THE AMERICAN MINERALOGIST
JOURNAL OF THE MINERALOGICAL SOCIETY OF AMERICA
VOL. 9 NOVEMBER, 1924 No. 11

THE CHRYSOBERYL PEGMATITE OF HARTFORD, MAINE

CHARLES PALACHE, *Harvard University*

Chrysoberyl of fine quality from several Maine localities has been in the hands of mineral collectors for several years past. Most of these specimens were obtained and distributed by Mr. Dudley of Buckfield, Maine, and the locality given by him was always Hartford. Other specimens, however, were labelled Sumner and Buckfield; but the appearance of all of these was sufficiently similar to make it seem probable, although not certain, that there was but one source. As no description of this notable occurrence seems to have been published, it appeared desirable to put on record observations made at the locality during a visit there in the summer of 1923; as well as a brief crystallographic description of the chrysoberyl.

On the Buckfield sheet of the U. S. G. S. topographic folio, in the center of the upper third of the sheet appears the name of Ragged Jack Mt., the southern end of a chain of hills trending from the northward. This summit is very nearly at the intersection of the town boundaries of Hartford, Sumner and Peru. The map shows by its contours a very steep cliff on the SW side of Ragged Jack Mt. and it is on the face of this cliff, in the town of Hartford, that the chrysoberyl occurs. The cliff is plainly visible from the road running north from Sumner to East Peru and may be reached by a walk of half a mile to the eastward across fields and wooded slopes. The dominating topographic feature of the region is Black Mt. which rises to the west of the valley in which the road lies.

On reaching the base of the cliff one finds a bold mass of granite rising almost vertically for 200 feet. The base is buried in a talus slope of very large blocks of granite, fallen from the ledge and piled confusedly, with many open spaces.

The pegmatite dike which is the source of the chrysoberyl traverses the face of the cliff in a diagonal direction and is well

exposed in section. It is from 3 to 5 feet wide in its main extent and is 2 feet wide at the top of the cliff, but at the base it narrows to a few inches. Segments of the dike are seen in many of the fallen blocks and from these alone has the chrysoberyl been collected, the cliff face being too abrupt for foothold or attack.

The dike is largely composed of gray or milky quartz. Along the walls, however, some feldspar is developed in well formed and occasionally large individuals of unusual habit. Muscovite, black tourmaline, occasional garnet crystals, and chrysoberyl are the minor mineral constituents. They are very irregularly distributed in the dike and "like chrysoberyl" are found embedded both in quartz and feldspar. The quartz is unusually brittle, being apparently under pressure strain; and some chrysoberyl crystals show cracks and offsets with quartz infilling. The friable nature of the quartz is favorable to the collector; it generally breaks away readily and cleanly from the crystals of the other minerals.

FELDSPAR. The feldspar is oligoclase. It is sparingly present in the dike and was the first mineral to crystallize, forming the dike walls. Few crystals with definite form were obtained, but all are of the same habit. This is determined by the equant development of faces of the base, *c* (001), the brachypinacoid, *b* (010), and the macrodome, *y* ($20\bar{1}$) with extremely subordinate faces of *m* (110), and *o* (111). The effect is surprisingly cube-like; the largest crystal is effectively a cube measuring seven inches on an edge and quite unlike any crystal of feldspar before seen by the writer or any figured in Goldschmidt's Atlas. Study of cleavage fragments and powder in index fluids indicated a slightly calcic oligoclase. The feldspar is clear and glassy and shows few and very narrow albite twin-striae on the basal cleavage. The surfaces of the crystals are often coated with a film of muscovite. But one crystal of any other feldspar than oligoclase was found in the material collected; this proved to be microcline-microperthite.

TOURMALINE. The black tourmaline is mostly in well developed crystals of which some are singly terminated, showing the common rhombohedral forms. Crystals as much as six inches in length were seen and from that they show every gradation to slender needles, but the mineral is not abundant in the dike. It contains quartz in places and muscovite but appears to have formed before the chrysoberyl since chrysoberyl is never included in it.

GARNET. The garnet appears to be an almandine, fairly bright

red in color and crystallized in trapezohedrons. The largest crystal was less than one half an inch in diameter.

MUSCOVITE. Muscovite seems to be present in the rock in two generations. It is an original constituent of the pegmatite in well formed crystals embedded in quartz, in feldspar, and in tourmaline. In this form it is moderately abundant. It is also widely distributed as a secondary mineral coating joint surfaces of feldspar and the contact surfaces both of feldspar and chrysoberyl with quartz. Although described above as secondary, there is no certainty that it may not have been a later generation of mica of a primary character. The fact, however, that the rock has undergone some shearing and that some of the muscovite crystals are surrounded by a wreath of fine scaly muscovite similar to the coatings mentioned above, makes one suspect that it is of a secondary nature.

ZIRCON. Minute zircon crystals not to exceed 1/16 of an inch in length were observed sparsely distributed through the rock. They are embedded in part in the feldspar and in part in chrysoberyl. About a few of these minute crystals in chrysoberyl radiating cracks were observed forming a strain zone and suggesting the presence of radio-active constituents.

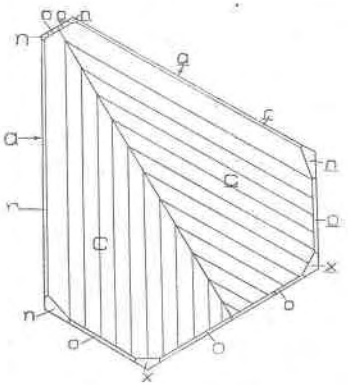

Fig. 1. Chrysoberyl. Twin on *r* (031). Projection on *a* (100). Drawn by M. N. Short

(*Errata:* In the above drawing for *a* and $\underline{a}$, read *b* and $\underline{b}$; for *c* and $\underline{c}$, read *a* and $\underline{a}$).

CHRYSOBERYL. Chrysoberyl is the most abundant constituent of the pegmatite aside from quartz and feldspar. Several hundreds of crystals are represented in the collections and they vary in size

from plates up to two inches in diameter by a sixteenth of an inch in thickness to tiny scale-like crystals of extreme thinness. The vast majority of the crystals are twins consisting of two individuals in contact, generally very symmetrically developed. Very exceptional trilling crystals were observed and only two untwinned individuals were discovered in the whole collection. In these simple crystals the habit is prismatic with an almost square section determined by the front and side pinacoids. The twin crystals are always flattened parallel to the front pinacoid and generally form arrow shaped groups as shown in the drawing, Figure 1. The forms present are *a* (100), *b* (010), *s* (120), *x* (101), *i* (011), *o* (111), and *n* (121). The face *a*, as usual for this mineral, is deeply striated in the vertical direction. Other faces are apt to be dull, but crystals were obtained in which all the forms gave reflections on the goniometer. The twin plane is the general one for the mineral, (031). The color of the mineral is a pale wine yellow, and while most of the crystals have been more or less shattered by the movements that have effected the rock, a few of them are clear and beautifully transparent. Viewed in the direction of the brachypinacoid there is a pale bluish opalescence visible. The cleavage seems to be developed more distinctly parallel to the brachypinacoid than in any other direction. The shattering of the crystals due to movements in the rock in which they are embedded is characteristic of a great many specimens. The shattering takes the form of sharp breaks across the dominant pinacoid and the crystal may be broken into two or many fragments which lie at sharp angles to one another and have sometimes been moved laterally so as to be separated by as much as a quarter of an inch. The cracks are always healed with quartz. While the shattering generally produces clean fractures an occasional crystal shows a warping of its surface with invisible breaks, but this is to a slight degree only. Reference has already been made to the intimate way in which the surfaces of the crystals are coated with fine scaly muscovite. This does not appear to have been produced at the expense of the chrysoberyl, since where scraped away the faces are sharp and brilliantly reflecting, not etched.

Order of Crystallization. The crystallization of the minerals of the pegmatite began with oligoclase and ended with quartz. All of the other minerals however, must have begun to crystallize before the feldspar ceased since all are found embedded

in oligoclase. They, however, continue to appear after the beginning of quartz crystallization and the larger and better developed chrysoberyls especially are found embedded in quartz. Quartz, enormously the most abundant constituent of the dike, closed the period of crystallization leaving no cavities and forming, alone of all the minerals present, no free crystals.

CLINOZOISITE FROM LOWER CALIFORNIA[a]

AUSTIN F. ROGERS, *Stanford University*

The locality for the specimens described in this article is the Juarez District, Lower California, Mexico, about 65 miles south of the international boundary. The specimens were obtained from R. M. Wilke, mineral dealer of Palo Alto, California. The mineral is said to occur at the contact between a limestone and an igneous rock. It is probably the same locality that furnished the zoisite described by Farrington.[1]

The material at my disposal consists of five specimens including minerals associated with the clinozoisite. Two of them are pure clinozoisite, one of which is a rough euhedral crystal. Another specimen consists of pink and colorless zoisite (n about 1.710) in prismatic aggregates with an interior of gray clinozoisite, the two minerals apparently being in parallel position. This specimen resembles the material described by Farrington,[2] but the clinozoisite was evidently overlooked by him. The clinozoisite and zoisite may be distinguished by peculiarities in the interference colors as will be shown later.

In this specimen, and another somewhat similar one, the zoisite is embedded in a matrix of colorless prehnite. Farrington has suggested that the prehnite is the mineral analyzed by Schaller.[3]

The fifth specimen consists of slightly tapering and somewhat flattened prismatic aggregates of zoisite ($n = 1.707 \pm 003$). This is distinguished from the clinozoisite by both the index of refraction and interference colors.

[a] Since this article has gone to press there has appeared in the *Am. Min.*, **9**, p. 199, a paper by E. L. Bruce and C. W. Greenland on "A low iron epidote from Porcupine." It is quite likely that this is another occurrence of clinozoisite although no mention is made of anomalous interference colors.—EDITOR.

[1] FIELD COLUMBIAN MUSEUM. *Publication* **112**, *Geol. Series*, **III**, 55-57, (1906).

[2] *Loc. cit.*

[3] *Bull.* **262**, *U. S. Geol. Surv.*, p. 128 (1905).