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MINERALOGICAL NOTES: No. V.—CASSITERITE CERUSSITE, ZEOLITES AND OTHER AUSTRALIAN MINERALS.

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(Plates lxxv.-lxxx.).

CASSITERITE.

Emmaville, New South Wales.

(Plate lxxv., fig. 1).

The crystal of cassiterite from this locality here figured is of interest as having an acute pyramidal habit through predominance of the di-tetragonal pyramid *z* (321); it resembles the needle or sparable tin of the Cornish miner, a type which seems very rare in Australian cassiterite. The prism faces are strongly striated owing to oscillatory combination between *m* (110) and *r* (230), *r* however being subordinate. The crystal measures 1·25 × ·75 cm. The part bounded by the prism faces is mainly black with patches of semi-transparent "ruby tin," the apex of the crystal down to the faint line traversing the faces of *z*, a little below and parallel to its intersections with *s*, is black with metallic lustre, while the central part is reddish and opaque. From this curious distribution of colour the probable history of the crystal may be deduced. Thus it may be inferred that it was at first prismatic in habit, most likely terminated by *s* (111), and of a black colour. With a change in composition (indicated by the change in colour) the prism ceased growing and the pyramid *z* predominated; finally came another change in composition at a time when the crystal had assumed nearly its present habit.

Elsmore, New South Wales.

(Plate lxxv., figs. 2, 3).

Fine crystals of tinstone are found at Elsmore, where they occur disseminated through greisen; weathering sets free the crystals which become concentrated into alluvial deposits of economic importance. A large proportion of the crystals are reddish, forming the so-called ruby tin. The usual habit is stout prismatic, and the crystals seem to be invariably twinned on *e* (101), the usual law; doublets are comparatively rare and some of the crystals are very complex. Fivelings in which a large individual supports on each *e* face a smaller crystal in twin position are abundant, and specimens showing the nine individuals composing a complete twin crystal of this type are by no means uncommon.

In Pl. lxxv., fig. 2, is represented according to its actual development a doublet of ·75 × ·5 cm. in which the two portions are about equal in size and development and the line of junction is barely visible. Unfortunately this beautiful crystal is fractured on one side where it was attached to the matrix. It is essentially similar to the crystal figured by Becke,[1] which however has no *z* planes. The forms determined and the mean coordinate angles are tabulated below:

Forms.		Measured.		Calculated.		Error.	
		ϕ	ρ	ϕ	ρ	ϕ	ρ
		° ′	° ′	° ′	° ′	′	′
a	100	0 3	89 57	0 0	90 0	3	3
m	110	44 57	90 0	45 0	90 0	3	0
r	230	33 43	90 0	33 41	90 0	2	0
h	120	26 38	90 0	26 34	90 0	4	0
s	111	44 51	43 35	45 0	43 33	9	2
z	231	33 31	67 36	33 41	67 35	10	1
$\underline{a}$	100	0 15	22 12	0 0	22 12	15	0

[1] Becke—Min. Mitth., Heft 3, 1877, pl. i., f. 5.

A more complicated twin is drawn (Pl. lxxv., fig. 3) in orthographic projection; here we have a relatively large crystal with four smaller individuals twinned to the former on (101). As the four smaller crystals are essentially similar the group has been idealised in the drawing. The lower surface consists of the *s* faces of the main crystal and one very small individual in twin position. The colour is black and the faces are as a rule smooth and brilliant, yielding excellent reflections. The dimensions are approximately ·75 cm. (parallel to vertical axis) × 1·00 cm.

The measured and calculated angles are given below :

Forms.		Measured.		Calculated.		Error.	
		ϕ	ρ	ϕ	ρ	ϕ	ρ
		° ′	° ′	° ′	° ′	′	′
a	100	0 4	89 56	0 0	90 0	4	4
m	110	45 7	89 58	45 0	90 0	7	2
r	230	33 33	89 57	33 41	90 0	8	3
h	120	26 33	89 56	26 34	90 0	1	4
s	111	45 16	43 18	45 0	43 33	16	15
z	231	33 37	67 38	33 41	67 35	4	3
$\underline{a}$	100	0 5	22 11	0 0	22 12	5	1

Hogue's Creek, near Dundee, New South Wales.

(Plate lxxv., fig. 6).

Hogue's Creek furnishes good tinstone crystals with the usual stout prismatic habit, sometimes simple, sometimes twinned ; a fine example of a simple crystal yielding the forms *a*, *m*, *r*, *h*, *s*, *z*, is here figured. The faces of *r* are narrow, the pyramid *s* is large and striated parallel to its intersections with *e*. Dimensions approximately 1 × 1 cm.

The Glen, New England, New South Wales.

(Plate lxxv., fig. 5).

A rather large crystal, about 3 × 2·5 cm., from this locality presents a form different from those described above; it is a fourling on the common law, two segments being about equal in size, the other two much smaller.

STANTHORPE, QUEENSLAND.

(Plate lxxv., fig. 4).

The figure is drawn from one of several small crystals partly embedded in a decomposed rock of indeterminate nature carrying crystals of quartz. It measures only 2 mm. approximately in length, but its faces are bright and the signals good. It is twinned on *e*.

The following forms and measurements were obtained:

Forms.		Measured.		Calculated.		Error.	
		ϕ	ρ	ϕ	ρ	ϕ	ρ
		° ′	° ′	° ′	° ′	′	′
a	100	0 0	90 2	0 0	90 0	0	2
m	110	45 0	90 0	45 0	90 0	0	0
r	230	33 37	89 59	33 41	90 0	4	1
h	120	26 35	90 1	26 34	90 0	1	1
s	111	44 55	43 27	45 0	43 33	5	6
z	231	33 44	67 38	33 41	67 35	3	3
$\underline{a}$	100	0 13	22 17	0 0	22 12	13	5

CERUSSITE.

BROKEN HILL, NEW SOUTH WALES.

(Plate lxxvi., figs. 1, 2, 3; Plate lxxvii., figs. 1, 2, 3).

The mines of Broken Hill have yielded some magnificent examples of crystallised cerussite; the form and appearance is so characteristic that Broken Hill cerussite can generally be recognised at a glance. It occurs as long prismatic crystals, often coated with rounded, tapering crystals of smithsonite (carbonate of zinc), or again covered with brilliant anglesite. Frequently it is found in reticulated masses, forming very attractive specimens. Very typical are arrow-head twins on *r* (130), sometimes opaque white and of considerable size, at other times transparent, when they are as a rule smaller. Twinning on *m* (110), the more usual law, I have not observed, but Mügge[2] and Spencer[3] mention its occurrence.

Simple crystals are not common ; one such is represented in Pl. lxxvi., figs. 1, 2. It is tabular on *b* which is striated parallel to prism and brachydome edges ; *r* oscillates slightly with *b*.

It yielded the following forms and angles :

Forms.		Measured.		Calculated.		Error.	
		ϕ	ρ	ϕ	ρ	ϕ	ρ
		° ′	° ′	° ′	° ′	′	′
b	010	0 1	89 55	0 0	90 0	1	5
r	130	28 37	89 57	28 39	90 0	2	3
x	012	0 2	20 4	0 0	19 52	2	12
k	011	0 1	35 51	,,	35 52	1	1
i	021	0 2	55 21	,,	55 20	2	1
v	031	0 2	65 6	,,	65 15	2	9
z	041	0 2	70 59	,,	70 55	2	4
n	051	0 1	74 55	,,	74 32	1	23
y	102	89 56	30 40	90 0	30 39	4	1
s	121	39 26	61 42	39 20	61 51	6	9
p	111	58 37	54 14	58 37	54 14	0	0
o	112	58 21	34 48	,,	34 46	16	2

When twinned on *r* and long prismatic in habit the crystals resemble Pl. lxxvi., fig. 3 ; if the prisms are short vertically with predominant *r*, and the faces of the domes *k* and $\bar{k}$ meet in an edge, above, below, and at the sides, the resemblance to an arrow-head is very striking. A typical twin of this form is shown in Pl. lxxvii., figs. 1, 2 ; here the notch is formed by *r* in oscillatory combination with *m*, and the edges are replaced by *r* oscillating with *b*.

The forms and angles obtained are as in the table below, in which we have the mean result of measurements on three crystals :

[2] Mügge—Neues Jahrb. Min., ii., 1897, p. 78.
[3] Spencer—Min. Mag , xiii , 1901, p. 39, f n.

Forms.		Measured.		Calculated.		Error.	
		ϕ	ρ	ϕ	ρ	ϕ	ρ
		° ′	° ′	° ′	° ′	′	′
c	001						
b_1	010	0 2	89 58	0 0	90 0	2	2
m_1	110	58 36	89 59	58 37	,,	1	1
r_1	130	28 35	89 59	28 39	,,	4	1
x_1	012	0 1	19 53	0 0	19 52	1	1
k_1	011	0 1	35 55	,,	35 52	1	3
i_1	021	0 2	55 23	,,	55 20	2	3
y_1	102	89 26	30 46	90 0	30 39	34	7
p_1	111	58 37	54 15	58 37	54 14	0	1
b_2	010	57 16	90 0	57 18	90 0	2	0
m_2	110	1 20 64 9	89 59	1 19 64 5	,,	1 4	1
r_2	130	85 39	90 0	85 57	,,	18	0
x_2	012	57 15	19 53	57 18	19 52	3	1
k_2	011	57 11	35 57	,,	35 52	7	5
S_2	032	57 12	47 33	,,	47 19	6	14
i_2	021	57 13	55 9	,,	55 20	5	11
y_2	102	32 34	30 38	32 42	30 39	8	1
p_2	111	1 24 64 5	54 14	1 19 64 5	54 14	5 0	0
o_2	112	1 29 64 42	34 46	1 19 64 5	34 46	10 37	0

Two groups of four crystals, twinned in pairs on r were measured. Denoting the four segments by I, II, III, IV, we have I and II twinned on r, likewise III and IV twinned on r, but although the orientation of III and IV relative to I and II is almost the same in the two groups I have not succeeded in proving it due to twinning on any known face. Appended are the angles obtained between the b pinacoids of the four segments:

(1). $b_1 \wedge b_2 = 57° 13'$ (Calculated for r twin 57° 18′).
$b_1 \wedge b_3 = 61\ 26$
$b_1 \wedge b_4 = 4\ 4$

(2). $b_1 \wedge b_2 = 57\ 18$
$b_1 \wedge b_3 = 61\ 54$
$b_1 \wedge b_4 = 4\ 38$

An attempt was made to determine whether the reticulated form so common with Broken Hill cerussite is due to repeated twinning on *r* or twinning on *r* combined with twinning on *m* or on some other law. Suitable specimens for this purpose are not easy to get, but, from a group consisting of part of the plate forming one side of the rhomb-shaped net and two small attached crystals with elongation apparently parallel to the two remaining directions, the following measurements were obtained, all the reliable data being utilised in order to get results as accurate as possible :

$b_1 \wedge b_2$	57° 1′	(Calculated for *r* twin 57° 18).
$b_1 \wedge b_3$	58 35	

From these figures it is apparent that I and II are twinned on *r* while III is independent, or exemplifies a third twinning law. Mügge, who was the first to describe the cerussite of Broken Hill says[4]:—" Neben Zwillingen kommen auch Drillinge vor, indessen wurden polysynthetic Bildungen nach (130) auch in Dünnschliffen nicht beobachtet, wohl aber Verbindungen von Zwillingen nach (130) mit gitterförmigen Drillingen nach (110), welche letztere auch durch tafeligen Habitus nach (010) sich von Zwillingen nach (130) unterscheiden." If Mügge means by this that the mesh-like form is the result of twinning on (110) combined with twinning on (130) I can only say that so far as my observations go I am not able to substantiate his conclusions. Unfortunately he does not give the measurements on which his inferences are based, and it would be absurd for me to question their correctness, but a tabular extension on *b* is not a criterion of distinction between twinning on (130) and twinning on (110) as the habit is a common one with cerussite.

ZEEHAN, TASMANIA.

(Plate lxxvii., fig. 4).

One specimen in the Museum collection shows several small but well developed crystals, simple and twinned, on a matrix of galena with patches of friable limonite. A doublet on *m* was measured and yielded the forms *c* (001), *b* (010), *m* (110), *r* (130), *x* (012), *k* (011), *i* (021), *v* (031), *z* (041), *p* (111). The faces in the zone [010, 001] are striated and slightly inter-oscillating. A group (Pl. lxxvii., fig. 4), is made up of four individuals of which I and II, also III and IV are twinned to each other on *m*, while I is twinned to III and II to IV on a possible face (760) for which the calculated value of ϕ is 62° 24′. This form has not been recorded for cerussite, and it is just possible that we have here merely a case of accidental grouping, but the

[4] Mügge—*Loc. cit.*, p. 79.

measured angles given in the table agree rather well with the assumption that a new twinning law is in operation.

Forms.		Measured.		Calculated.		Error.	
		ϕ	ρ	ϕ	ρ	ϕ	ρ
		° ′	° ′	° ′	° ′	′	′
c	001	—	—	—	—	—	—
b_1	010	0 1	90 1	0 0	90 0	1	1
a_1	100	90 2	90 0	90 0	,,	2	0
m_1	110	58 41	89 59	58 37	,,	4	1
r_1	130	28 41	89 56	28 39	,,	2	4
x_1	012	0 12	19 38	0 0	19 52	12	14
i_1	021	0 12	55 22	,,	55 20	12	2
y_1	102	89 34	30 41	90 0	30 39	26	2
p_1	111	58 40	54 15	58 37	54 14	3	1
b_2	010	62 57	89 52	62 46	90 0	11	8
a_2	100	27 3	89 59	27 14	,,	11	1
m_2	110	4 23	89 52	4 9	,,	14	8
r_2	130	88 26 34 20	89 59	88 35 34 7	,,	11 13	1
x_2	012	63 1	19 6	62 46	19 52	15	46
i_2	021	63 1	55 24	,,	55 20	15	4
v_2	031	63 1	65 11	,,	65 15	15	4
z_2	041	63 1	70 56	,,	70 55	15	1
y_2	102	27 9	30 40	27 14	30 39	5	1
p_2	111	4 32	54 12	4 9	54 14	23	2
b_3	010	55 11	89 56	55 12	90 0	1	4
m_3	110	3 29	89 59	3 25	,,	4	1
r_3	130	26 29	89 58	26 33	,,	4	2
x_3	012	55 10	19 53	55 12	19 52	2	1
k_3	011	55 10	35 54	,,	35 52	2	2
i_3	021	55 7	55 19	,,	55 20	5	1
v_3	031	55 7	65 15	,,	65 15	5	0
z_3	041	55 4	70 44	,,	70 55	8	11
y_3	102	34 49	30 41	34 48	30 39	1	2
p_3	111	66 22 3 28	54 13	66 11 3 25	54 14	11 3	1
b_4	010	7 17	89 31	7 34	90 0	17	29
m_4	110	66 3 51 5	90 0	66 11 51 3	,,	8 2	0
x_4	012	7 26	20 5	7 34	19 52	8	13

Washington Extended Mine, Whyte River, Tasmania.

(Plate lxxvi., fig. 4).

This is represented in our collection by one specimen in which small crystals of cerussite occur in cavities in galena coated with yellow limonite; in habit it is tabular on *b*, which is slightly striated parallel to prism and brachy-dome intersections. The angles are tabulated below :

Forms.		Measured.		Calculated.		Error.	
		ϕ	ρ	ϕ	ρ	ϕ	ρ
		° ′	° ′	° ′	° ′	′	′
b	010	0 0	89 59	0 0	90 0	0	1
r	130	28 40	90 2	28 39	,,	1	2
x	012	0 0	19 50	0 0	19 52	0	2
k	011	0 2	35 57	,,	35 52	2	5
i	021	0 0	55 25	,,	55 20	0	5
v	031	,,	64 59	,,	65 15	0	16
z	041	0 1	70 37	,,	70 55	1	18
n	051	0 0	74 8	,,	74 32	0	24
y	102	90 2	30 41	90 0	30 39	2	2
p	111	58 37	54 12	58 37	54 14	0	2

Comet Mine, Dundas, Tasmania.

(Plate lxxvi., fig. 5).

The crystals, which occur on a matrix of galena and powdery limonite, are thin tabular on *b* and twinned on *m*; the figured crystal is a trilling resembling the cerussite of the Magnet Mine[5]. The two crystals twinned to that in the conventional position are small in comparison and scarcely penetrate the larger. The measured angles agree fairly well with the calculated values.

[5] Anderson—Rec. Austr. Mus., vi., 2, 1905, p. 93, pl. xx., f. 1-3.

Forms.		Measured.		Calculated.		Error.	
		ϕ	ρ	ϕ	ρ	ϕ	ρ
		° ′	° ′	° ′	° ′	′	′
b_1	010	0 3	89 58	0 0	90 0	3	2
a_1	100	89 57	89 56	90 0	,,	3	4
m_1	110	58 40	89 59	58 37	,,	3	1
r_1	130	28 40	89 58	28 39	,,	1	2
x_1	012	0 6	19 53	0 0	19 52	6	1
k_1	011	,,	35 55	,,	35 52	6	3
i_1	021	0 0	55 20	,,	55 20	0	0
v_1	031	0 3	65 12	,,	65 15	3	3
p_1	111	58 36	54 14	58 37	54 14	1	0
b_2	010	62 47	89 59	62 46	90 0	1	1
a_2	100	27 13	90 0	27 14	,,	1	0
m_2	110	4 7	89 58	4 9	,,	2	2
r_2	130	{88 35 {34 8	89 59	{88 35 {34 7	,,	{0 {1	1
v_2	031	62 46	65 39	62 46	65 15	0	24
b_3	010	62 35	89 58	,,	90 0	11	2
a_3	100	27 20	89 58	27 14	,,	6	2
m_3	110	3 59	89 57	4 9	,,	10	3
r_3	130	{88 48 {34 3	89 58	{88 35 {34 7	,,	{13 {4	2
i_3	021	62 36	55 16	62 46	55 20	10	4
p_3	111	3 57	54 15	4 9	54 14	12	I

BARITE.

Commonwealth mine, Wellington, New South Wales.

(Plate lxxviii., fig. 1).

Crystallised barite is by no means common in New South Wales; in fact the crystals now dealt with and those from St. Peter's near Sydney[6] are the only examples known to me.

At the Commonwealth Mine it occurs as clusters of transparent, colourless or slightly yellowish (iron stained) crystals, with prismatic development along the *b* axis. The faces are not quite smooth and the angles obtained are not very good.

[6] Anderson—Rec. Austr. Mus., vi., 2, 1905, p. 89, pl. xix., f. 2.

Forms.		Measured.		Calculated.		Error.	
		ϕ	ρ	ϕ	ρ	ϕ	ρ
		° ′	° ′	° ′	° ′	′	′
c	001	—	—	—	—	—	—
η	320	61 22	89 58	61 28	90 0	6	2
m	110	50 52	90 4	50 49	,,	3	4
o	011	0 7	52 54	0 0	52 43	7	11
d	102	90 0	39 1	90 0	38 51	0	10
u	101	89 46	58 34	,,	58 10	14	24
f	113	51 11	34 27	50 49	34 43	22	16
z	111	50 51	64 26	,,	64 18	2	8
y	122	31 18	57 07	31 31	57 1	13	6

MONAZITE.

THE GULF, NEAR EMMAVILLE, NEW SOUTH WALES.

(Plate lxxviii., fig. 2).

The crystal is reddish brown, somewhat worn and not measurable on the reflecting goniometer, but the angles obtained with the contact goniometer are sufficiently good for determinative purposes. The crystal measures 1·5 × 1·5 × ·5 cm. and is twinned on (100). It is projected on the plane (010) and drawn in ideal symmetry.

Specific gravity : 5·152.

SCHEELITE.

HILLGROVE, NEW SOUTH WALES.

(Plate lxxviii., fig. 3).

At Hillgrove scheelite has been found in considerable quantity but it seldom occurs in crystals. One specimen consisting of a number of fragmentary crystals grouped in parallel position is in our collection and is here figured. It is greyish and translucent; the faces are rough and striated, and the angles obtained with the reflecting goniometer are not very satisfactory. Specific gravity : 6·00.

	Measured.	Calculated (Dana).
$s_1 \wedge s_1^{iv}$	$= 131 \wedge 13\bar{1} = 23° 20'$	23° 16′
$s_1 \wedge p$	$= 131 \wedge 111 = 28$ 18	28 21
$s_1 \wedge e$	$= 131 \wedge 101 = 67$ 12	68 $18\frac{1}{2}$

Mount Ramsay, Tasmania.

(Plate lxxviii., fig. 4).

This is the mineral analysed by Traube[7]. It occurs in hornblendic rock in well formed crystals up to one inch in length and in crystalline bunches. The measured crystal is about 1 cm. in the direction of the vertical axis and is greyish and semi-translucent. The faces are fairly brilliant and gave good signals; only the pyramid *e* (101) is present.

	Measured.	Calculated (Dana).
$e \wedge e' = 101 \wedge 011$	$= 72° 45'$	$72° 40\frac{1}{2}'$
$e \wedge e^{vii} = 101 \wedge 0\bar{1}\bar{1}$	$= 107\ 15$	$107\ 19\frac{1}{2}$

VESUVIANITE.

Barraba, New South Wales.

(Plate lxxviii., figs. 5, 6).

Vesuvianite is found as yellowish-green transparent crystals in and near a cutting on the road from Barraba to Bundarra, slightly eastward of the Ironbarks Creek crossing. It has been described by Mr. D. A. Porter[8], who states that it is found lining cavities in massive garnet forming a vein in serpentine. The crystals are accompanied by silica in the form of hyalite, and a greenish mineral in thin tabular, hexagonal crystals which has not yet been determined but may belong to the chlorite group. The base is usually present but is invariably rough and non-reflecting.

One of the best and largest crystals, 3·5 × 1 mm., was measured and gave the following forms and angles:

Forms.		Measured.		Calculated.		Error.	
		ϕ	ρ	ϕ	ρ	ϕ	ρ
		° ′	° ′	° ′	° ′	′	′
c	001	—	—	—	—	—	—
a	100	0 5	90 0	0 0	90 0	5	0
m	110	45 1	89 45	45 0	,,	1	15
o	011	0 37	28 15	0 0	28 15	37	0
p	111	45 10	37 12	45 0	37 14	10	2
t	331	44 56	66 46	,,	66 19	4	27
s	131	18 27	59 41	18 26	59 32	1	9
i	132	18 16	40 7	,,	40 22	10	15

7 Traube—Neues Jahrb. Min., Beil-Bd. vii., 1890, p. 232, quoted Dana's System of Mineralogy, 6th Edition, 1892, p. 987.

8 Porter—Journ. Roy. Soc. N.S. Wales, xxii., 1888, p. 85, pl. i., f. 12.

ZEOLITES.

Wherever we find decomposed felspathic rocks we may look for zeolites in their amygdaloidal cavities. Generally several zeolitic species occur together, sometimes forming intergrowths, and, as in crystalline habit, qualitative and even quantitative composition certain zeolites have a strong family resemblance it is not always easy to discriminate between them. In this paper I have confined myself to describing those of whose identity there is no reasonable doubt.

CHABAZITE.

BEN LOMOND, NEW SOUTH WALES.

(Plate lxxix., figs. 1, 2).

The basalt of Ben Lomond is much decomposed and so full of cavities that in hand specimens it sometimes presents the vesicular appearance of pumice. The smaller cavities are often completely filled with an incoherent, yellowish-green substance which has a clayey odour when wetted; the powder has not been analysed but is probably bole or some equally indefinite mineral of the kaolin group. Larger cavities are filled with zeolites sometimes beautifully crystallised; chabazite predominates and is accompanied by analcite and delicate acicular crystals which are mainly mesolite but may possibly be natrolite in some cases. Yellowish calcite in scalenohedra or in spherical aggregates accompanies the zeolites. The specimens in the Museum collection were obtained by purchase from Mr. D. A. Porter who has also supplied us with particulars of the occurrence.[9] The specimens were obtained from excavations and cuttings on the Northern Railway line, the finest being found in the " Big Cutting " situated about a mile in a northerly direction from Ben Lomond railway station.

The chabazite is sometimes crystallised in simple rhombohedra much striated parallel to the edges r/r' and r/r'' or forms unequal interpenetrating twins with the vertical axis as axis of twinning, but it usually presents the characteristic form of phacolite with the forms r $(10\bar{1}1)$, s $(02\bar{2}1)$ and e $(01\bar{1}2)$ twinned on the same law. The crystals, which attain a diameter of 3 cm., are but little inferior to the well-known phacolite of Richmond, Victoria; they are less regularly developed however, and are strongly striated parallel with the intersections r/e. A common feature is a crateriform depression at the apex shown in plan in Pl. lxxix., fig. 2. In such crystals each individual of the twin really consists of three portions in parallel position.

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[9] Porter—Journ. Roy. Soc. N.S. Wales, xxii., 1888, p. 87.

Four analyses (III and IV being duplicates) were made with the following result :

	I.	II.	III.	IV.	V.	VI.	VII.
	%	%	%	%	%	%	%
H_2O @ 100° C –	21·67	21·30	3·43	not det.	3·43	22·11	21·3
H_2O @ 100° C +			19·11		18·41		
SiO_2	47·70	46·85	47·41	47·53	47·37	47·52	47·4
Al_2 O_3	19·34	20·14	18·63	18.53	19·16	19·48	20·2
CaO	9.05	10·72	9·21	9·09	9·52	9·63	11·1
SrO	—	—	—	—	—	·43	—
K_2O	0·47	0·80	1·05	1·40	0·93	·36	—
Na_2O	1·06	0·97	1·08	1·33	1·11	·52	—
	99·29	100·78	99·92	—	99·93	100·05	100·0

I.—Ben Lomond ; taken for water ·4915 gram , general ·9914 gram
II.— „ ; „ ·4920 „ , „ ·5878 „
III.— „ ; „ ·8631 „ , „ ·8631 „
IV.— „ ; „ 1·2842 „
V.— „ ; mean of analysis I. II. III. IV.
VI.—Table Mt., Colorado.[10]
VII.—Calculated for CaO. Al_2O_3. $4SiO_2$. $6H_2O$.

After 46 hours over strong sulphuric acid the loss of water amounted to 2·0 %.

INVERELL, NEW SOUTH WALES.

Crystals of chabazite similar to Pl. lxxix., fig. 1, are found embedded in a decomposed basaltic rock forming a cliff near the bridge at Inverell.[11]

BELL MOUNT, MIDDLESEX, TASMANIA.

(Plate lxxix., fig. 3).

Some fine crystals, ·75 to 1·5 cm. in diameter, have been found loose and coating a vugh in tertiary basalt at this locality.[12] Like the Ben Lomond and Inverell minerals these are penetration twins on the vertical axis, but they differ from the former in the presence of *a* $(11\bar{2}0)$ and *t* $(11\bar{2}3)$. The crystals are strongly striated in the directions indicated in the figure. Two crystals were obtained by exchange with Mr. W. F. Petterd of Tasmania.

ANALCITE.

BEN LOMOND, NEW SOUTH WALES.

The analcite is beautifully crystallised, transparent and glassy. The crystals are small averageing about two mm. in diameter and seem to consist uniformly of the trapezohedron (211), A typical crystal was measured and gave the result :

$211 \wedge 2\bar{1}1 = 48^\circ\ 41'$; calculated $48^\circ\ 11\frac{1}{2}'$
$211 \wedge 121 = 33\ \ 17$; „ $33\ \ 33\frac{1}{2}$

10 Hillebrand—Bull. U. S. Geol. Surv., 20, 1885, p. 24.
11 Wilkinson—Notes on the Geology of N.S. Wales, p. 62, Government Printer, Sydney, 1882 ; Porter—Journ. Roy. Soc. N.S. Wales, xxii., 1888, p. 88, pl. i., f. 7.
12 Petterd—Papers and Proc. Roy. Soc. Tas., 1902-3, p. 24.

For analysis material was selected from several specimens carrying analcite in druses and cavities.

	I.	II.	III.
	%	%	%
H_2O	8.71(ign)	8·37	8·2
SiO_2	54·39	55·81	54·5
Al_2O_3 ...	21.76	22·43	23·2
CaO	1.33	—	—
K_2O	tr.	—	—
Na_2O ...	13·77	13·47	14·1
	99·96	100·08	100.0

I.—Ben Lomond, N. S. Wales; taken for water ·1492 gram, general ·3539 gram.

II.—Table Mt., Colorado.[13]

III.—Calculated for $Na_2O.\ Al_2O_3.\ 4SiO_2.\ 2H_2O$.

MESOLITE.

Ben Lomond, New South Wales,

The slender crystals are too minute for optical determination; extinction is sensibly straight. The mineral fuses to an opaque white bead giving the sodium flame. For analysis a vugh lined with a downy covering of interlacing acicular crystals was denuded, yielding, ·5509 gram. of apparently pure material. Water was determined by ignition.

	I.	II.	III.	IV.
	%	%	%	
H_2O ...	11·86	12·16	11·75	12·4
SiO_2 ...	43·88	46·17	43·83	46·4
Al_2O_3 ...	27·14	26·88	29·04	26·3
CaO ...	7·03	8·77	7·84	9·6
K_2O ...	tr.	—	—	—
Na_2O ...	10.48	6.19	7·80	5·3
	100·39	100·17	100·26	100·0

[13] Hillebrand—*Loc. cit.*, p. 29.

I.—Ben Lomond, N.S. Wales.
II.—Table Mt., Colorado.[14]
III.—Eisenach, Thuringia.[15]
IV.—Calculated for $\begin{cases} Na_2O.\ Al_2O_3.\ 3SiO_2.\ 2H_2O. \\ 2\ (CaO.\ Al_2O_3.\ 3SiO_2.\ 3H_2O). \end{cases}$

NATROLITE.

INVERELL, NEW SOUTH WALES.

The mineral occurs as transparent colourless aggregates, radiated in structure. Extinction is straight and compensation takes place with quartz wedge perpendicular to direction of elongation.

	I.	II.	IV.
	%		
H_2O @ 100° C –	0·38	9·84	9·5
H_2O @ 100° C +	8·90		
SiO_2	46·38	47·31	47·4
Al_2O_3	27·36	26·77	26·8
CaO	0·83	0·41	—
K_2O	0·13	0·35	—
Na_2O	15·63	15·44	16·3
	99·61	100·12	100·0

I.—Inverell, N.S. Wales; taken for water ·6459 grams, general ·8978 grams.
II.—Cape Blomidon, Nova Scotia.[16]
III.—Calculated for $Na_2O.\ Al_2O_3.\ 3SiO_2.\ 2H_2O$.

THOMSONITE.

INVERELL, NEW SOUTH WALES.

This is white, radiated, decrepitates before the blowpipe, intumesces slightly and yields an opaque white bead. Analysis was made in duplicate :

[14] Hillebrand—*Loc. cit.*, p. 35.
[15] Luedecke—Neues Jahrb. Min., 1881, ii., p. 34.
[16] Brush—Amer. Journ. Sci, xxxi., 1861, p. 365.

	I.	II.	III.	IV.
	%	%	%	%
H_2O @ 100° C –	·68	not det.	12·91	13·75
H_2O @ 100° C +	12·05			
SiO_2	40·60	40·76	40·88	37·00
Al_2O_3	29·67	29·79	29·68	31·39
CaO	11·74	11·58	11·88	11·50
Na_2O	5·62	5·87	4·72	6·36
	100·36	—	100·07	100·00

I.—Inverell ; taken for water ·4240 gram, general ·4820 gram.
II.—Inverell ; taken ·5395 gram.
III.—Table Mt., Colorado.[17]
IV. – Calculated for $\begin{cases} Na_2O.\ Al_2O_3\ 2SiO_2.\ 2\frac{1}{2}H_2O. \\ 2\ (CaO.\ Al_2O_3.\ 2SiO_2.\ 2\frac{1}{2}H_2O). \end{cases}$

SCOLECITE

Werris Creek, New South Wales.

This mineral is associated with heulandite and stilbite in a decomposed andesitic rock containing phenocrysts of plagioclase almost completely zeolitised ; the scolecite occurs as white nodular radiated masses. Before the blowpipe intumesces slightly and fuses to a blebby enamel. Mr. D. A. Porter who presented the specimens to the Trustees informs me that it is rather rare at the locality.

The mineral gelatinises with hydrochloric acid and yielded the following percentages :

	I.	II.	III.
	%	%	%
H_2O	13·94	14·48(diff.)	13·8
SiO_2	45·19	46·03	45·9
Al_2O_3	25·56	25·28	26·0
Fe_2O_3 ...	—	0·27	
CaO	15·39	12·77	14·3
K_2O . .	0·74	0·13	—
Na_2O ..		1·04	—
	100·82	100·00	100·0

17 Hillebrand—*Loc. cit.* p. 25.

I.—Werris Ck., N.S. Wales; taken for water ·4540 gram general ·7504 gram.
II.—Table Mt., Colorado.[18]
III.—Calculated for CaO. Al_2O_3. $3SiO_2$. $3H_2O$.

HEULANDITE.

Werris Creek, New South Wales.

(Plate lxxviii., fig. 7).

At Werris Creek heulandite occurs as minute transparent colourless crystals lining small amygdaloidal cavities in the decomposed rock. It has the usual pearly lustre on the clinopinacoidal cleavages, which are found to be perpendicular to an acute positive bisectrix, thus distinguishing the mineral from stilbite which otherwise it resembles closely. The crystals have the characteristic coffin shape, the forms present being *b* (010), *m* (110), *x* (021), *t* (201), *u* ($\bar{1}$11), *s* ($\bar{2}$01). The available material is too scanty to permit an analysis.

STILBITE.

Jamberoo, New South Wales.

This locality was discovered by Mr. B. G. Engelhardt by whom the mineral, which occurs in trachyte, has already been described.[19] An analysis was made on a specimen in the Australian Museum presented by the original discoverer, with the appended result:

	I.	II.	III.
	%	%	%
H_2O	17·53	17·30	17·2
SiO_2	57·61	58·79	57·4
Al_2O_3 ...	15·56	14·61	16·3
Fe_2O_3 ...		0·47	—
CaO	8·22	9·53	7·7
K_2O	1·19	0·23	—
Na_2O ...		0·32	1·4
	100·11	101·25	100·0

I.—Jamberoo; taken for water ·2755 gram, general ·5593 gram.
II.—Bordö, Faroes.[20]
III.—Calculated for (Na_2,Ca) O. Al_2O_3. $6SiO_2$. $6H_2O$.

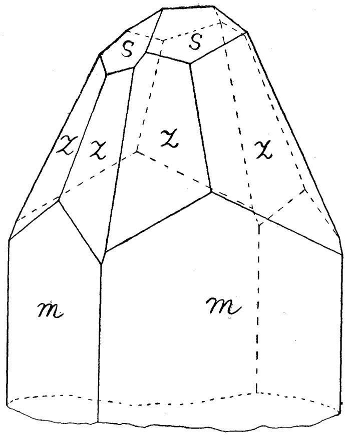
[18] Hillebrand—*Loc. cit.*, p. 37.
[19] Engelhardt—Proc. Linn. Soc. N.S. Wales, (2), vi., 1891, p. 5, pl. i.; Jaquet and Card—Rec. Geol. Surv. N.S. Wales, viii., 1, 1905, p. 17.
[20] Heddle—Min. Mag., i., 1877, p. 21.

EXPLANATION OF PLATE LXXV.

Cassiterite.

Fig. 1. Emmaville, N. S. Wales.
,, 2. Elsmore, N. S Wales. Doublet on *e* (101).
,, 3. Elsmore. Fiveling on *e* in orthographic projection.
,, 4. Stanthorpe, Queensland. Doublet on *e*.
,, 5. The Glen, New England, N. S. Wales. Fourling on *e*.
,, 6. Hogue's Creek, N. S. Wales.

Forms :—*a* (100), *m* (110), *r* (230), *h* (120), *e* (101), *s* (111), *z* (231).



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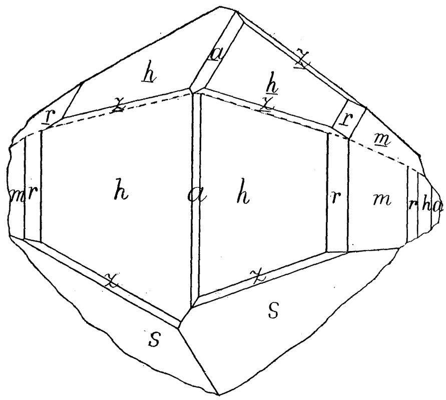

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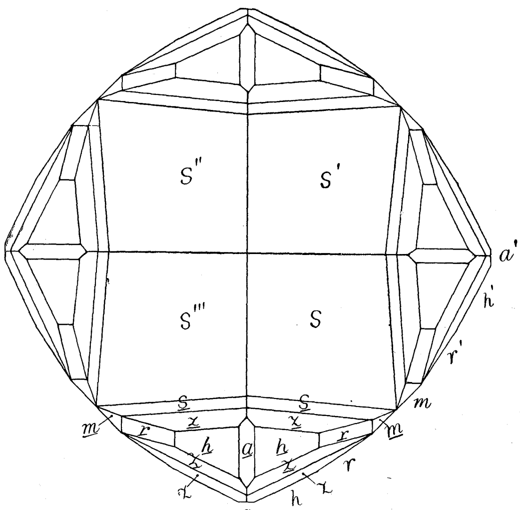

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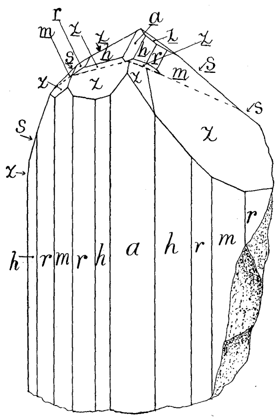

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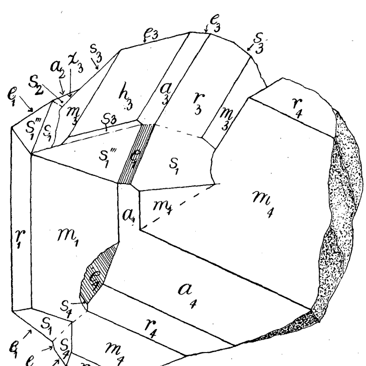

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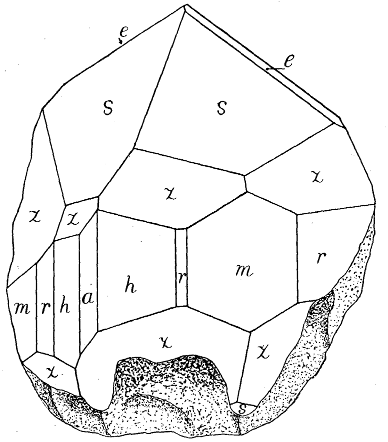

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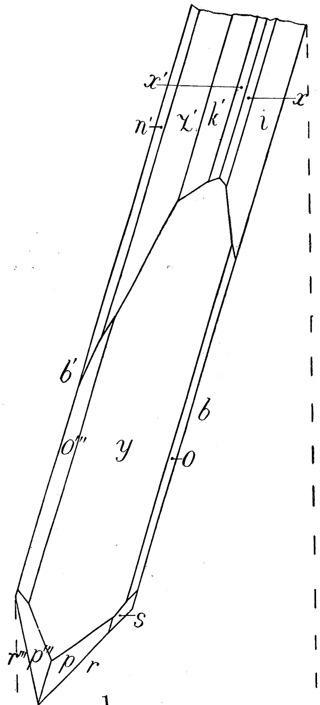
EXPLANATION OF PLATE LXXVI.

CERUSSITE.

Figs. 1 2. Broken Hill, N. S. Wales. In orthographic and clinographic projection.
Fig. 3. Broken Hill. Twin on *r* (130).
,, 4. Washington Extended Mine, Whyte River, Tasmania.
,, 5. Comet Mine, Dundas, Tasmania. Trilling on *m* (110).

Forms:—*c* (001), *b* (010), *a* (100), *x* (012), *k* (011), *i* (021), *v* (031), *S* (032), *z* (041), *n* (051), *y* (102), *s* (121), *p* (111), *o* (112).



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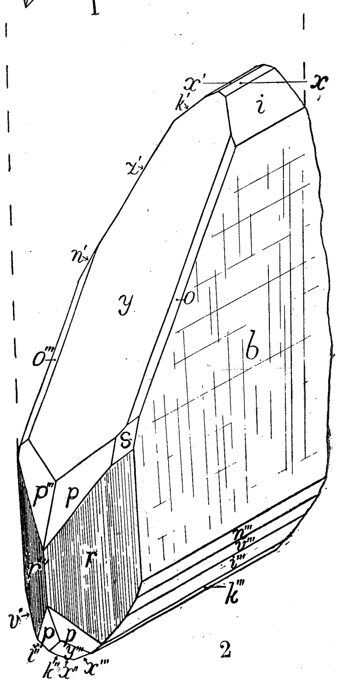

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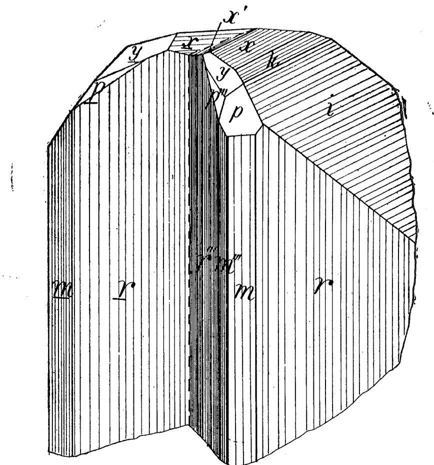

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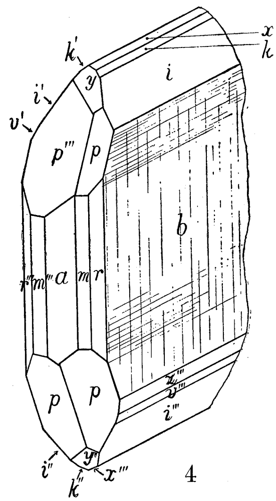

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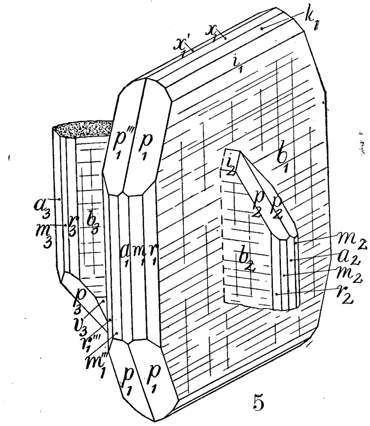

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EXPLANATION OF PLATE LXXVII.

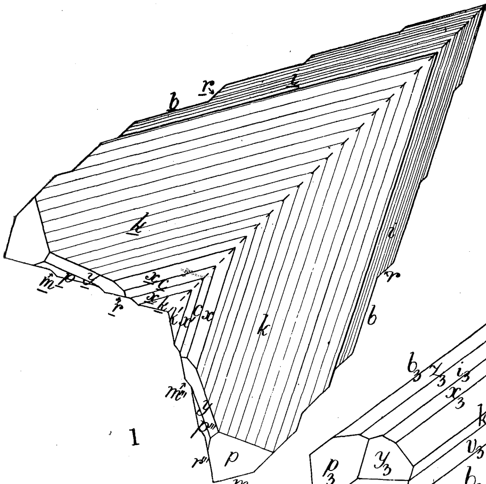
CERUSSITE.

Figs. 1, 2. Broken Hill, N. S. Wales. Arrowhead twin on *r* (130) in orthographic and clinographic projection.

Fig. 3. Broken Hill. Stereogram (the form *s* (121) is inadvertently omitted).

„ 4. Zeehan, Tasmania. Segments subscribed 1 and 2 are twinned to each other on *m* (110), as are those subscribed 3 and 4.

(For lettering and indices see Explanation of Plate lxxvi.).



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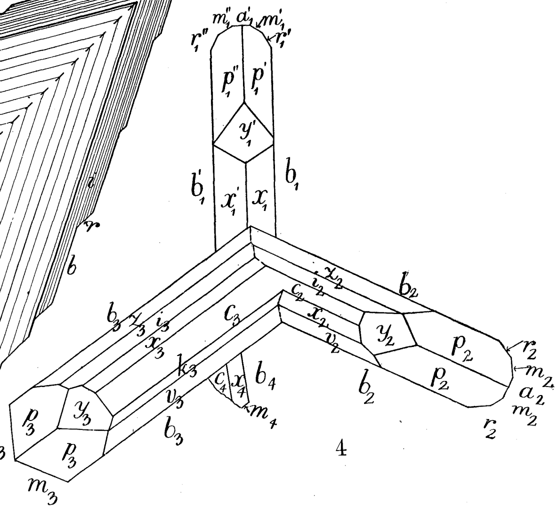

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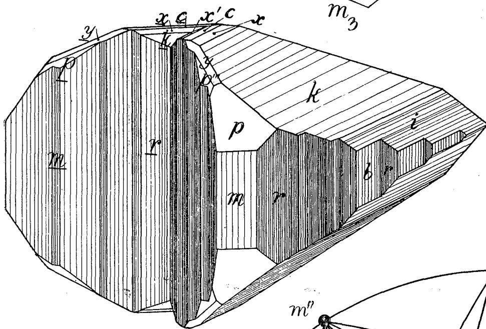

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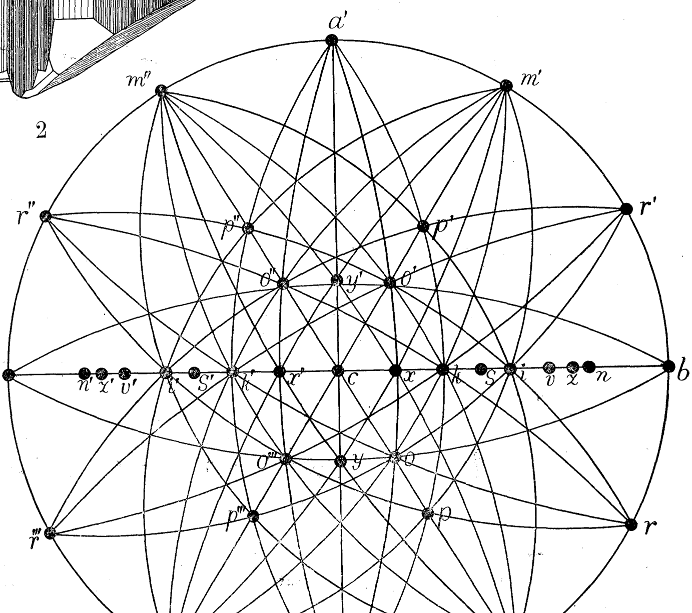

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EXPLANATION OF PLATE LXXVIII.

Fig. 1. Barite. Commonwealth Mine, Wellington, N. S. Wales.

Forms :—*c* (001), *m* (110), *η* (320), *o* (011), *d* (102), *u* (101), *f* (113), *z* (111), *y* (122).

Fig. 2. Monazite. The Gulf, N. S. Wales. Twin on *a* (100) projected on (010).

Forms :—*a* (100), *m* (110), *w* (101), *x* ($\bar{1}01$), *u* (021), *v* ($\bar{1}11$), *z* ($\bar{3}11$).

Fig. 3. Scheelite. Hillgrove, N. S. Wales.

Forms :—*e* (101), *p* (111), *s* (131).

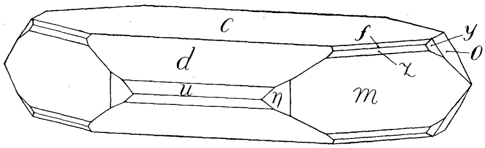
Fig. 4. Scheelite. Mount Ramsay, Tasmania.

Figs. 5, 6. Vesuvianite. Barraba, N. S. Wales. Orthographic and clinographic projections.

Forms :—*c* (001), *a* (100), *m* (110), *e* (101), *p* (111), *t* (331), *s* (311), *i* (312).

Fig. 7. Heulandite. Werris Creek, N. S. Wales.

Forms :—*b* (010), *m* (110), *x* (021), *t* (201), *s* ($\bar{2}01$), *u* ($\bar{1}11$).



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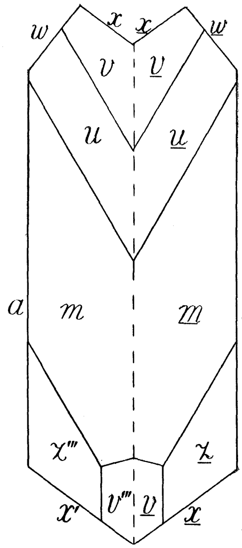

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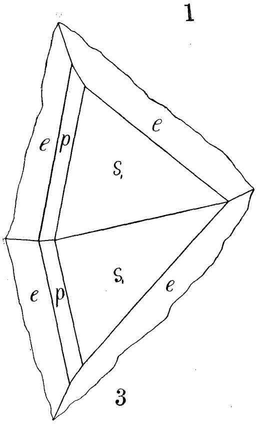

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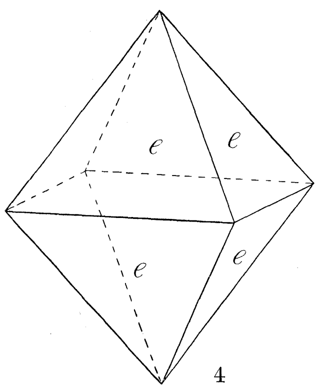

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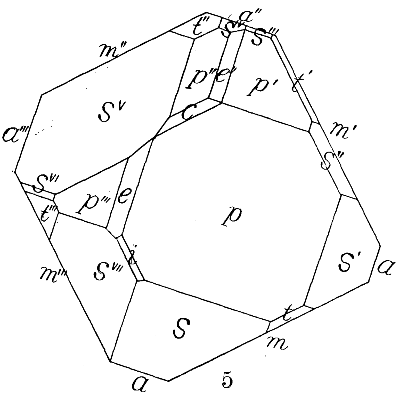

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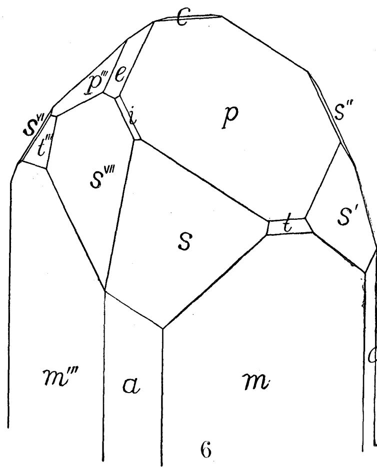

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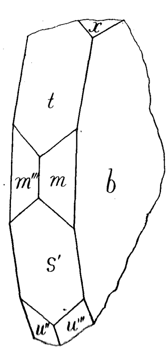

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EXPLANATION OF PLATE LXXIX.

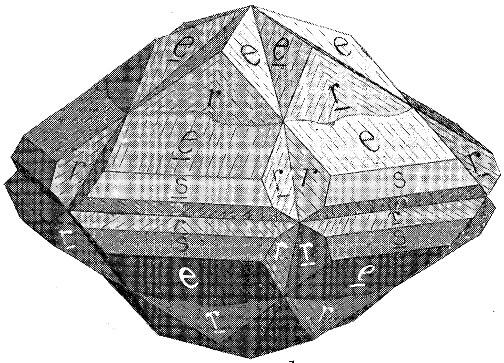
CHABAZITE.

Fig 1. Ben Lomond, N. S. Wales. Penetration twin on vertical axis.

,, 2. Ben Lomond. Apex of crystal in plan; both segments of the twin consist of three parts in parallel position.

,, 3. Middlesex, Tasmania. Penetration twin on vertical axis.

Forms:—*a* $(11\bar{2}0)$, *r* $(10\bar{1}1)$, *e* $(01\bar{1}2)$, *s* $(02\bar{2}1)$, *t* $(11\bar{2}3)$.



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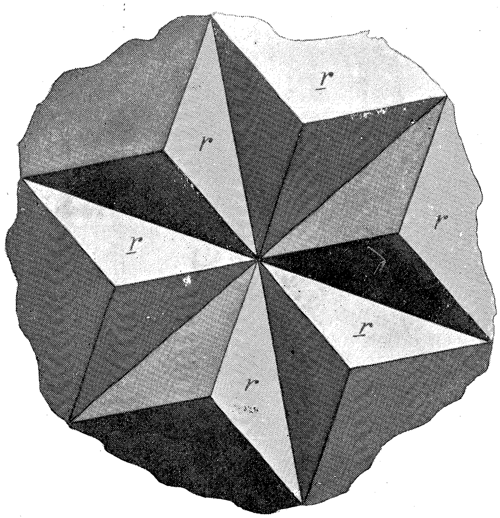

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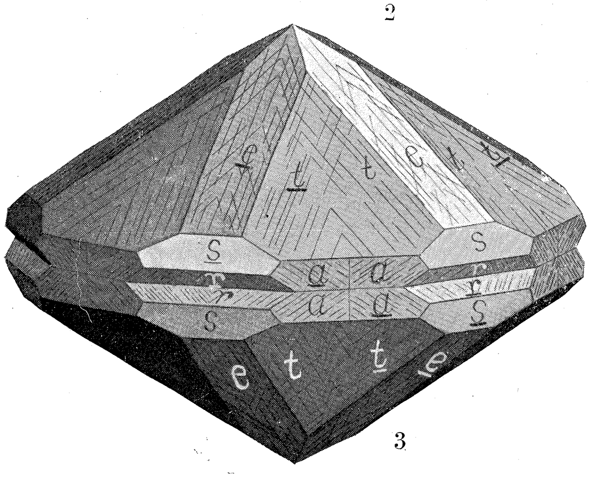

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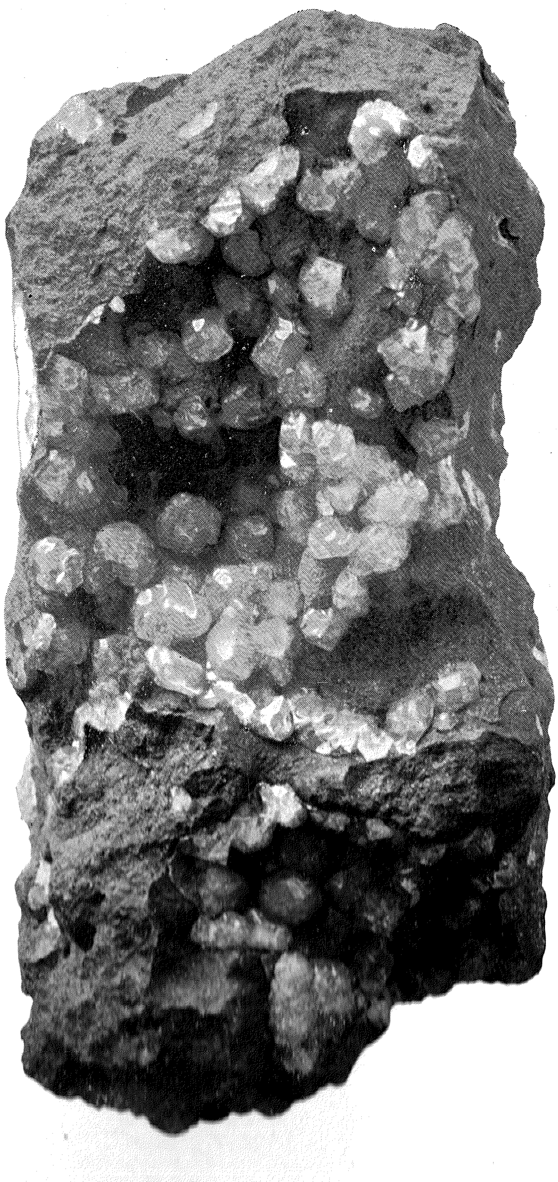
EXPLANATION OF PLATE LXXX.

CHABAZITE.

In basalt, Ben Lomond, N. S Wales.



H BARNES, Junr., photo.,
Austr. Mus.

CORRECTIONS.

Page 256, footnote—for "portion" read "position."

Plates xlii., xliii., xlv., at foot of plate—for "H. Barnes, Junr." read "T. Whitelegge."

Plate liii.—substitute the plate inserted in this part (5) for that previously issued (in part 4), on which the figure numbers were omitted.

Page 404, line 18—for "the faint line" read "a line."

CORRECTIONS.

Page 34, in description of text figure—for "*b*" read "*B*."

„ 83, line 7—for "and" read "with."

„ 92, line 16—for "anhrydrous" read "anhydrous."

„ 134, liue 14—for "orthogonal" read "orthographic."

„ 256, footnote—for "portion" read "position."

„ 367, line 18—for "off" read "of."

„ 390, line 21—for "born" read "borne."

„ 393, line 18—for "dessication" read "desiccation."

„ 404, line 18—for "the faint line" read "a faint line."

Plate xx. explanation line 7 add $\underline{o}$ (112).

„ xxvii.—read xxviia.

Plates xlii., xliii., xlv., at foot of plate—for "H. Barnes, Junr., read "T. Whitelegge."

Plate liii—substitute the plate inserted in part 5 for that previously issued in part 4, on which the figure numbers were omitted.

„ lxxii. explanation—for "Rosewell" read "Russell."

lxxii explanation—for "dessication" read "desiccation."