamath Mts." U.S.G.S. Bull. 196, 1902
The magnetite sandstone deposit represents a normal lenticular beach concentration of titaniferous, vanadium-bearing magnetite, re-deposited on a post-Cretaceous (Cretaceous?) shore by the same type of selective wave-action which has produced the Pleistocene and recent black-sands along the Oregon coast. It has since been uplifted, tilted, probably faulted, and has undergone slight secondary solution and redeposition of minerals within it.

The titaniferous magnetite was originally derived from the streams and the eroded coastline of that time, probably from the gabbroic and gneissose rocks which are known to be present both adjacent to the deposit and further to the east. Primary magnetite deposits are known. The chromite was derived from the serpentine and peridotite, which at that time had not been exposed as they are today. The vanadium occurs within the titaniferous magnetite in an amount which is slightly greater than is usual in other deposits and it is possible in view of this fact, as well as the fact that the magnetite has been concentrated by nature and is in an entirely that under the present emergency the deposit may be of commercial value.

John Eliot Allen
Wallace D. Lowry

Département of Geology and Mineral Industries,
Portland, Oregon
March 30, 1943
ABSTRACT

"A vanadium-bearing black-sand deposit of middle Mesozoic age, in central Curry county, Oregon", by John Eliot Allen and Wallace D. Lowry, Oregon Department of Geology and Mineral Industries.

The Pleistocene black-sand deposits lying upon sea-terraces up to 300 feet in elevation along the southern Oregon coast are well known in the literature, and are at the present time being mined on a large scale for their chromite content. A deposit of black-sand lying at an elevation of 3000 feet in central Curry county twenty miles inland, which had previously been called an "impregnation iron deposit" has been found to be a consolidated titaniferous magnetite sandstone containing amounts of vanadium varying from one tenth to one percent.

The elongated deposit, 650 feet long and 100 feet wide, crosses a shallow saddle in an east-west trending ridge composed of "greenstone" (altered lavas and tuffs) and serpentines. Elsewhere along this ridge are downfaulted blocks of conglomerate and sandstone with fossils showing them to be of "Myrtle" age (upper Jurassic or lower Cretaceous) age, younger than the Jurassic greenstones and serpentines. Most of the deposit lies south of the saddle, ranging in elevation from 2650 feet at the lower southern end to 2900 feet in the saddle. It is a massive greenish-brown sandstone of uniform composition and a specific gravity of 3.2. A few layers of exogenic pebbles were found at one locality. The sandstone is medium grained (averaging 0.25 mm. diameter of the grains), indurated, and composed of 95% magnetite, about 3% ilmenite, less than 1% hornblende, with minor amounts of zircon, quartz, garnet, tremolite, chrysotile, pyrite, and probably chromite.

Chemical and spectrographic analyses of the original rock, and of magnetic and heavy mineral separates show the composition to be as follows:

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Spectrographic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fe .......</td>
<td>Cr ....... 2.0 - 5.0 %</td>
</tr>
<tr>
<td>TiO2 ....</td>
<td>Al ....... less than 10.0</td>
</tr>
<tr>
<td>V .......</td>
<td>Mg ....... less than 10.0</td>
</tr>
<tr>
<td>P .......</td>
<td>Si ....... 10.0 about 1.0</td>
</tr>
<tr>
<td>S .......</td>
<td>Ca ....... about 1.0 KAc</td>
</tr>
<tr>
<td></td>
<td>Ni ....... 0.1 - 1.0</td>
</tr>
<tr>
<td></td>
<td>Cu ....... 0.1 - 1.0</td>
</tr>
<tr>
<td></td>
<td>Na ....... trace</td>
</tr>
<tr>
<td></td>
<td>As ....... trace</td>
</tr>
</tbody>
</table>

The non-magnetic separate showed no vanadium, and no vanadium minerals were identified microscopically. It is thought to be contained in the magnetite molecule, as is much of the titanium.
All the contained minerals are also present in relatively small amounts in the adjacent meta-igneous and serpentine rocks of Jurassic age. The small chromite content, in comparison to the large chromite content (up to 40%) in the Pleistocene black-sand deposits, indicate that the serpentines and peridotites from which the chromite is derived had at the time of formation of this deposit, only begun to be exposed to erosion, and thus be able to contribute their minerals to the deposit.

The deposit is thought to have been deposited along the shore of the Myrtle (late Jurassic or early Cretaceous) sea which covered much of the Klamath province at that time.

May 24, 1943

* Published by permission of the Director

A crescent-shaped section about 1000 feet long and 200 feet wide, of the 70 foot sea-cliff at the north city limits of Newport, Oregon recently broke off and dropped down a distance of 5 to 25 feet, causing considerable property damage. Together with many small tributary cracks and openings, two major fissures opened up from 20 to 30 feet apart, and the block between them fell from 10 to 25 feet.

Minor disturbances which caused walls to crack and doors to stick, were noted by residences as early as late December, 1942, but the major movements occurred following heavy rains during the latter part of March and culminated on March 30. Some houses were removed, other were broken apart and left hanging over the crevasse. Previous movements are reported to have occurred in 1911 and again in 1921, and the present movement is a recurrence along the older break, and an extension of it 800 further north.

The sea-cliff is composed of 25 feet of flat-lying Pleistocene dune-sands, unconformably overlying massive brown and gray argillaceous sandstones and sandy shales of Miocene age, which strike north and south parallel to the coast and dip 21° to the west. At the base of the cliff a few feet of dark gray to black crumbly shales of the Nye formation of Oligocene age are exposed. These underly the sandstones and are notorious along the coast for their incompetent charater, as they readily slack to mud upon exposure.

The removal by sea-cliff erosion of the more competent sandy Miocene beds overlying the shales now permits the movement of a block down the sea-sloping unconformity between them. When the shales became saturated by heavy rains soaking through the pervious Pleistocene sandmovement occurred seaward in the lubricated shales, and a block of the cliff moved down and outward.

May 24, 1943

* Published by permission of the Director.
REFUGEE PROPERTY (BLACK SAND)

OWNERS: Mr. L. S. Klineman and Mr. Wade.

LOCATION: SW1, sec. 27, T. 31 S., R. 15 W., on Boulder Creek, 3 miles south of Denmark. The property adjoins, and lies east of Hwy. 101.

AREA: 160 acres.

HISTORY: One of the oldest black sand mines in the area. Worked at various times by various people. Klineman worked parts of it. In 1940 Leverett Davis put down several test holes.

DEVELOPMENT: 8½ acres have been mined to bedrock. The area is now grown to alders and brush. Klineman reports that he has drilled the entire area, but kept no drill records.

GEOLOGY: The area is an old back-beach. Bedrock elev. is about 145 ft. Above bedrock is black sand, the thickness of which is 1 ft. at the highway and 6 ft. on the east. The black sand is covered by 15-30 ft. of sand.

ECONOMICS: Klineman states that the black sand underlies the entire 160 acres. Davis put down 3 holes south of the mined area and found similar conditions. Gold and platinum varies; some spots are very rich, others are poor. Analyses of the black sand are reported as showing 20 per cent Cr₂O₃. No black sand was exposed so no samples could be cut. Water table appears to be as high or higher than the black sand.

INFORMANT: Mr. Klineman and Ray C. Treasher, July 8, 1941.

REPORTED BY: RCT., 7/11/41

A sample taken late by department engineers assayed 18.4% Cr₂O₃.
CONFIDENTIAL

REFUGEE BLACK SAND

If Klineman's statements are correct, his section contains 770,000 cubic yards of black sand. (43,560 \times 3 \times 160 + 27) of this 20% is Cr2O3 or 154,176 cubic yards of chromite. Roughly figuring 3 tons to the yard, the figure would be 462,528 tons of chromite. This seems like a shale of a lot of chromite.

However, the area, and the situation might justify further investigation.

Ray C. Treasher.

3 Tons 2 yard (?)
Grants Pass, Oregon
Baker, Oregon

Sample submitted by Klinekatt, F. W. Libbey, Portland office

Sample description: 33 S14 Chromite sand

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The assay results recorded below are made without charge as provided by Chapter 176, Section 10, Oregon Laws 1937, the sender having complied with the provisions thereof.

NOTICE: The assay results recorded below are from a sample furnished by the above named person. This Department had no part in the taking of the sample and assumes no responsibility, other than the accuracy of the assay of the material as furnished it by the sender.

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>GOLD</th>
<th>SILVER</th>
<th>Chrome oxide</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ounces per ton</td>
<td>Value</td>
<td>Ounces per ton</td>
</tr>
<tr>
<td>33 S14</td>
<td>18.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Market Quotations:
- Gold $ per oz.
- Silver $ per oz.
- $ per lb.

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Black Sand
Sample by F. W. L
Trip to properly with Klinekatt

STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
ASSAY REPORT

July 17 1941

STATE ASSAY LABORATORY

Assayer