bution, and is the more readily recognized when it is enclosed in biotite or cordierite, so as to give the characteristic pleochroic halos. He does not, however, discuss its pneumatolytic origin and it may be simply of residual detrital origin.

Zircon occurs in the phlogopite deposits at Renfrew, Ontario, which De Schmidt[20] thinks are contact metamorphosed limestones. Eckermann,[21] gives zircon as a contact mineral, stating that it occurs in the limestone in the neighborhood of the igneous contact, and that it was derived by pneumatolytic transport of material from the igneous source. In the limestone surrounding the essexite of Mount Royal, at Montreal, Dolan[22] found zircon to be one of the minerals resulting from the effects of pneumatolytic contact metamorphism.

These descriptions prove that zircon is known in many contact zones, in some if not all of which it has been formed under pneumatolytic or hydrothermal conditions.

The author wishes to thank Professor E. S. Larsen of Harvard University who examined a number of the thin sections and carefully went over the manuscript before publication.

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[20] De Schmidt, H. S., Mica, its occurrence, exploitation and uses: *Canada Dept. Mines, Mines Branch*, No. **118**, p. 277 (1912).

[21] Eckermann, Harry von, The rocks and contact minerals of the Mansjö Mountain: *Geol. Fören. Förh.*, p. 343, (**1922**).

[22] Dolan, E. P., The contact metamorphic zone of Mount Royal, Montreal, P. Q.: *Trans. Royal Soc. Canada*, 3rd ser. vol. **17**, section IV, p. 131, (1923).

JAMESONITE FROM SLATE CREEK, CUSTER COUNTY, IDAHO[1]

Earl V. Shannon, *U. S. National Museum*

There has long been a tendency among geologists and, to a less extent, among mineralogists to refer to the mineral jamesonite all of the so-called "needle-ore" or "feather-ore" minerals of fibrous structure which are found by qualitative tests to be lead sulphantimonites. The name jamesonite has thus had a sort of "natural history" significance which it has in no wise earned. This has been

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pointed out in several papers by L. J. Spencer.[2] Investigations by the present writer[3] have indicated that boulangerite is far more widespread than is generally supposed, and that many of the fibrous sulphantimonites, formerly referred to jamesonite, are in reality boulangerite. Spencer has pointed out that jamesonite is distinguished from the other minerals of this group by the fact that it has a fairly good cleavage across the prismatic direction which causes free fibers or acicular crystals to break across the elongation upon slight bending.

The purpose of the present short paper is to describe a specimen of a granular-massive sulphosalt from Idaho which upon analysis has been found to be genuine jamesonite, a comparatively rare mineral.

The specimen in question was received for identification from Mr. Stewart Campbell, Idaho State Inspector of Mines. The locality is given as "On the head of Slate Creek near the summit of Railroad Ridge. Slate Creek is a tributary of Salmon River flowing north and into the river about 12 miles west of Clayton in Custer County."

The mass as received weighed about 12 ounces (260 grams) and, with the exception of minor amounts of quartz, pyrite, siderite and arsenopyrite, consisted entirely of the sulphosalt. Mr. Campbell, influenced by the writer's discussions of the occurrence of boulangerite in Idaho, was inclined to identify it as the latter minera but it differs in appearance, particularly in being blacker gray in color and more brilliant in luster with a tendency to tarnish iridescent instead of dull.

Mr. M. N. Short of the U. S. Geological Survey very kindly submitted a portion of the specimen to a careful mineragraphic examination and reports it homogeneous, except for the nonmetallic gangue (quartz and siderite) and a few per cent of pyrite and arsenopyrite. The material examined by Mr. Short was found to be optically strongly anisotropic and gave the following reactions when tested with the standard microchemical reagents as reccommended by Davy and Farnham: with HNO_3 quickly stains

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[2] L. J. Spencer: Plagionite, heteromorphite and semseyite as members of a natural group of minerals, *Mineralog. Mag.*, **12**, 55-68 (1899). Note on "feather-ore": identity of domingite (="warrenite") with jamesonite, *Mineralog. Mag.*, **14**, 207-211 (1904).

[3] Earl V. Shannon: Boulangerite, naumannite, bismutoplagionite and a silver-bearing variety of jamesonite, *U. S. Nat. Museum Proc.*, **58**, 589-607 (1920).

black; HCl fumes tarnish iridescent–not washed off; KCN feeble or negative; $FeCl_3$ negative; KOH quickly tarnishes dark brown; $HgCl_2$ negative. The reaction with KOH immediately distinguishes this mineral, in polished surfaces, from boulangerite which gives a negative reaction with this reagent.

Although the specimen as a whole was found to contain several per cent of arsenopyrite and pyrite, these occurred interstitially with relation to the jamesonite grains and it was possible, by careful selection of the coarsely crushed particles, to avoid them to a large extent. Moreover, they remained largely undissolved when the analyzed sample was brought into solution by gentle warming in concentrated hydrochloric acid. Consequently the following analysis represents a comparatively pure sample of the sulphosalt. The results and ratios of the analysis are as follows:

Analysis and Ratios of Jamesonite from Idaho

Constituents	Per cent	Ratios		
Insol.	1.24			
Pb	40.32	.195	.049x4	1.02x4
Fe	3.68	.066	.066x1	1.37x1
Sb	32.92	.274	.049x6	1.02x6
S	21.40	.667	.047x14	.98x14
	99.56			

The ratios of the above analysis yield the formula $Pb_4FeSb_6S_{14}$ or $4PbS.FeS.3Sb_2S_3$, which is Schaller's formula for jamesonite, the only serious deviation from whole numbers being in the iron. This is doubtless to be explained by partial solution of the pyrite or arsenopyrite present as admixed impurity, or by the presence of a minor amount of siderite in the sample.

The structure of the specimen is coarse massive-granular and does not approximate the "needle-ore" or "feather-ore" nature ordinarily considered typical of jamesonite. Grains which are individual crystals reach dimensions of 5 by 10 millimeters or more and show well defined cleavages in several directions. The cleavages are of sufficient interest to merit careful description. Spencer, in the papers cited above, has classified the acicular lead sulphosalts as having brittle and flexible needles. Jamesonite he places in the former class since it has a basal cleavage across the prismatic direction, along which the needles break upon slight bending. Spencer's emphasis upon the basal cleavage as a diagnostic character for this mineral is correct. Textbooks give the cleavages for this mineral as "basal, perfect; *b*, *m*, less so."[4] Spencer comments upon this as follows[5]: "The statement of the cleavages of jamesonite given in the textbooks dates back to F. Mohs (1824). The basal cleavage *c*(001), though good, can scarcely be described as perfect, and the others, *m*(110) and *b*(010), probably do not exist. The latter were not to be observed on any of the jamesonites I have examined; any apparent cleavage in these directions can be explained by the parallel aggregation of the acicular crystals." Spencer's specimens consisted of acicular crystals not exceeding $\frac{1}{2}$ by 5 mm in dimensions and it is not surprising that needles of such size could not be split to demonstrate imperfect cleavages in the vertical direction. The specimen from Idaho, containing crystals up to 5 by 10 mm, shows well defined cleavages in the prism zone, equally as good as the basal cleavage which, as Spencer states, is good though not perfect. A number of cleavage fragments were mounted on the goniometer and found to have cleavages in four directions, one the basal cleavage emphasized by Spencer and three in the vertical zone. Two of these are parallel to the faces of a prism, the average angle of which is 62°51′, and the third evidently a pinacoid truncating this prismatic angle. Comparison of these angles with Spencer's crystallographic angles in the paper last cited shows that the prism cannot be the unit prism for which the angle $m(110) : m'''(1\bar{1}0)$ is 78°38′. They do agree, however, with the prism $n(120)$ for which the angle $n(120) : n'(\bar{1}20)$ is 62°44′. This makes the pinacoidal cleavage *b*(010) so that this jamesonite, at least, shows good, though not perfect, cleavages parallel to *n*(120), *b*(010), and *c*(001).

When the two are side by side, the jamesonite is seen to have a much blacker gray color than boulangerite, a more brilliant luster and a tendency to tarnish iridescent instead of dull. It is interesting to record this occurrence of the really rare mineral jamesonite, especially since, to judge from the size and quality of the specimen received, the mine is capable of furnishing excellent material for distribution in collections.

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[4] Edward S. Dana: System of Mineralogy, 6th edition, page 122, **1892**.

[5] L. J. Spencer: Analysis of crystallized jamesonite, *Mineralog. Mag.*, **14**, 310 (1906).