(figs. 554, 556). Faces of P striated parallel to the polar edge, those of the prism horizontally (fig. 555). Cl. ∞P distinct. Gelatinizes

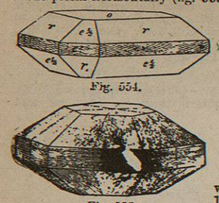

Fig. 554.

Fig. 555.

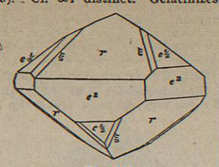

Fig. 556.

with h. acid. C.c.: 47·6 silica, 19·7 alumina, 12 soda, 20·7 water. Certain crystals seem to indicate twinning. Talisker in Skye (twins of fig. 555), Glenarm in Antrim (fig. 555), Vicenza, Pyrgo in Cyprus, Cape Blomidon in Nova Scotia.

610. Levyne, $\dot{A}lSi_2 + \dot{C}aSi + 5\dot{H}$.

Rhombohedral; R (*s*) 79° 29′; −½R (*r*) 106° 3′; 0R (*o*). Forms intersecting twins as in fig. 557. H. = 4; G. = 2·1 to 2·2. Colourless and white. C.c.: silica 43·8, alumina 23·8, lime 9·7, water 21. Storr in Skye (*o*, *s*), Ireland (at Glenarm, Island Magee, Londonderry, &c.), Iceland, Dalsnypen, and Naalsö in the Faroes.

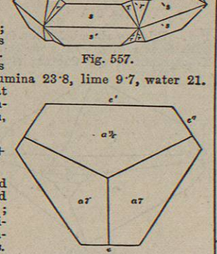

Fig. 557.

611. Herschelite, $\dot{A}lSi_3 + (\dot{C}a\dot{N}a)Si + 5\dot{H}$.

Hexagonal prisms (*e*) surmounted by two trihedral pyramids of a_7 and one of $a^{\frac{11}{7}}$ (fig. 558). $a_7 : e$ 122° 8′; $a^{\frac{11}{7}} : e$ 107° 26′; *e* striated horizontally. Cl. *e*; fracture conchoidal; transparent; vitreous. White or colourless. H. = 5·5; G. = 2·06. C.c.: silica 47, alumina 21·2, lime 5·2, soda 4·8, potash 2, water 17·86. Aci-Castello and Palagonia in Sicily, Yarra in Australia.

Fig. 558 (sp. 611).

612. Laumontite (*Leonhardite*), $\dot{A}lSi_3 + \dot{C}aSi + 4\dot{H}$.

Oblique prismatic, C 80° 42′. ∞P (*m*) 86° 16′. ∞P : −∞$\breve{P}$ (*s*) 113° 30′; P∞ (x_2) : −∞$\breve{P}$ 111° 14′; *s* : *a* 125° 41′; *a* : *b* 90°; *s* : *z* 149° 15′. Twin face *a*. Cl. *m*, perfect; very brittle. H. = 3 to 3·5; G. = 2·2 to 2·3. Pellucid when fresh; vitreous; pearly on cl. White, cream-coloured, brick-red. Decomposes rapidly through loss of water. B.B. intumesces, and melts first to a white enamel, ultimately to a clear glass. Gelatinizes in h. acid. C.c: silica 50·9, alumina 21·8, lime 11·9, water 16·3. Rapidly loses 1 equivalent or 3·86 per cent. of water, and becomes friable (*Hypostilbite*). Kilfinichen, Mull (fig. 559); Storr and Quiraing, Skye (hypostilbite); Tod Head, Snizort, Glen Farg (red); Bowling, Dumbarton (twins of *m*, *s*); Huelgoat in Brittany; Prague, Falun, Iceland, Faroes, Nova Scotia. *Caporcianite* from Tuscany has only 3 water.

Fig. 559.

613. Epistilbite (*Reissite*), $\dot{A}lSi_3 + \dot{C}aSi_3 + 5\dot{H}$.

Oblique prismatic, C 54° 53′. ∞P (*m*) 135° 10′; P∞ (*t*) 109° 46′; ½P (*s*) 147° 40′ (fig. 560). Hemitropes united by *m*, with twins of the same united by the brachydiagonal (*c*). Cl. brachydiagonal, perfect. H. = 3·5 to 4; G. = 2·3 to 2·4. Pellucid; vitreous; pearly on cl. Colourless. Sol. without gelatinizing. C.c.: silica 59, alumina 17·5, lime 9, soda 1·5, water 14·5. Talisker in Skye (*m*, *t*, *a*); Hartlepool (in twins), Iceland, Faroes, Nova Scotia, and New Jersey.

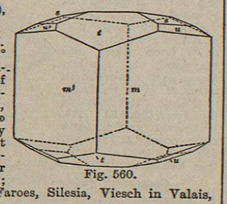

Fig. 560.

614. Heulandite, $\dot{A}lSi_3 + \dot{C}aSi_3 + 5\dot{H}$.

Oblique prismatic, C 63° 40′. P∞ (*p*) 50° 20′; 2P (*z*); ½P (*u*) ½2P∞ (*r*); 3P∞ (*s*); ∞P∞; ∞P∞ · 0P. *z* : *z* 136° 4′; *u* : *u* 146° 52′. Crystals elongated along each of the axes present very varying forms, but generally tabular. Cl. clinodiagonal, perfect; pearly on this, vitreous on others; brittle. H. = 3·5 to 4; G. = 2·1 to 2·2. Transparent to translucent; colourless, white, brick-red, rose, green, hair-brown. B.B. melts with exfoliation and intumescence to a white enamel. Sol. in h. acid, leaving silica. Storr and Talisker, Skye (fig. 562); Sanda; Kilmalcolm; Catterline, Kincardine (fig. 563); Kilpatrick Hills (*p*, *m*, *n*, *z*, *u*, *r*, *s*) and Kintyre (red); Iceland, Faroes, Fassa Valley, Nova Scotia, Baltimore (*Beaumontite*) (fig. 565) (*p*, *m*, *n*, *z*, *l*); Vindhya Mountains in India (fig. 564).

Fig. 561.

Fig. 562.

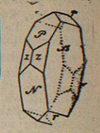

Fig. 563.

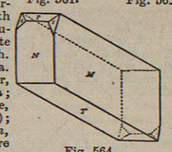

Fig. 564.

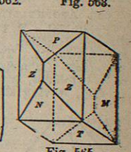

Fig. 565.

615. Brewsterite, $\dot{A}lSi_3 + \dot{R}Si_3 + 5\dot{H}$. $\dot{R} = (\frac{1}{2}Sr + \frac{1}{2}Ba + \frac{1}{2}Ca)$.

Oblique prismatic, C 86° 56′. ∞P∞ (*a*); ∞P∞ (*b*); 0P (*c*); *n*P∞ (*e*); ∞P (*m*); ∞P2 (*c*); ∞P$\frac{3}{2}$ (*t*). *e* : *e* 173° 10′ (fig. 566). Cl. clinodiagonal, perfect; pearly on do., vitreous on others; pellucid. H. = 5 to 5·5; G. = 2·5 to 2·45. Colourless, yellow, or brown. Sol. with gelatinization in h. acid. C.c.: 54·3 silica, 15 alumina, 9 strontia, 6·6 baryta, 1·3 lime, 13·5 water. Strontian, Freiburg in the Breisgau, Pyrenees.

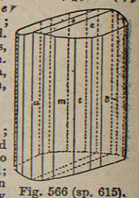

Fig. 566 (sp. 615).

616. Phillipsite, $\dot{A}lSi_3 + (\dot{C}a, \dot{K})Si + 5\dot{H}$.

Oblique prismatic, C 55° 1′. ∞P (*m*); ∞P∞ (*b*); 0P (*c*). Polar edges 120° 42′ and 119° 18′. Faces *b* and *m* striated parallel to the intersections. Apparently always twinned; generally these duplicated by intersection on face *b* or face *c* (figs. 567, 568), and frequently twins intersect at right angles to one another, forming the cruciform fig. 569. arranged so that three of the above double

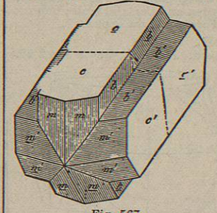

Fig. 567.

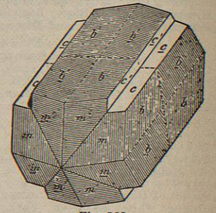

Fig. 568.

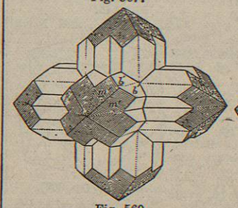

Fig. 569.

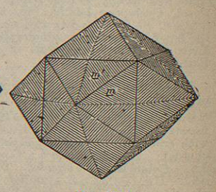

Fig. 570.

When the prismatic faces of these are short, the faces *m* of the

intersecting individuals fall nearly into one plane, presenting the form fig. 570; when long, fig. 190. Brittle; fracture uneven. H. = 4·5; G. = 2·15 to 2·2. Gelatinizes in h. acid. C.c.: silica 48·6, alumina 20·2, lime 7·3, potash 6·2, water 17·7. Giant's Causeway, Giessen, Marburg, Cassel, Capo di Bove, Vesuvius, Iceland.

617. Harmotome, $\dot{A}lSi_3 + \dot{B}aSi_3 + 5\dot{H}$.

Oblique prismatic, C 55° 10′. ∞P (*s*); ∞P∞ (*b*); 0P (*u*). Forms like phillipsite, but more frequently in simple twins. Physical properties like phillipsite, but G. = 2·3 to 2·5, and fuses

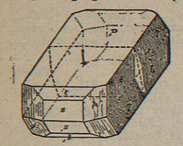

Fig. 571.

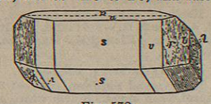

Fig. 572.

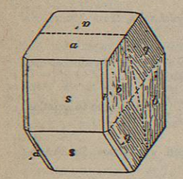

Fig. 573.

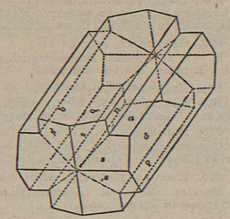

Fig. 574.

with difficulty. Difficultly sol. in h. acid. C.c.: 46·5 silica, 15·9 alumina, 23·7 baryta, and 13·9 water. Strontian, transparent (*Morvenite*, fig. 572) and opaque (figs. 571, 573); Glen Arbuck (fig. 574) and Bowling in Dumbarton; Corstorphine near Edinburgh; Andreasberg, Kongsberg, Oberstein.

618. Stilbite, $\dot{A}lSi_3 + \dot{C}aSi_3 + 6\dot{H}$.

Oblique prismatic, but with right prismatic habit; C 50° 49′. ∞$\breve{P}$∞ (*a*); ∞P∞ (*b*); P (*r*); ∞P2 (*m*); 0P (*p*). Cl. *a*, perfect. H. = 3·5 to 4; G. = 2·1 to 2·2. Transparent; vitreous. Pearly on *a*. Colourless, white, yellow, pale brown, brick-red. Decomposed by h. acid, leaving silica. C.c.: silica 57·5, alumina 16·4, lime 8·9 water 17·2. Storr and Talisker in Skye (*a*, *b*, p_2 (fig. 575), and in Hebrides (colourless); Arran and Kilmalcolm (pale brown); Long Craig (Dumbarton) and Kinneff (Kincardine) (brick-red); Iceland, Faroes, Andreasberg, Vindhya Mountains, Wellington Mountains (Australia), Nova Scotia.

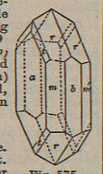

Fig. 575 (sp. 618).

619. Pufflerite, $\dot{A}lSi_3 + \dot{C}a_2Si_3 + 5\dot{H}$.

Fibrous globular concretions, with vitreous surface. H. = 4; G. = 2·21. Greyish white. Transparent. C.c.: silica 52·8, alumina 16·3, lime 11·2, water 17·2. Pufflatsch in the Seisser Alp.

620. Edingtonite, $4\dot{A}lSi_3 + 3\dot{B}aSi + 12\dot{H}$.

Pyramidal; hemihedral with inclined faces. P 87° 19′; ½P (*n*) 129° 8′; ∞P (*a*); polar edges P 92° 51′ (fig. 576). Cl. *a*, perfect; fracture uneven. H. = 4 to 4·5; G. = 2·7 to 2·71. Translucent; vitreous. Colourless. C.c.: silica 37·3, alumina 23·75, baryta 26·52, water 12·46. Kilpatrick Hills in Dumbartonshire.

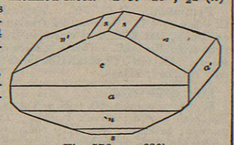

Fig. 576 (sp. 620).

621. Foresite, $2\dot{A}lSi_2$ $\dot{R}(\dot{N}a_2, \dot{C}a_3)Si_2 + 6\dot{H}$.

Right prismatic. ∞P∞; ∞P∞; 0P. Cl. brachydiagonal, perfect; lustre thereon pearly. G. = 2·4. White. C.c.: silica 50, alumina 27·4, lime 5·5, soda 1·4, water 15·1. San Piero in Elba.

622. Natrolite, $\dot{A}lSi_2 + \dot{N}aSi + 2\dot{H}$.

Right prismatic. ∞P (*m*) 91°; P (*o*); polar edges 143° 20′ and 144° 40′, middle edge 53° 20′; ∞P∞ (*b*); ∞P∞ (*a*). Radiating acicular crystals, often fibrous. Cl. ∞P, perfect. H. = 5 to 5·5; G. = 2·17 to 2·26. Pellucid; vitreous. Colourless, ochre-yellow, reddish. Is not pyro-electric. B.B. melts quietly to a clear glass, colouring flame yellow. Sol. in oxalic acid. C.c.: 47·2 silica,

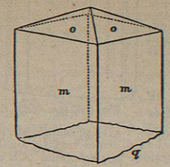

Fig. 577.

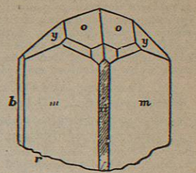

Fig. 578.

27 alumina, 16·3 soda, 9·4 water. Glen Farg (fig. 577), (colourless and reddish), Tantallon Castle (fig. 578), Dumbarton, Bowling (green), Campsie, Biahopton, Glenarm and Port Rush (Ireland), Auvergne, Hesse, Hohentwiel in Swabia, Norway. *Crocalite* is red, fibrous, and investing; Kintyre, Forfarshire, Wemyss Bay, and the Urals.

623. Scolecite, $\dot{A}lSi_2 + \dot{C}aSi + 3\dot{H}$.

Oblique prismatic, C 89° 6′. ∞P (*m*) 91° 35′; P (*o*) 144° 20′; −P. Prismatic and acicular crystals. Twins common, on face ∞P∞, one face with feathered striæ. Cl. ∞P, perfect. H. = 5 to 5·5; G. = 2·2 to 2·3. Pellucid; vitreous; pyro-electric. White to reddish white. B.B. twists in a vermicular manner; melting readily to a porous glass. Only partially sol. in oxalic acid. C.c.: silica 45·8, alumina 26·2, lime 14·3, water 13·7. Staffa; Loch Screden, Mull; Talisker, Skye; Berufiord, Iceland (fig. 579); Faroes; Vindhyas, India. Natrolite and scolecite pass into one another. There are two definite intermediates—*Fargite*, consisting of two equivalents of natrolite and one of scolecite, and *Mesolite*, consisting of one of the former and two of the latter. The first of these occurs at Glen Farg and at Bishopton (*Galactite*); the second is the ordinary radiated zeolite of the amygdaloids of the Tertiary igneous rocks of the Hebrides and the Faroes. It there occurs in matted crystals of extreme tenuity (*Cottonstone*), also in delicate feathery tufts; in Renfrewshire in spheres with an internally radiated structure, and also in needle form and in downy tufts.

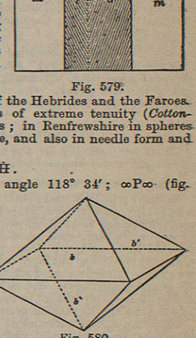

Fig. 579.

624. Gismondine, $\dot{A}lSi + \dot{C}aSi + 4\dot{H}$.

Pyramidal. P (*b*) 92° 30′; polar angle 118° 34′; ∞P∞ (fig. 580). Cl. P. H. = 5, on edges and angles 5 to 6; G. = 2·26. Translucent; vitreous. Bluish white to pale red. C.c.: silica 35·9, alumina 27·3, lime 13·1, potash 2·8, water 21·1. Island Magee and Larne, Ireland; Vesuvius, Aci-Castello, and Capo di Bove; Schiffenberg near Giessen; Schlauroth near Görlitz.

Fig. 580.

625. Zeagonite, $\dot{A}lSi + (\dot{C}a\dot{K})Si + 4\dot{H}$.

Right prismatic. P polar angle 120° 37′ and 121° 44′; middle angle 89° 13′. Crystals like fig. 419. H. = 5, on edges and angles 7; G. = 2·2. Transparent; vitreous. Colourless, white, or bluish. C.c.: silica 44, alumina 23·3, lime 5·3, potash 11·1, water 15·3. Capo di Bove.

626. Thomsonite, $2\dot{A}lSi + 2(\dot{C}a\dot{N}a)Si + 5\dot{H}$.

Right prismatic. ∞P (*m*) 90° 26′; ∞P∞ (*a*); ∞$\breve{P}$∞ (*b*); ½$\breve{P}$∞ (*y*); P∞ (*r*); −½$\breve{P}$∞ (*x*). *x* : *x* 177° 24′ 20″. Cl. macrodiagonal and brachydiagonal, both perfect. H. = 5 to 5·5; G. = 2·35 to 2·38. Translucent; vitreous; pearly on macrodiagonal. Colourless. B.B. difficultly fusible with intumescence to a white enamel. Sol. with gelatinization in h. acid. C.c.: silica 38·7, alumina 30·8, lime 13·4, soda 4·4, water 13·1. Lochwinnoch, Renfrew; Kilpatrick (fig. 581); Quiraing and Talisker (sometimes

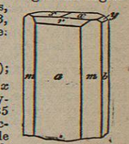

Fig. 581 (sp. 626).

massive-granular); Rathlin and Magee Island, Ireland; Faroes, Vesuvius (fig. 581), Sicily, Bohemia, Tyrol, Nova Scotia.

Faroelite is a variety with 42·5 of silica. It replaces thomsonite generally in Tertiary igneous rocks, occurring at Storr and elsewhere in the Hebrides, Faroes, Iceland, and Nova Scotia. The angle of the vertical prism is within 5′ of that of thomsonite. It contains an equivalent more silica.

627. Prehnite, $\dot{A}l\ddot{S}i + 2\dot{C}a\ddot{S}i + \dot{H}$.

Right prismatic. ∞P (*m*) 99° 58′; 0P (*c*); $3\breve{P}\infty$ (*e*) 33° 26′; $\frac{1}{2}P\infty$ (*v*) 90° 32′; $\infty\breve{P}\infty$ (*a*); $\infty P\infty$ (*b*); P (*s*). Crystals either tabular of *c*, or prismatic along both the vertical and the brachydiagonal axes, hence varying much in form. Also in fan-shaped and botryoidal aggregations. Cl. *c*, perfect; pearly thereon, vitreous elsewhere. H. = 6 to 7; G. = 2·8 to 3. Transparent to translucent. Colourless, but generally green of bright but pale tints, also lemon-yellow. Becomes electrically polar by heat. B.B. intumesces greatly, melting to a porous enamel. Decomposed by h. acid. C.c.: silica 43·6, alumina 24·9, lime 27·1, water 4·4. Glen Gairn, Aberdeen (fig. 583); Skye and Mull; Corstorphine Hill (green and pink), Castle Rock (white), and Salisbury Crags (yellow), Edinburgh; Frisky Hall, Dumbartonshire (fig. 584); Hartfield Moss, Renfrew (botryoidal); Cornwall; Dauphiné; Tyrol: Cape of Good Hope; China (*Yu*).

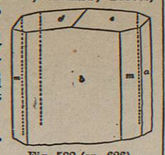
Fig. 582 (sp. 626).

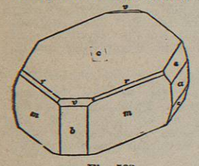
Fig. 583.

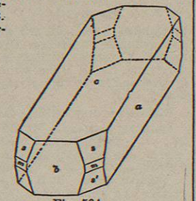
Fig. 584.

628. Friedelite, $\dot{M}n_5\ddot{S}i_3 + 2\dot{H}$.

Rhombohedral; R 123° 42′. 0R; ∞R. Tabular habit, and in granular aggregates. Cl. basal, perfect. H. = 4 to 5; G. = 3·1. Rose-red, with paler streak. C.c.: silica 36, protoxide of manganese 53, lime 2·96, water 7·9. Adervielle on the Neste de Louron (Pyrenees).

Hydrous Silicates of Alumina.

These are probably for the most part products of decomposition of felspars under atmospheric exposure.

629. Kaolin (*Porcelain Earth*), $\dot{A}l\ddot{S}i_2 + 2\dot{H}$.

Massive; in beds and veins. Fracture uneven; fine earthy, very soft, sectile, and friable. H. = 1; G. = 2·2. Opaque, dull. White or grey, inclining to blue, green, yellow, or red. Feels meagre, not greasy when dry, and plastic when wet. B.B. infusible. Not affected by h. acid, but decomposed by warm a. acid, leaving silica. C.c. very variable, but approximates to 46 silica, 40 alumina, and 14 water. Chiefly a product of the decomposition of orthoclase, or of granite, porphyry, and other rocks containing that mineral. Cornwall and Devonshire in England are the chief European localities for the kaolin used in manufacturing porcelain.

Clays are merely varieties of kaolin, mixed with quartz-sand, carbonate of lime, magnesia, and the oxyhydrates of iron. Often 40 to 50 silica, 30 alumina, 13 to 20 water, and 4 iron peroxide, with lime and potash. In the fire they are infusible, burning hard. Generally they are compact and friable, of white, yellow, red, blue, grey, or brown colours. Their specific gravity varies from 1·8 to 2·7. The following are varieties. *Pipe-clay*, greyish or yellowish white, with a greasy feel, adheres strongly to the tongue, when wet is very plastic and tenacious, and in the fire burns white. Abundant in Devonshire, and in the Trough of Poole in Dorsetshire; in France, Belgium, and Germany. Used for manufacturing tobacco-pipes and similar articles. *Potter's Clay*, red, yellow, green, or blue, becoming yellow or red when burnt; more easily fused than the former, and often effervesces with acids. That used in the potteries in England comes chiefly from Devonshire. *Loam*, coarser and more impure, with more sand, and consequently less plastic. *Shale* or *Slate Clay*, greyish black, and much mixed with bituminous or carbonaceous matter. *Bituminous Shale*, known by its shining resinous streak. *Black Chalk*, with more carbon, leaves a black mark on paper. *Iron Clay* contains much peroxide of iron, is reddish-brown, and forms the basis of many amygdaloids and porphyries.

630. Nacrite, $\dot{A}l\ddot{S}i_2 + 2\dot{H}$.

Right prismatic; minute six-sided tables in fan-like group; and scaly. H. = 0·5 to 1; G. = 2·35 to 2·6. Glimmering to pearly, snow-white or yellowish white. C.c.: silica 46·3, alumina 39·8, water 13·9. A crystalline form of kaolin. Fins in Allier, Mons, Freiberg, Pennsylvania, and coal formation commonly.

631. Lithomarge.

Kaolinic substances, compact, earthy, and pseudomorphous. H. = 2·5 to 3; G. = 2·4 to 2·6. White, yellow, or red. Greasy, adheres to tongue. Klausthal, Harz, &c. Similar are *Carnat*, *Myelin*, *Melopsite*.

632. Halloysite, $\dot{A}l\ddot{S}i + 4\dot{H}$.

Massive and reniform. H. = 1·5 to 2·5; G. = 1·9 to 2·1. Translucent when moist. Bluish white, green, or yellow. C.c.: 41·5 silica, 34·4 alumina, 24·1 water. Hospital Quarry near Elgin, on the Tweed, Liége, Tarnowitz, Eifel (*Lenzinite*). *Fuller's Earth* may be an impure ferruginous variety. Maxton in Scotland, Reigate and Maidstone in England, Saxony, Bohemia, &c.

633. Glagerite, $\dot{A}l_2\ddot{S}i_2 + 6\dot{H}$.

H. = 1; G. = 2·35. Bergnersreuth. *Malthazite*, from Steindörfel near Bautzen, has less alumina.

634. Kollyrite, $\dot{A}l_2\ddot{S}i + 9\dot{H}$.

H. = 1 to 2; G. = 2. Also similar. Schemnitz, Pyrenees, and Saxony. *Scarbroite* from Scarborough has $10H_2O$.

635. Miloschin.

Conchoidal or earthy. H. = 2; G. = 2·1. Indigo-blue to celadon-green; has 2 to 4 chrome oxide. Rudnik in Servia.

636. Montmorillonite, $\dot{A}l_2\ddot{S}i_2 + 2\dot{H}$.

Massive. Rose-red. Montmorillon and elsewhere in France, Poduruoj in Transylvania.

637. Razoumoffskin, $\dot{A}l\ddot{S}i_2 + 3\dot{H}$.

From Carinthia. *Chrome Ochre*, with 2 to 10 per cent. of chrome oxide, from Waldenburg in Silesia and Creusot in France, is similar.

638. Cimolite, $\dot{A}l_2\ddot{S}i_3 + 6\dot{H}$.

Pseudomorphous after augite. Bilin, Limburg, Kaiserstuhl, Argentiera and Milo.

639. Allophane, $\dot{A}l\ddot{S}i + 5\dot{H}$.

Botryoidal and reniform. Fracture conchoidal; brittle. H. = 3, G. = 1·8 to 2. Pellucid; vitreous. Pale blue, white, green, or brown. Colour due to copper. Charlton, Woolwich, Baden, and Bonn.

640. Pyrophyllite, $\dot{A}l\ddot{S}i_4 + \dot{H}$.

Right prismatic, but radiated, foliated. Cl. perfect; flexible, sectile. H. = 1; G. = 2·8 to 2·9. Translucent, pearly. Light verdigris-green to yellowish white. B.B. swells up with many twistings to a white infusible mass. C.c.: 67 silica, 28 alumina, and 5 water. Urals, Spa, Morbihan, Westana in Sweden, Carolina, and Brazil. *Talcosite*, from Heathcote in Victoria, has silica and alumina about equal.

641. Anauxite, $\dot{A}l\ddot{S}i_4 + 3\dot{H}$.

Granular. H. = 2 to 3; G. = 2·2 to 2·4. Translucent, pearly Greenish white. C.c.: 60·5 silica, 26 alumina, and 13·5 water. Bilin in Bohemia.

Hydrous Silicates of Zirconia, Thoria, &c.

642. Malacone, $3\dot{Z}r\ddot{S}i + \dot{H}$.

Pyramidal. P 83° 30′. Typical form ∞P∞, P, ∞P. H. = 6, G. = 3·9 to 4·1. Conchoidal fracture. Lustre vitreous. C.c. same as zircon, but with 3 of water in the Hitterö variety and over 9 in that from Finland. Has a surface opalescence, and may be altered zircon. Hitterö, Chantelonbe (near Limoges), near Dresden, Rosendal, Finland, Miask.

643. Eucrasite.

Right prismatic (?). H. = 4·5 to 5; G. = 4·39. Lustre greasy. Blackish brown; streak brown. Translucent on edges. Fracture uneven; brittle. C.c. very complex: silica 16, thoria 36, cerium protoxide 5·5, peroxide 6, lanthania 2·4, yttria 4·3, erbia 1·6, titanic acid 1·3, ferric oxide 4·25, alumina 1·8, water 9 Barkevig near Brevig.

644. Thorite, $\dot{T}h\ddot{S}i + 2\dot{H}$.

Pyramidal. ∞P : P 133° 30′. Generally massive. H. = 4·5 5. G. = 5 to 5·4. Lustre brilliant vitreous; when weathered resinous. Fracture conchoidal when fresh, splintery when weathered. Brownish black to clove-brown. C.c. complex, but essentially 18 silica, 73 thoria, 9 water. In syenite at Lochan Hacon, and in a boulder on Ben Bhreck in Sutherland, in crystals (fig. 585); Löwö near Brevig, Norway. *Uranothorite*, from Arendal, has 50 per cent. thoria and 10 uranous oxide; found also at Hitterö and at Champlain (U. S.)

645. Orangite, $3\dot{T}h\ddot{S}i + 2\dot{H}$.

Massive. Orange-yellow to cinnamon-red. Other characters like thorite. C.c.: 17 silica, 75 thoria, 7 water. Ben Bhreck, Langesund near Brevig. The mineral from Ben Bhreck passes gradually into thorite, which thus would appear to be altered orangite.

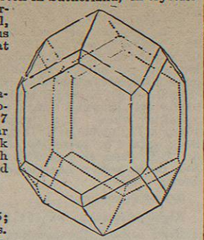
Fig. 585 (sp. 644).

646. Tritomite, $\dot{\ddot{E}}_2\ddot{S}i_3 + 4\dot{H}$.

Cubic. In tetrahedra. H. = 5·5; G. = 3·9 to 4·66. Lustre vitreous. Dull brown; streak yellowish grey. Subtranslucent. C.c. complex: silica 21, alumina 2·5, ceria 40, lanthania 15, yttria 4·6, lime 4, water 8. Lamö near Brevig.

Magnesian Silicates.

647. Agalmatolite (*Figure Stone*), $4\dot{A}l\ddot{S}i_2 + \dot{K}\ddot{S}i_3 + 3\dot{H}$.

Massive or slaty. Fracture splintery, rather sectile. H. = 2 to 3; G. = 2·8 to 2·9. Translucent; glimmering. Green, grey, red, and yellow. Feels somewhat greasy, but does not adhere to the tongue. Sol. in s. acid. C.c.: 55 silica, 33 alumina, 7·6 potash, and 5 water; but in many localities magnesian. Calligaig in Sutherland; China, where it is cut into various works of art; also Nagyag in Hungary, and Saxony.

648. Oncosin, $2\dot{A}l\ddot{S}i_2 + (\dot{K},\dot{M}g)\ddot{S}i_2 + 2\dot{H}$.

Fracture uneven or splintery; sectile. H. = 2; G. = 2·8. Translucent; slightly resinous. Apple-green or brown. Sol. in s. not in h. acid. Salzburg.

649. Liebenerite.

Hexagonal. ∞P; 0P. Cl. prismatic, perfect; fracture hackly. H. = 3·5; G. = 2·8. Oil-green, bluish green, and greenish grey. Greasy lustre. C.c.: silica 44·7, alumina 36·5, potash 9·9, water 5·5. Monte Viesena near Forno, Predazzo in Tyrol.

650. Giesekite.

Hexagonal. ∞P; 0P. Fracture splintery. H. = 3 to 3·5; G. = 2·7 to 2·9. Kangerdluarsuk in Greenland, Diana in New York.

651. Killinite, $2\dot{A}l\ddot{S}i_2 + \dot{R}\ddot{S}i_2 + 3\dot{H}$.

Crystalline, foliated. Cl. along a prism of 135° 44′. G. = 2·65. Greenish grey, yellow, or brownish green. C.c.: 48 silica, 31 alumina, 2·3 protoxide of iron, 6·5 potash, 10 water. Killiney near Dublin.

652. Hygrophilite.

Scaly. H. = 2 to 2·5; G. = 2·7. Greenish grey. Lustre and feel greasy. C.c.: silica 48·4, alumina 32·1, protoxide of iron 3·3, potash 5·7, water 9. Sol in h. acid. Halle on the Saale.

653. Bravaisite, $\dot{R}_2\ddot{S}i_2 + 2\dot{A}l\ddot{S}i_2 + 4\dot{H}$.

Aggregates of thin plates. H. = 1 to 2; G. = 2·6. C.c.: silica 51·4, alumina 18·9, peroxide of iron 4, magnesia 3·3, potash 6·5, water 13·3. Noyant in Allier.

654. Pinitoid.

Massive. Leek- and oil-green. H. = 2·5; G. = 2·8. C.c.: silica 48·5, alumina 28, protoxide of iron 8, potash 5·8, water 4·5. Freiberg and Chemnitz in Saxony.

655. Bole.

Earthy, in nests and veins. Conchoidal. H. = 1 to 2; G. = 2·2 to 2·5. Opaque; dull resinous; streak shining. Brown, yellow, or red. Feels greasy; some adhere strongly to the tongue, others not at all. In water crackles and falls to pieces. C.c. hydrous silicates of alumina and iron peroxide, in various proportions. Scotland, Ireland, Dransfeld, Clermont in Auvergne. *Stolpenite*, *Rock Soap*, *Pinthite*, *Yellow Earth* or *Pelinite*, *Fetbol*, and *Ochran* are varieties.

656. Carpholite, $\dot{A}l\ddot{S}i + \dot{M}n\ddot{S}i + 2\dot{H}$.

Right prismatic. P 111° 27′. Radiating stellated. H. = 5 to 5·5; G. = 2·9. Translucent; silky; straw- to wax-yellow. B.B. intumesces and fuses to an opaque brown glass. C.c.: silica 38, alumina 29·4, protoxide of iron 2·9, peroxide of iron 4, protoxide of manganese 11·8, water 10·8. Schlaggenwald, Wippra in the Harz, Meuville in the Ardennes.

657. Nontronite, $\dot{F}e\ddot{S}i_2 + 5\dot{H}$.

Massive; fracture uneven. H. = 2 to 3; G. = 2 to 2·3. Opaque; dull or glimmering; streak resinous. Straw-yellow or siskin-green. B.B. decrepitates, becomes black and magnetic, but without fusing; sol. and gelatinizes in warm acids. C.c.: 43 silica, 36 iron peroxide, and 21 water, with 3·5 alumina and 2 magnesia. Nontron in France, Harz, and Bavaria. *Chloropal* is similar. B.B. brown. Unghvar in Hungary, and Passau.

658. Pinguite.

Massive; fracture splintery; sectile. H. = 1; G. = 2·3. Light to dark green. Lustre vitreous. Feels greasy. C.c.: silica 36·9, peroxide of iron 29·5, protoxide of iron 6·1, water 25·1. Wolkenstein, Suhl.

659. Hisingerite, $\dot{F}e_2\ddot{S}i_3 + 2\dot{F}e\ddot{S}i + 9\dot{H}$.

Reniform, and in crusts. H. = 3·5 to 4; G. = 2·6 to 3. Opaque, resinous. Brownish or bluish black; streak liver-brown or yellowish brown. C.c.: various, but 32·5 silica, 33·5 iron peroxide, 13·1 iron protoxide, and 19 water, in the *Thraulite* from Bodenmais. Also Gilling and Riddarhyttan in Sweden, and Breitenbrunn (*Polyhydrite*).

660. Bergholz.

Fine fibrous; glimmering lustre. Wood-brown to green. G. = 2·4. C.c.: silica 55·5, peroxide of iron 19·5, magnesia 15, water 10·3. Sterzing in Tyrol. *Xylite*, probably from the Urals, is similar.

661. Umber.

Massive; fracture conchoidal. H. = 1·5; G. = 2·2. Liver-brown; streak shining. Mixtures of peroxide of iron, oxide of manganese, and alumina with water. Cyprus. *Hypoxanthite* and *Siderosilicite* are similar.

662. Klipsteinite, $(\dot{R}_3,\dot{\ddot{R}}_2)\ddot{S}i_3 + \dot{R}_2\dot{H}_3$.

Compact. H. = 5 to 5·5; G. = 3·5. Liver-brown to black; streak yellow-brown. C.c.: silica 25, peroxide of iron 4, sesquioxide of manganese 57, water 9. Klapperud in Dalecarlia, Herborn near Dillenburg.

663. Wolkonskoite.

Amorphous. Horny; bluish green to grass-green. Fracture conchoidal; brittle. C.c.: silica 36, alumina 3, sesquioxide of chromium 19, ferric oxide 10, water 21. Okhansk in Siberia.

664. Rüttisite, $3\dot{N}i\ddot{S}i + 4\dot{H}$.

Amorphous and reniform. Apple-green to emerald-green. H. = 2 to 2·5; G. = 2·35 to 2·37. C.c.: silica 43·7, nickel oxide 35·9, water 11·2. Röttis near Reichenbach in Saxony. *Komarit* is similar.

665. Uranophane, $3\dot{C}a\ddot{S}i + \ddot{U}_2\ddot{S}i_3 + 18\dot{H}$.

Right prismatic. ∞P 146°; $\infty\breve{P}\infty$; $\breve{P}\infty$; with polar angle 90°. Crystals honey-yellow; when massive leek-green. H. = 2·5; G. = 2·6 to 2·8. C.c.: silica 17, alumina 6·1, oxide of uranium 53·3, lime 5·1, water 15·1. Kupferberg in Silesia.

666. Uranotile, $\dot{C}a\ddot{S}i + \ddot{U}_2\ddot{S}i_3 + 9\dot{H}$.

Right prismatic. ∞P 164. In stellate groups. Lemon-yellow. G. = 3·96. C.c.: silica 13·8, oxide of uranium 66·75, lime 5·27, water 12·67. Wölsendorf in Bavaria, Joachimsthal, Mitchel county in North Carolina.

667. Bismutoferrite, $\ddot{B}i_2\ddot{S}i_3 + 2\ddot{F}e_2\ddot{S}i_3$.

Crypto-crystalline; oblique prismatic. Siskin- to olive-green. H. = 3·5; G. = 4·48. C.c.: silica 24, oxide of bismuth 42·8, peroxide of iron 33·1. Schneeberg in Saxony. *Hypochlorite* is a variety containing 13 of bismuth. In a third variety, from Bräunsdorf, antimony replaces bismuth.

Silicates with Titanates, Niobates, &c.

668. Sphene, $\dot{C}a\ddot{S}i_2 + \dot{C}a\ddot{T}i_2$.

Oblique prismatic, C 85° 22′. ∞P (*l*) 133°2′; $\frac{1}{2}P\infty$ (*x*) 55° 21′; P∞ (*y*) 34° 21′; ∞P∞ (*g*) : 0P (*P* or *c*) 90°; ∞P3 (*M*) 76° 7′; P∞ (*r*) 113° 30′; $\frac{1}{2}P2$ (*n*) 136° 12′; 4P4 (*s*) 67° 57′ Crystals vary extremely in form, being generally apparently oblique-tabular, from predominance of *n*, which are hemidomes in alternate position on opposite ends; also, but more rarely, prismatic, with dominance of *l* and *M*. Twins frequent. Twin face *c*, and formed by revolution either (*a*) on an axis normal to *c* or (*b*) on a vertical axis; the former very common and usually producing thin tables with a re-entering angle along one side, and sometimes elongated. Occasionally in double twins. Sometimes granular or foliated. Cl. in some (*l*), in others (*r*). H. = 5 to 5·5; G. = 3·4 to 3·6. Semitransparent; adamantine or resinous.

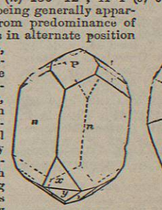
Fig. 586.

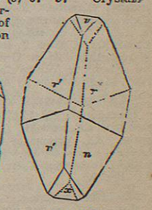
Fig. 587.

Yellow, brown, and green. B.B. fuses with micro-salt in the red flame, gives reaction for titanic acid. C.c.: silica 30·6, titanic acid 40·8, lime 28·6. In Scotland, typical of syenites and primary limestones. In minute hair-brown crystals in the first; as at Lairg (Sutherland), Achavarasdale (Caithness), and Criffel (Kirkcud-

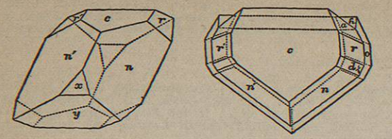

Fig. 588.

Fig. 589.

bright) (figs. 586 to 588). In the latter often in highly complex twins, yellow to brown, at Shinness (figs. 193, 589), Urquhart, Dalnain, Torbane, &c., also with ilmenite and allanite in exfiltration veins of grey granite. Dauphiné, Mont Blanc, St Gotthard, Tyrol, Arendal, America. *Greenovite*, flesh-red from Glen Gairn in Aberdeenshire (like 194), and St Marcel in Piedmont; contains manganese at the latter locality.

669. KEILHAUITE (*Yttrotitanite*), $5(\dot{C}a\dot{Y})(\dot{S}i\ddot{T}i)+(\dot{A}l\ddot{F}e)(\dot{S}i\ddot{T}i)_3$. Oblique prismatic, C 58°. ∞P 114. Cl. −2P, 138° H. = 6 to 7; G. = 3·5 to 3·7. Blackish brown; streak greyish yellow. B.B. with borax forms blood-red glass in the red flame; other features like sphene. C.c.: 29·7 silica, 28·7 titanic acid, 21·1 lime, 10·8 yttria, 6·2 alumina, and 6·5 iron peroxide. Near Arendal.

670. SCHORLOMITE (*Ferrotitanite*), $\dot{C}a_3\dot{S}i+\ddot{F}e_3\dot{S}i_2+\dot{C}a\ddot{T}i_2$. Cubic; ∞O and 2O2; generally massive; fracture conchoidal. H. = 7 to 7·5; G. = 3·8. Black; streak grey-black; vitreous. C.c.: silica 26, titanic acid 23·3, peroxide of iron 20, lime 29·4. Arkansas, Kaiserstuhl, Ivaara in Finland. Perhaps a titaniferous garnet.

671. TSCHEWKINITE. Massive; fracture flat conchoidal. H. = 5 to 5·5; G. = 4·5. Opaque, vitreous, splendent. Velvet-black; streak dark brown. B.B. intumesces greatly, becomes porous, and often incandesces; in white heat fuses to black glass; gelatinizes with h. acid. C.c.: 21 silica, 20 titanic acid, 11 iron protoxide, 45 peroxides of cerium metals with perhaps thoria, lime 4. Miask, Coromandel.

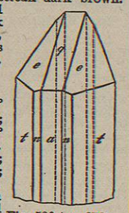

Fig. 590 (sp. 672)

672. MOSANDRITE. Oblique prismatic, C 71° 24½'. ∞P (*t*) 88° 36'; ∞P2 (*n*); ∞P∞ (*a*); −P (*e*) 124° 1'; −P∞ (*q*); ∞P∞, *t* : *a* 134° 18'; *n* : *a* 152° 52'; *q* : *a* 138° 2'. Twin face the orthopinacoid. Generally massive. Fracture uneven. H. = 4; G. = 2·93 to 3. Yellowish or reddish brown; streak pale green. Vitreous to resinous lustre. C.c.: silica 29·9, titanic acid 9·9, oxide of cerium metals 26·5, lime 19, water 8·9. Brevig and Langesundfiord.

673. EUDIALITE (*Eukolite*), $6\dot{R}\ddot{S}i_2+\dot{R}\ddot{Z}r$. Rhombohedral; R 73° 10'. R (*p*), 0R (a_1), ∞P2 (d_1), ½R (a_2); also ∞R, ⅔R, −½R, −2R, −½R, R3, ⅔P2 (fig. 591). Generally massive, granular. Cl. a_2 and a_3; fracture uneven. H. = 5 to 5·5; G. = 2·84 to 2·95. Peachblossom-red to brownish red; streak white. Translucent; vitreous. B.B. fuses easily to a light-green opaque glass; gelatinizes in h. acid. C.c.: silica 50, zirconia 16·9, protoxide of iron 7, lime 11, soda 12. Kangerdluarsuk in Greenland, Sedlovatoi Island in White Sea, Brevig (*Eukolite*), Magnet Cove in Arkansas.

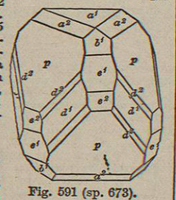

Fig. 591 (sp. 673).

674. CATAPLEITE, $2(\dot{N}a_2\dot{C}a)(\dot{S}i\ddot{Z}r)_2+9\dot{H}$. Hexagonal. P 114° 43'. 0P, ∞P, P, also with 2P, and ½P. In lamellar aggregates. Cl. prismatic and P; fracture uneven. H. = 6; G. = 2·8. Yellowish brown to pale green; streak yellow, lustrous. C.c.: silica 46·7, zirconia 29·6, soda 10·8, water 9 Brevig.

675. ŒRSTEDITE. Pyramidal. P 84° 25'. P, ∞P, ∞P∞. Like zircon. H. = 5·5; G. = 3·63. Lustre adamantine. Reddish brown. C.c.: silica 19·7, titanate of zirconia 68·96, water 5·6. Arendal.

676. WÖHLERITE, $9\dot{R}\ddot{S}i+3\dot{R}\ddot{Z}r+\dot{R}\ddot{N}b$. Oblique prismatic, C 70° 45'. ∞P 90° 14'; ∞P2 127° 4' −P∞ 43° 18'. 0P : ∞P∞ 109° 15'; −P∞ : ∞P∞ 136° 42'; 0P : ∞P 103° 31'. Crystals tabular and prismatic. Cl. clinodiagonal; fracture conchoidal. H. = 5 to 6; G. = 3·4. Light yellow, honey-yellow to brownish grey; streak yellowish white. C.c.: silica 28, zirconia 19, niobic acid 13·9, lime 27·8, soda 8·3, protoxide of iron 3. B.B. fuses to yellowish glass. Sol. in h. acid. Langesundfiord, Brevig.

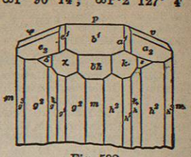

Fig. 592.

677. ARDENNITE. Right prismatic. ∞P 131° 2'; P∞ 112° 24'; $\dot{P}\frac{3}{2}$; ∞$\dot{P}\frac{3}{2}$; ∞$\breve{P}2$; ∞P∞; ∞$\breve{P}\infty$. Crystals like ilvanite. Cl. brachydiagonal, and ∞P. H. = 6 to 7; G. = 3·62. Yellow to yellow-brown. Dichroic; brittle. C.c.: silica 27·8, alumina 24, protoxide of manganese 26·7, lime 2·2, magnesia 4·3, vanadic acid 3·2, arsenic acid 6·3, water 5. Ottrez in the Ardennes (Luxemburg).

678. ROSCOELITE. Foliated masses, sometimes stellated. H. = 1; G. = 2·3 to 2·9. Dark green to greenish blue. Pearly lustre. C.c.: silica 47·7, vanadic acid 22, alumina 14·1, magnesia 2, potash 7·6, water 5. Eldorado in California.

TITANATES WITH NIOBATES.

679. TITANOMORPHITE, $\dot{C}a\ddot{T}i_2$. Oblique prismatic. Like sphene. ∞P, 0P, ½P∞, P∞, ⅔P2. C.c.: titanic acid 74·3, lime 25·3. Lampersdorf in Silesia, Weistritz.

680. PEROVSKITE, $\dot{C}a\ddot{T}i$. Right prismatic. In complicated twins, often distorted, pseudocubic. H. = 5·5; G. = 4 to 4·1. Lustre metallic-adamantine. Pale yellow, reddish brown to iron-black; streak grey. C.c.: 58·8 titanic acid, 41·2 lime. B.B. with micro-salt in outer flame gives a bead greenish while hot, colourless on cooling; in inner flame grey-green when hot, violet-blue when cold. Decomposed by boiling a. acid. Zlatoust, Schelingen, Zermatt, Malenco Valley near Sondrio, Pfitsch in Tyrol, Magnet Cove in Arkansas.

Fig. 593.

681. KOPPITE, $\dot{R}_2\ddot{N}b_2$. Cubic; ∞O∞. G. = 4·45 to 4·56. Brown. Transparent. C.c.: niobic acid 62·46, oxide of cerium 6·7, oxide of lanthanum 3. Schelingen on the Kaiserstuhl in Baden.

682. ANNERÖDITE, $2\dot{R}_2\ddot{N}b+5\dot{H}$: Right prismatic. H = 6. G 5·7. Metallic to greasy. Black. Streak black, brown, greenish grey. Translucent in splinters; brittle. C.c.: 48 niobic acid, with zirconia, thoria, ceria, yttria, and uranium oxide. Anneröd near Moss (Norway).

683. DYSANALYTE, $6\dot{R}\ddot{T}i+\dot{R}\ddot{N}b$. Cubic; ∞O∞. Cl. cubic. G. = 4·13. Black. C.c.: titanic acid 41·5, niobic acid 23·2, cerium oxide 5·7, lime 19·8; protoxide of iron 5·3, soda 3·6. Vogtsburg on the Kaiserstuhl.

684. PYROCHLORE, $5\dot{R}\ddot{N}b+4\dot{R}(\ddot{T}i\ddot{T}h)_2+4NaF$. Cubic (fig. 594). Cl. octahedral; brittle; fracture conchoidal. H. = 5; G. = 4·2 to 4·4. Resinous, opaque. Red-brown to black, ruby-red and transparent rarely; streak pale brown. C.c.: niobic acid 53·2, titanic acid 10·5, thoria 7·6, cerium oxide 7, lime 14·2, soda 5, fluorine 3·1. Miask, Kaiserstuhl, Brevig, and Frederiksvärn. *Microlite*, from Chesterfield in Massachusetts, has tantalic acid 68·4, niobic acid 7·75, 11·7 lime and 7·7 protoxide of manganese. *Pyrrhite* from Mursinsk in the Urals, San Piero in Elba, and the Azores may be the same; at the last locality it is in orange-red octahedra, and is a niobate of zirconia.

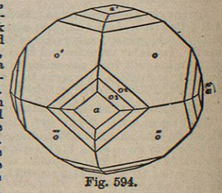

Fig. 594.

685. BLOMSTRANDITE, $(\dot{C}a,\dot{F}e)$, $\dot{T}i+\dot{U}\ddot{N}b_2+\dot{H}$. Massive. H = 5·5. G. = 4·17 to 4·25. Vitreous, black. Streak

brown. Translucent in splinters. C.c.: niobic acid 49·8, titanic acid 10·7, uranium oxide 23·7, protoxide of iron 3·3, lime 3·5, water 7·9. Nohl (Sweden):

686. POLYCRASE, $4\dot{R}\ddot{T}i+\dot{R}\ddot{N}b$. Right prismatic (fig. 595). ∞P∞, ∞P (140°), P, 2P∞ (56°). Fracture conchoidal. H. = 5 to 6; G. = 5·1. Black; streak grey-brown. B.B. decrepitates violently, incandescing, but does not fuse. Sol. in s. acid. C.c.: titanic acid 26·6, niobic acid 20·4, yttria 23·3, erbia 7·5, oxide of uranium 7·7, water 4. Hitterö (Norway), Slettåkra in Jönköping (Sweden).

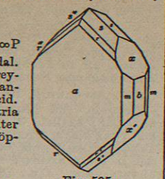

Fig. 595.

687. EUXENITE, $2\dot{R}\ddot{T}i+\dot{R}\ddot{N}b+\dot{H}$. Right prismatic (fig. 596). ∞P (*m*) 140°; ∞P∞ (*b*); 2P∞ (*d*) 52°; P (*p*) 102° 58'. *p* : *b* 103° 6'. Fracture conchoidal. Opaque; metallic to vitreous. Black and brownish black; streak red-brown. B.B. infusible. Not acted on by acids. C.c.: niobic acid 32, titanic acid 19·2, uranium oxide 19·5, yttria 13·2, cerium oxide 2·8, but variable. Jölster, Tromö, Alvö, &c., in Norway; also Hitterö and Cape Lindesnaes.

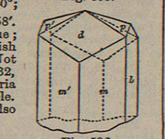

Fig. 596.

688. ÆSCHYNITE. Right prismatic. ∞P (*M*) 128° 34'; 2P∞ (*y*) 73° 16'; P (*o* : *o*) 137° 14'; ∞P3 69° 23'; P∞; 0P. Crystals long prismatic (fig. 597). Cl. traces; fracture imperfect conchoidal. H. = 5 to 5·5; G. = 4·9 to 5·1. Opaque; submetallic or resinous. Iron-black or brown; streak yellowish brown. B.B. swells and becomes yellow or brown, but is infusible. Not sol. in h. acid, partially in s. acid. C.c.: niobic and tantalic acids 28·8, titanic acid 22·6, thorium oxide 15·7, cerium protoxide 18·5, lanthanum oxide and didymium oxide 5·6. Miask, Hitterö.

Fig. 597 (sp. 688).

689. POLYMIGNITE. Right prismatic. P (*p*) polar 136° 28' and 116° 22'; ∞P 109° 46'; ∞P∞; ∞$\breve{P}\infty$ (fig. 598). Cl. macro- and brachydiagonal, imperfect; fracture conchoidal. H. = 6·5; G. = 4·7 to 4·8. Opaque; semimetallic. Iron-black; streak dark brown. B.B. infusible. Sol. in h. acid. C.c.: titanic acid 46·3, zirconia 14·1, yttria 11·5, lime 4·1, iron peroxide 12·2, cerium oxide 5. Frederiksvärn.

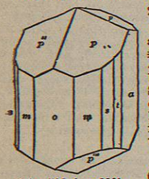

Fig. 598 (sp. 689).

690. MENGITE, $(\dot{F}e,\dot{Z}r)\ddot{T}i$. Right prismatic. P (*e*) polar angle 151° 27' and 101° 10'; ∞P 136° 20'; ∞$\breve{P}3$; ∞P∞ (fig. 599). Fracture uneven. H. = 5 to 5·5; G. = 5·48. Opaque; semimetallic. Iron-black; streak chestnut-brown. B.B. infusible, but becomes magnetic. Sol. in s. acid. Miask, Groix island in Morbihan.

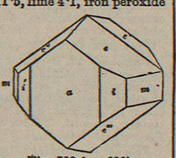

Fig. 599 (sp. 690).

691. TANTALITE, $\dot{F}e\ddot{T}a_2$. Right prismatic. P (*p*) with polar edges 126° and 112° 30', middle 91° 42'. ∞$\breve{P}\frac{3}{2}$ (*r*) 122° 53' · ∞P∞ (*s*); ∞$\breve{P}\infty$ (*i*); $\breve{P}\infty$ (*m*) 113° 48; 3$\breve{P}\infty$ (*q*) 54° 10'; ⅓$\breve{P}\infty$ (*n*) 167° 36'; $\dot{P}\frac{3}{2}$ (*o*); 2$\breve{P}2$ (*o*). Fracture conchoidal or uneven. H. = 6 to 6·5; G. = 6·1 to 8. Opaque; semimetallic, adamantine, or resinous. Iron-black; streak cinnamon- or coffee-brown. B.B. infusible; scarcely affected by acids. C.c.: 76 to 50 tantalic acid, 7·5 to 29 niobic acid, 9 to 16 iron protoxide, and 1 to 6 manganese protoxide; some with 1 to 10 tin oxide (*Cassiterotantalite*); also in union with iron (manganese) protoxide. Kimito and Tammela in Finland, Broddbo and Finbo near Falun, and Chanteloube near Limoges; always in granite.

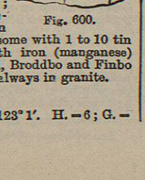

Fig. 600.

692. TAPIOLITE, $4\dot{F}e\ddot{T}a+\dot{F}e\ddot{N}b$. Pyramidal. P middle angle 84° 52', summit 123° 1'. H. = 6; G. = 7·2 to 7·5. Black. Lustrous. C.c.: tantalic acid 73·9, niobic acid 11·2, protoxide of iron 15. Tammela in Finland.

693. COLUMBITE, $m\dot{F}e\ddot{N}b+n\dot{F}e\ddot{T}a$. Right prismatic. P (*u*) polar angles 104° 10' and 151°, middle angle 83° 8'; 0P (*c*); ∞$\breve{P}\infty$ (*b*); ∞$\breve{P}\infty$ (*a*); ∞P (*g*) 135° 40'; ∞$\breve{P}\infty$ (*m*) 101° 26'; 2P (*s*); 3$\breve{P}3$ (*o*); 3$\breve{P}\frac{3}{2}$ (*r*); ½$\breve{P}\infty$ (*l*) 161°; $\breve{P}\infty$ (*k*) 143°; 2$\breve{P}\infty$ (*h*) 112° 26'; P∞ (*i*) 101° 12'; 2P∞ (*e*) 62° 40'. Hemitropes, face *c*; vertical axes forming an angle of 62° 40'; also on faces 2P2 (*n*), and rarely *b*. Also granular and foliated. Cl. brachydiagonal, perfect, also macrodiagonal. H. = 6; G. = 5·4 to 6·4. Metallic, adamantine. Iron-black to brownish: streak black

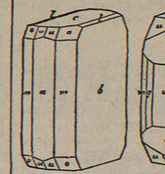

Fig. 601.

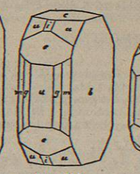

Fig. 602.

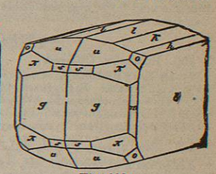

Fig. 603.

or reddish brown. B.B. infusible; not affected by acids. C.c.: isomorphic mixtures of niobic and tantalic acids with protoxide of iron (or manganese). Pure columbite would give 78·8 niobic acid, pure tantalite 86 tantalic acid. The niobic acid generally prevails, and the crystals are better formed the more this is the case. Rabenstein, Bodenmais, Chanteloube, Finland, Ilmen Hills, Evigtok in Greenland, Haddam and Middletown in Connecticut, Acworth in New Hampshire, Pike's Peak in Colorado.

694. YTTROTANTALITE, $(\dot{Y},\dot{C}a,\dot{F}e,\dot{U})_2(\ddot{T}a,\dot{W},\ddot{N}b)$. In two varieties. (*a*) *Black*. Right prismatic; in short prismatic or tabular crystals. ∞$\breve{P}\infty$; ∞P (*m*) 121° 48'. 0P : 2$\breve{P}\infty$ 103° 26'; $\breve{P}\infty$: 0P 131° 26'; *i* : *i* 149° 42' (fig. 604); also in grains and lamellæ. Cl. brachydiagonal, indistinct; fracture conchoidal or uneven. Opaque, or in thin splinters translucent. Velvet-black, semimetallic lustre, and greenish grey streak. H. = 5·5; G. = 5·4 to 5·7. (*b*) *Yellow*. Amorphous, yellowish brown, or yellow, often striped or spotted; resinous or vitreous; streak white. G. = 5·46 to 5·88. Both varieties B.B. infusible, but become brown or yellow. Not affected by acids. C.c.: 57 to 60 tantalic acid, 1 to 8 tungstic acid, 0 to 20 niobic acid, 20 to 38 yttria, 0·5 to 6 lime, 0·5 to 6 uranium peroxide, and 0·5 to 3·5 iron peroxide. Ytterby, and near Falun.

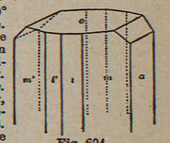

Fig. 604.

695. FERGUSONITE, $(\dot{Y},\dot{E}r,\dot{C}e)_6(\ddot{N}b,\ddot{T}a)$. Pyramidal and hemihedric; P (*s*) 128° 28'. Usual form (½) 3P$\frac{3}{2}$ (*z*), P, ½∞P$\frac{3}{2}$ (*y*), 0P (*c*) (fig. 605). *s* : *s* 100° 54', *s* : *c* 115° 16', *z* : *r* 169° 17. Cl. traces along P; fracture imperfect conchoidal; brittle. H. = 5·5 to 6; G. = 5·6 to 5·9. Translucent in thin splinters; semimetallic. Brownish black; streak pale brown. B.B. infusible. C.c.: chiefly niobic acid and yttria, with erbia, also a little cerium protoxide, tin oxide, uranium pxide, and iron protoxide. Cape Farewell in Greenland, Ytterby, Riesengebirge, Rockport in Massachusetts. *Tyrite*, from Helle near Arendal, is similar.

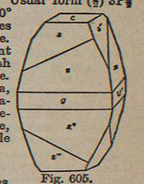

Fig. 605.

696. HJELMITE. Massive, with granular fracture and traces of crystals. H. = 5; G. = 5·82. Velvet-black; streak greyish black. Lustre metallic. C.c.: tantalic acid 62·4, tin 6·6, uranium 4·9, protoxide of iron 8·1, yttria 5·2. B.B. infusible. In closed tube decrepitates and yields water. Kararfvet near Falun.

697. SAMARSKITE (*Uranotantalite*), $(\dot{R}_3,\dot{H},\dot{R}_2)_5(\ddot{N}b\ddot{T}a)_3$. Right prismatic. ∞P 122° 46'; ∞$\breve{P}2$ 95°; P∞ 93°; P; ∞P∞; ∞$\breve{P}\infty$; 3$\dot{P}\frac{3}{2}$; also in grains. Fracture conchoidal; brittle. H. = 5·56; G. = 5·6 to 5·76. Opaque; strong semimetallic. Velvet-black; streak dark reddish brown. B.B. fuses on the edges to a black glass. In the closed tube decrepitates, yields water, incandesces, and becomes brown. Sol. in h. acid to a greenish fluid