

NOTES AND NEWS

OCCURRENCE OF CHRYSOBERYL AT WAKEFIELD, CARROLL COUNTY, NEW HAMPSHIRE*

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A pegmatite exposed on the R. B. Weeks property, Wakefield, N. H., is one of several recently investigated by the Bureau of Mines, United States Department of the Interior, in connection with studies on the development and beneficiation of New England beryl ores. The pegmatite is situated in the northern part of Wakefield, about 1 mile west of Province Lake and 5 miles east of Ossipee, and has been worked for feldspar. It is circular or oval in shape and apparently nearly vertical in dip. Most of the beryl formerly visible in the quarry has been removed in the course of sampling.**

Mineralogically, the sample submitted to the Eastern Experiment Station is that of a simple pegmatite. It consists chiefly of coarse alkali-feldspar, is rather poor in quartz, and carries only minor amounts of muscovite. Beryl is the principal accessory mineral, constituting several per cent of the sample submitted and certainly far less of the total pegmatite. A little of the blue tourmaline and red garnet so common in New England pegmatites, and the chrysoberyl described below complete the roster of minerals identified in the ore.

A curious yellow to apple-green mineral, coating or cutting beryl or lying in feldspar immediately adjacent to beryl crystals, was first noticed by Frederick W. Horton, who brought it to the writer's attention. This mineral has the usual optical and physical properties of chrysoberyl, and the identification was confirmed by powder diffraction patterns obtained by H. F. Carl from a few grains isolated from the surrounding rock with considerable difficulty.

The mineral is everywhere closely intergrown with muscovite, and the intergrowth is frequently accompanied by quartz. In favorable specimens it can be seen that this associated quartz is concentrated along cracks in feldspar or along crystal boundaries. It must be of very late crystallization. This is true also of the muscovite-chrysoberyl intergrowth, for its distribution seems to require the previous presence of beryl crystals, feldspar crystals, or preferably beryl-feldspar boundary surfaces. It is not clear from the sample material whether this late generation of quartz,

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** Field information from unpublished Bureau of Mines and Federal Geological Survey Reports.

muscovite, and chrysoberyl is merely a vein and fracture filling or has been introduced by replacement, but the close association of beryl and chrysoberyl certainly suggests the latter.

The writer has had no opportunity to study the occurrence in the field and cannot say whether the chrysoberyl is disseminated throughout the deposit or is confined to the outcrops from which the bulk sample was taken. In this sample, however, it is not at all uncommon. Streaks of the chrysoberyl-muscovite intergrowth lying along beryl-feldspar boundary surfaces are generally attached more strongly to beryl than to feldspar and, when the beryl is broken out of the matrix, usually come along with it as a coating, leaving the feldspar nearly or quite barren. It is impossible to estimate accurately the percentage of chrysoberyl present in our sample; it is certainly less than a hundredth and probably less than a thousandth of the beryl.

Although there are 14 previously recorded occurrences of chrysoberyl in New York and New England, the writer has been unable to find any reference to the Wakefield locality. Of the known occurrences, 12 are in Maine (1), 2 in New York (2), 1 is in Connecticut (3), and 1 in New Hampshire (4). The new locality, near the Maine border, is about 50 miles due east of the only other New Hampshire occurrence (Orange Summit) and lies about 50 miles south-southwest of the general area in which most of the Maine finds have been made.

The occurrence of chrysoberyl in New England has been known since early in the nineteenth century, and all save one of the previously recorded occurrences, that at Hartford, Maine, were already on record by 1885. Of the 12 Maine localities in which chrysoberyl is said to have been found, one (Buckfield) is questioned by Palache (1*c*), the evidence for three (Stowe, Peru, and Canton) seems to consist solely of a paraphrase of a letter from N. H. Perry (1*c*) with no details concerning either locality or occurrence, and three (Auburn, Greenwood, and Topsham) are represented only by specimens in the National Museum. Perry's notice mentions "small dark-colored crystals in the fibrolite at Stoneham," and the National Museum study collection contains a specimen said to have come from Stoneham. Notice of the specific locality either has been lost or was never properly recorded. In a letter to the writer, Dr. Palache states that the Harvard-collection chrysoberyl specimens "labeled from Buckfield, from Greenwood, and from Sumner . . . were undoubtedly from the Hartford locality." He also mentions a Harvard specimen from Minot Township and suggests that the National Museum specimen labeled "Auburn" might be from that locality. Thus, the imposing total of 12 Maine occurrences is reduced to 2, Hartford and Norway, which have been studied adequately. If successful collections have been made from

Haddam, Connecticut, or Orange Summit, New Hampshire, in recent years, nothing has been published concerning them.

All this makes it clear that chrysoberyl is an exceptionally rare mineral, so rare that generalizations concerning its occurrence are of dubious value. In New England it seems to be associated invariably with dark tourmaline and red garnet, but this association can be claimed for almost any pegmatite mineral in New England. At Hartford, chrysoberyl occurs in a highly siliceous pegmatite, but at Wakefield the part of the pegmatite in which it has been found is singularly poor in quartz. It may occur with or in the absence of beryl, as at Wakefield and Hartford, respectively. No beryl was noted by Hubbard in the original notice of the Orange Summit occurrence (4), and although beryl was subsequently collected from Haddam, Conn. (5), nothing was said of its relation to the site of the original chrysoberyl find.

To date, no specimens of chrysoberyl have been described as occurring in the phosphate-rich pegmatites characterized by the presence of rare manganese-iron-lithium phosphates or by large amounts of apatite, and it may be suspected that the relative concentration of phosphate ion determines whether a given pegmatite carries chrysoberyl or herderite. Unfortunately, herderite has been reported from three of the questionable chrysoberyl localities cited above (Stoneham, Greenwood, Auburn), and from Stoneham beryllonite has also been described. In each instance, however, the chrysoberyl "locality" consists of no more than a town name, and it is possible that chrysoberyl and herderite (or beryllonite) might have come from the same town but from very different pegmatites.

REFERENCES

1. *Maine:*

- a. Auburn—specimen in United States National Museum.
- b. Buckfield—Bastin, E. S., *U.S.G.S. Bull.*, **445**, 71 (1911).
- c. Canton—Perry, N. H., *Am. Jour. Sci.*, 3d Ser., **29**, 263 (1885); specimen in Columbia University Museum.
- d. Greenwood—specimen in United States National Museum; specimen in Harvard University Museum, probably from Hartford.
- e. Hartford—Palache, C., *Am. Mineral.* **9**, 217 (1924; specimen in United States National Museum).
- f. Minot—specimen in Harvard University Museum, possibly from Auburn.
- g. Norway—Verrill, A. E., *Proc. Bost. Soc. Nat. Hist.*, **7**, 423 (1860); Perry, N. H., *op. cit.*; Bastin, E. S., *op. cit.*, 78.
- h. Peru—Perry, N. H., *op. cit.*
- i. Stoneham—Perry, N. H., *op. cit.*; specimen in United States National Museum.
- j. Stowe—Perry, N. H., *op. cit.*
- k. Sumner—specimen in Harvard University Museum, probably from Hartford.
- l. Topsham—specimen in United States National Museum.

2. *New York*:
 - a. Saratoga Springs—Steele, J. H., *Am. Jour. Sci.*, 1st Ser., **4**, 37 (1821).
 - b. New York City—Moses, A. J., *Am. Jour. Sci.*, 4th Ser., **12**, 104 (1901).
3. *Connecticut*:
Haddam—Hatry, R. J., *Journal des Mines*, **30**, 179 (1811).
4. *New Hampshire*:
Orange Summit—Hubbard, E. O., *Am. Jour. Sci.*, 2d Ser., **11**, 424 (1851).
5. Martin, D. S., *N. Y. Ac. Sci.*, **18**, 294 (1908).

A METHOD FOR ISOLATING GRAINS MOUNTED IN INDEX OILS*

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In investigating an assemblage of minerals, as in the study of detrital heavy minerals for correlation purposes, an estimation of the relative abundance of each mineral is made by counting the component mineral grains in an oil mount. The minerals are then identified by their crystal form and grain shape, and by their optical properties. The mineral grains are placed on a slide, and an index oil is spread thinly over them, forming a flat surface, above which the grains should not project. A cover glass need not be used when counting grains. If an unknown mineral is present, it may be isolated for further study in the manner outlined in this paper.

In the method described by Reed¹ and that by Calkins² the grain is removed from the oil by means of a wire that has been dipped into an adhesive substance (Canada balsam, vaseline, etc.). In the procedure here described the grain is removed by means of a glass dropper which offers the advantage of transferring the unknown mineral without the use of Canada balsam or vaseline, which are slowly soluble in index oils.

A low-power objective is used to give the maximum amount of working room between the slide and the objective. The dropper is made by heating and pulling out a glass tube having an inside diameter of 4 mm., so that the capillary has a diameter slightly larger than the grains on the mount. A bulb made from a section of rubber tubing about 5 cm. long, closed at one end, is fitted to the dropper. The completed dropper is 12–15 cm. long. This glass dropper is held nearly vertical over the unknown mineral, and then lowered into the oil. The mineral with some immersion oil is sucked into the dropper and transferred to a clean slide without release of pressure on the bulb of the dropper. If the first slide is thick with

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¹ Reed, R. D., Some methods for heavy mineral investigations: *Ec. Geology*, **19**, 332 (1924).

² Calkins, F. C., Transfer of grains from one liquid to another: *Am. Mineral.*, **19**, 143–149 (1934).