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Topaz from Cornwall, with an account of its localities.

By ARTHUR RUSSELL.

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TOPAZ, so common an accessory in tin lodes in all parts of the world, has hitherto been looked upon as comparatively rare in Cornwall. When massive, or even in the form of small, well-developed crystals, it is a mineral easily overlooked, or apt cursorily to be mistaken for quartz.

The presence of topaz as a microscopic accessory in granite, greisen, and rarely elvans, from most of the Cornish masses, has been determined by Dr. J. S. Flett in the course of the work of the Geological Survey; while the late Mr. J. H. Collins was responsible for the record of other interesting localities.

In the present notes I have collected all the available information respecting its mode of occurrence and localities; and have added several new ones, at some of which the mineral occurs in considerable mass, thus affording evidence that topaz is in Cornwall, as in the case of other countries, a comparatively common associate of cassiterite and wolframite, both in granite and sedimentary rocks.

As will be seen from the drawings which accompany this paper, and which have been selected as the result of the measurement of a large number of crystals, the various localities do not show any great variation

in the habit or of the forms present. The relative development of the faces on the crystals is, however, very varied, giving rise to a great diversity of appearance. The following table gives a list of all the forms, seventeen in number, observed on Cornish topaz, the lettering and the indices being those adopted by Dana ('Mineralogy', 6th edit., 1892):—

	St. Michael's Mount.		Lamorna.	Great Wheal Fortune.	Gwinear.	Cligga Head.	Wheal Kitty.	Trevaunance mine.		Belowda Beacon mine.	Castle-au-Dinas mine.	Beam mine.	St. Mewan Beacon.	Mulberry mine.
<i>b</i> (010)	—	—	×	—	—	×	—	—	×	—	—	—	×	—
<i>c</i> (001)	—	×	×	—	—	×	×	×	×	—	—	—	×	—
<i>m</i> (110)	×	×	×	×	×	×	×	×	×	×	×	×	×	×
<i>M</i> (230)	×	—	×	×	×	×	×	×	—	×	×	—	×	×
<i>λ</i> (470)	—	—	—	—	—	—	—	×	—	—	—	—	—	—
<i>l</i> (120)	×	×	×	×	×	×	×	×	×	×	×	×	×	×
<i>g</i> (130)	—	×	×	—	—	×	—	×	—	×	×	—	×	×
<i>h</i> (203)	—	—	—	—	×	—	—	—	—	—	—	—	—	—
<i>p</i> (101)	×	—	—	—	—	×	—	—	—	—	—	—	—	—
<i>d</i> (201)	×	×	×	—	×	×	×	×	×	×	×	—	—	×
<i>f</i> (021)	×	×	×	×	×	×	—	×	×	×	×	×	—	×
<i>y</i> (041)	×	×	—	—	×	×	×	×	—	×	×	×	×	—
<i>i</i> (223)	—	×	—	—	×	×	×	×	—	×	×	×	—	—
<i>u</i> (111)	×	×	×	×	×	×	×	×	×	×	×	×	—	×
<i>o</i> (221)	×	×	×	—	×	×	—	×	×	×	×	×	—	—
<i>x</i> (243)	—	×	—	—	×	×	—	—	—	—	—	—	—	—
<i>t</i> (261)	—	—	—	—	×	—	—	—	—	—	—	—	—	—

That the topaz of tin lodes is a mineral formed by pneumatolytic action is now universally recognized. It is also certain that much of the topaz in granitic rocks, particularly greisen, is of secondary origin, having been formed along with muscovite and secondary quartz by the alteration of felspar: biotite likewise being altered to brown tourmaline and secondary quartz. Primary topaz is also very common as an accessory in Cornish granites, having clearly been formed before the complete consolidation of the mass. It is worthy of note that in no instance has fluor been observed in any of the veins that contain topaz and traverse granite; while the single specimen from Maudlin mine, Lanlivery, which is in killas, and is hereinafter described, is the only example from Cornwall known to myself in which topaz and fluor are associated. The only certain alteration-product of topaz that has been observed is gilbertite.

St. Michael's Mount, Marazion.—Most old collections of Cornish minerals contain specimens of topaz from this locality. The first record of the occurrence is apparently that given in 1816 by John Ayrton Paris, M.D., in his anonymously published work, 'A Guide to the Mount's Bay, and the Land's End' (p. 24). J. Sowerby, in 1817, in his 'British Mineralogy' (vol. 5, tab. 463, p. 111) figures and describes a specimen and gives two rough drawings of crystals. Sir Humphry Davy, in 1818, also mentions topaz from here;¹ while John Forbes, M.D., in 1819, writing on the minerals of the Mount says: 'The crystals of tin and of apatite are often of considerable magnitude; those of topaz are uniformly small: they are however extremely numerous, many hundreds being observable on the face of some small blocks of the granite that have fallen from the precipices.'²

The mineral occurs in certain of the small tin-wolfram-quartz-veins with greisen walls which traverse the granite on the east and south side of the Mount. Topaz *in situ* is now no longer to be seen; it is still, however, possible to obtain, though rarely, tolerably good specimens by breaking open those water-worn greisen boulders on the foreshore that exhibit a traversing vein.

The topaz crystals are usually associated with small, very brilliant, black, twinned crystals of cassiterite, rarely a little wolframite, these minerals resting on platy aggregates or rosettes of a brown lithia-mica with projecting broken prisms of quartz, the whole forming the sides of veins in hard greisen. Minute crystals of topaz and prisms of tourmaline may also occasionally be seen in cavities in the greisen itself in close proximity to the veins. Fig. 1 represents a small, doubly-terminated, colourless crystal on which the forms present are $m(110)$, $M(230)$, $l(120)$, $p(101)$, $d(201)$, $f(021)$, $y(041)$, $u(111)$, $o(221)$. Fig. 2 is fairly typical of the more ordinary, large, and distinctly bluish crystals, the largest of these I have observed measuring 9×9 mm. Owing to the very unequal and varied development of the principal faces, crystals of this type are at first sight not easy to orientate; they are often also of composite growth. The forms observed are $c(001)$, $m(110)$, $l(120)$, $g(130)$, $d(201)$, $f(021)$, $y(041)$, $i(223)$, $u(111)$, $o(221)$, $x(243)$. The base (001) is always pitted and dull; (110) and (120) are vertically striated; (021) and (041) are striated parallel to their intersection, and

¹ Sir Humphry Davy, Hints on the geology of Cornwall. Trans. Roy. Geol. Soc. Cornwall, 1818, vol. 1, p. 41.

² J. Forbes, On the geology of St. Michael's Mount. Trans. Roy. Geol. Soc. Cornwall, 1822, vol. 2, p. 370.

contains microscopic crystals of topaz and a little cassiterite.¹ The exact locality is not stated, but is most probably Balleswidden mine, where cassiterite and gilbertite occur in veins traversing greisen and kaolinized granite.

Great Wheel Fortune, Breage.—J. H. Collins recorded topaz as occurring here very rarely along with cassiterite, &c., in small veins forming a stockwork in killas,² his observations having been made during the last working by open quarrying from 1892 to 1896. A specimen in his collection shows small, yellowish, prismatic crystals of topaz up to 3 mm. in length, some doubly-terminated and all more or less completely invested with yellowish, scaly gilbertite, and accompanied by brownish-black, twinned crystals of cassiterite and a little quartz, the whole forming the wall of a narrow vein in grey killas rich in tourmaline. The forms present are $m(110)$, $M(230)$, $l(120)$, $f(021)$, $u(111)$. The faces as a whole are rough and dull.

Gwinear.—There is in the British Museum a specimen (No. 44624) purchased from R. Talling in 1872 and labelled as being from a mine in this parish. It shows a number of small, mostly broken, yellowish, prismatic crystals of topaz implanted on black, twinned crystals of cassiterite. One of these crystals, rich in faces and 1 mm. long, was detached and measured by Mr. E. D. Mountain. It shows a somewhat irregular development and possesses the following combination of forms: $c(001)$, $m(110)$, $M(230)$, $l(120)$, $h(203)$, $d(201)$, $f(021)$, $y(041)$, $i(223)$, $u(111)$, $o(221)$, $x(243)$, $t(261)$.

John Garby mentions topaz as having been occasionally found in the granite quarries in the parishes of Constantine and Mabe, accompanied by schorl and well-defined crystals of beryl.³ During repeated visits to these quarries I have never succeeded in detecting either topaz or beryl; crystals of apatite are, however, common, and these were probably mistaken for beryl and topaz.

Topaz is common as a microscopic accessory in the granite at Lesceave Por near Trewavas Head, Breage.⁴ In the Carnmenellis granite it is said to be rare,⁵ but has been noted in the fine-grained muscovite-biotite-granite at Crowan Beacon, Crowan.⁶

Cligga Head, Perranzabuloe.—In the whole of Cornwall, be it to the lover of cliff scenery, to the geologist, or mineralogist, there are few

¹ J. H. Collins, On Cornish tin-stones and tin-capels. *Min. Mag.*, 1882, vol. 5, p. 125.

² *Ibid.*, Observations on the West of England mining region. 1912, p. 75.

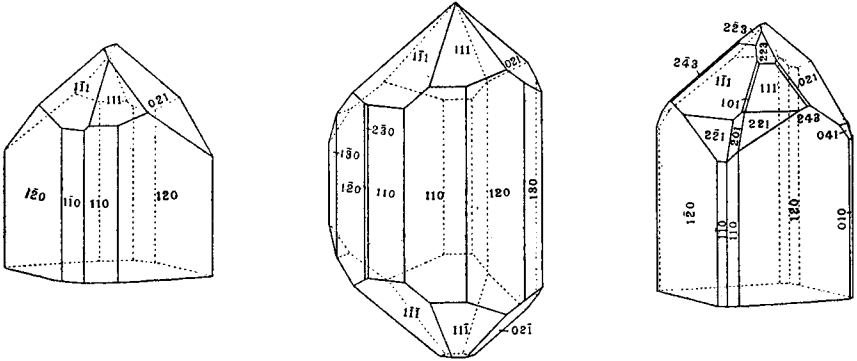
³ J. Garby, A catalogue of minerals found in Cornwall, with their localities. *Trans. Roy. Geol. Soc. Cornwall*, 1848, vol. 7, p. 78.

⁴ *Mem. Geol. Survey, Land's End district*, 1907, p. 53.

⁵ *Ibid.*, Falmouth, Truro, Camborne, and Redruth, 1906, p. 53.

⁶ *Ibid.*, p. 57.

spots more fascinating than this little granite outcrop with its wonderful cliff exposures of numerous tin and wolfram veins and splendidly defined greisenization. The geological phenomena have been described by many early and later-day writers on Cornish geology, and within recent years in detail by Mr. J. B. Scrivenor, to whom we are indebted for the discovery in 1903 of topaz at this locality.¹ Mr. Scrivenor detected topaz as a microscopic accessory of the greisen bordering the quartz-cassiterite-wolframite-veins and in minute quantity in the closely adjoining granite; also as crystals up to 6 mm. in length on joint-faces of a large mass of rock that had fallen from the cliff; the best specimens of his find being now in the Museum of Practical Geology. For a good many years past the spot has been rendered somewhat difficult of access through



Topaz crystals from Cligga Head, St. Agnes, Cornwall.

FIG. 4.

FIG. 5.

FIG. 6.

being included within the explosive works of Messrs. Nobel & Co.; since the war, however, these works have been dismantled, and, thanks to the especial help of Mr. C. H. Trenerry, the still resident manager, I have been able to examine closely the whole area.

During the spring of 1923, as the result of a very careful search, crystallized topaz was found to be widely distributed in many of the veins which are accessible along the whole of the top of the granite portion of the cliff. The spot at which the topaz is most abundant is on the floor of a flat, quarry-like excavation, a little north of the steep gully leading to the beach, a vein here consisting of solid topaz-tourmaline-

¹ J. B. Scrivenor, The granite and greisen of Cligga Head (western Cornwall). Quart. Journ. Geol. Soc. London, 1903, vol. 59, pp. 142-159.

rock about a foot wide. The mass of the vein consists of colourless, white, and yellow-stained, crystalline topaz showing many small cavities lined with crystals of that mineral and small scales and rosettes of pearly gilbertite, the whole rock being penetrated by innumerable small prisms of brownish-black tourmaline. Needles of tourmaline, sometimes curiously bent, are to be seen crossing the smaller cavities and supporting and penetrating minute topaz crystals covered with a yellow iridescent film. No metallic minerals were observed in this vein.

In the veins carrying quartz, cassiterite, and wolframite, many of which are exposed in small open-cuts along the edge of the cliff, larger and isolated crystals of topaz occur implanted on the joint-faces with a brown, crystallized lithia-mica, apparently zinnwaldite, much imper-

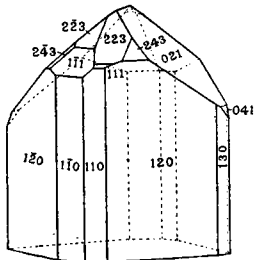


FIG. 7. Cligga Head, St. Agnes.

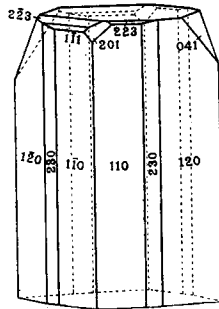


FIG. 8. Wheal Kitty, St. Agnes.

fectly crystallized quartz, and occasionally brown crystals of cassiterite, the enclosing rock being normal greisen.

The topaz crystals are of short-prismatic habit and either colourless, yellowish, or more rarely bluish. The largest crystal found measures 7 mm. in length, is of simple habit, and is represented in fig. 4. Doubly-terminated crystals are fairly common (fig. 5). Fig. 6 represents the most complex crystal observed. Fig. 7 represents a colourless, transparent crystal measuring 6×6 mm., for which I am indebted to Mr. A. B. Edge. The forms observed are $b(010)$, $c(001)$, $m(110)$, $M(230)$, $l(120)$, $g(130)$, $p(101)$, $d(201)$, $f(021)$, $y(041)$, $i(223)$, $u(111)$, $o(221)$, $x(243)$. The basal plane (001) is rare.

The occurrence at Cligga Head closely resembles that at St. Michael's Mount, the formation of the topaz, tourmaline, quartz, and cassiterite

being evidently approximately contemporaneous, and the gilbertite being clearly a secondary product.

Wheal Kitty, St. Agnes.—Mr. J. H. Collins's collection contains two specimens which are labelled as having come from this mine, which is in killas. They show numerous transparent, yellowish (iron-stained) to colourless crystals of topaz, the largest of which measures 6 mm. in length, implanted on and partially embedded in rusty limonite forming with quartz the filling of a small vein enclosed in an altered killas. A curious feature of these crystals is that they mostly show transverse open cracks along the basal cleavage, the two portions of the crystal being held by the limonite crust upon which they rest, in positions slightly out of line; while other of the crystals consisting of terminated portions are completely separated and at some little distance from their base. Fig. 8 represents a typical crystal, characterized by the large development of the basal plane (001) and also of (041). The forms observed are $c(001)$, $m(110)$, $M(230)$, $l(120)$, $d(201)$, $y(041)$, $i(223)$, $u(111)$. The terminal faces are often much corroded. Several of the crystals contain included specks of a mineral that appears to be iron-pyrites.

Trevaunance mine, St. Agnes.—Philip Rashleigh, in Part 1 (plate 5, fig. 2) of his 'British Minerals', published in 1797, describes and figures as an especial rarity a specimen said to be from this locality. It shows cassiterite in the form of large, lustrous, black, twinned crystals associated with small, yellowish crystals of topaz. This specimen is now in Truro Museum. An exactly similar specimen, also said to be from Trevaunance (Rashleigh MS. Catalogue, Tin ore, No. 38), is in my own collection, while several others, also exactly the same, though not localized, came to me from the Burdett-Coutts collection. Of these last, several show the enclosing rock to be a hard siliceous killas, which agrees well enough with the Trevaunance mine rock. The topaz crystals on all these specimens are yellow in colour from iron staining, of prismatic habit, attain a length of 6 mm., and possess exceptionally brilliant faces. A characteristic of these crystals is that three or more are often united in parallel position, forming a more or less uniform prism, with, however, a number of distinct terminations. The forms observed are $c(001)$, $m(110)$, $M(230)$, $l(120)$, $g(130)$, $d(201)$, $f(021)$, $y(041)$, $i(223)$, $u(111)$, $o(221)$, $x(243)$. The basal plane (001) is invariably very smooth and bright, and the general appearance of the crystals is very similar to fig. 10, many of them being, however, doubly-terminated. The habit of the cassiterite and general character of these specimens are unlike other

c (001), *m* (110), *M* (230), *l* (120), *g* (130), *d* (201), *f* (021), *y* (041), *i* (223), *v* (111), *o* (221). The prism-faces are less striated than is usual in Cornish topaz and the base (001) is bright. The faces of the associated quartz crystals are much etched and rough.

Wheal Kine, St. Agnes.—This mine (also spelt Wheal Kind) adjoins Trevaunance and was afterwards included in the Polberro sett. Topaz was recorded from here by W. Phillips in 1823 and is stated to have accompanied vivianite and chalybite in a tin lode.¹ T. Hogg, writing in 1825, gives the associated minerals as apatite and calcite.²

Seal Hole mine, another part of Polberro on the cliff, and St. Agnes Cliffs are given as localities for topaz by J. H. Collins.³

Secondary topaz is abundant as a microscopic accessory in the St. Agnes granite; in greisen at Wheal Bungay; and north of St. Agnes Beacon in Pliocene sands derived from the adjacent granite.⁴

Kea.—Greg and Lettsom⁵ record topaz from this parish; the exact locality is, however, not given, and the occurrence needs confirmation.

Belowda Beacon mine, Roche.—In 1917–18 some small mining trials were undertaken by Mr. W. E. Cox, of Newquay, on the northern side of Belowda Beacon near its summit, and it was during this work that there was brought to light an occurrence of topaz on a larger scale and in many ways more remarkable than any hitherto observed in Cornwall. Belowda Beacon, which rises to a height of 744 feet, lies about $1\frac{3}{4}$ miles north-west of Roche village, and is a small outlying mass of much altered, fine-grained, porphyritic granite, with abundance of schist-rock and in places greisen. On the south side near the summit is situated the original Belowda Hill mine (or Beacon mine) formerly worked both as an open-work and by mining, and described by Sir C. Le Neve Foster⁶ and J. H. Collins.⁷ The deposit consists of altered granite and an elvan, both of which are traversed by numerous small veins containing quartz, tourmaline, and cassiterite, the whole mass, including the overburden, yielding a small but hitherto unprofitable amount of tin. In 1880, during the last

¹ W. Phillips, *Mineralogy*. 3rd edition, 1823, p. 86.

² T. Hogg, *Manual of Mineralogy*. 1825, p. 156.

³ J. H. Collins, *Mineralogy of Cornwall and Devon*. 1871, part 2, p. 101.

⁴ Mem. Geol. Survey, Newquay, 1906, pp. 36–38 and 63.

⁵ R. P. Greg and W. G. Lettsom, *Manual of the Mineralogy of Great Britain and Ireland*. 1858, p. 221.

⁶ Sir C. Le Neve Foster, *Notes on Belowda Hill mine*. Journ. Roy. Inst. Cornwall, 1875, vol. 5, p. 213.

⁷ J. H. Collins, *Observations on the West of England mining region*. 1912, p. 69.

working, Collins observed amongst the stamped stuff many minute crystals of topaz.

In the trials conducted by Mr. Cox on the northern side, a short and very shallow level communicating with a shaft has exposed masses of coarsely crystalline topaz, tourmaline, and quartz, this rock in places, though rarely, containing nests of platy wolframite, the mineral sought for. The topaz-rock is included in the form of irregular and disconnected masses in an extremely rotten, coarsely porphyritic granite, which here and there contains isolated kaolinized crystals of felspar several inches in length. Farther in the level, but more particularly in another trial shaft a little to the west, tourmaline-rock is abundant, graduating from a fine-grained rock consisting of quartz and black tourmaline with little nests of yellowish gilbertite, to masses of nearly pure, black tourmaline. The whole of the small trials made are in granite, but very close to the killas junction, which, however, is nowhere actually exposed. At 430 yards west of the topaz locality on the flank of the hill is a small china-clay work.

The topaz, where present, is perfectly white and passes from a coarse crystallized mineral to a fine-grained, saccharoidal admixture of topaz and quartz. Long blades and nests of black to bluish-grey tourmaline are constantly present, and very rarely a little partially kaolinized orthoclase. Small cavities are fairly common, and these contain well-defined, colourless to yellowish, prismatic crystals of topaz, occasionally doubly-terminated and measuring up to 1 cm. in length. A characteristic crystal is shown in fig. 11; the forms present are $c(001)$, $m(110)$, $M(230)$, $l(120)$, $d(201)$, $f(021)$, $y(041)$, $i(223)$, $u(111)$, $o(221)$. The faces as a whole are rough and corroded from re-absorption or superficial alteration to gilbertite, and they afford poor reflections. A step-like repetition of (001) and (223) , as shown in the drawing, is common. A characteristic feature of these crystals is that they are often covered with a pearly-white or yellowish crust of scaly gilbertite, delicate rosettes of that mineral penetrated by tourmaline needles occupying other of the cavities, while small rosettes are present in many of the minutest crevices in the rock. That the gilbertite is derived from the alteration of the topaz there can be no doubt; and on one remarkable specimen the exterior of the crystals is everywhere coated to such an extent as to render them partial pseudomorphs. The wolframite at this locality is occasionally penetrated by needles of tourmaline, a fact I have never previously observed nor seen recorded.

Castle-an-Dinas wolfram mine, St. Columb Major.—The hill of Castle-

an-Dinas rises to a height of 700 feet, lies directly west of Belowda Beacon, and is 3 miles north-west of Roche village. It is capped on its summit and western side down to the 600 feet contour-line by a small elliptical outcrop of granite rising through banded sediments belonging to the Meadfoot series. The granite is fine-grained, contains tourmaline, and is much decomposed. The killas is pinkish, contains quartz veins coated with limonite, and near the lode is altered to a light-brown, markedly banded rock. The wolfram mine,¹ which in many respects is an extremely interesting one, lies on the northern side of the hill and is on a lode discovered by Mr. W. E. Cox, of Newquay, in 1917. In 1918 it was acquired by Great Western Ores, Limited, and worked by them up to the year 1920, when, owing to the fall in price of wolfram, the mine ceased working. A description of the main geological features has been given by Mr. E. H. Davison in 1920.² Captain Josiah Paull has furnished me with other particulars, while several visits which I have paid to the mine have led to the discovery of the minerals hereinafter described.

The lode has a bearing about 18° east of north, a somewhat unusual direction for this class of vein. It is vertical, and has an average width of 3½ feet, dwindling to 2 feet, and increasing to 6 feet for short distances; and in places splitting into two branches. The greater part of the workings, which consist of two levels driven into the side of the hill, are in the sediment, but near the southern end greisen and granite were reached in both levels.

The lode-filling consists principally of quartz, through which is disseminated large and small masses of platy wolframite. Cassiterite is present but never visible to the naked eye, 3 % being the maximum in the concentrates of 70 % wolframite. Under the microscope, Mr. Davison detected topaz, along with tourmaline and brown lithia-mica, in the greisen from the upper level; he remarks, however, that one of the almost unique characters of the lode is 'the absence of pneumatolytic minerals such as tourmaline, fluor-spar, and topaz, from the lode constituents'. In this he is in error, for topaz certainly does occur in the lode-filling, in places even in tolerable abundance, while tourmaline, though rare, is also present. The topaz occurs in mass as greenish-white,

¹ South of Castle-an-Dinas Hill there is another old mine known as Castle-an-Dinas mine; this was worked for tin on a continuation of the stanniferous elvan which traverses Belowda Hill mine.

² E. H. Davison, *The geology of Castle-an-Dinas and Belowda Beacon*. *Trans. Roy. Geol. Soc. Cornwall*, vol. 19. On the geology of Castle-an-Dinas wolfram mine. *Geol. Mag.*, 1920, vol. 57, pp. 347-351 [*Min. Abstr.*, vol. 1, p. 387].

coarsely crystalline patches with quartz, wolframite, brown lithia-mica, and scorodite; also as distinct, colourless to white crystals up to 6 mm. in length, with quartz on the light-brown, banded sediment forming the walls of the lode. A measured crystal of topaz is shown in fig. 12, the forms present being $c(001)$, $m(110)$, $M(230)$, $l(120)$, $g(130)$, $d(201)$, $f(021)$, $y(041)$, $i(223)$, $u(111)$, $o(221)$. The other directly associated minerals are a little tourmaline as aggregates of small, brown needles, and, somewhat rarely, beautiful radiating spheres of wavellite up to 2 cm. in diameter, this mineral being probably that referred to by Mr. Davison as wollastonite; also an as yet undetermined phosphate of alumina, forming crusts and little crystalline spheres of a bluish-green to blue colour.

A topaz-cassiterite-bearing granitic rock has been recorded from Cost All Lost or Cornubia mine, Roche;¹ the lode of this mine being partly in killas and partly in granite.

Beam mine, St. Austell.—Topaz does not appear to have hitherto been recorded from this mine, although well-defined crystals are present on many of the specimens of cassiterite preserved in old collections from this locality. These specimens were derived from rich, but narrow veins, traversing more or less kaolinized granite.

The topaz forms small, opaque, yellowish to white, short-prismatic crystals up to 4 mm. in length, coating the faces of the altered granite, and is intimately associated with large, black, twinned crystals of cassiterite, bunches of black tourmaline needles, and a little quartz, the interstices being filled with kaolin. A crystal from a specimen in my collection was measured and is shown in fig. 13, the forms present being $c(001)$, $m(110)$, $l(120)$, $f(021)$, $y(041)$, $i(223)$, $u(111)$, $o(221)$. The prism-faces are deeply furrowed owing to repeated alternations of (110) and (120).

The four minerals—topaz, cassiterite, tourmaline, and quartz—all grow either one on the other or interpenetrate, and are obviously of approximately contemporaneous formation; topaz is often also present to a large extent in the rock directly adjacent to the crystal-covered walls of the vein.

Bunny mine, St. Austell (formerly known as St. Austell Hills or Shelton mine).—De la Beche mentions the occurrence of numerous small crystals of topaz accompanying quartz, tourmaline, and cassiterite, in

¹ J. H. Collins and J. M. Coon, On the topaz rock of St. Mewan Beacon, Cornwall. Trans. Roy. Geol. Soc. Cornwall, 1915, vol. 15, pp. 1-12 [Min. Abstr., vol. 1, p. 92.]

primary, having been formed at an early period of crystallization, before the black mica of the rock had completely separated.

Topaz is also invariably present in china-stone and is so abundant as to be, along with gilbertite, almost an essential component. It occurs, too, in certain elvans, in both these cases being of secondary and pneumatolytic origin, subsequent to the consolidation of the rock.

Topaz has been recorded from the Carpalla china-clay pit, St. Stephen-in-Brannel,¹ and from St. Stephens Beacon by Mr. J. H. Collins.² It has also been recorded by Mr. Collins from Stenna Gwyn mine, St. Stephen-in-Brannel;³ a specimen, however, so labelled in his collection is apatite. Other localities noted in the Geological Survey Memoir are Dyer's quarry, Chytane, St. Enoder, where it occurs with fluor and apatite in a fine-grained granite; at Melangoose, St. Enoder, in an elvan, in a quarry north of Chytane clay works.⁴

Conce Moor, Luxulian.—Mr. J. H. Collins's collection contains an interesting specimen which was obtained from this locality by Sir William Serjeant, of St. Benet's Abbey, Lanivet. It consists of a mass of small, brownish-black, malformed cassiterite crystals cemented together by small, rough, short-prismatic crystals of opaque, white topaz, with a good deal of black tourmaline in needles and some scales of gilbertite. Sir William Serjeant informs me that this specimen along with others was found during tin-streaming operations within a few years of 1913.

Mulberry mine, Lanivet.—This remarkable open working, now abandoned, has been worked intermittently for tin from time immemorial, and is situated $3\frac{1}{2}$ miles west-south-west of Bodmin. The killas, which is a light ash-grey, finely micaceous sediment, is traversed by innumerable small quartz-cassiterite-veins, varying in width from a mere joint to ones occasionally 4 or 5 inches in thickness. The direction of the veins is unusual, being a little west of north, the whole forming a stockwork, which has been worked by a pit 300 yards along the strike of the veins, 30 yards wide, with a maximum depth of 40 yards.⁵ The filling of the veins consists largely of quartz, and when open they often contain small, black, pyramidal crystals of cassiterite, rarely accompanied by crystallized topaz, gilbertite, and a little chlorite; the other minerals present being small quantities of mispickel with its alteration-product scorodite, wolframite, and copper-pyrites.

The specimens of topaz here described were found by myself in 1922

¹ J. H. Collins, A list of minerals found in Cornwall and Devon. Journ. Roy. Inst. Cornwall, 1911, vol. 18, p. 459.

² J. H. Collins and J. M. Coon, 1915, loc. cit.

³ J. H. Collins, The Hensbarrow granite district. Truro, 1878, p. 41.

⁴ Mem. Geol. Survey, Bodmin and St. Austell, 1909, pp. 58 and 111.

⁵ C. Le Neve Foster, On some tin stockworks in Cornwall. Quart. Journ. Geol. Soc. London, 1878, vol. 34, pp. 655-656.

on vein-stuff obtained from the pit during the last working in 1911, and now forming dumps on the dressing floors. The topaz crystals are of short-prismatic habit, of a yellowish colour from iron staining, attain a maximum diameter of about 2 mm., and completely cover considerable areas of the rock. Fig. 14 shows a typical example which was measured, the forms being $m(110)$, $M(230)$ one face only, $l(120)$, $d(201)$, $f(021)$, $u(111)$. The topaz here is clearly of approximately contemporaneous formation with the cassiterite, wolframite, and quartz, all four minerals being intergrown. The gilbertite and chlorite are secondary. No tourmaline is visible on the specimens examined.

Maudlin mine, Lanlivery. A single specimen from this locality, collected by R. Talling in 1872, is preserved in the British Museum (No. 44625). It shows a single, yellowish, prismatic crystal of topaz, 5 mm. in length, indistinctly terminated at one end, and resting on sheaf-like crystals of dark-brown chalybite, upon a matrix of fluor and iron-pyrites. Mr. E. D. Mountain at my request kindly identified by measurement, without detaching the crystal, the prism-forms $m(110)$ and $l(120)$. The dumps on this mine, which is in killas, I have searched in vain for further samples.

Topaz has so far not been observed in the Bodmin Moor granite. At Fenterlarick, St. Mabyn, there is a porphyritic elvan containing topaz and pinite with pink orthoclase.¹ Topaz has not been recorded from the Kit Hill granite and greisen, although it might be expected to occur there.

As will be seen from the descriptions given, the localities where topaz should be especially looked for are near the killas-granite junctions, and in veins enclosed in greisen.

¹ Mem. Geol. Survey, Padstow and Camelford, 1910, pp. 54 and 60.