AUSTRALIA

〃

Topaz, Qtz, monazite

etc

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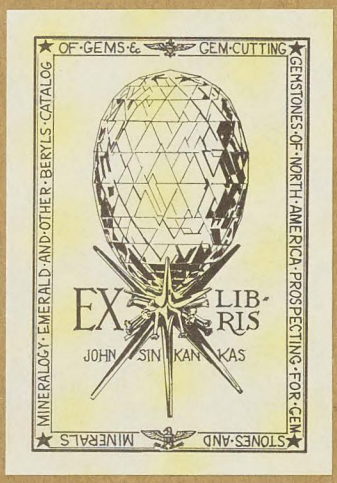
ANDERSON

JAPANESE TWINS!!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MINERALOGICAL NOTES: No. IX.—TOPAZ, QUARTZ, MONAZITE, AND OTHER AUSTRALIAN MINERALS.

By C. ANDERSON, M.A., D.Sc. (Edin.), Mineralogist.

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By C. Anderson, M.A., D.Sc. (Edin.), Mineralogist.

(Plates xxxvi.-xxxix.)

TOPAZ.

Cow Flat, near Torrington, New South Wales.

(Plate xxxvi., fig. 1.)

Three fine, isolated, colourless crystals, the largest measuring $1 \times 1{\cdot}4 \times 1{\cdot}6$ cm., have been recently added to the Museum collection; the exact locality is Meehan's Lease. The crystals, which have a pyramidal habit, are slightly waterworn, but the wo which were measured gave fairly good signals.

ANGLES.

Forms.		Measured.				Calculated. (Goldschmidt.)				Difference.	
		ϕ		ρ		ϕ		ρ		ϕ	ρ
		°	′	°	′	°	′	°	′	′	′
m	110	62	6	90	0	62	8	90	0	2	0
M	230	51	35	89	58	51	35	,,		0	2
l	120	43	26	90	0	43	25	,,		1	0
g	130	32	28	90	0	32	14	,,		14	0
O	560	57	42	—		57	37	,,		5	—
d	201	89	58	60	48	90	0	61	0	2	12
f	021	0	4	43	33	0	0	43	39	4	6
o	221	62	7	63	46	62	8	63	54	1	8
u	111	62	16	45	41	62	8	45	35	8	7

The prism faces are in general vertically striated; on *m* (110) are raised rectangular markings (*wachtums-figuren*), similar to those described on the topaz of Carpet Snake Creek[1]. Reflections were obtained from the sides of these markings, the average ϕ

[1] Anderson—Austr. Mus. Rec., vii., 1909, pl. lxxix., fig. 2.

angle being 64°28. On *g* (130) are striations with $\phi = 29°$, approximately. The form O (560) is represented by lines in *m* (110).

Tate River, Queensland.

(Plate xxxvi., figs. 2-5.)

For the loan of these and other Queensland topaz described in this paper I am indebted to Mr. B. Dunstan, Government Geologist of Queensland.

The topaz of the Tate River was shortly described by G. vom Rath[2]; he found the forms *m* (110), *l* (120), *f* (021), *y* (041), *d* (201), *o* (221), but did not figure the crystals. The specimens which I have examined are small, averaging ·4 × ·6 × ·7 cm; some are very well formed with smooth brilliant faces giving good reflections; the habit is either pyramidal (figs. 2, 3), or domal (fig. 4). The terminal faces are etched progressively from the apex downwards, the base when present being quite dull; this seems to be a constant feature of worn topaz crystals. The form *v* (121), present on one crystal, I have not previously encountered on the numerous Australian crystals which have passed through my hands.

Below are the average co-ordinate angles obtained from the three measured crystals.

Forms.		Measured				Calculated. (Goldschmidt.)				Difference.			
		ϕ		ρ		ϕ		ρ		ϕ		ρ	
		°	′	°	′	°	′	°	′	′		°	′
c	001	—		—		—		—		—		—	
m	110	62	9	90	0	62	8	90	0	1		0	
M	230	51	39	,,		51	35	,,		4		0	
l	120	43	26	,,		43	25	,,		1		0	
π	250	37	12	,,		37	7	,,		5		0	
g	130	32	12	89	59	32	14	,,		2		1	
d	201	—		60	57	90	0	61	0	—		3	
h	203	—		30	44	,,		31	2	—		18	
f	021	0	0	43	39	0	0	43	39	0		0	
y	041	0	0	62	20	,,		62	20	0		0	
o	221	62	9	63	53	62	8	63	54	1		1	
u	111	62	8	45	33	,,		45	35	0		2	
i	223	62	0	36	0	,,		34	14	8		1	46
v	121	43	46	52	48	43	25	52	42	21		6	

[2]Rath—Sitz. Niederrh. Ges. Bonn, xliv., 1887, p. 291.

STANTHORPE, QUEENSLAND.

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

The crystal shown in fig. 1 is from Spring Gully ; it measures ·4 × ·6 × 1· cm,, and is clear and colourless. The terminal planes are much corroded and towards the apex even channelled. On the faces of *f* (021) are elongated markings the blunt ends of which are directed towards the apex and the pointed ends towards *y* (041) ; *y* is striated parallel to its intersection with *f*.

MEASURED AND CALCULATED ANGLES

Forms.		Measured.				Calculated. (Goldschmidt.)				Difference.	
		ϕ		ρ		ϕ		ρ		ϕ	ρ
		°	′	°	′	°	′	°	′	′	′
b	010	0	1	89	57	0	0	90	0	1	3
m	110	62	8	90	1	62	8	,,		0	1
M	230	51	22	90	1	51	35	,,		13	1
l	120	43	21	90	2	43	25	,,		4	2
d	201	90	32	61	21	90	0	61	0	32	21
f	021	0	3	43	47	0	0	43	39	3	8
y	041	0	1	62	16	,,		62	20	1	4
o	221	62	13	64	10	62	8	63	54	5	16
u	111	62	14	45	58	,,		45	35	6	23

Fig. 2 represents a crystal of which the locality is given as Stanthorpe simply. It is light blue in colour, domal in habit, and measures 1·2 × 1·3 × 1·8 cm. It resembles somewhat the Stanthorpe crystal previously described in these Records[3] ; probably these larger crystals belong to an older generation than does the Spring Gully specimen described above. The rectangular markings on *m* (110) are very pronounced ; the faces of *c* (001) and *f* (021) are much etched as shown in the figure ; all the terminal planes are somewhat worn, and gave only approximately correct angles. The prism *n* (140) is doubtfully present as striations in *g* (130).

[3]Anderson—Rec. Austr. Mus., vii., 1908, p. 61, pl. xiii., figs. 3, 4.

MEAN ANGLES.

Forms.		Measured.				Calculated. (Goldschmidt.)				Difference.			
		ϕ		ρ		ϕ		ρ		ϕ		ρ	
		°	′	°	′	°	′	°	′	′		°	′
c	001	—		—		—		—		—		—	
b	010	0	39	90	2	0	0	90	0	39			2
m	110	62	7	90	0	62	8	,,		1			0
M	230	51	35	89	59	51	35	,,		0			1
l	120	43	23	90	0	43	25	,,		2			0
g	130	32	16	,,		32	14	,,		2			0
n	140	25	54	89	59	25	19	,,		35			1
d	201	90	0	61	0	90	0	61	0	0			0
h	203	—		32	25	,,		31	02	—		1	23
f	021	0	9	43	10	0	0	43	39	9			29
o	221	62	16	63	44	62	8	63	54	8			10
u	111	62	4	45	49	,,		45	35	4			14

Lancewood Tin Mines, Chillagoe, Queensland.

(Plate xxxvii., fig. 3.)

This is a bluish crystal of domal habit measuring 1·3 × 1·6 × 1·5 cm. It is simple with *f* (021), *m* (110) and *l* (120) largely developed; the faces of *b* (010), *M* (230), and *o* (221) are small. The prisms are strongly striated and *o* and *f* are much worn towards the apex.

TETRAHEDRITE.

Hercules Mine, Mt. Read, Tasmania.

(Plate xxxvii., fig. 4.)

A hand specimen from this mine carrying crystallised tetrahedrite was lent to me for description by the late Mr. W. F. Petterd, of Launceston. The tetrahedrite, in minute but beautifully formed and brilliant crystals, occurs with rhombohedral calcite and siderite in small vughs of the country rock, which con-

tains veins and patches of chalcopyrite. The mineral was examined chemically and found to be normal tetrahedrite, containing copper, antimony and sulphur ; no arsenic was detected but it may be present in slight amount as the quantity available for testing was very small.

Two crystals were measured ; they show the tetrahedral development, the forms present being *o* (111), o_1 ($\bar{1}11$), *d* (110), *n* (211), *r* (332). One line face of the cube was observed. The crystals are of almost ideal symmetry as represented in the figure.

GYPSUM.

Mount Elliott, Cloncurry, Queensland.

(Plate xxxvii., fig. 5.)

Since a short description of a crystal of selenite from this mine was published[4], additional specimens have been obtained from Mr. W. T. Watkin Brown. Particularly fine are the groups of large, interpenetrating crystals, in the interstices of which are small well formed crystals, suitable for goniometric investigation. The large crystals seem to be without exception twinned on *a* (100) and elongated parallel to the *c* axis, while the smaller crystals are untwinned and elongated along the *a* axis, by one end of which they are usually attached.

Mr. W. H. Corbould, general manager of the mine, has kindly furnished me with the following particulars of the mode of occurrence. "The country rock is slate. The ore body in places is over one hundred feet wide. . . At the 400 ft. level (No. IV.) the ore is primary sulphide and, judging by the way the ore makes at this level and the large vughs, it points to the copper being deposited through uprising waters. In all the vughs there is lime. . . Between the Nos. II. and III. levels the ore has been altered in places and even at the present time there is a large amount of chemical action going on, as is noticed by the heat generated. It is between the Nos. II. and III. levels that the selenite is found, not always in vughs but at times in large deposits—one face I saw was quite twenty feet long by fifteen feet high of nothing but crystals It was a great sight but I regret to say it was used as flux."

[4] Anderson—Rec. Austr. Mus., vii. 1909, p. 276.

Four crystals were measured; they are about ·5 × ·2 × ·2 cm. and colourless and transparent as glass. Twelve forms were identified, the indices and angles being tabulated below.

Forms.		Measured.				Calculated. (Goldschmidt.)				Difference.	
		ϕ		ρ		ϕ		ρ		ϕ	ρ
		°	′	°	′	°	′	°	′	′	′
a	100	89	59	89	59	90	0	90	0	1	1
b	010	0	0	90	0	0	0	,,		0	0
z	310	77	12	89	59	77	11	,,		1	1
a	210	71	11	90	0	71	11	,,		0	0
χ	320	65	32	90	1	65	35	,,		3	1
m	110	55	45	90	0	55	44	,,		1	0
δ	350	41	24	90	3	41	22	,,		2	3
h	120	36	14	90	0	36	17	,,		3	0
k	130	26	17	89	56	26	5	,,		12	4
l	111	61	34	41	0	61	36	41	0	2	0
n	$\bar{1}11$	47	14	31	18	47	22	31	23	8	5
	$\bar{3}13$	72	57	25	6	72	57	25	10	0	4

The crystals have the following combinations (iii is figured).

Crystal.	*a* 100	*b* 010	*z* 310	*a* 210	ψ 320	*m* 110	δ 350	*h* 120	*k* 130	*l* 111	*n* $\bar{1}11$	$\bar{3}13$
i.	—	×	—	—	—	×	×	×	×	×	×	—
ii.	—	×	—	—	—	×	—	×	—	×	×	?
iii.	×	×	×	×	×	×	—	×	—	×	×	×
iv.	×	×	×	×	—	×	×	×	—	×	×	—

The largest faces are usually those of *m* (110) and *l* (111); some of the prism faces are slightly striated vertically; *n* is striated parallel to its intersection with *b*. The form $\bar{3}13$, of which two faces giving good signals were observed, has been previously recorded by Artini[5] on the gypsum of Ballabio.

[5] Artini—Rend. R. Inst. Lomb., xxxvi., 1903, p. 1181 (*fide* Dana—2nd App., Syst. Min., 1909, p. 48.)

QUARTZ

Moonbi, New South Wales.

(Plate xxxvii., fig. 6.)

Mr. D. A. Porter informs me that this fine example of a quartz crystal twinned on the Japan law (twinning plane ξ $(11\bar{2}2)$) was found with several similar twins *in situ* at a depth of ten or fifteen feet about two and a half miles S.S.E. from Moonbi Railway Station. It has the usual flattened form of the Japan twin and the two segments are united in an irregular line; height 2 cm. For measurement each segment in turn was mounted in the conventional position to furnish the meridian and polar plane to which the poles of both segments were referred.

ANGLES.

Forms.		Measured.				Calculated.				Difference.	
		ϕ		ρ		ϕ		ϕ		ϕ	ρ
		°	′	°	′	°	′	°	′	′	′
m	$10\bar{1}0$	0	0	89	59	0	0	90	0	0	1
r	$10\bar{1}1$	0	0	51	49	0	0	51	47	0	2
z	$01\bar{1}1$										
s	$11\bar{2}1$	29	59	65	44	30	0	65	33	1	11
m	$10\bar{1}0$	9	15	30	24	9	23	30	27	8	3
$\bar{r}$	$10\bar{1}1$	5	34	42	40	5	29	42	36	5	4
$\bar{z}$	$01\bar{1}1$	21	55	86	39	21	35	86	38	20	1

Nundle, New South Wales.

(Plate xxxvii., fig. 7.)

This Japan twin differs somewhat from the preceding. One segment is much larger than the other and above the junction (as figured) the larger segment tapers rapidly, while below it is of less diameter; height 2·7 cm. The apex of the smaller segment can be traced within the other but not distinctly. The twin is very similar to that from Dauphiné, described by Goldschmidt[6].

[6]Goldschmidt—Zeits. Kryst., xliv., 1908, p. 415, pl. ix., figs. 2, 3.

HEFFERNAN'S LEASE, TORRINGTON, NEW SOUTH WALES.

(Plate xxxviii.)

Here we have a large Japan twin in a group of untwinned crystals of quartz. It has the characteristic flattened form. Towards the bottom of the figure can be seen the impression of a crystal of beryl with prismatic striations, beryl being associated with quartz at this mine[7].

WULFENITE.

JUNCTION MINE, BROKEN HILL, NEW SOUTH WALES.

Plate xxxix., figs. 1, 2.)

At this mine wulfenite occurs in small crystals, light red in colour, of about ·3 cm. in diameter. Two somewhat different habits are recognisable as shown in the figures. Forms present are :—*c* (001), *m* (110), *g* (310), *k* (210), *e* (101), *n* (111). The prisms are not well developed, *m* being very narrow while *k* and *q* are very much rounded. When both *n* and *e* are present *e* is the larger and is dull with drusy appearance ; *n* is bright and gives a good reflection. In every case there is apparently a horizontal plane of symmetry.

LEIGH CREEK, SOUTH AUSTRALIA.

At this locality small brown crystals of wulfenite are associated with galena. The crystals are very simple, *n* (111) being the only form present

MONAZITE.

KING'S BLUFF, OLARY, SOUTH AUSTRALIA.

(Plate xxxix., figs. 3-7.)

Monazite was found in October, 1906, in small veins and vughs in the quartzite at the King's Bluff gold mine[8]. It has also been obtained in the alluvial gold deposits of the same district. The Trustees recently acquired a collection of the crystallised monazite from Mr. Charles Bogenrieder, Mining Engineer. The crystals are about ·5 cm. in greatest diameter, and of a

[7] Anderson—Rec. Austr. Mus., vii., 1908, p. 62, 63.

[8] Brown—Record Mines S. Austr., 4th Edit., 1908, p. 362.

reddish brown colour. The faces are often wavy and imperfect, hence the signals are sometimes hazy and indistinct, and the readings obtained not good. Both simple and twinned crystals occur.

Four crystals were measured with results as tabulated below; the form λ (212) is new. The angles of *c* (001), *n* (120) and *t* ($\bar{2}12$) were obtained from single faces, of *s* (121) and λ from two faces. In addition to the seventeen forms enumerated there were observed on one crystal (No. I.) a single face each of what may be σ ($\bar{3}01$) previously observed on monazite from California Creek, Queensland[9] (ρ obs = $\overline{67}°20$, calc. $\overline{69}$ 43), and a new form ($\bar{3}02$) (ρ obs = 49°26, calc. $\overline{50}$ 55). The crystal is apparently untwinned, but the supposed new face ($\bar{3}02$), which consists of small patches giving a fairly good signal, may possibly belong to the form *w* (101) (ρ = 5 0°40) of a twinned portion.

FORMS AND ANGLES.

Forms.		Measured.				Calculated. (Goldschmidt.)				Difference.			
		ϕ		ρ		ϕ		ρ		ϕ		ρ	
		°	′	°	′	°	′	°	′	°	′	°	′
c	001	88	18	12	29	90	0	13	40	1	42	1	11
a	100	89	59	90	5	,,		90	0		1		5
b	010	0	3	90	8	0	0	,,			3		8
m	110	46	46	90	2	46	43	,,			3		2
n	120	26	28	—		27	58	,,		1	30	—	
w	101	89	52	50	37	90	0	50	48		8		11
x	$\bar{1}01$	$\overline{89}$	40	36	27	$\overline{90}$	0	36	29		20		2
e	011	14	39	43	35	14	43	43	44		4		9
r	111	53	2	56	35	52	57	56	56		5		21
s	121	34	17	67	18	33	31	65	45		46	1	33
f	112	57	53	40	42	57	47	40	58		6		16
*λ	212	70	32	52	15	69	20	52	40	1	12		25
v	$\bar{1}11$	$\overline{38}$	32	49	49	$\overline{38}$	37	49	50		5		1
t	$\bar{2}12$	$\overline{58}$	0	40	6	$\overline{57}$	58	41	6		2	1	0
o	$\bar{1}21$	$\overline{21}$	51	63	4	$\overline{21}$	46	63	21		5		17
i	$\bar{2}11$	$\overline{61}$	44	62	51	$\overline{61}$	45	62	55		1		4
z	$\bar{3}11$	$\overline{70}$	43	70	47	$\overline{71}$	6	70	43		23		4

[9] Anderson—Rec. Austr. Mus., vii., 1909, p.281, pl. lxxxi., fig. 5.

The four crystals exhibited the following combinations (i. figs. 3 4 ; iii. figs. 5, 6) :—

	c	*a*	*b*	*m*	*n*	*w*	*x*	*e*	*r*	*s*	*f*	λ	*v*	*t*	*o*	*i*	*z*
Cryst.	001	100	010	110	120	101	$\bar{1}01$	011	111	121	112	212	$\bar{1}\bar{1}1$	$\bar{2}\bar{1}2$	$\bar{1}\bar{2}1$	$\bar{2}\bar{1}1$	$\bar{3}\bar{1}1$
i.	—	×	×	×	—	×	×	×	×	×	—	—	×	—	×	×	×
ii.	—	×	—	×	—	×	—	×	—	—	—	—	×	—	—	×	×
iii.	—	×	×	×	×	×	×	×	×	—	×	×	×	×	×	×	×
iv.	×	×	—	×	—	×	×	×	×	×	—	—	×	—	×	×	×

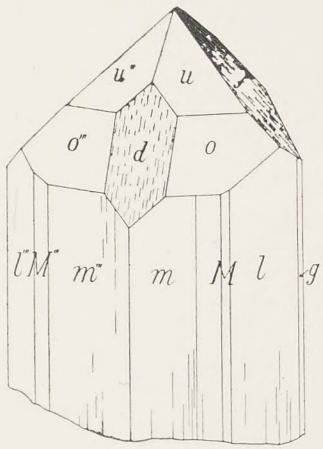
EXPLANATION OF PLATE XXXVI.

TOPAZ.

Fig. 1. Meehan's Lease, near Torrington, N. S. Wales.

Figs. 2-5. Tate River, Queensland.

Forms.—*c* (001), *m* (110), *M* (230), *l* (120), π (250), *g* (130), *d* (201), *h* (203), *f* (021), *y* (041), *o* (221), *u* (111), *i* (223), *v* (121).



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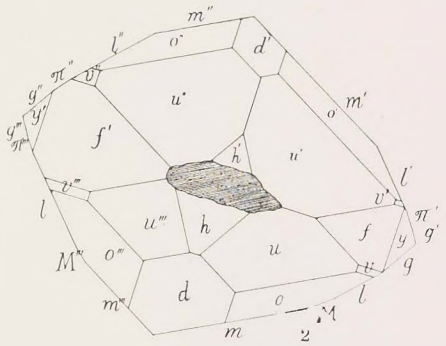

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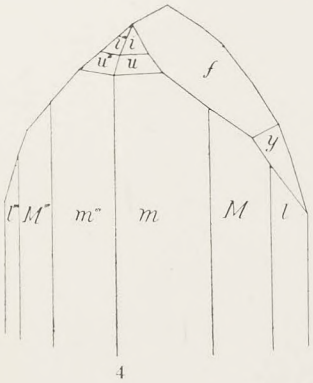

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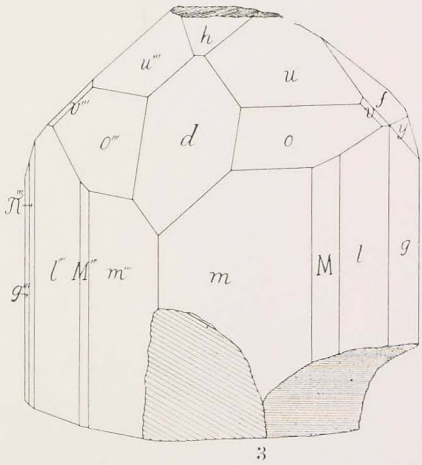

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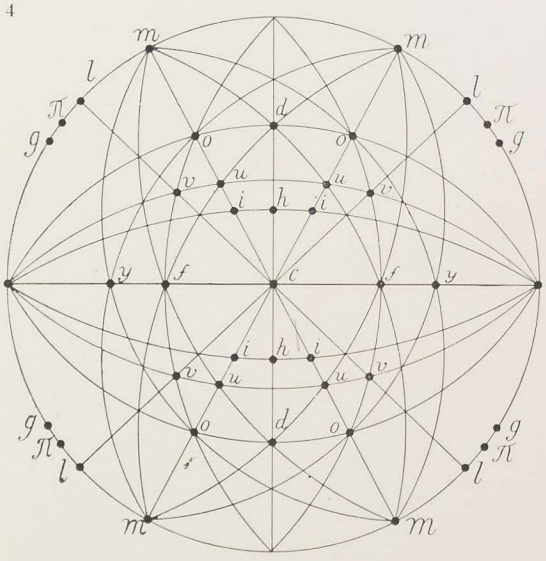

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C. ANDERSON and M. AUROUSSEAU, del.,
Austr. Mus.

EXPLANATION OF PLATE XXXVII.

Topaz.

Fig. 1. Spring Gully, Stanthorpe, Queensland.
,, 2. Stanthorpe, Queensland.
,, 3. Lancewood Tin Mines, Chillagoe, Queensland.

Forms.—c (001), b (010), m (110), M (230), l (120), g (130), n (140), d (201), h (203), f (021), o (221), u (111).

Tetrahedrite.

Fig. 4. Hercules Mine, Mt. Read, Tasmania.

Forms.—o (111), o_1 ($\bar{1}11$), d (110), n (211), r (332).

Gypsum.

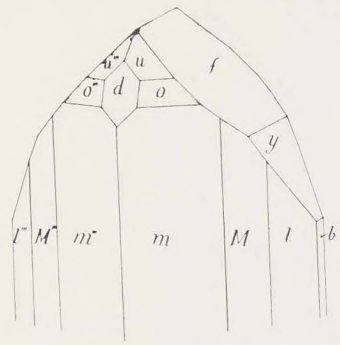
Fig. 5. Mt. Elliott, Cloncurry, Queensland.

Forms.—a (100), b (010), z ($3\bar{1}0$), a ($2\bar{1}0$), ψ ($3\bar{2}0$), m (110), δ ($3\bar{5}0$), h (120) k (130), l (111), n ($\bar{1}11$), ($\bar{3}13$).

Quartz.

Fig. 6. Moonbi, N. S. Wales ; twinned on ξ ($11\bar{2}2$) (Japan Law).
, 7. Nundle, N. S. Wales do. (do.)

Forms.—m ($10\bar{1}0$), r ($10\bar{1}1$), z ($01\bar{1}1$), s ($11\bar{2}1$).



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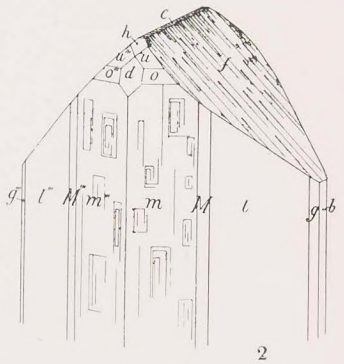

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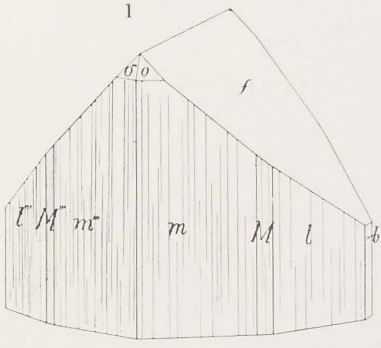

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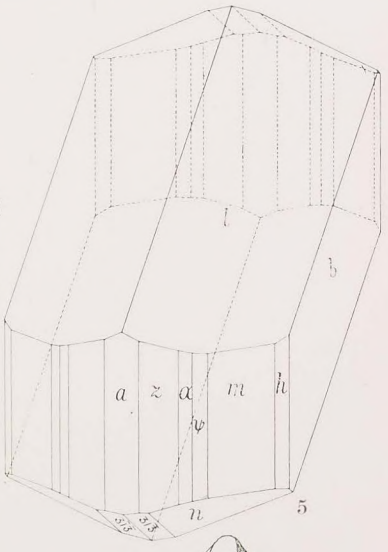

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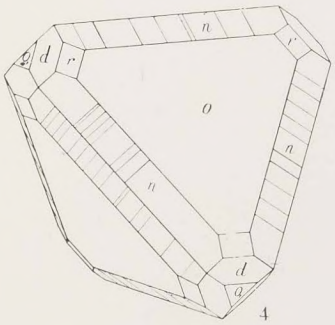

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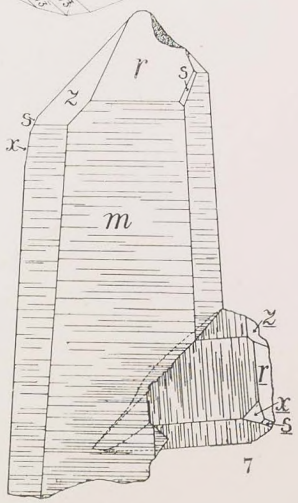
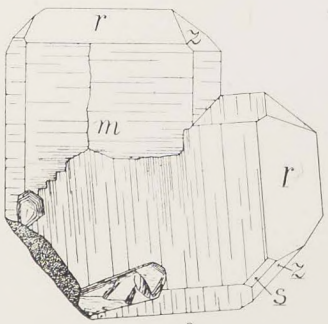


7



6

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EXPLANATION OF PLATE XXXVIII.

QUARTZ.

Heffernan's Lease, Torrington, N. S. Wales; twinned on ξ (11$\bar{2}$2) (Japan Law).

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EXPLANATION OF PLATE XXXIX.

Wulfenite.

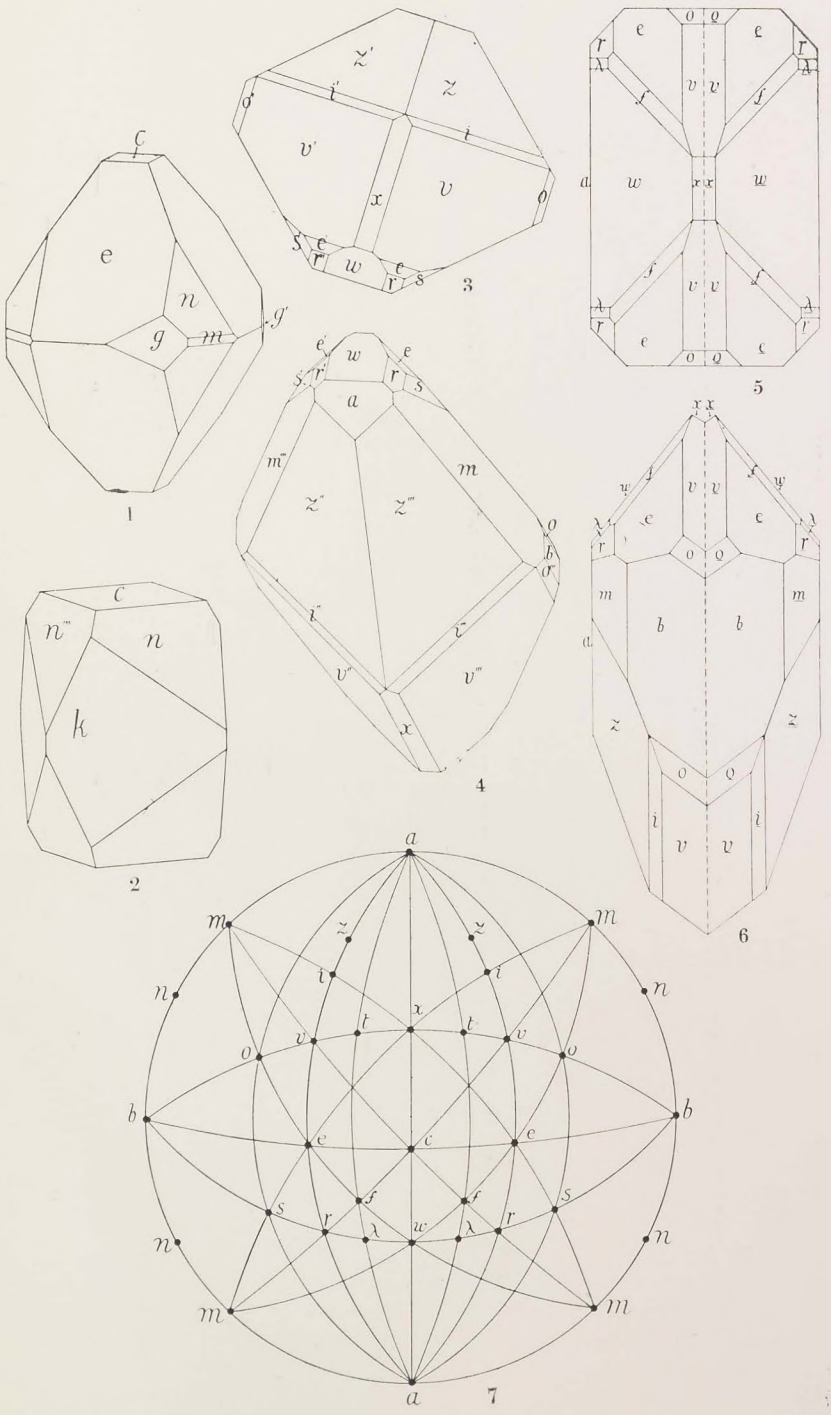
Figs. 1, 2. Junction Mine, Broken Hill, N. S. Wales.

Forms.—*c* (001), *m* (110), *g* (310), *k* (210), *e* (101), *n* (111).

Monazite.

Figs. 3-7. King's Bluff, Olary, S. Australia.

Forms.—*c* (001), *a* (100), *b* (010), *m* (110), *n* (120), *w* (101), *x* ($\bar{1}$01), *e* (0$\bar{1}$1), *r* (111), *s* (121), *f* (112), λ (212), *v* (111), *t* (2$\bar{1}$2), *o* (12$\bar{1}$), *i* (2$\bar{1}$1) *z* (3$\bar{1}$1).



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