

This comparison, based on the ratio 21 : 22 : 159, is as satisfactory as could be expected.

Of these component molecules, the first represents the normal phlogopite type: the second is a trisilicate alkaline biotite; and the third, which forms 74.5 per cent of the whole mass, is a muscovite in which two-thirds of the aluminum have been replaced by vanadium; in short, a vanadium muscovite. Ordinary muscovite is  $\text{Al}_3(\text{SiO}_4)_3\text{KH}_2$ ; and whether a corresponding  $\text{V}_3(\text{SiO}_4)_3\text{KH}_2$  exists, can be determined only by analyses of roscoelite from other localities, and so learning its range of variation. That vanadium may replace aluminum is shown by the fact that Piccini has prepared true vanadium alums. That roscoelite is essentially a vanadium muscovite seems to be fairly well established. As for the molecule  $\text{Al}_2(\text{Si}_2\text{O}_8)_2\text{K}_2\text{H}_4$ , its existence is indicated in some other micas; and in Simmler's "helvetan" it seems to be the dominant molecule.

#### THE OCCURRENCE OF ROSCOELITE, BY H. W. TURNER.

According to H. G. Hanks,\* at one time State mineralogist of California, attention was first called to roscoelite by Dr. James Blake at a meeting of the San Francisco Microscopical Society, July 2d, 1874. The specimens then exhibited were from the Stockslager† mine, which is about 1<sup>km</sup> southwesterly from Lotus on Granite Creek in Eldorado County.

At a meeting of the California Academy of Sciences held July 20, 1874, Dr. Blake presented specimens of the same mineral, which he then supposed to be a chromium mica.

At a meeting of the California Academy held August 2, 1875,‡ Dr. Blake read a paper on roscoelite. Samples sent by him to Dr. Genth of Philadelphia were found to contain vanadium. The mineral was named by Blake in honor of Professor Roscoe of Manchester, England, who had made vanadium a special study. Dr. Blake calls attention to the fact that Dr. Hall found vanadium widely diffused in many rocks, generally associated with phosphorus. According to Hanks the Stockslager vein from which the roscoelite obtained by Dr. Blake was taken, is small and not continuous, varying from two inches to a foot in thickness and running nearly parallel with Granite Creek. Associated with the quartz is calcite, and there are at least two varieties of iron sulphide present, probably pyrite and chalcopyrite. Hanks states further that the gold occurs only with the roscoelite and is

\* Second Ann. Rep. State Mineralogist of California, pp. 263-4, 1880-2.

† According to Lindgren (see Economic Sheet of the Placerville folio of the Geol. Atlas of the U. S.) this name should be spelled as above, but Hanks spells it *Stuckslager*.

‡ Proceedings Cal. Acad., vol. vi, p. 150, 1875

found interstratified with the roscoelite laminae in pieces from the value of one dollar to the minutest microscopic particles. He also states that from four to five hundred pounds of roscoelite were obtained by the miners, all of which was wasted in extracting the gold.

Mr. George W. Kimble of Placerville, California, for many years county surveyor, has furnished the California material analyzed by Dr. Hillebrand as well as other specimens. In these specimens the roscoelite is in part embedded in quartz and probably contemporaneous in formation with the quartz, and in part fills little cracks in the quartz and therefore somewhat later.

There are given below four localities where roscoelite has been found, according to Mr. Kimble, to whom the author is indebted for the following information about the occurrence of the mineral at these localities.

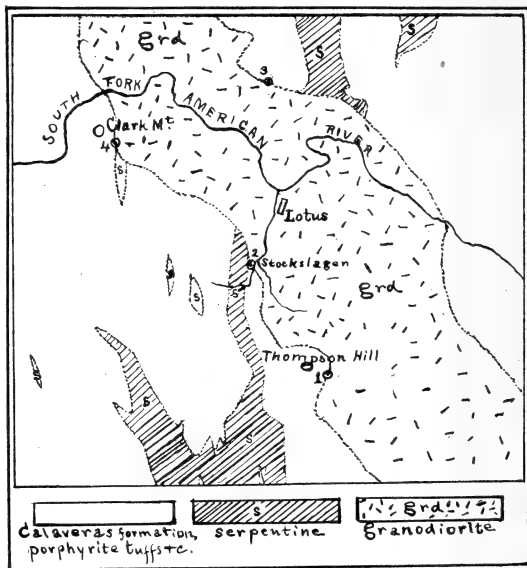


FIG. 1. Geological map copied from the Placerville folio, showing roscoelite localities. Geology by W. Lindgren.

The accompanying map, on the scale of about 1-150000, gives the exact localities where the roscoelite has been found. The Calaveras formation is largely of Carboniferous age, as may

also be the augite-porphyrite tuff associated with it. The serpentine is later than the Calaveras formation and earlier than the granodiorite, which is probably late Jurassic or early Cretaceous. It will be observed that all of the localities are at or near the contact of an intrusive granodiorite mass with the surrounding rocks, chiefly sediments and older lavas. This suggests that the mineral may be regarded as in some way due to the mineralizing solutions accompanying the intrusion of the granodiorite. However, the quartz veins clearly fill fractures which formed in the granodiorite and associated rocks after the consolidation of the granodiorite; consequently the deposition of the quartz and the associated gold and roscoelite must have been also subsequent to the consolidation of the granodiorite. The following are the localities reported by Mr. Kimble. They are all in Eldorado County, from 8 to 15<sup>km</sup> northwest of Placerville.

*Locality 1. Thompson Hill on its northeast slope about 2.5<sup>km</sup> southeast of the Stockslager mine.*—There are here fifteen or more small seams of quartz having a strike of north of west. As these seams pass through the contact of the granodiorite with the greenstone (augite-porphyrite?) they contain rich spots of gold and roscoelite. The seams of quartz pass on through the northeast point of Thompson Hill and come into the granodiorite again.

*Locality 2. Stockslager mine on Granite Creek.*—Mr. Lindgren informs me that the vein of the Stockslager mine is in a narrow wedge of metamorphic sediments of the Calaveras formation. Immediately east of this wedge is granodiorite, and immediately west is serpentine. Mr. Kimble states that there is here but one vein of quartz. This passes from the granodiorite into the narrow wedge of the Calaveras formation. It does not penetrate the serpentine. As previously stated, it was at this locality that by far the larger part of the roscoelite was obtained, including that analyzed by Dr. Hillebrand.

*Locality 3. South slope of spur about 2.7<sup>km</sup> north of the village of Lotus.*—In micaceous slate, which is part of a contact metamorphic zone of the Calaveras formation. The exact locality is about 500 feet east of the contact. It has never been demonstrated, but Mr. Kimble thinks that this quartz vein extends southeast into the granodiorite.

*Locality 4. Clark Mountain on its east slope at the contact of the Calaveras formation and the granodiorite.*—The occurrence here is identical with that at the Stockslager mine.

According to Kimble no roscoelite has ever been found where the seams are in granodiorite, and the latter is not altered; but some has been found at the contact of the quartz with serpentine in localities 2 and 4. All of the quartz seams at localities 1, 2, and 4 dip southwest and have pockets of gold.

Prof. Hanks\* states that roscoelite was also found in Sec. 31, T. 11 N. Range 10 E, two miles from the Stockslager mine. This appears to be the Thompson Hill locality of Kimble, to whom, indeed, Prof. Hanks was probably indebted for his information. Hanks states that the roscoelite was found here in the bed rock of Big Red ravine in a dark-colored micaceous rock in small seams of quartz with calcite and gold.

The roscoelite from California shows a tendency to crystallize in little rosettes, so that individual scales of any size with the same optical orientation throughout are difficult to obtain. Some scales gave with convergent light a nearly uniaxial black cross, the hyperbolas opening but slightly on rotation, indicating a small axial angle. Like all other micas it is optically negative. The pleochroism as seen in thin foils is, *c* and *b* clove brown to greenish yellow brown, *a* light greenish yellow. In the scales of the powder analyzed no rutile needles or other inclusions were detected, but in the center of a rosette of roscoelite scales were found dark grains with a metallic luster. These grains are of sufficient size to have fallen with the heavy minerals during the process of separation with the Thoulet solution, and it is not likely that any of them have been included in the powder analyzed, although they were noted in the impure material before it had undergone the final separation. The grains show no crystal form and were not determined.

\* *Loco citato*, p. 263.