With the Authors

best respects

TREATISE

ON

MINERALOGY:

SECOND PART,

[illegible]

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[illegible]

IN TWO VOLUMES.

VOLUME I.

NEW HAVEN.

[illegible]

TREATISE

ON

MINERALOGY:

SECOND PART,

CONSISTING OF

DESCRIPTIONS OF THE SPECIES, AND TABLES ILLUSTRATIVE OF THEIR NATURAL AND CHEMICAL AFFINITIES.

WITH FIVE HUNDRED WOOD CUTS.

BY

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IN TWO VOLUMES.

VOLUME I.

NEW HAVEN:

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TO

BENJAMIN SILLIMAN, LL. D.

PROFESSOR OF CHEMISTRY, MINERALOGY AND GEOLOGY

IN YALE COLLEGE,

&c. &c.

DEAR SIR,

The distinguished services you have rendered to the cause of Mineralogy and Geology in America, not merely in contributing to their early introduction, but to their efficient cultivation among us, prompt me to dedicate the present work to you.

The wisdom and zeal of those exertions which secured to Yale College the most splendid collection of minerals in the country, the valuable instruction and enthusiasm imparted by your lectures to a great body of young men now dispersed through the whole nation, and the public spirit which has led you at a personal sacrifice to maintain in the American Journal of Science a free medium for the diffusion of this kind of knowledge, are too well known and justly appreciated to require the feeble acknowledgment of this tribute; but as the work was undertaken at your suggestion, and has been aided in its progress by your advice, I may perhaps be permitted the pleasure of improving this occasion to express publicly the sense I feel of the value of your labors, and to acknowledge the many kind services for which I stand indebted to your friendship.

I have the honor to be,

Your very faithful

And obliged Servant,

CHARLES U. SHEPARD.

New Haven, May, 1835.

PREFACE.

The eclectic character of my introductory volume, which was intended to give a view of all the departments of Mineralogy excepting Physiography, rendered it difficult for persons employing it to avail themselves of other treatises for full descriptions of the species. The inapplicability was principally owing to my adoption of the improvements of Mohs in relation to simple and compound varieties and to the numerical scale for expressing the hardness, and to my following Brooke in the treatment of the regular forms; not to mention the circumstance, that my artificial tables enumerated a number of species whose descriptions had not found their way into any English work. This was foreseen in the preparation of that volume; and notice was accordingly given in it, that a second part, devoted exclusively to descriptions, and constructed in accordance with the principles of the first, was in preparation.

In addition to the desire of supplying what was thus wanting to carry out the plan of study which had appeared to me to possess the greatest advantages, I was stimulated to the attempt, in the hope of being able to contribute something towards the more satisfactory determination of American localities; an undertaking for which my mineralogical travels had afforded me considerable facilities. Indeed, so numerous had been the discoveries in important mineral depositories since the last edition of Cleaveland's

Mineralogy and the publication of ROBINSON's Catalogue, and so many doubtful points existed in relation to many of those quoted in these works—not a few having been erroneously announced, either through inaccurate determinations of the species, or their occurrence in trifling and accidental quantitity—that the proposed work seemed justifiable solely on this ground, provided there was a reasonable hope of placing the subject in a more just light. Besides, it was had in view to indicate the crystalline forms noticeable among our minerals, a point which had been so much overlooked as to have created a very unfavorable impression of the mineralogical riches of the country. There seemed room also, to perform a desirable service by appropriating to the work the latest discoveries of the German mineralogists, to whom the science is indebted for its most important advances during the last ten years.

The general rules according to which the descriptions have been drawn up, are those laid down in §. 126, of the Introductory volume. The trivial names to the species having been adopted in the analytical tables for the reasons given in §. 117, it became necessary to employ them also in the present work. Indeed so small is the number of species in the mineral kingdom compared with the species in the other departments of Natural History, and so deficient in fixity are many of the still accounted species, that it is, and probably for some time to come will be, most prudent to call them by these names. The chemical designations having by general usage been dropped where other names existed, BEUDANT in his system of Mineralogy has attempted by the invention of new names, where it was necessary, to render universal the application of the trivial nomenclature. Approving of this reform, I have adopted his names in numerous instances; and where species were still left unprovided with trivial epithets, I have ventured in a few instances to propose them.

To the trivial name, the systematic denomination is added in a smaller type, as it appeared to me important not to lose sight of what in its other branches, is conceded to be one of the greatest advantages of Natural History; viz. that of expressing in the names, the connexion in natural properties, subsisting among the species. Whether the names here employed, which are mostly those contrived by Mohs, will ultimately be approved of by Naturalists, is not at present certain; but their use in the intercourse of Mineralogists will often be found to possess important convenience, and though compelled in the future and more perfected state of the science to give place to simpler expressions—perhaps to those, constructed according to the genius of the Latin language by which means the difficulty of their translation from one language into another will be avoided—they still appeared to me to be worthy of being retained, especially as they are introduced merely as synonyms.

The alphabetical arrangement of the species has been adopted because it seemed most likely to subserve the convenience of students using my characteristic, or any other, in the determination of specimens; as well as that of persons having occasion to refer to the descriptions for less general purposes, as for example, to learn only the crystalline form of a particular species, or to obtain information respecting its locality. Had the natural-historical arrangement, the chemical, or any mixture of the two, been employed, the inconvenience of consulting an index must necessarily have been encountered.

But while the alphabetical distribution has the advantage at least, of being independent of all scientific arrangement—concerning whose present existence many entertain doubts,—the two tabular views, one at the commencement of this volume, and the other at the conclusion of the second, will present the species grouped in accordance with two classes of affinities, the first, the natural-historical, the second, the chemical, resemblance. In the construction of these tables, I cannot, of course, suppose that I have acquitted myself to the satisfaction of all, when I have but so imperfectly satisfied myself.

The chemical arrangement, however, is such as the present state of chemical science seemed to force upon me without much choice. A more extensive and accurate analysis of minerals, however, will undoubtedly produce in it many changes, while also it will permit the composition of a considerable number of species, now left in uncertainty, to be expressed with atomic precision.

Both in this tabular view, and elsewhere in the work, I have refrained from adopting the algebraical language of Berzelius for denoting the chemical constitution of minerals, although it would have afforded much convenience in the present state of chemical nomenclature, more particularly in relation to isomorphous compounds, because I have every where sought to exclude whatever has an abstruse and forbidding air; knowing that many have been discouraged from entering upon this pleasing and facile pursuit by the discovery of even the occasional use of unintelligible language in a professedly elementary treatise of its principles.

The natural-historical arrangement of the species is principally that brought forward by MOHS. I have nevertheless ventured, though not without considerable hesitation, to propose a number of alterations, which will be obvious on a comparison of the two systems. In making these changes, I have endeavored so to constitute the genera that the species of each should be bound together by a similar amount of resemblance. If in the execution of this difficult task, I have not violated the affinities of the species, an important advantage will have been secured in the simplification of the nomenclature by the great reduction of genera, especially in the orders, *Ore*, *Pyrites*, *Glance* and *Blende*.

The formation of the new order, *Picrosmine*, appeared to be indispensable in providing a place for a number of species, which MOHS had declined incorporating with his system from their deficiency in regular forms. The production of the genus *Lusine-Ore* was rendered necessary for a similar reason, in order to receive such species of the requisite structure and specific gravity, as are believed to owe their formation to the decomposition of other species. The above mentioned writer does not allow such minerals, provided they are in a friable state, to constitute distinct species; remarking of them, that "it is in direct opposition to the principles of Natural History, to consider decomposed varieties of one species as varieties of another." To the correctness of this as a general rule I readily assent, allowing it full force when the resulting mass is not homogeneous in its mechanical composition and at the same time destitute of a fixed chemical constitution.

The general order observed in the particulars of the descriptions is that adopted by MOHS, whose language in relation to a number of the properties has been employed, *verbatim*. The description of the regular forms, however, is quite different and requires some explanation. In many instances, all the observed forms are represented; in others, where the number was too great to admit of this, such a selection has been made as appeared best adapted to give a correct idea of the entire series of modifications within the species. The locality is sometimes subjoined, when the form represented is not common, or when it is known to occur at a particular spot in unusual perfection.

The primary forms of BROOKE have been adhered to, more for the reason that they are still in such common use in English works and from their expressing in general the cleavage forms with correctness, than because they are in every instance the most simple solids from which the secondaries are capable of being derived. In the last mentioned view, they would certainly admit of a very important reduction. The tetrahedron, cube, regular octahedron and rhombic dodecahedron might form a single system,—the right square prism and the octahedron with a square base, another,—the right rectangular prism and the octahedron with a rectangular base, a third,—and the right rhombic prism and the octahedron with a rhombic base, a fourth system.

For the sake of easy intelligibility also, the angles and faces of the crystals are described without adopting an algebraical system of notation. Nor have I thought it best to quote the corrected angles in place of such as were obtained by observation, except in those crystals depending upon forms of invariable dimensions. In other cases, it would no doubt have been safe to have employed such angles in the great majority of instances, yet the slight variations occurring in the constancy of angles in the individuals of several species, still leaves us in doubt what dimensions to assume as the most free from error by which to correct the others. Until this confusion is removed, the student will not suffer much inconvenience by adopting the present somewhat circuitous method of becoming acquainted with crystals. And besides, to have adopted the mathematical treatment of crystals alluded to, would have prevented a large number of persons from understanding the subject, to whom in its present popular form, it is perfectly intelligible.

In the preparation of this work it has been necessary to examine a great number of doubtful minerals, as well as newly proposed species with which the Scientific Journals abound. It may therefore be expected that something should be said in this place concerning the disposition which has been made of these materials. But a single new species, the *Microlite*, has been proposed; though a number of observations have been made, calculated to place the specific claims of a few minerals before proposed in a stronger light.

If, however, my investigations have not led me to increase the number of species, they have on the other hand, compelled me to treat a number heretofore regarded distinct, as varieties only of older species,—examples of which are the *Fibrolite*, *Sillimanite*, *Pinite*, *Fowlerite*, *Deweylite*, *Marmolite*, &c.

But while I have constantly been concerned to find good reasons for reducing the number of the species, I cannot concur in the proposal of Rose for uniting *Pyroxene* and *Hornblende*, notwithstanding the ingenious reasons he uses in favor of this procedure. To overlook their marked disagreement in crystalline structure and to cause them to coalesce, would shake to the foundations the most secure support of all specific distinction. These species as they occur in the United States do not at all favor his conclusion, inasmuch as they exist together at several places in dolomite, preserving their peculiar angles and cleavages.

The proposed union of *Schiller Spar* with *Pyroxene* by Kobell, is equally in violation of two of the best specific properties in the absence of crystalline form; viz. specific gravity and hardness. Indeed, all conclusions in case of such complex compounds, drawn from chemical composition, must necessarily be indecisive.

The introduction of historical matter, as well as a notice of the authorities quoted, has been avoided, excepting only the mention of the author to the systematic name of the species, and occasionally the source whence the angles and the specific gravity have been derived.* To have carried these acknowledgments farther, would have swelled the dimensions of the work to an inconvenient size, without having proportionably enhanced its value as an elementary treatise. The more accomplished mineralogist will of

* The works to which I have been most indebted in the preparation of this Treatise, are mentioned at the conclusion of the preface.

course always have at hand the requisite works for consultation when information of this kind is desired. The best single work adapted to the purpose, with which I am acquainted, is the *Handbuch* of LEONHARD.

It will not be demanded of me to pronounce a panegyric upon Mineralogy. When systematically and thoroughly pursued, it does not yield in rational interest to any department of Natural History; but if its fundamental principles are overlooked, or but imperfectly acquired, the pursuit can afford no satisfaction to a sound mind. A degree of excitement may indeed attend the accumulation of rarities, but this is usually of temporary duration; and if a good cabinet should be acquired, the perpetual conviction of ignorance, which its inspection is calculated to force upon the possessor, is sufficient to produce ultimate indifference, if not disgust. When on the contrary, the preliminary principles are acquired, the progress of the pupil is uniform, rapid and delightful. Every acquisition to his collection supplies some link in the chain of his knowledge. His cabinet will exhibit the symmetry and beauty of his attainments. Every specimen worthy of possession, will have its location defined beforehand, from which it cannot be removed without a palpable violation of order. A cabinet thus formed becomes of itself an expression of the principles of the science, by means of which its possessor is enabled to corroborate the accuracy of its details, to correct its errors, and to extend its limits. Nature here becomes the guide and teacher, at the same time permitting the pupil to experience the enthusiasm, and to sustain the dignity, of an original investigator.

But though mineralogy thus pursued, fully rewards her devotees, its numerous connected inquiries and pursuits confer upon it, also, a high and deserving interest.

To the chemist who proposes to extend his knowledge to the productions of the mineral kingdom, this science becomes indispensable in order to enable him to know what he has analyzed, or how to distinguish and describe the body whose composition he has studied. To the geologist also, it is a collateral study of no small importance; since the discrimination of many rocks, and the description of all, depend upon a knowledge of no inconsiderable number of mineral species.

Of connected inquiries, however, the most fertile and highly interesting, is that arising out of the regular forms assumed by crystals, where, considering the absence of the living principle, a most surprising mixture of simplicity and complexness exists. To trace out the geometrical and numerical laws by which the secondary forms are derived from a few fundamental solids, though essential as a part of determinative and descriptive mineralogy, still leaves out of the question numerous, shorter and more beautiful modes of treating the subject, in consequence of the circuitous route by which it is necessarily effected in popular treatises. The invention, therefore, of new and more scientific methods of studying the geometry of crystals will always afford entertainment and delight to those who possess the adequate mathematical knowledge. The theoretical consideration of the shapes possessed by the elementary particles as connected with the same subject, though without any positive means of verification and utility in the practice of mineralogy, will afford to such inquirers a pleasing occupation.

As a collateral pursuit, that of Optics is perhaps one of the most beautiful and productive, as seems to be evinced by the rich harvest of discoveries made by Brewster in relation to the polarization of light and double refraction,—discoveries which are fruitful in new and highly curious experimental phenomena, as well as useful in affording an unexpected method for detecting in ambiguous cases, the primary forms of crystals. In addition to which mention may be made of Herschel's ingenious explanation relative to the deviation of the succession of colors, which many crystals exhibit, from that scale of tints established by Newton, by conceiving the axis of double refraction to be different for different colors; and of another discovery of the same philosopher, concerning the circular polarization of light to the right or left, and the plagihedral crystallization of Quartz; (see figures 371 and 373,) from which it appears that right handed polarization always accompanies right handed plagihedral faces, and left handed polarization, left handed faces. Very interesting observations are likewise connected with the origin of the various kinds of lustre as dependent on structure, and the phenomena of colors in Labradorite as the result of internal cavities having the shape of the primary solid.

Not the least curious developement is that made by Savart, from which it appears that the acoustical phenomena depending on the elasticity of the parts of the crystal lead to information connected with the internal structure of minerals. The elasticity of all the diametral lines in transverse plates cut from a common crystal of Quartz, parallel to the axis, having similar optical properties, is equal; but though all the plates cut parallel to the axis have similar optical relations, their acoustical properties have a relation to the edges of the prism; such however, that any three plates at angles of 120° have an equal acoustical elasticity. He found also that by the acoustical properties he could determine the cleavage planes of Quartz, and in general whether a given portion of a mineral belongs to a simple crystal, or to a mass of compound individuals, as the vibration in the different cases gives corresponding differences of note, amounting to a full tone.

Besides its own peculiar attractions, and the recommendations it possesses from its affiliation with many branches of general Physics, there is necessarily superadded to mineralogy in this country a strong interest arising out of the unexplored state of its mineral riches. By far the largest part of our territory still waits for the first labors of the Mineralogist; and as proof that the full harvest of discovery has not yet been gathered in even in the New England states, New York, New Jersey and Pennsylvania, in which mineralogical inquiries commenced, and where they have been followed up with the greatest activity, it needs only to be mentioned that these states still continue to develope with each passing year, discoveries of increasing interest. Should the present work contribute to promote investigations so inviting in themselves, and so important to mankind, whereby the science may reap fresh acquisitions, and the country increased resources, I shall experience a reward greatly beyond the merits of such imperfect labors.

CHARLES U. SHEPARD.

New Haven, May, 1835.

LIST OF THE PRINCIPAL WORKS CONSULTED IN THE PREPARATION OF THIS TREATISE.

Treatise on Mineralogy, by FREDERICK MOHS, translated from the German, with considerable additions, by WILLIAM HAIDINGER. Edinburgh, 1825.

Traité élémentaire de Minéralogie par F. S. BEUDANT. Paris, 1830.

Vollständige Charakteristik des Mineral-Systems, von AUGUST BREITHAUPT. Dresden and Leipzig, 1832.

Charakteristik der Mineralien, von FRANZ von KOBELL. Nurenberg, 1831.

Traité de Minéralogie, par L'ABBE' HAUY. Paris, 1823.

Die Mineralogie in sechs und Zwanzig Vorlesungen, von Dr. CARL FRIEDR. ALEX. HARTMANN. Ilmenau, 1829.

Handbuch der Oryktognosie von CARL CAESAR von LEONHARD. Heidelberg, 1826.

Die Anwendung des Löthrohrs in der Chemie und Mineralogie, von T. JACOB BERZELIUS. Nürnberg, 1828.

An Elementary Introduction to the Knowledge of Mineralogy, by WILLIAM PHILLIPS. London, 1823.

An Elementary Treatise on Mineralogy and Geology, by PARKER CLEAVELAND. Boston, 1822.

Nouveau Système de Minéralogie, par J. J. BERZELIUS. Paris, 1819.

Elementos de Orictognosia, por el C. ANDRES DEL RIO. Filadelfia, 1832.

Minéralogie appliquée aux Arts, par C. P. BRARD. Paris, 1821.

Der Naturgeschichte des Mineralreiches, von FRIEDERICH MOHS. Wien, 1832.

A Manual of Mineralogy, by ROBERT ALLAN. Edinburg, 1834.

Numerous works devoted to Crystallography, among which may be mentioned those of HAUY, BOURNON, BROCHANT, BROOKE and NAUMANN.

Various Memoirs in the different English, French and German Journals, and Transactions of Academies and Learned Societies; the Yearly Account of the Progress of Chemistry and Mineralogy, by BERZELIUS; the American Journal of Science; the Transactions of the Academy of Natural Sciences of Philadelphia, and of the New York Lyceum.

BREITHAUPT'S SCALE OF HARDNESS.

1. Foliated Talc. 2. Foliated Gypsum. 3. Foliated Mica. 4. Calcareous Spar, distinctly foliated. 5. Fluor, distinctly foliated. 6. Apatite. 7. Sodalite, vitreous Actynolite and foliated Scapolite. 8. Adularia. 9. Quartz. 10. Topaz. 11. Foliated Corundum. 12. Diamond.

ERRATA.

Vol. I.

Page 12, line 31, *for* Yttria *read* Lithia. [and *dele* Partsch.
" 43, " 20, *for* Habroneme-Malachite *read* Copper-Baryte
" 51, " 7, *after* P *insert* on do.
" 83, " 21, *for* 93° 40′ *read* 136° 50′.
" 83, " 23, *for* 87° 8′ *read* 133° 34′.
" 101, " 2, *for* 135° *read* 127° 27′.
" 122, " 10, *for* 80° *read* 60°.
" 143, " 25, *for* 107° 05′ *read* 177° 05′.
" 147, " 25, *for* 49·00 *read* 58 71.
" 147, " 26, *for* 14·00 *read* 21·31.
" 147, " 27, *for* 35·00 *read* 19·98.
" 159, " 30, *for* Cupreous *read* Euotomous.
" 160, " 20, *for* Prismatoidal *read* Cupreous.
" 178, " 1, *for* Pyramidal *read* Prismatic.
" 188, " 10, *for* 54·44 *read* 59·44.
" 233, " 5, *for* 180° *read* 130°.
" 233, " 18, *for* Antimony *read* Tellurium.
" 256, " 10, *for* 115° 53′ *read* 64° 51′.
" 281, " 26, *for* Iron *read* Chlorone.

Vol. II.

Page 31, line 28, *for* protoxide *read* peroxide.
" 32, " 9, *insert* color black.
" 48, " 13, *for* Molybdic *read* Plombic.
" 128, " 24, *for* Brachytypous *read* Pyromorphous.
" 176, " 14, *for* Scheeverite *read* Scheenerite.
" 186, " 28, *after* Rome *insert* and.
" 279, " 24, *for* Wolchouskoit *read* Wolchonskoit.
" 288, " 19, *for* Prismatic *read* Hemi-Prismatic.
" 293, " 9, *for* rather *read* rarely.
" 296, " 16, *for* affixed *read* prefixed.

TABULAR VIEW

OF THE

CLASSES, ORDERS, GENERA AND SPECIES OF THE NATURAL SYSTEM.*

GENERAL PROPERTIES OF THE CLASSES.

CLASS I.

G. under 3·8.
No bituminous odor.

CLASS II.

G. above 1·8.
Tasteless.

* The following abbreviations are employed in the tabular view:

G. for Specific Gravity.
H. for Hardness.
Beu. for Beudant.
B. for Breithaupt.
H. for Haidinger.
M. for Mohs.
P. for Partsch.
S. for Shepard.

CLASS III.

G. under 1·8.

GENERAL PROPERTIES OF THE ORDERS OF CLASS I.

Order I. Gas. (M.)

G. 0·0001 . . . 0·0014.
Gasiform.
Not acid.

Order II. Water. (M.)

G. 1·0.
Liquid.
Tasteless.

Order III. Acid. (M.)

G. 0·0015 . . . 3·7.
Acid.

Order IV. Salt. (M.)

G. 1·2 . . . 2·9.
Solid.
Not acid.

GENERAL PROPERTIES OF THE ORDERS OF CLASS II.

Order I. Haloide.[1] (M.)

Unmetallic. Streak uncolored.
H. 2·0 . . . 5·0.
G. 2·2 . . . 3·5.

---

[1] Αλς, *salt*, and ειxὸς, *like*.

Order II. Baryte.[2] (M.)

Unmetallic. Streak uncolored, or orange-yellow.
H. 2·5 . . . 6·0.
G. 3·3 . . . 7·3.

Order III. Kerate.[3] (M.)

Unmetallic. Streak uncolored.
H. 1·0 . . . 2·0.
G. 5·5 . . . 6·5.

Order IV. Mica. (M.)

Cleavage monotomous.[4]
H. 1·0 . . . 4·5.
G. 1·8 . . . 3·4.

Order V. Picrosmine.[5] (S.)

When moistened, emits an argillaceous odor.
H. 2·0 . . . 3·0.
G. 2·0 . . . 2·8.

Order VI. Spar. (M.)

Unmetallic.
H. 3·5 . . . 7·0.
G. 2·0 . . . 3·7.

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[2] Βαρὺς, *heavy*.

[3] Κέρας, *horn*.

[4] Μόνος, *single*, and τεμνω, *I cleave*,—implying that the cleavage is distinct only in a single direction.

[5] Πικρὸς, *bitter*, and οσμὴ, *odor*,—in allusion to the smell when moistened.

Order VII. Gem. (M.)

Unmetallic. Streak uncolored.
H. 5·5 . . . 10·0.
G. 1·9 . . . 4·7.

Order VIII. Ore. (M.)

H. 1·0 . . . 7·0.
G. 3·4 . . . 7·4.

Order IX. Metal. (M.)

Metallic.
H. 0·0 . . . 5·0.
G. 5·7 . . . 20·0.

Order X. Pyrites. (M.)

Metallic.
H. 3·0 . . . 6·5.
G. 4·1 . . . 7·7.

Order XI. Glance. (M.)

Metallic. Color grey, black.
H. 1·0 . . . 4·0.
G. 4·2 . . . 7·6.

Order XII. Blende. (M.)

H. 1·0 . . . 4·0.
G. 3·9 . . . 8·2.

Order XIII. Sulphur. (M.)

Unmetallic.
H. 1·0 . . . 2·5.
G. 1·9 . . . 2·01.

GENERAL PROPERTIES OF THE ORDERS OF CLASS III.

Order I. Resin. (M.)

H. 0·0 . . . 2·5.
G. 0·7 . . . 1·6.

Order II. Coal. (M.)

Streak brown, black.
H. 1·0 . . . 2·5.
G. 1·2 . . . 1·6.

GENERAL PROPERTIES OF THE GENERA OF CLASS I. *with an enumeration of the Species they contain.*

I. GAS.

Gen. I. Hydrogen Gas. (M.) Odor disagreeable.

Sp. 1. Pure (M.) *Hydrogen.*
2. Empyreumatic (M.) *Carburetted Hydrogen.*
3. Sulphuretted (M.) *Sulphuretted Hydrogen.*
4. Phosphuretted (M.) *Phosphuretted Hydrogen.*

Gen. II. Oxygen Gas. (S.)

Sp. 1. Pure (S.) *Oxygen.*

Gen. III. Nitrogen-Gas. (S.)

Sp. 1. Pure (S.) *Nitrogen.*

Gen. IV. Atmospheric-Gas. (M.)

Sp. 1. Pure (M.) *Atmospheric Air.*

II. WATER.

Gen. I. Atmospheric-Water. (M.)

Sp. 1. Pure (M.) *Water.*

III. ACID.

Gen. I. CARBONIC-ACID. (M.)

Sp. 1. Aeriform (M.) *Carbonic Acid.*

Gen. II. MURIATIC-ACID. (M.)

Sp. 1. Aeriform (M.) *Muriatic Acid.*

Gen. III. SULPHUROUS-ACID. (M.)

Sp. 1. Aeriform (M.) *Sulphurous Acid.*
2. Liquid (M.) *Sulphuric Acid.*

Gen. IV. BORACIC-ACID. (M.)

Sp. 1. Prismatic[6] (M.) *Sassolin.*

Gen. V. ARSENIC-ACID. (M.)

Sp. 1. Octahedral[7] (M.) *White Arsenic.*

IV. SALT.

Gen. I. NATRON-SALT. (M.) Taste pungent, alkaline.
H. 1·0 ... 1·5. G. 1·4 ... 1·5.

Sp. 1. Peritomous[8] (S.) *Gay Lussite.*
2. Hemi-prismatic[9] (M.) *Natron.*
3. Tetarto-prismatic[10] (S.) *Trona.*

---

[6] Applied to crystals derived from the right rhombic prism.

[7] Applied to crystals derived from the regular octahedron.

[8] Περι, *around*, and τεμνω, *I cleave*,—implying that the cleavage takes place in more than one direction parallel to the axis, and that the faces are all of the same quality. The result of the cleavage is a vertical prism.

[9] Ἡμι, *half*, applied to oblique rhombic prisms.

[10] Τέταρτος, *fourth*, applied to oblique rhombic prisms.

Gen. II. EARTHY-SALT. (S.) Deliquescent.

Sp. 1. Calcareous (S.) *Nitrocalcite.* (S.)
2. Magnesian (S.) *Nitro-Magnesite.* (S.)

Gen. III. GLAUBER-SALT. (M.) Taste cool, then saline and bitter: weak. H. 1·5 . . . 2·0. G. 1·4 . . . 1·5.

Sp. 1. Prismatic (M.) *Glauber-Salt.*
2. Prismatoidal[11] (S.) *Aphthitalite*[12] (BEU.)

Gen. IV. NITRE-SALT. (M.) Taste saline and cool. H. 2·0. G. 1·9 . . . 2·0.

Sp. 1. Prismatic (M.) *Nitre.*
2. Rhombohedral[13] (S.) *Soda Nitre.* (S.)

Gen. V. ROCK-SALT. (M.)

Sp. 1. Hexahedral[14] (M.) *Common Salt.*

Gen. VI. AMMONIA-SALT. (M.)

Sp. 1. Octahedral (M.) *Sal-Ammoniac.*

Gen. VII. VITRIOL-SALT. (M.) Taste astringent. H. 2·0 . . . 2·5. G. 1·8 . . . 2·3.

Sp. 1. Hemi-prismatic (M.) *Copperas.*
2. ———— *White Copperas.*
3. Paratomous[15] (S.) *Botryogene.* (HAID.)
4. Tetarto-prismatic (M.) *Blue Vitriol.*

---

[11] Alluding to a single cleavage, parallel to the axis.

[12] Αφθιτος, *unalterable*, and αλς, *salt*.

[13] Implying the connexion of the forms with the rhomboid.

[14] Implying the connexion of the forms with the cube.

[15] Παρὰ, *about*, and τεμνω, *I cleave*, referring to faces of cleavage of an indeterminate number.

5. Prismatoidal (S.) *Brochantite.* (Levy.)
6. Prismatic (M.) *White Vitriol.*
7. Staphyline[16] (S.) *Cobalt Vitriol.*
8. Habroneme[17] (S.) *Uranium Vitriol.*

Gen. VIII. Uranium Salt. (S.)

Sp. 1. Cupric (S.) *Johannite.*

Gen. IX. Bitter-Salt. (M.) Taste saline, bitter. H. 2·0 . . . 2·5. G. 1·7 . . . 1·8.

Sp. 1. Prismatic (M.) *Epsom Salt.*
2. Volatile (S.) *Mascagnine.* (Reuss.)

Gen. X. Alum-Salt. Taste sweetish, astringent. H. 2·0. 2·5. G. 1·7 . . . 1·8.

Sp. 1. Octahedral (M.) *Alum.*
2. Prismatic (S.) *Solfatarite.*[18] (S.)

Gen. XI. Borax-Salt. (M.)

Sp. 1. Prismatic (M.) *Borax.*

Gen. XII. Brithyne[19]-Salt. (M.) Taste saline, feebly astringent. H. 2·5 . . . 3·0. G. 2·75 . . . 2·85.

Sp. 1. Peritomous (S.) *Thénardite.*
2. Prismatic (M.) *Glauberite.*
3. Stelene[20] (S.) *Polyhallite.*

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[16] Σταφυλὴ, *a bunch of grapes*, alluding to botryoidal shapes.

[17] Ἁβρὸς, *delicate*, and νῆμα, *a thread* or *fibre*.

[18] From the solfataras, in which the mineral is chiefly found.

[19] Βριθὺς, *dense*, (heavy.)

[20] Στήλη, *a column*, in allusion to the columnar structure of the mineral.

GENERAL PROPERTIES OF THE GENERA OF CLASS II.

HALOIDE.

Gen. I. Cryone[21]-Haloide. (M.)

Sp. 1. Orthotypous[22] (M.) *Cryolite.*

Gen. II. Alum-Haloide. (M.)

Sp. 1. Rhombohedral *Alum-Stone.*

Gen. III. Malachite-Haloide. (S.) Color green, or bluish green. H. 2·0 . . . 3·0. G. 2·3 . . . 3·0.

Sp. 1. Staphyline (S.) *Chrysocolla.*
2. Lirocone[23] (S.) *Liroconite.*
3. Hexahedral (S.) *Cube Ore.*
4. Prismatic (S.) *Skorodite.*
5. Habroneme (S.) *Nickel Green.*

Gen. IV. Fluor-Haloide. (M.) H. 4·0 . . . 5·0. G. 3·0 . . . 3·3.

Sp. 1. Octahedral (M.) *Fluor.*
2. Rhombohedral (M.) *Apatite.*
3. Prismatic (S.) *Herderite.*
4. ———— *Fluellite.*
5. Hemi-prismatic (S.) *Yttrocerite.*

Gen. V. Lime-Haloide. (M.) H. 3·0 . . . 4·5. G. 2·5 . . . 3·2.

Sp. 1. Prismatic (M.) *Arragonite.*

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[21] Κρύος, *ice*, in allusion to the easy fusibility of the mineral.

[22] Ορθὸς, *straight*, and τυπος, *form*, in allusion to the perpendicular cleavage of the mineral.

[23] Λειρὸς, *pale*, and κονία, *powder*, or *dust*.

2. Rhombohedral (M.)	*Calcareous Spar.*
3. Macrotypous [24] (M.)	*Dolomite.*
4. Brachytypous [25] (M.)	*Rhomb Spar.*
5. Paratomous (M.)	*Ankerite.*
6. Microtine [26] (S.)	*Plumbocalcite.* (TURNER.)
7. Staphyline (S.)	*Magnesite.*

BARYTE.

Gen. I. PARACHROSE[27]-BARYTE. (M.) H. 3·5 ... 6·0. G. 3·3 ... 3·9.

Sp. 1. Macrotypous (M.)	*Diallogite.*
2. Brachytypous (M.)	*Spathic Iron.*
3. Rhombohedral (S.)	*Troostite.* (S.)
4. Prismatic (S.)	*Triplite.*
5. Tetarto-prismatic (S.)	*Manganese Spar.*
6. Staphyline (S.)	*Bustamite.*

Gen. II. ZINC-BARYTE. (M.) H. 5·0. G. 3·3 ... 4 5.

Sp. 1. Prismatic (M.)	*Electric Calamine.*
2. Axotomous [28] (S.)	*Willemite.*
3. Rhombohedral (M.)	*Calamine.*

---

[24] Μακρὸς, *long*, and τυπος, *form*.

[25] Βραχὺς, *short*, and τυπος, *form*.

[26] Μικρὸς, *small*, alluding to the minuteness of the crystals.

[27] Παράκρωσις, *change of color*, from the alteration in color which the species undergo from exposure to the weather.

[28] Αξων, *the axis*, and τεμνω, *I cleave*; the cleavage consisting of a single face, which is perpendicular to the axis.

Gen. III. Tungstic Baryte. (M.) H. 4·0...5·5. G. 4·5...6·1.

Sp. 1. Pyramidal[29] (M.)	*Tungsten.*
2. Prismatic (S.)	*Xenotime.*[30] (Beu.)
3. Octahedral (S.)	*Microlite.* (S.)
4. Peritomous (S.)	*Thorite.*
5. Rhombohedral (S.)	*Flucerine.*
6. Tetarto-prismatic (S.)	*Monazite.* (B.)

Gen. IV. Hal-Baryte. (M.) Prismatic and hemi-prismatic. H. 3·0...4·0. G. 3·6...4·7.

Sp. 1. Peritomous (M.)	*Strontianite.*
2. Hemi-prismatic (M.)	*Baryto-Calcite.*
3. Di-prismatic[31] (M.)	*Witherite.*
4. Prismatic (M.)	*Heavy Spar.*
5. Prismatoidal (M.)	*Celestine.*

Gen. V. Lead-Baryte. (M.) H. 2·5...4·0. G. 5·4...7·3.

Sp. 1. Peritomous (M.)	*Kerasite.*
2. Kerasine (S.)	*Corneous Lead.*
3. Di-prismatic (M.)	*White Lead Ore.*

---

[29] Applied to crystals derived from the right square prism, and from the octahedron with a square base.

[30] Κενὸς, *vain*, and τιμὴ, *honor*; in allusion to the circumstance that the phosphate of yttria, of which this mineral consists, was for a time regarded as the oxide of a new metal, the Thorium.

[31] When the cleavages are parallel to the sides of a four-sided vertical prism, and at the same time to a horizontal prism.

4. Hedyphanous (S.)	*Hedyphane.*
5. Pyromorphous[33] (S.)	*Pyromorphite.*
6. Staphyline (S.)	*Plumbo-Gummite.* (S.)
7. Hemi-prismatic (M.)	*Red Lead-Ore.*
8. Pyramidal (M.)	*Yellow Lead-Ore.* (S.)
9. Tungstic (S.)	*Scheeletine.* (Beu.)
10. Prismatic (M.)	*Anglesite.* (Beu.)
11. Axotomous (M.)	*Leadhillite.* (Beu.)
12. Prismatoidal (S.)	*Dyoxylite.*[34] (B.)
13. Cupreous (S.)	*Caledonite.* (Beu.)
14. Euotomous[35] (S.)	*Cupreous Anglesite.*
15. ————	*Vauquelinite.*

Gen. VI. Copper-Baryte. (S.) Color blue and green.
H. 2·5 . . . 5·0. G. 3·2 . . . 4·6.

Sp. 1. Prismatic (S.)	*Olivinite.*
2. Di-prismatic (S.)	*Libethenite.*
3. Aphanistic[36] (S.)	*Aphanesite.*
4. Azure (S.)	*Blue Malachite.*
5. Rhombohedral (S.)	*Dioptase.*
6. Peritomous (S.)	*Euchroite.*
7. Hemi-prismatic (S.)	*Pseudo Malachite.*

---

[33] Πυρ, *fire*, and μορφὴ, *form*, referring to its crystallization from fire.

[34] Δὶς, *twice*, and οξὺς, *acid*, from its containing two acids.

[35] Ευ, *well*, and τέμνω, *I cleave*, from the distinctness of the cleavages.

[36] Αφανὴς, *indistinct.*

8. Habroneme (S.) *Green Malachite.*
9. Prismatoidal (S.) *Atacamite.*
10. Dystome[37] (S.) *Erinite.*

Gen. VII. Tellurium-Baryte. (S.)

Sp. 1. Staphyline (S.) *Herrerite.*

Gen. VIII. Bismuth-Baryte. (S.)

Sp. 1. Tetrahedral (S.) *Bismuth-Blende.*

Gen. IX. Antimony-Baryte. (M.)

Sp. 1. Prismatic (M.) *White Antimony.*

KERATE.

Gen. I. Pearl Kerate. (M.) H. 1·0...2·0. G. 5·5...6·5.

Sp. 1. Hexahedral (M.) *Horn Silver.*
2. Pyramidal (M.) *Horn Quick Silver.*
3. Monotomous (S.) *Iodic Silver.*

MICA.

Gen. I. Euchlore[38]-Mica. (M.) Color green and yellow. H. 1·0...2·5. G. 2·5...3·2.

Sp. 1. Rhombohedral (M.) *Copper Mica.*
2. Prismatic (M.) *Kupaphrite.* (S.)
3. Pyramidal (M.) *Uranite.*

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[37] Δυς, *with difficulty*, and τέμνω, *I cleave.*

[38] Ευ, *well*, and χλωρὸς, *green*, from the distinctness of the green color.

Gen. II. Cobalt-Mica. (M.)

Sp. 1. Diatomous[39] *Cobalt Bloom.*

Gen. III. Pyrosmalite-Mica. (B.)

Sp. 1. Hexagonal (B.) *Pyrosmalite.*

Gen. IV. Iron-Mica. (M.) H. 2·0...2·5. G. 2·6 ...2·7.

Sp. 1. Prismatic (M.) *Vivianite.*
2. Rhombohedral (S.) *Cronstedite.*

Gen. V. Graphite-Mica. (M.)

Sp. 1. Rhombohedral (M.) *Plumbago.*

Gen. VI. Talc-Mica. (M.) H. 1·0...2·5. G. 2·4 ...3·0.

Sp. 1. Prismatic (M.) *Talc.*
2. Rhombohedral (M.) *Mica.*

Gen. VII. Gypsum-Mica. (S.) H. 1·0...3·5. G. 2·3...3·0.

Sp. 1. Rhombohedral (S.) *Native Magnesia.*
2. Prismatoidal (S.) *Gypsum.*
3. Prismatic (S.) *Anhydrite.*
4. Diatomous (S.) *Haidingerite.*
5. Hemi-prismatic (S.) *Pharmacolite.*

Gen. VIII. Pearl-Mica. (M.)

Sp. 1. Rhombohedral (M.) *Margarite.*

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[39] Διὰ, *through*, and τέμνω, *I cleave*,—implying that the crystals possess one distinct diagonal-cleavage.

PICROSMINE.

Gen. I. Atelene[40]-Picrosmine. (S.) Lustre dull. H. 2·5 . . . 3·0. G. 2·2 . . . 2·6.

Sp. 1. Prismatic (S.) *Serpentine.*
2. Fibrous (S.) *Picrolite.*
3. Prismatoidal (S.) *Picrosmine.*
4. Nemaline[41] (S.) *Nemalite.*
5. Brittle (S.) *Kerolite.*
6. Glyptic (S.) *Figure Stone.*

SPAR.

Gen. I. Schiller-Spar. (M.) Cleavage monotomous. H. 3·5 . . . 5·0. G. 2·6 . . . 3·3.

Sp. 1. Diatomous (M.) *Schiller Spar.*
2. Hemi-prismatic (M.) *Bronzite.*

Gen. II. Disthene-Spar. (M.) H. 5·0 . . . 7·0. G. 3·0 . . . 3·7.

Sp. 1. Prismatic (M.) *Kyanite.*
2. Prismatoidal (S.) *Spodumene.*

Gen. III. Dystome-Spar. (M.) H. 5·0 . . . 7·0. G. 2·8 . . . 3·0.

Sp. 1. Prismatic (M.) *Datholite.*
2. Pyramidal (S.) *Gehlenite.*
3. Periotomous (S.) *Edingtonite.*

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[40] Ατελής, *imperfect;* in allusion to the want of regular forms in the genus.

[41] Νῆμα, *a thread,*—from the fibrous structure.

Gen. IV. Wavelline-Spar. (S.) Botryoidal, and columnar. H. 3·0 . . . 4·5. G. 1·85 . . . 3·00.

Sp. 1.	Staphyline (S.)	*Gibbsite.*
2.	Uncleavable (S.)	*Allophane.*
3.	Prismatic (S.)	*Wavellite.*
4.	Prismatoidal (S.)	*Karpholite.*
5.	Hemi-prismatic (S.)	*Cummingtonite.*
6.	Tetarto-prismatic (S.)	*Diaspore.*

Gen. V. Kouphone-Spar. (M.) H. 3·5 . . . 6·0. G. 2·0 . . . 2·5.

Sp. 1.	Axotomous (M.)	*Prehnite.*
2.	Abrazitic[42] (S.)	*Gismondin.*
3.	Trapezohedral (S.)	*Leucite.*
4.	Dodecahedral (M.)	*Sodalite.*
5.	Hexahedral (M.)	*Analcime.*
6.	Paratomous (M.)	*Harmotome.*
7.	Vesuvian (S.)	*Comptonite.*
8.	Staurotypous[43] (M.)	*Phillipsite.*
9.	Rhombohedral (M.)	*Chabasie.*
10.	Sarcoline[44] (S.)	*Gmelinite.*
11.	Macrotypous (M.)	*Levyne.*
12.	Diatomous (M.)	*Laumonite.*
13.	Prismatic (M.)	*Mesotype.*
14.	Orthotomous (M.)	*Thomsonite.*
15.	Prismatoidal (M.)	*Stilbite.*

[42] A and Βράζω, *to bubble*, from the fact that it does not effervesce when melted before the blow-pipe.

[43] Σταυρὸς, *a cross*, and τύπος, *a form*, in allusion to the cross form of its macles.

[44] Σὰρξ, *flesh*, from its reddish white color.

16. Hemi-prismatic (M.) *Heulandite.*
17. Diplogenous (M.) *Epistilbite.*
18. Polyprismatic[45] (S.) *Brewsterite.*
19. Pyramidal (M.) *Apophyllite.*

Gen. VI. Azure-Spar. (M.) Color blue. H. 5·0 ... 6·0. G. 2·83 ... 3·10.

Sp. 1. Prismatic (M.) *Lazulite.*
2. Prismatoidal (M.) *Blue Feldspar.*
3. Uncleavable (S.) *Turquoise.*

Gen. VII. Feld-Spar. (M.) H. 5·0 ... 6·0. G. 2·5 ... 3·1.

Sp. 1. Rhombohedral (M.) *Nepheline.*
2. Orthotomous (M.) *Feldspar.*
3. Heterotomous[46] (M.) *Periklin.*
4. Tetarto-prismatic (M.) *Albite.*
5. Anorthotomous (M.) *Anorthite.*
6. Polychromatic[47] (M.) *Labradorite.*
7. Eruthrone[48] (S.) *Latrobite.*

Gen. VIII. Andalusite-Spar. (M.)

Sp. 1. Prismatic (M.) *Andalusite.*

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[45] Πολὺς, *many*, in allusion to the numerous prisms its crystals present in a single form.

[46] Ἕτερος, *another*, and τέμνω, *I cleave*, in allusion to its having a different cleavage from Feldspar.

[47] Πολὺς, *many*, and χρωμα, *color*, in allusion to the play of colors it presents.

[48] Ερυθρὸς, *red*.

Gen. IX. Petaline-Spar. (M.) H. 5·0...6·5. G. 2·8...3·2.

Sp. 1. Uncleavable (S.) *Nephrite.*
2. Dusclaone (S.) *Saussurite.*
3. Prismatic (M.) *Petalite.*
4. Rhombohedral (S.) *Eudyalite.*
5. Pyramidal (S.) *Scapolite.*
6. Peritomous (S.) *Fahlunite.*
7. Prismatoidal (S.) *Amblygonite.*

Gen. X. Augite-Spar. (M.) H. 4·5...7·0. G. 2·7...3·5.

Sp. 1. Prismatoidal (M.) *Epidote.*
2. Dystome (H.) *Bucklandite.*
3. Paratomous (M.) *Pyroxene.*
4. Achmitic (S.) *Achmite.*
5. Axotomous (M.) *Babingtonite.*
6. Hemi-prismatic (M.) *Hornblende.*
7. Peritomous (M.) *Arfwedsonite.*
8. Metalloidal (S.) *Hypersthene.*

Gen. XI. Tabular-Spar. (S.) H. 3·5...6·0. G. 2·0...2·9.

Sp. 1. Tetarto-prismatic (S.) *Tabular Spar.*
2. Prismatic (S.) *Pyrallolite.*
3. Parachrose (S.) *Boltonite.*

GEM.

Gen. 1. Corundum. (M.) H. 7·0...9·0. G. 3·5...4·6.

Sp. 1. Dodecahedral (M.) *Spinel.*
2. Octahedral (M.) *Automolite.*
3. Rhombohedral (M.) *Corundum.*

Gen. II. Diamond. (M.)

Sp. 1. Octahedral (M.) *Diamond.*

Gen. III. Topaz. (M.)

Sp. 1. Prismatic (M.) *Topaz.*

Gen. IV. Emerald. (M.) H. 7·5...8·0. G. 2·6...3·2.

Sp. 1. Prismatic (M.) *Euclase.*
2. Rhombohedral (M.) *Emerald.*
3. Pyramidal (S.) *Chrysoberyl.*
4. Phenakine (S.) *Phenakite.* (Nordenskiöld.)

Gen. V. Quartz. (M.) H. 5·5...7·5. G. 1·9...2·7.

Sp. 1. Prismatic (M.) *Iolite.*
2. Rhombohedral (M.) *Quartz.*
3. Uncleavable (M.) *Opal.*
4. Empyrodox[49] (M.) *Pitchstone.*
5. Isopyric (H.) *Isopyre.*

Gen. VI. Axinite. (M.) Color brown. H. 6·5...7·0. G. 3·0...3·3.

Sp. 1. Tetarto-prismatic (S.) *Axinite.*
2. Prismatoidal (S.) *Bucholzite.*

Gen. VII. Chrysolite. (M.)

Sp. 1. Prismatic (M.) *Peridot.*

Gen. VIII. Boracite.

Sp. 1. Tetrahedral (M.) *Boracite.*

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49 Εμπυρὸς, *belonging to fire*, and δόξα, *opinion.*

Gen. IX. TOURMALINE. (M.) H. 7·0 . . . 7·5. G. 3·0 . . . 3·2.

Sp. 1. Rhombohedral (M.) *Tourmaline.*
2. Hemi-prismatic (S.) *Brucite.*
3. Pyramidal (S.) *Idocrase.*

Gen. X. GARNET. H. 6·0 . . . 7·5. G. 3·1 . . . 4·3.

Sp. 1. Tetrahedral (M.) *Helvin.*
2. Dodecahedral (M.) *Garnet.*
3. Pyramidal (M.) *Zircon.*
4. Prismatoidal (S.) *Staurotide.*

ORE.

Gen. I. MELANE[50]-ORE. (P.) H. 6·0 . . . 7·0. G. 4·0 . . . 4·3.

Sp. 1. Tetarto-prismatic (P.) *Allanite.*
2. Hemi-prismatic (P.) *Gadolinite.*

Gen. II. ERUTHRONE-ORE. (S.) Some shade of red or brown. H. 3·5 . . . 7·0. G. 3·4 . . . 7·1.

Sp. 1. Prismatic (S.) *Sphene.*
2. Pyramidal (S.) *Anatase.*
3. Prismtoidal (S.) *Aischynite.* (BERZ.)
4. Pyrochlore (S.) *Pyrochlore.*
5. Melanous (S.) *Polymignite.* (BERZ.)
6. Diatomous (S.) *Brookite.*
7. Peritomous (S.) *Rutile.*
8. Octahedral (S.) *Red Copper-Ore.*
9. Hemi-prismatic (S.) *Red Zinc-Ore.*

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[50] Μέλας, *Black.*

10. Uncleavable (S.) *Cerite.*
11. Monotomous (S.) *Yttro-Tantalite.*

Gen. III. Iron-Ore. (M.) H. 5·0...6.5. G. 3·8...5·3.

Sp. 1. Octahedral (M.) *Magnetic Iron.*
2. Chromated (S.) *Chrome-Ore.*
3. Dodecahedral (M.) *Franklinite.*
4. Axotomous (M.) *Crichtonite.*
5. Uncleavable (S.) *Mohsite.*
6. Rhombohedral (M.) *Specular Iron.*
7. Prismatic (M.) *Limonite.*
8. Di-prismatic (M.) *Yenite.*

Gen. IV. Baryte-Ore. (S.) H. 5·0..,6·0. G. 6·0 ...7·4.

Sp. 1. Peritomous (S.) *Tin-Ore.*
2. Prismatic (S.) *Wolfram.*
3. Pyramidal (S.) *Columbite.*
4. Uncleavable (S.) *Pitchblende.*

Gen. V. Manganese-Ore. (M.) Color black. H. 2·0 ...6·5. G. 3·1...4·9.

Sp. 1. Pyramidal (M.) *Black Manganese.*
2. Brachytipous (M.) *Braunite.*
3. Uncleavable (M.) *Psilomelane.*
4. Prismatoidal (M.) *Manganite.*
5. Prismatic (M.) *Pyrolusite.*
6. Staphyline (S.) *Cupreous Manganese.*

Gen. VI. LUSINE[51]-ORE. (S.) Pulverulent.

Sp. 1. Bismuthic (S.)	*Bismuth Ochre.*
2. Tungstic (S.)	*Tungstic Ochre.*
3. Molybdic (S.)	*Molybdic-Ochre.*
4. Uranic (S.)	*Uranic-Ochre.*
5. Chromic (S.)	*Chrome-Ochre.*
6. Cobaltic (S.)	*Earthy Cobalt.*
7. Cupric (S.)	*Melaconite.*[52] (BEU.)
8. Plumbic (S.)	*Minium.*
9. Antimonic (S.)	*Antimony-Ochre.*

METAL.

Gen. I. MALACONE[53]-METAL. (S.) Color white, reddish and yellow. H. 0·0 . . . 3·5. G. 6·0 . . . 14·8.

Sp. 1. Auro-tellurium (S.)	*Mullerite.*[54] (BEU.)
2. Tellurium (S.)	*Native Tellurium.*
3. Bismuth (S.)	*Native Bismuth.*
4. Mercury (S)	*Native Mercury.*
5. Argento-mercury (S)	*Native Amalgam.*
6. Argento-antimony (S)	*Antimonial Silver.*
7. Silver (S)	*Native Silver.*
8. Copper (S.)	*Native Copper.*
9. Gold (S.)	*Native Gold.*
10. Arsenic (S.)	*Native Arsenic.*
11. Antimony (S.)	*Native Antimony.*

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[51] Λύσις, *decomposition*, from the circumstance that the species of this genus result from the decomposition of other species.

[52] Μέλας, *black*, and κονία, *powder*.

[53] Μαλακὸς, *soft*.

[54] The discoverer's name.

Genus II. SCLERONE[55] METAL. (S.) H. 4·0 ... 5·0. G. 7·31 ... 18·5.

Sp. 1. Iron (S.)	*Native Iron.*
2. Platina (S.)	*Native Platina.*
3. Iridium (S.)	*Native Iridium.*
4. Irid-osmium (S.)	*Irid-Osmine.*
5. Palladium (S.)	*Native Palladium.*

PYRITES.

Gen. I. ERUTHLEUCONE[56]-PYRITES. (S.) Color white to red. H. 5·0 ... 6·0. G. 5·7 ... 7·0.

Sp. 1. Cupreous (S.)	*Copper Nickel.*
2. Euotomous (S.)	*Nickel Glance.*
3. Antimonial (S.)	*Nickel Stibine.* (BEU.)
4. Axotomous (S.)	*Leucopyrite.*[57] (S.)
5. Prismatic (S.)	*Mispickel.*
6. Cobaltic (S.)	*Cobalt Pyrites.*
7. Octahedral (S.)	*Smaltine.* (BEU.)
8. Hexahedral (S.)	*Cobaltine.* (BEU.)

Gen. II. CHLORONE[58]-PYRITES. (S.) Color greenish yellow. H. 3·0 ... 6·5. G. 4·1 ... 5·1.

Sp. 1. Hexahedral (S.)	*Iron Pyrites.*
2. Pyramidal (S.)	*Yellow Copper Pyrites.*
3. Prismatic (S.)	*White Iron-Pyrites.*
4. Capillary (S.)	*Capillary Pyrites.*

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[55] Σκληρὸς, *hard.*

[56] Ερυθρὸς, *red,* and λευκὸς, *white,* the color being a mixture of red and white.

[57] Λευκὸς, *white,* and πυριτης, *a stone emitting fire.*

[58] Χλωρὸς, *yellowish green.*

Gen. III. BRONZE-PYRITES. (S.) Color bronze. H. 3·5 ... 4·0. G. 4·1 ... 4·7.	
Sp. 1. Rhombohedral (S.)	*Magnetic Iron Pyrites.*
2. Octahedral (S.)	*Variegated Copper.*

GLANCE.

Gen. I. COPPER-GLANCE. (M.) H. 2·5 ... 4·0. G. 4·3 ... 5·8.	
Sp. 1. Hexahedral (M.)	*Tin Pyrites.*
2. Tetrahedral (M.)	*Fahlerz.*
3. Di-prismatic (M.)	*Bournonite.*
4. Prismatic (M.)	*Vitreous Copper.*
Gen. II. POLYPOIONE[59]-GLANCE. (S.) H. 1·0 ... 2·5. G. 4·5 ... 8·5.	
Sp. 1. Prismatoidal (S.)	*Black Silver.*
2. Dodecahedral (S.)	*Vitreous Silver.*
3. Hexahedral (S.)	*Galena.*
4. Selenious (S.)	*Eukairite.*
5. Paratomous (S.)	*Clausthalite.*[60] (BEU.)
6. Prismatic (S.)	*Black Tellurium.*
7. Telluric (S.)	*Telluric Silver.*
8. Bismuthic (S.)	*Bornite.*[61] (BEU.)
9. Uncleavable (S.)	*Stromeyerite.*
10. Cupreous (S.)	*Cupreous Bismuth.*
11. Monotomous (S.)	*Sternbergite.*

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[59] Πολὺς, *many*, and ποίεω, *to make*, in allusion to the number of species in the genus.

[60] From the locality.

[61] Named from DE BORN.

12. Rhombohedral (S.) *Molybdenite.*
13. Axotomous (S.) *Polybasite.*[62]

Gen. III. Antimony-Glance. (M.) H. 1·5 ... 2·5. G. 4·2 ... 5·8.

Sp. 1. Prismatic (M.) *Graphic Gold.*
2. Prismatoidal (M.) *Grey Antimony.*
3. Axotomous (M.) *Jamesonite.*
4. Peritomous (P.) *Zinkenite.*[63]

BLENDE.

Gen. I. Sclerone-Blende. (S.) H. 3·5 ... 4·0. G. 3·9 ... 4·2.

Sp. 1. Hexahedral (S.) *Manganblende.*
2. Dodecahedral (S.) *Blende.*

Gen. II. Malacone-Blende. (S.) H. 1·0 ... 2·5. G. 4·5 ... 8·2.

Sp. 1. Prismatic (S.) *Red Antimony.*
2. Rhombohedral (S.) *Red Silver.*
3. Aphotistic[64] (S.) *Proustite.* (Beu.)
4. Hemi-prismatic (S.) *Myargyrite.*
5. Peritomous (S.) *Cinnabar.*
6. Selenious (S.) *Rionite.*[65] (S.)
7. Yellow (S.) *Orpiment.*
8. Red (S.) *Realgar.*

---

[62] Πολὺς, *many*, and Βάσις, *base*, having many bases in its composition.

[63] Named from Zinken, its discoverer.

[64] A and φως, *void of light*, from its dark color.

[65] Named from Del Rio.

SULPHUR.

Gen. I. Brittle Sulphur. (S.)

Sp. 1. Prismatic (S.)	*Sulphur.*
2. Selenious (S.)	*Sulpho-Selenite.* (S.)

GENERAL PROPERTIES OF THE GENERA IN CLASS III.

RESIN.

Gen. I. Melichrone[66]-Resin. (M.)

Sp. 1. Pyramidal (M.)	*Mellite.*

Gen. II. Mineral Resin. (M.) H. 0·0 . . . 2·5, G. 0·8 . . . 1·2.

Sp. 1. Yellow (M.)	*Amber.*
Black (M.)	*Bitumen.*

COAL.

Gen. I. Mineral-Coal. (M.) H. 1·0.

Sp. 1. Bituminous (M.)	*Bituminous Coal.*
2. Non-bituminous (M.)	*Anthracite.*

---

[66] Μελιχρων, *having the color of honey.*

GENERAL DESCRIPTIONS

OF THE

SPECIES.

Abrazite. (See *Gismondin.*)

ACHMITE. Achmitic Augite-Spar.

Primary form. Oblique rhombic prism. M on M=93° 4′.

Secondary form. The primary, having the obtuse lateral edges deeply truncated, together with the edges of the base in such a manner as to give rise to a very acute 4-sided summit: the acute lateral edges also slightly truncated in some instances.

Cleavage, parallel with M distinct; traces, parallel with the diagonals. Fracture imperfectly conchoidal. Surface, broad secondary lateral planes streaked longitudinally; the rest, smooth and shining.

Lustre vitreous. Color brownish-black, with a tinge of yellow or green. Streak pale yellowish-grey. Translucent on the edges, to opake.

Brittle. Hardness =6·0...6·5. Sp. gr. =3·2...3·3.

1. Before the blow-pipe it melts into a black globule, which moves the magnetic needle. It affords no moisture by calcination, and is not attacked by the acids.

2. *Analysis.*

By Berzelius.

Silica	55·25
Peroxide of iron	31·25
Soda	10·40
Lime	0.72
Protoxide of manganese,	1·08

3. It is found engaged in Quartz near Kongsberg in Norway.

4. This mineral has been referred to Pyroxene by several mineralogists, from which substance, however, it appears sufficiently distinct.

ACHYRITE. (See *Dioptase.*)

ACICULAR BISMUTH GLANCE. (See *Needle-Ore.*)

ACTINOTE. (See *Hornblende.*)

ACTYNOLITE. (See *Hornblende.*)

ADAMANTINE-SPAR. (See *Corundum.*)

ADINOLE. (See *Petrosilex.*)

ADIPOCIRE MINERAL. (See *Hatchetine.*)

ADULARIA.

The most transparent and pure varieties of *Albite* and *Feldspar*, q. v.

AEQUINOLITE. (See *Pitchstone.*)

AEROSITE. (See *Red Silver.*)

AGALMATOLITE. (See *Figure-stone.*)

AGARIC MINERAL. (See *Calcareous Spar.*)

AGATE. (See *Quartz.*)

AISCHYNITE. Prismatoidal Eruthrone-Ore.

Primary form. Right rhombic prism.

Secondary form. The primary, terminated by 4-sided pyramids.

Lustre sub-metallic. Color black. Streak dark grey to black.

Hardness =5·0...7·0. Sp. gr. =5·14...5·55.

1. In the matrass, it yields a little moisture, without altering its appearance. In an open tube it affords distinct traces of Fluoric acid. At an incipient red heat, upon charcoal, or in the platina forceps, it puffs up and enlarges in all its dimensions, especially in the direction of its cleavage, curls over to one side and remains without fusing of a dull yellow color. With borax, it is dissolved in large quantities; the glass presenting a dark yellow color both in the oxidation and reduction fire of the blow-pipe. When the mineral is added in excess, the glass after cool-

ing becomes opake. It is easily soluble into a clear and colorless glass with the salt of phosphorus. With soda, it is decomposed, without suffering fusion.

2. *Analysis.*

By HARTWALL.

Titanic acid - - - - - - -	56·00
Zirconia - - - - - - -	20·00
Oxide of cerium - - - - - -	15·00
Lime - - - - - - - -	3·80
Oxide of iron - - - - - -	2·60
Oxide of tin - - - - - - -	0·50

3. It was brought from Mias in the Ural mountains of Siberia, by MENGE.

ALBIN. (See *Apophyllite.*)

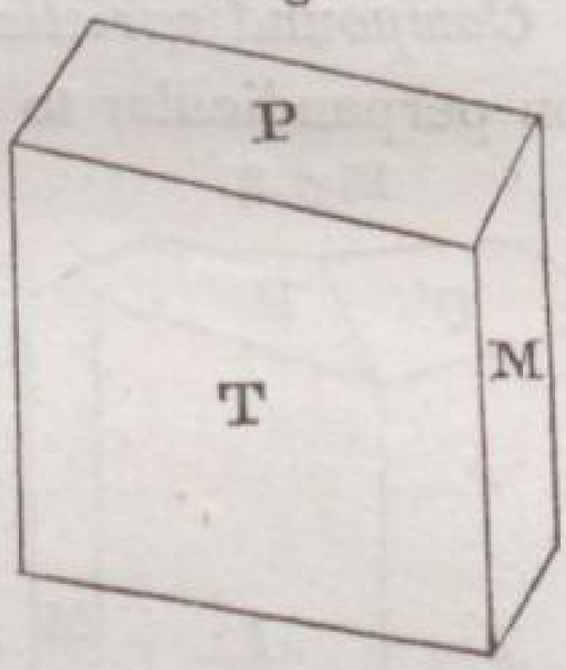
ALBITE. Tetarto-prismatic Feldspar.

PARTSCH.

Primary form. Doubly oblique prism.

M on T - - - - -	117° 53′
M on P - - - - -	93 30
T on P - - - - -	115 5

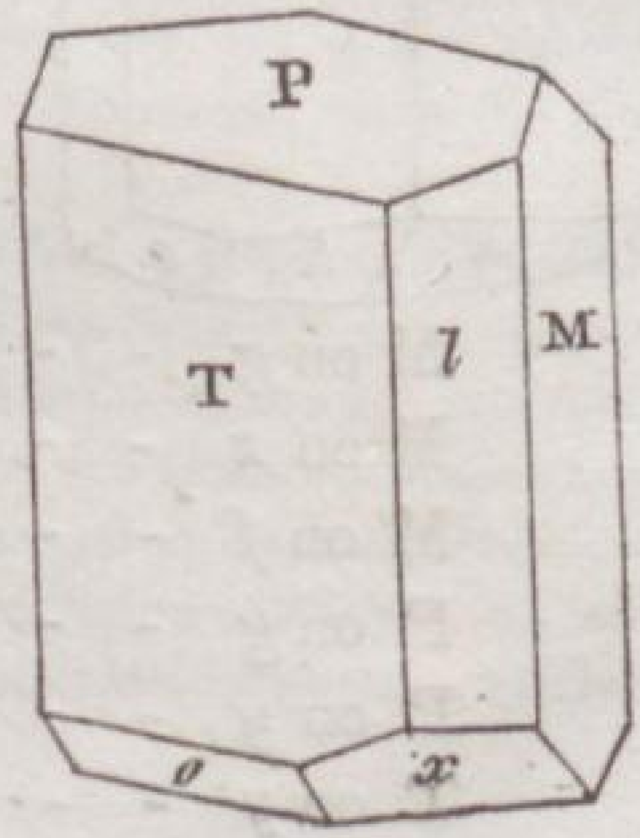
Fig. 1.



Secondary form.

M on l - - - - -	119° 52′
P on l - - - - -	119 51
P on x - - - - -	127 23
T on x - - - - -	110 29

Fig. 2.



Cleavage, parallel to P perfect; parallel to the faces M and T less perfect, though frequently obtained with sufficient precision to admit of the application of the reflective goniometer.

Fracture uneven, imperfectly conchoidal.

Surface slightly rough or streaked upon some of the primary faces, but even.

Lustre vitreous, often inclining to pearly upon perfect faces of cleavage. Color white, passing into grey, red and green. Streak white. Transparent in small crystals,... translucent on the edges. A bluish opalescence is sometimes observable.

Brittle. Hardness = 2·613 (small transparent crystals from Dauphiny.) Limits 2·61 ... 2·68.

Compound varieties. Twin-crystals. Axis of revolution perpendicular to the prismatic axis.

Fig. 3.

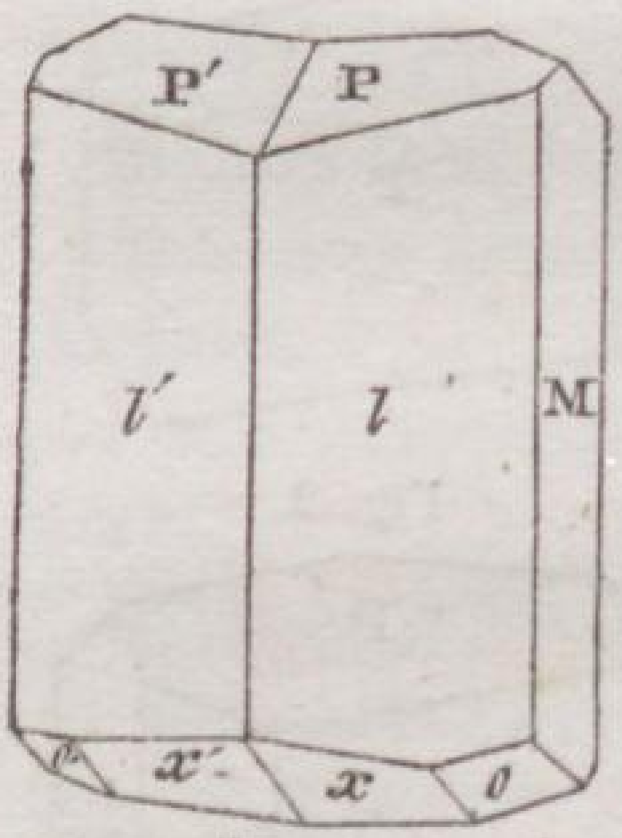
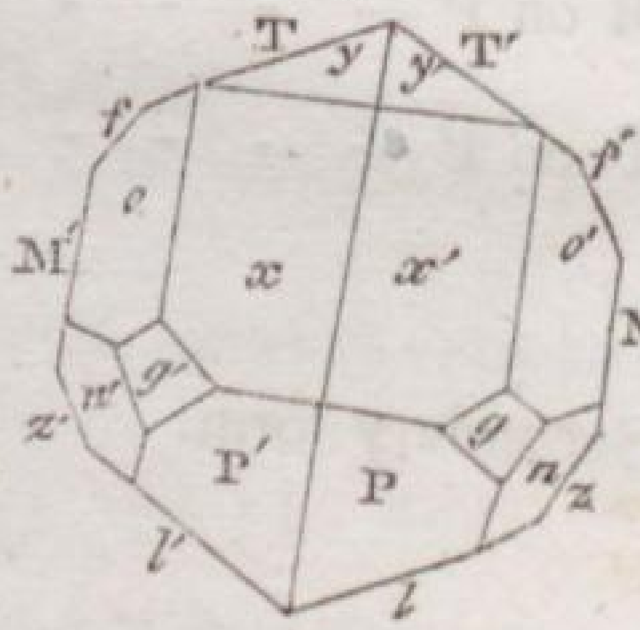


Fig. 4.



M on *g*	- - - - - - - -	100	52
M on *z*	- - - - - - - -	149	12
M′ on *f*	- - - - - - - -	148	30
P on *g*	- - - - - - - -	150	5
P on *y*	- - - - - - - -	97	37
T on *y*	- - - - - - - -	134	32

Twin-crystals, like the above figures, and others still more complicated, are of frequent occurrence, compared with simple forms.

Massive: composition granular; individuals of various sizes, commonly compressed parallel to T, in which case the composition assumes a lamellar appearance; the lamellæ being arranged somewhat in a stellular manner. The composition rarely approaches the impalpable, in which case it becomes strongly coherent.

1. Before the blow-pipe on charcoal, it becomes glassy, semi-transparent and white; but melts with difficulty only on its edges into a semi-transparent, vesicular glass. It is dissolved by borax, but slowly and without effervescence. If the borax be previously mingled with oxide of nickel, the resulting globule will present a brown color.

2. *Analysis.*

	By Eggertz, from Finbo.	By Rose, from Arendal.	By Stromeyer, from Chesterfield, Mass.
Silica	70·48	68·84	70·68
Alumina	18·45	20·53 With a little oxide of iron and lime.	19 80
Soda	10·50	9·12	9·06
Lime	·55	0·00	0·23
Oxide of iron & manganese	0·00	0·00	1·11

3. Albite is found entering into the composition of granite, either along with quartz and mica, or accompanied by feldspar. In general, it would appear, that in those granite veins and beds, where Tourmaline abounds, Albite is substituted for feldspar. Albite is also one of the constituents of sienite and greenstone.

4. The largest crystals of Albite hitherto known, are from Keräbinsk in Siberia. Crystallized varieties are found also in the highest districts of St. Gothard, and the Alps of Savoy. The foliated, massive, and nearly impalpable varieties, occur at Chesterfield and Goshen, (Mass.) associated with Tourmalines of various colors, as also at Paris in Maine; at the former places, small transparent crystals, lining cavities in the massive variety, rarely present themselves: in Middletown, Con., at Had-

dam, Con., in two different localities; the one along with Chrysoberyl and Columbite, where it is almost impalpably massive; the other, one mile and a half S.W., where it occurs in large granular individuals of a greenish white color, associated with Quartz, black Tourmaline, and rarely with the variety of mica called Pinite. A variety similar to that occurring along with the Columbite of Haddam, comes from Finbo and Brodbo in Sweden.

Allagite. (See *Red Manganese-Ore.*)

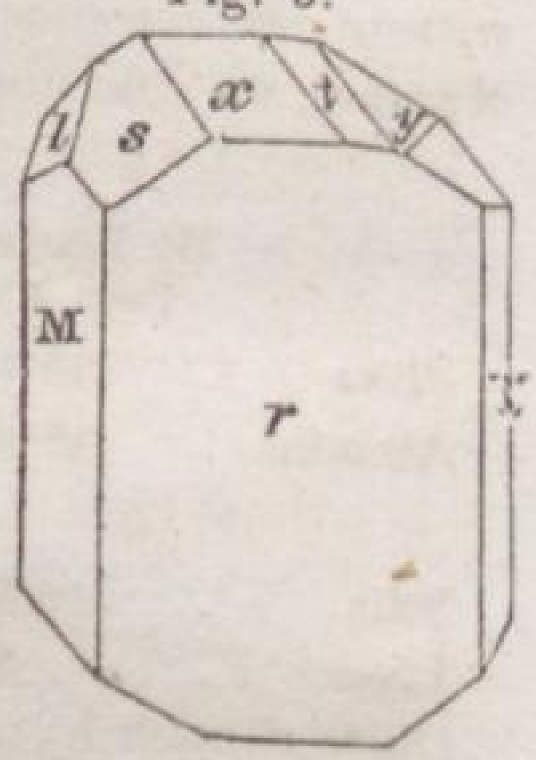
ALLANITE. Tetarto-Prismatic Melane-Ore. Partsch.

Primary form. Right oblique-angled prism. M on T =115°.

Secondary form.

M on *r*	- - - - - -	116° 00′
T on *r*	- - - - - -	129 00
s on *r*	- - - - - -	135 30
y on *r*	- - - - - -	109 01
s on *x*	- - - - - -	156 45
t on *x*	- - - - - -	164 30
y on *x*	- - - - - -	151 00
y on *t*	- - - - - -	166 30

Fig. 5.



Cleavage, parallel to *r* and M distinct. Fracture imperfectly conchoidal.

Lustre imperfectly metallic to resinous. Color brownish or greenish-black. Streak greenish-grey. Opake. Faintly translucent and brown in thin splinters, to opake.

Brittle. Hardness=6·0. Sp. gr.=4·001.

Compound varieties. In acicular aggregations. Massive. Composition impalpable. Lustre vitreous. Color passing into brown if the mineral be decomposed. Sp. gr. =3·1....4·0.

Allanite.

1. Several minerals, proposed by different authors as distinct, appear to fall within the present description. Of these the *Allanite* of THOMSON presents us with the most distinct crystals. The *Orthite* of BERZELIUS owes its diminished sp. gr. to its state of partial decomposition. The *Cerine* of the same author, or the *Cerium oxidé siliceux noir* of HAÜY, is usually compact and black.

2. Allanite froths before the blow-pipe, and melts imperfectly into a black scoria, and it gelatinizes in nitric acid. Orthite froths, becomes yellowish brown, and melts with effervescence into a black vesicular globule; with borax into a transparent one, and gelatinizes in heated acids. The Cerine behaves in a similar manner, but its globule acts upon the magnetic needle.

3. *Analysis.*

	By THOMSON,	By BERZELIUS,	
	Allanite, from Greenland.	*Orthite*, from Finbo.	from Gottliebsgang.
Oxide of cerium	33·90	17·39	19·44
Oxide of iron	25·40	11·42	12·44
Silica	35·40	18·83	32·00
Lime	9·20	4·89	7·84
Alumina	4·10	14·00	14·80
Yttria	00·00	3·80	3·44
Oxide of manganese	00·00	1·36	3.40
Water	00·00	8·70	5·36

	By WOLLASTON.	By HISINGER.
	Allanite, from Myssore.	*Cerine*, from Riddarhytta.
Silica	34·00	30·17
Alumina	9·00	11·31
Oxide of cerium	19·80	28·19
Oxide of iron	32·00	20·72
Lime	00·00	9.12
Oxide of copper	00·00	0·89
Water	00·00	0·40

4. Allanite was first found at Alluk in East Greenland, accompanied by Zircon and Quartz. Orthite occurs at Finbo, near Fahlun in Sweden, along with Quartz, Feldspar and Albite, in gneiss. The Cerine exists in the copper mines of St. Görans at Riddarhytta.

ALLOCHROITE. (See *Garnet.*)

ALLOPHANE. Uncleavable Wavelline-Spar

Reniform, botryoidal, massive; composition impalpable. Fracture conchoidal.

Lustre vitreous, inclining to resinous. Color blue, green, brown and grey. Transparent . . . translucent on the edges.

Hardness = 3·0 nearly. Sp. gr. = 1·85 . . . 1·88.

1. Alone upon charcoal before the blow-pipe, it does not melt, though it swells up, becomes feebly coherent, and communicates to the flame a copper green color. With borax, it fuses with great difficulty into a colorless glass. It is not soluble in soda; but the mass becomes green in the oxidation heat, and red in the reduction flame: on the addition of borax, a speck of metallic copper may be obtained.

2. *Analysis.*

By Stromeyer, from Saalfeld.	
Alumina	32.202
Silica	21·922
Lime	0·730
Sulphate of lime	0·517
Carbonate of copper	3·058
Hydrate of iron	2·270
Water	41·301

By Ficinus, from Schneeberg.	
Hydrate of alumina	34·30
Silica	30·
Hydrate of copper	23·70
Carbonate of lime	2·80
Oxide of manganese	1·80
Water	7.80

3. It is found at Saalfeld in Thuringia, Schneeberg in Saxony, and at Taune in the Hartz.

Almandin. (See *Garnet*.)

ALUM. Octahedral Alum-Salt. Mohs.

Stalactitic: composition columnar or granular, often impalpable. Mealy efflorescence.

Lustre vitreous; if delicately fibrous, pearly; sometimes dull. Color white or greyish white. Transparent . . . translucent or opake.

Hardness=2·0 . . . 2·5. Sp. gr.=1·75. Taste sweetish astringent.

1. Alum is very soluble in water, melts before the blow-pipe in its water of crystallization, and is converted into a spongiform mass.

2. *Analysis.*

Potash	9·94
Alumina	10·82
Sulphuric acid	33·77
Water	45·47

3. It occurs in a state of efflorescence upon minerals and rocks which contain alumina, potash and sulphuret of iron; as upon alum-stone, alum-slate and mica-slate: it is also found accompanying brown-coal, and is contained in the waters of certain mineral springs.

4. Alum occurs on the alum-slate rocks near Christiania in Norway, and under the same circumstances as near Moffat in Dumfries-shire, and Ferry-town of Cree in Galloway; on bituminous shale and slate-clay at Hurlet near Paisley in Scotland: in coal mines in Bohemia, Bavaria and Italy; and in various places, too numerous to be mentioned, in New-England, upon mica-slate.

5. This salt, as produced by nature, requires first to be purified, in order to be fitted for the purposes of the arts. Its artificial solution affords it in regular crystals, having the form of the regular octahedron. A great quantity of alum is obtained by the aid of chemical processes. Its uses are various; as for instance, in dyeing, in medicine, for the manufacture of leather and paper, and the prevention of putrefaction.

ALUMINITE. (See *Websterite.*)

ALUM-STONE. Rhombohedral Alum-Haloide. MOHS.

Primary form. Rhomboid. P on P 92° 50′ r. g.

Secondary form. The primary form with one or more of its lateral solid angles replaced by tangent planes.

Cleavage parallel with the tangent secondary planes rather perfect, that parallel with the primary faces indistinct. The primary faces sometimes streaked parallel to the edges of the secondary faces.

Lustre vitreous, inclining to pearly upon the more distinct faces of cleavage. Color white, sometimes reddish or greyish. Streak white. Transparent . . . translucent.

Brittle. Hardness =5·0. Sp. gr. =2·694 (a crystallized variety from Tolfa.)

Compound Varieties. Massive: composition small granular, often impalpable; fracture uneven, flat conchoidal, splintery, sometimes earthy.

1. Alone, in the matrass, before the blow-pipe, it at first disengages moisture; but a more intense heat occasions a sublimate of sulphate of ammonia. The crystals decrepitate with great energy when heated, and become reduced to powder like Diaspore. Upon charcoal in a strong heat it contracts, but does not melt. It dissolves however, in borax, with effervescence, and gives rise to a colorless and transparent glass.

2. *Analysis.*

	By Vauquelin.		By Cordier, of the crystals.
Alumina	43·92		39·654
Silica	24·00		0·000
Sulphuric acid	25·00		35·495
Potash	3·08		10·021
Water	4·00	and loss	14·380
			a trace of oxide of iron.

3. Alum-stone is found at Tolfa near Civita Vecchia, in the vicinity of Rome; also in Tuscany in the kingdom of Naples, and in the county of Beregh in Hungary. According to Cordier, it exists in almost all burning volcanoes. It seems to form beds of greater or less extent, chiefly made up of the massive varieties, in which small cavities occasionally present themselves lined with the crystals, which are always very minute.

4. It is employed in the manufacture of alum; and the superior quality of that from Tolfa has been ascribed to this mineral.

Amalgam. (See *Native Amalgam.*)

Amazon stone. (See *Feldspar.*)

Amausite. (See *Petrosilex.*)

AMBER. Yellow Mineral-Resin. Mohs.

Irregular forms, grains and spheroidal masses.

Amber.

Cleavage none. Fracture conchoidal. Surface uneven and rough.

Lustre resinous. Prevalent color yellow, passing into red, brown and white. Streak white. Transparent ... translucent.

Not very brittle. Hardness = 2·0 ... 2·5. Sp. gr. = 1·081.

Resinous electricity produced by friction.

1. Two sub-species have been distinguished in Amber, according to their lustre and transparency. *Yellow* Amber contains yellow and red varieties, and which possess the highest degrees of transparency to be met with in the species. *White* Amber refers to white and pale yellow, faintly translucent varieties. Often, however, both kinds are joined in one and the same specimens,—passing insensibly into each other, which demonstrates their identity.

2. Amber burns with a yellow flame, giving out an agreeable odor, and leaves a carbonaceous residue. It is soluble in alcohol.

3. *Analysis.*
By Drappier.

Carbon	80·59
Hydrogen	7·31
Oxygen	6·73
Lime	1·54
Alumina	1·10
Silica	0·63

4. Amber, without doubt owes its origin to the vegetable kingdom; an opinion sufficiently established by the insects and other organic bodies which it often includes, by the analogous substance known in commerce under the name of Gum Copal, which is afforded by a family of trees growing in India, as well as by the circumstances under which Amber is known to occur,—it being found in beds of bituminous wood, from which it is disengaged by the action of the waves on the sea coast.

5. The principal places from whence Amber is obtained are: the Prussian borders of the Baltic Sea, (where it is collected by the government, either during or immediately after storms, which rake it up from its bed and throw it on shore,) Denmark, Spain, Sicily, Greenland, Chi-

na and other countries. It has repeatedly been met with in various parts of the Green sand formation of the United States, either loose in the soil, or engaged in marl or lignite, as at Gay Head on Martha's Vineyard, near Trenton in New Jersey, at Camden in Pennsylvania, and at Cape Sable (near Magothy river) in Maryland.

6. The more transparent and handsomely colored specimens are cut into various ornaments and works of art; more common varieties are employed in the formation of certain kinds of varnish. It is also used for fumigation. The oil and acid of amber were formerly articles of medicine.

AMBLYGONITE. Prismatoidal Petaline-Spar.

Primary form. Oblique rhombic prism. M on M′ = 106° 10′.

Cleavage parallel to the prismatic faces, apparently with greater facility in one direction than in the other. Fracture uneven.

Lustre vitreous, inclining to pearly. Color greenish-white, passing into light mountain and celandine-green. Streak white. Semi-transparent . . . translucent.

Hardness=6·0. Sp. gr.=3·00 . . . 3·04.

Compound Varieties. Massive: composition columnar.

1. Heated by itself in a matrass, it affords a little moisture, which in a high heat is perceptibly acid, and corrodes the glass. Upon charcoal, before the blow-pipe, it easily melts into a clear glass, which however becomes opake on being suffered to cool.

2. *Analysis.*

By Berzelius.

Phosphoric acid	54·12
Alumina	38·96
Yttria	6·92

3. It is found only at Chursdorf near Penig in Saxony, where it occurs in granite along with Tourmaline and Topaz.

Amethyst. (See *Quartz.*)

Amianthus.

Silky fibrous varieties of *Hornblende, Pyroxene, Picrosmene* and *Nemolite.* q. v.

Amphibole. (See *Hornblende.*)

Amphige'ne. (See *Leucite.*)

Amphodellite.

Crystalline; the form of the crystals said to resemble those of Feldspar. Cleaves in two directions, whose mutual inclination is 94° 9′.

Fracture resembles that of Scapolite. Color reddish.

Hardness = 4·5. Sp. gr. = 2·793.

1. *Analysis.*

By Nordensköld.

Silica	45·80
Alumina	35·45
Lime	10·15
Magnesia	5·05
Protoxide of iron	1·70
Moisture and loss	1·85

2. It is found in the lime quarries of Lozo in Finland.

3. There does not appear to be any sufficient reason why Amphodellite should not be included under Scapolite, except the indications of crystalline form, which however do not appear to have received much attention.

ANALCIME. Hexahedral Kouphone-Spar. Mohs.

Primary form. Cube.

Secondary forms.

Fig. 6.

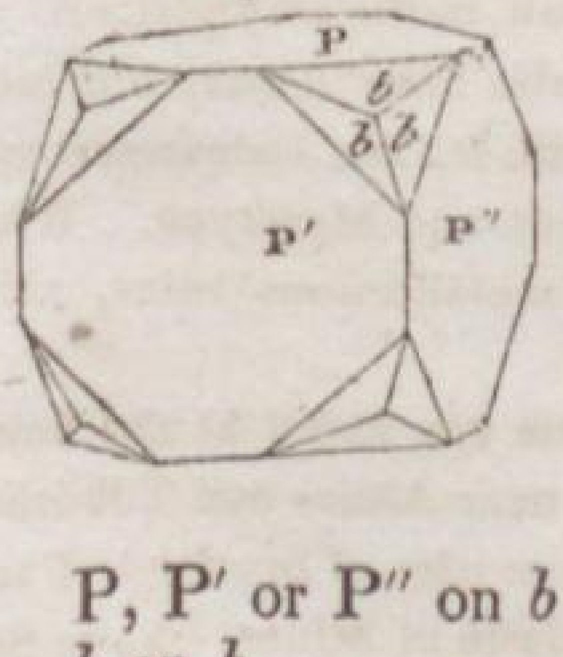
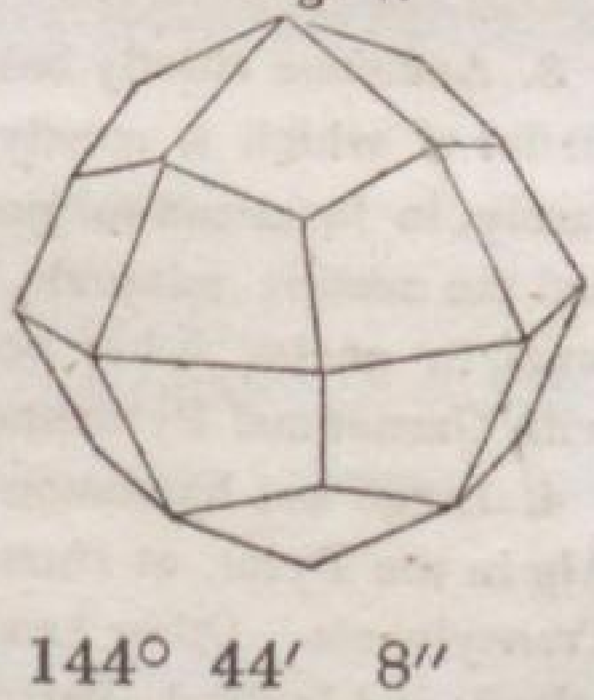


Fig. 7.



P, P′ or P″ on *b*	- - - -	144° 44′ 8″
b on *b*	- - - -	146 26 33

Analcime.

Cleavage parallel with the primary form obtained with difficulty; and even when most distinct, of a very interrupted appearance.

Fracture, imperfectly conchoidal, uneven.

Surface in general smooth, sometimes faintly streaked.

Lustre vitreous. Color white, passing into grey, more frequently into reddish-white and flesh-red. Streak white transparent . . . translucent.

Brittle. Hardness = 5·5. Sp. gr. = 2·068 (crystals from the Tyrol.)

Compound Varieties. Massive: composition granular, of various sizes of individuals, more or less strongly coherent. Faces of composition uneven and rough, and often irregularly streaked.

1. When first heated, Analcime becomes milk-white, and affords a little moisture: in a more intense heat upon charcoal, it melts without intumescence or ebullition into a clear, slightly vesicular, glassy globule. It gelatinizes in muriatic acid.

2. *Analysis.*

By Berzelius.

Silica	55·84
Alumina	22·55
Soda	13·73
Water	7·90

3. Analcime chiefly belongs to trap and basalt, in the amygdaloidal varieties of which it mostly abounds. It has also been found, but more rarely, in lavas and in gneiss. Associated with it, are Calcareous spar and the zeolitic minerals, particularly Chabasie and Mesotype. When found in gneiss, it has occurred in beds, or metalliferous veins, along with Garnet and Pyroxene.

4. Large and handsome crystals of Analcime are found at the Seiser Alp in the Tyrol, at Dumbarton in Scotland, near Almas and Tökörö in Transylvania. Other localities are, the western isles of Scotland, Faroe Islands and Iceland, Partridge Island in the Basin of Mines, (Nova Sco-

tia,) and Monte Somma—where from its being of a flesh-red color it has received the name of *Sarcolite*. It is met with in the iron-stone beds of Arendal in Norway, and in the silver veins of Andreasberg in the Hartz.

ANATASE. Pyramidal Titanium-Ore. MOHS.

Primary form. Octahedron with a square base. P on P (over the base) =136° 47′.

Secondary forms.

Fig. 8.

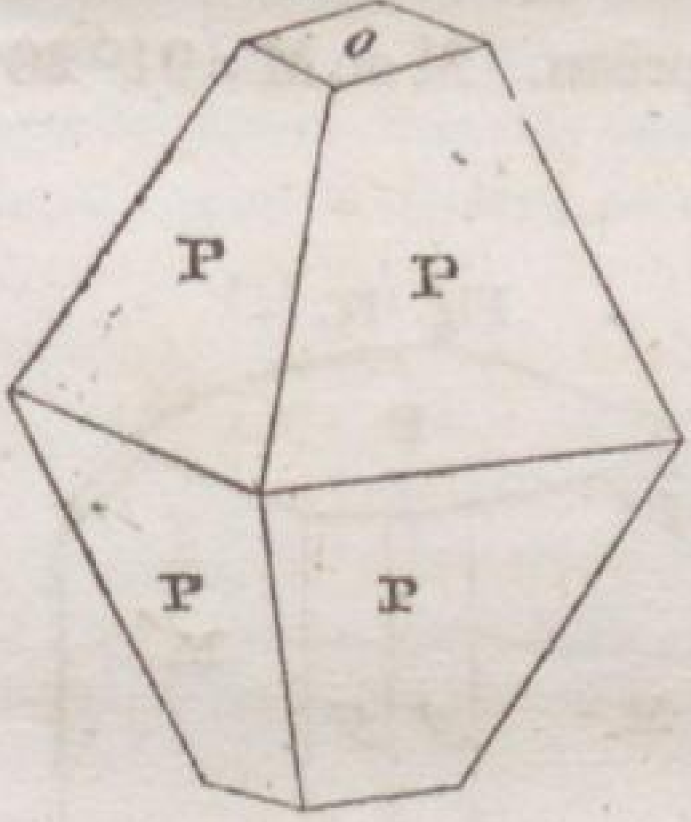
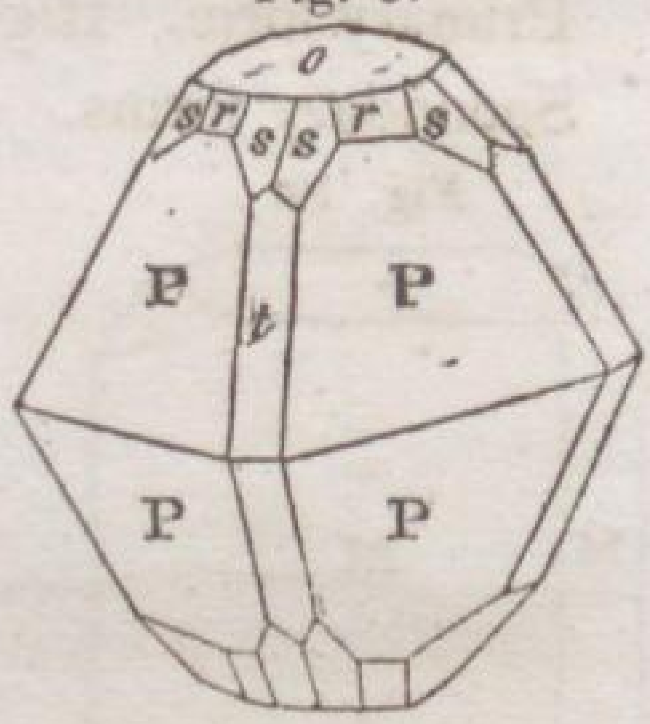


Fig. 9.



P on *o*	- - - - -	111° 17′
r on *o*	- - - - -	152 27
r on *s*	- - - - -	166 30
P on *s*	- - - - -	132 5

Cleavage parallel to the primary faces and to *o*, both perfect.

Fracture conchoidal, scarcely observable.

Surface smooth and shining.

Lustre metallic adamantine. Color various shades of brown, more or less dark, also indigo-blue. Streak white. Semi-transparent . . . translucent.

Hardness=5·5 . . . 6·0. Sp. gr. =3·826.

Anatase—Andalusite.

1. Before the blow-pipe, it behaves like pure oxide of titanium. It dissolves, with difficulty, in the salt of phosphorus, and the portion not melted becomes white and semi-transparent. The experiments of VAUQUELIN prove it to be a pure oxide of titanium.

2. It occurs in narrow, irregular veins, consisting of those species which constitute the rocks themselves, viz. Albite, Quartz, Mica and Augite, and is sometimes accompanied by Axinite and Crichtonite.

Its chief localities are Bourg d'Osians, in Dauphiny and Switzerland; but it is also found in Cornwall, in Norway, in Spain and Brazil.

ANDALUSITE. Prismatic Andalusite. MOHS.

Primary form. Right rhombic prism. M on M′ = 91° 20′

Secondary forms.

Fig. 10.

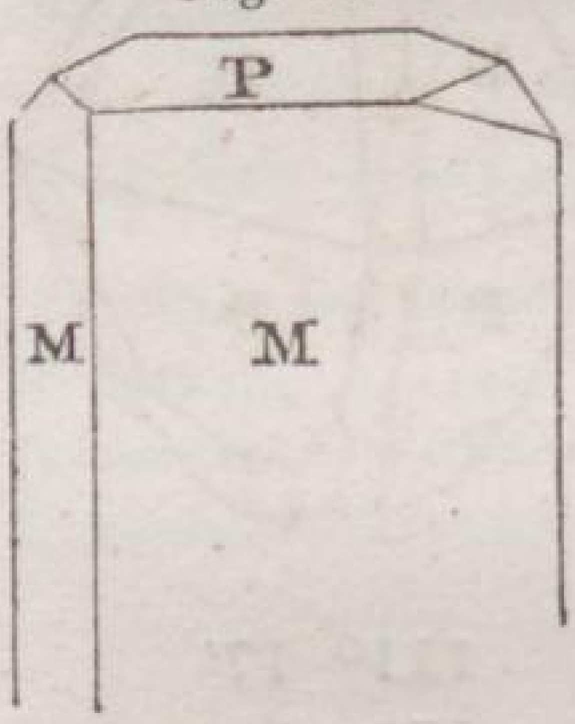
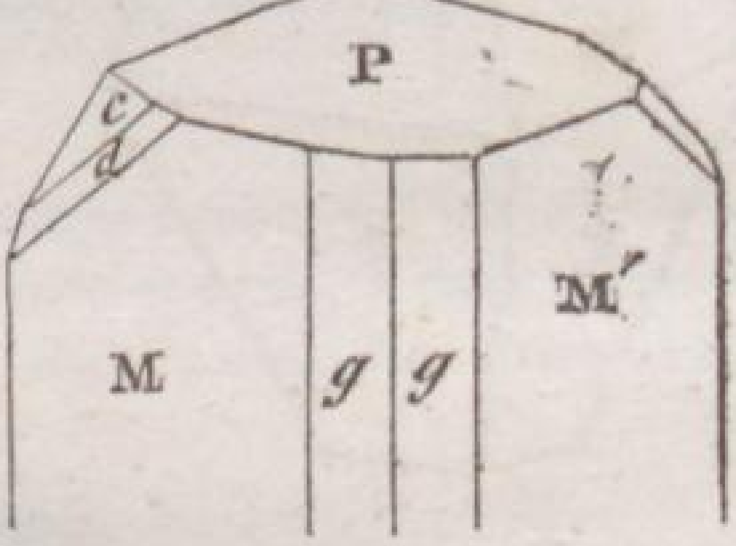


Fig. 11.



M on M′	- - -	91° 20′
P on M′ or M	- - -	90 00
P on *c*	- - -	140 00
d on *c*	- - -	145 00
g on *g*	- - -	125 00

Cleavage, parallel with M and M′ distinct; parallel with P scarcely perceptible.

Fracture uneven.

Surface uneven and rough. Generally covered with plates of Mica or Talc.

Lustre vitreous. Color flesh-red passing into pearl-grey. Streak white. Translucent on the edges.

Andalusite.

Hardness = 7·5. Sp. gr. = 3·104 (of a cleavable variety.)

Compound varieties. Massive : composition indistinctly granular and columnar.

1. The mineral long known under the name of *Macle* or *Chiastolite* appears to be a mixed mineral, consisting of Andalusite and some of the minerals entering into the formation of clay slate ; the Andalusite assuming a crystalline form and being subject to a remarkable composition, which will be understood from the annexed figures representing cross sections of the twin-crystals. The twin crystal in each instance, it will be seen, results from the juxta-position of four single crystals, whose nearest point of contact, as respects any two of them, is formed by

Fig. 12.

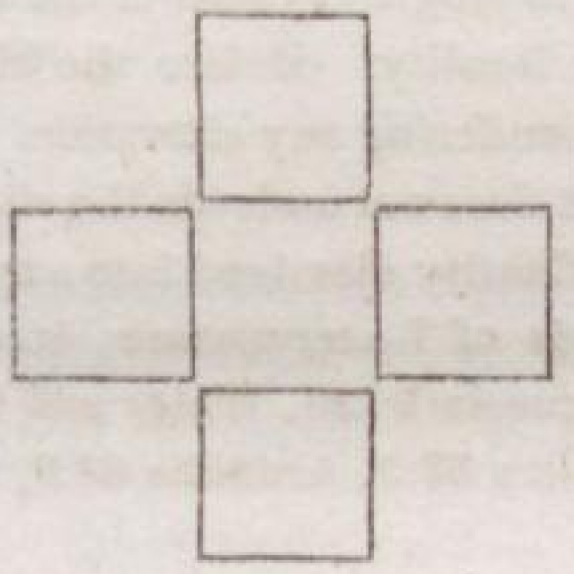


Fig. 13.

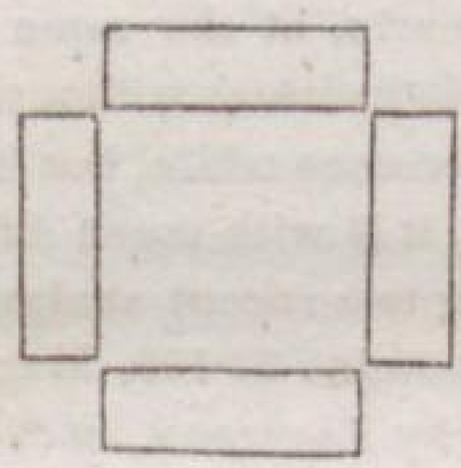
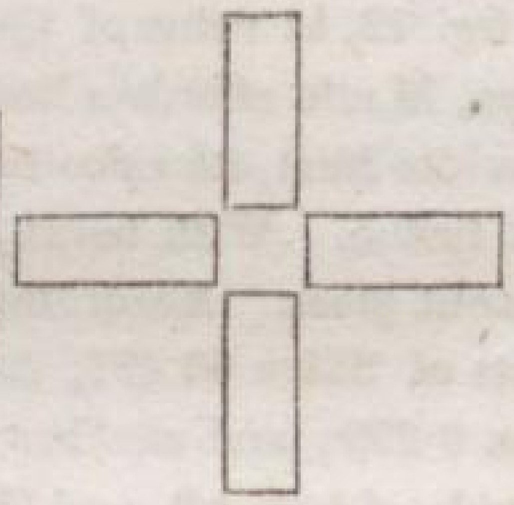


Fig. 14.



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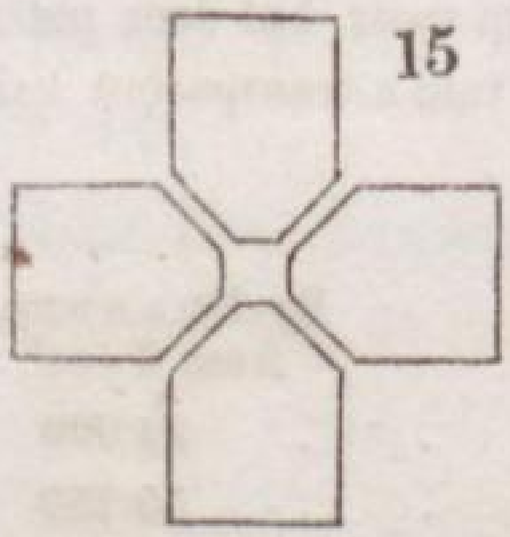

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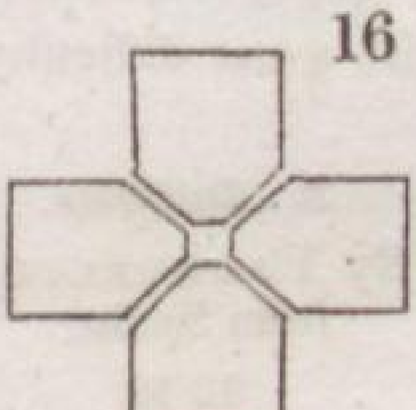

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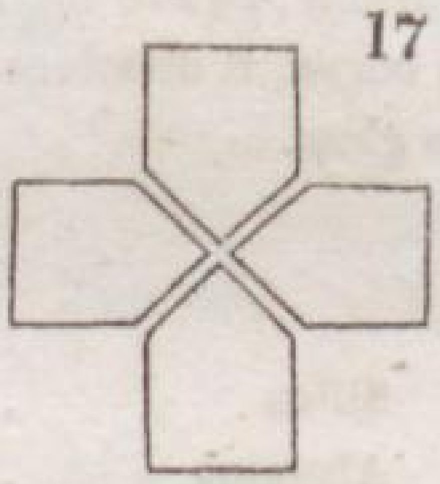

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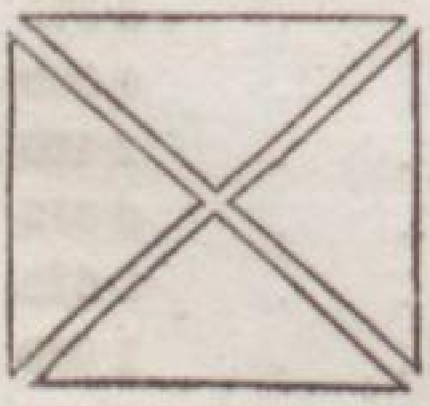

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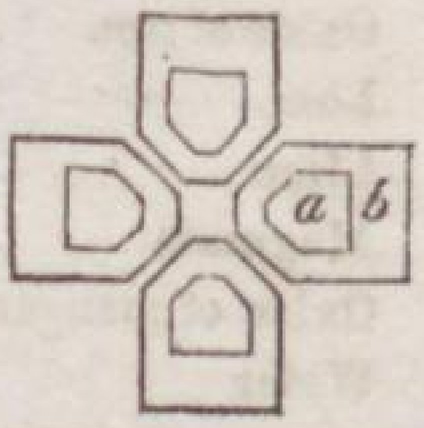


their lateral edges. It is not common to find the edges of the bases equal, as in fig. 12; two of the sides being more frequently unduly extended, as in figs. 13 and 14. Cross-sections made in different parts of one crystal sometimes afford the different appearances of figs. 12, 13, and 14. But the more common mode of aggregation is represented by figs. 15, 16, 17 and 18, which results from the greater or less replacement of the angles that are adjacent in the composition. Rarely, we are presented with a parti-colored aspect, as in figs. 19 and 20, the inner portion *a* exhibiting a milk-white color, while the exterior *b*, is of a greenish grey color. The hardness of these crystals varies from 3·0 to 7·5, according to the preponderance of Andalusite in their composition. Those which possess the hardness of 7·5 have the color, lustre and cleavages of Andalusite. The circumstance which determines to the formation of these twin-crystals pertains apparently to the gangue; for the Macle occurs only in clay slate, while a similar aggregate, varying in hardness from 3·0 to 7·5, is found imbedded in single crystals of the form of fig. 12, in veins of Quartz, at the same locality. Before the blowpipe, Macle affords a little moisture without suffering any alteration. In a white heat, its color becomes white, but it does not undergo the slightest fusion. With borax, it is with much difficulty dissolved into a transparent glass. According to a recent analysis of LANDGREBE, it consists of Silica 68·497, Alumina 30·109, Magnesia 1·125, Water and Carbon 0·269; and another by JACKSON, of Silica 33·0, Alumina 61.0, protoxide of iron 4·0, and Water 1·50.

2. Alone, before the blowpipe, it whitens in spots, but does not melt. With borax, it dissolves with great difficulty into a transparent and colorless glass.

3. *Analysis.*

	By VAUQUELIN, from Spain.	By BRANDES, from Tyrol.
Silica	32·16	34·000
Alumina	52·24	55·750
Potash	8·10	2·000
Oxide of iron	2·00	3·375
Loss	6·00	0·000
Lime		2·125
Magnesia		0·375
Oxide of manganese		3·625
Water		1·000

4. Crystals of Andalusite are found imbedded in mica slate, or implanted in the cavities of rocks forming irregular beds or nodules in gra-

nite and primitive slate. It is generally associated with Quartz, sometimes with a decomposing Mica.

5. This species was first discovered in the province of Andalusia in Spain. Crystals of very considerable magnitude are found in the valley of Lisenz near Inspruck in the Tyrol. It also occurs near Bräunsdorf in Saxony, at Herzogau in the Upper Palatine, at Forez in France, in grey dolomite containing Hornblende in the Simplon, and in black limestone with granular Iron-Pyrites at Coulepeux in the valley of Ger, (Haut Garonne,) in mica-slate in Aberdeenshire in Scotland, in the counties of Wicklow and Dublin in Ireland. In the United States at Westford, Mass. it occurs abundantly both crystallized and massive. A few handsome crystals have also been found at Litchfield, (Con.)

6. The Chiastolite or Macle is found at a great number of places; but no where so plentifully, or under such a diversity of forms, as in the towns of Lancaster and Sterling, (Mass.) It is in Lancaster that the single crystals of Macle imbedded in Quartz have been found, and which occur under the common form of Andalusite. Foreign localities of Chiastolite are the following: St. Jago di Compostella in Spain, Barèges in the Pyrenees, the Bayreuth, Hartz, and Cumberland in England.

Andreolite. (See *Harmotome.*)

Anglarite. (See *Vivianite.*)

ANGLESITE. Prismatic Lead-Baryte. Mohs.

Primary form. Right rhombic prism. M on M′ = 103° 42′.

Secondary forms.

Fig. 21.

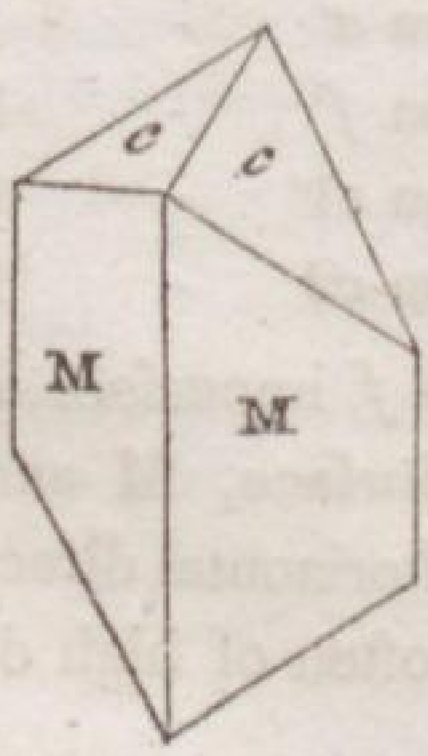
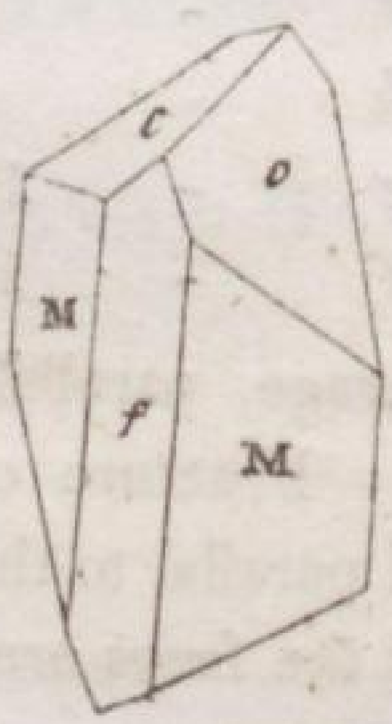


Fig. 22.



Anglesite.

Fig. 23.

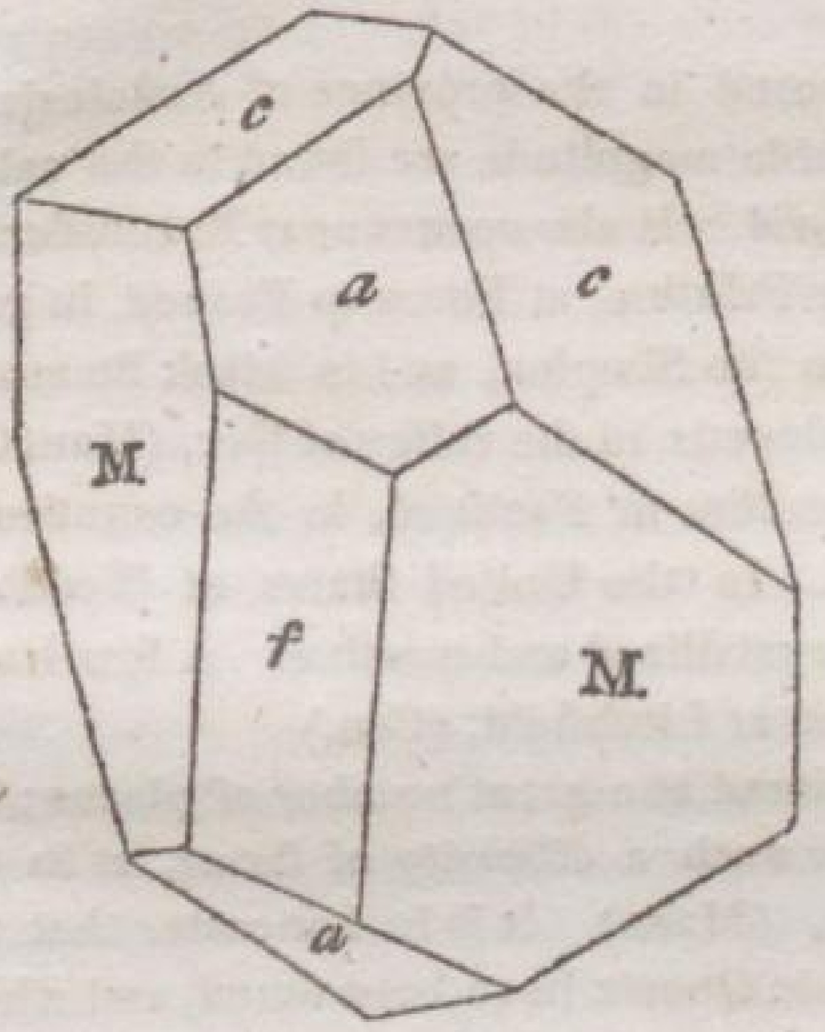


Fig. 24.

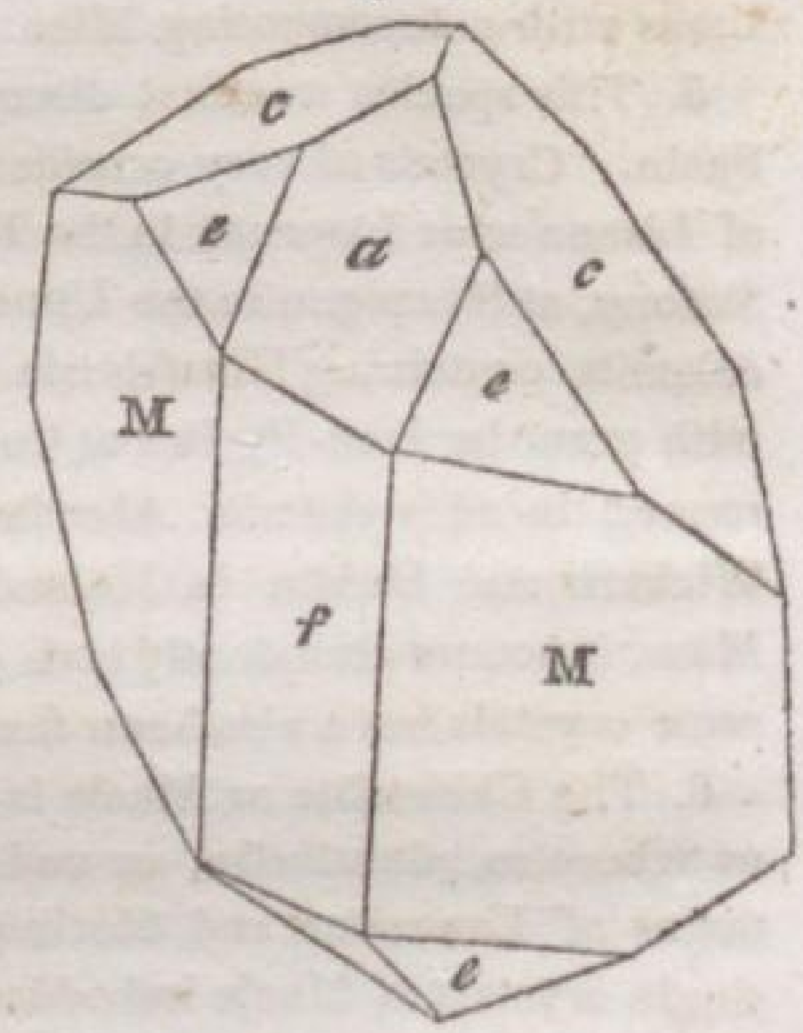
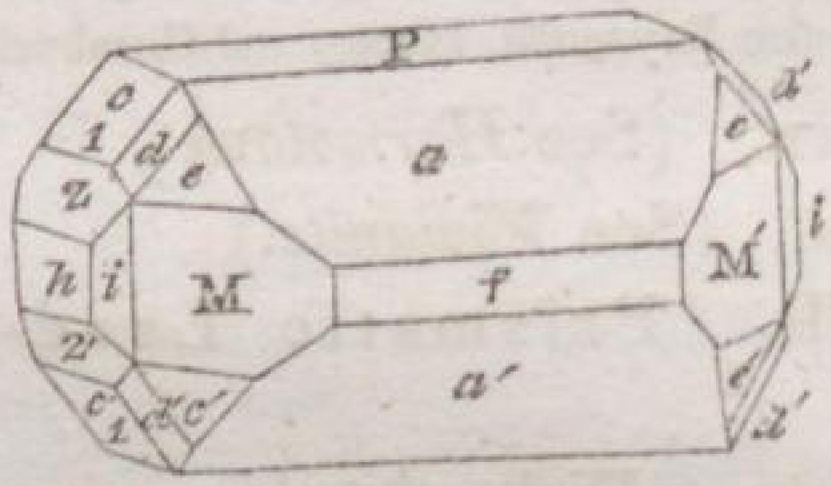


Fig. 25.



M on M′	-	103°	47′	M on *h*	-	128°	10′
P on *a*	-	140	36	M on *c*1	-	127	56
P on *e*	-	115	40	M on *i*	-	160	42
P on *f*	-	90	00	*a* on *a*′	-	79	30
P on *h*	-	90	00	*a* on *f*	-	129	28
M on *c*	-	153	20	*c*1 on *c*1′	-	104	30
M on *f*	-	141	52	*c*1 on *c*2	-	142	20

Cleavage, parallel with M and *f* imperfect and interrupted. Fracture conchoidal. Surface, M and *f* often striated parallel to the axis, *a* in a horizontal direction. In general the faces are smooth, and often of high degrees of lustre.

Lustre adamantine, inclining to vitreous and resinous. Color yellowish, greyish, or greenish white, also yellowish, smoke and ash-grey. Sometimes faintly tinged green or blue. Streak white. Transparent . . . translucent.

Brittle. Hardness = 2·5 . . . 3·0. Sp. gr. = 6·298.

Compound Varieties. Massive: composition lamellar, also granular, of various sizes of individuals, often strongly connected. Faces of composition rough.

1. It decrepitates in the flame of a candle, and frequently assumes a slight reddish tinge on the surface. Reduced to powder it melts easily before the blow-pipe into a white slag, which is reduced to metallic lead by the addition of soda.

2. *Analysis.*

By Stromeyer.

Oxide of lead . . .	72·47
Sulphuric acid . . .	26·09
Water . . .	0·12
Hydrous oxide of iron . . .	0·09
Oxide of manganese . . .	0·06
Silica . . .	0·51

3. It is found in lead and copper veins, traversing clay-slate and greywacke slate, along with various ores of lead and copper.

4. It is found at the Lead hills and Wanlockhead in Scotland, Pary's mine in Anglesea, Mellanoweth in Cornwall; also at Clausthal and Zellerfeld in the Hartz, near Freiberg in Baden, at Siegen in Prussia, in Spain, and Siberia.

It occurs along with Galena in the lead mines of Missouri: also in the lead mine of Southampton, (Mass.)

ANHYDRITE. Prismatic Gypsum-Haloide. Mohs.

Primary form. Right rectangular Prism.

Anhydrite.

Secondary form.

Fig. 26.

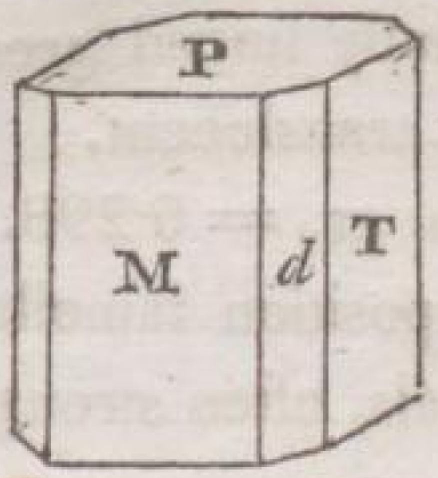
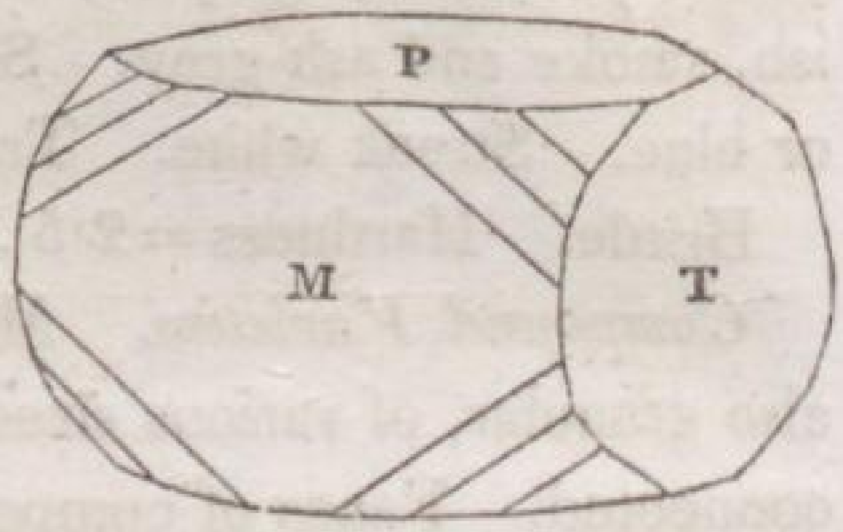


Fig. 27.



P on M, or T	- -	90°	0′
M on T	- -	90	0
M on *d*	- -	140	4
T on *d*	- -	129	56

Cleavage parallel with M and T perfect; less easily obtained parallel with P, yet quite distinct.

Fracture imperfectly conchoidal, uneven. Surfaces M and T smooth; P rough.

Lustre vitreous, inclining a little upon the most distinct faces of cleavage to pearly. Color generally white, sometimes passing to flesh-red, violet-and smalt-blue or ash-grey. Streak greyish-white. Transparent . . . translucent.

Brittle. Hardness = 3·0 . . . 3·5. Sp. gr. = 2·89.

Compound Varieties. Contorted; composition columnar in thin fibres, parallel and variously bent. Massive: composition granular, of different sizes, sometimes impalpable, and then the fracture is splintery; in other massive varieties, the composition is columnar, commonly thin and parallel. Faces of composition rough.

1. This species has been divided into several subspecies in the earlier treatises on mineralogy. Thus the *Cubic Muriacite*, also called Cube spar, comprehends simple varieties, and easily cleavable compound ones, in which the individuals possess a considerable size. The name *Anhydrite* was appropriated to varieties of a smaller granular composition, and

that of *Tripe stone* (*Gekrösstein*) to the contorted compositions, consisting of thin columnar individuals. *Compact* and *fibrous* Muriacite were the denominations of compound varieties of very small individuals, the one granular and impalpable, the other columnar. The *Vulpinite* of Italy, so named from its locality, is composed of granular individuals, a little longer in one direction, of a greyish white or grey color, and very much resembling a coarse grained, primitive marble.

2. When heated alone in a matrass, it yields no moisture. Before the blow-pipe in platina forceps, it is converted, with difficulty, into a white enamel, the heated mass affording when moistened an alkaline reaction. With borax, it dissolves, accompanied by effervescence, into a transparent glass, which on cooling assumes a yellow or brownish yellow color.

3. *Analysis.*

By Klaproth,
a cleavable variety from Hall in the Tyrol.

Sulphuric acid	55·00
Lime	41·75
Muriate of soda	1·00

Except the muriate of soda, the other varieties which have been analyzed, have presented nearly the same proportions.

By a peculiar process, which is natural, Anhydrite attracts water, loses its transparency, becomes diminished in hardness and specific gravity and approaches in these properties common Gypsum. The cleavage of this altered substance still enables us to distinguish it from Gypsum. It has been called *Chaux sulfatée épigène* by Hauy.

4. Anhydrite is found in beds of gypsum, and of clay along with common salt. It also occurs with metallic minerals, as Galena and Blende.

5. Splendid geodes of large and well defined crystals (fig. 11.) of Anhydrite have been found at Aussee in Stiria; other crystallized varieties at Hall in the Tyrol, at Hallein in Salzburg, in Switzerland, &c. The blue variety is found at Sulz on the Neckar, and at Bleiberg in Carinthia. Foliated Anhydrite, transparent and of a fine blue color, is frequently met with in geodes in the black limestone at Lockport, (N.Y.) associated with crystals of Calcareous spar and Gypsum. Columnar varieties occur at Ischel and Berchtesgaden; compact ones, in the Hartz, in Mansfeld, &c.; the contorted varieties are found at Wieliczka and Bochnia in Poland. The decomposed Anhydrite occurs in considerable quantities at Aussee in Stiria, at Bex in Switzerland, and in other places. It is observed at Lockport in thin coatings upon the foliated variety above alluded to, and also filling up crevices among the foliæ.

6. The blue varieties, in which the granular particles of composition cohere more firmly than in others, are cut and polished for various ornamental purposes, and are known in the arts by the name of *Marmo bardiglio di Bergamo*.

Anhydrous Silicate of Iron.

Massive: foliated.

Cleavage, divides easily into four-sided prisms.

Color dark brown, opake.

Hardness = 4. Sp. gr. = 3·884.

Brittle. Attracted by the magnet.

1. Heated in a glass-tube, it emits ammoniacal vapors, and loses 1·97 of its weight. Alone before the blow-pipe, it is infusible, but in the reducing flame acquires a metallic lustre, and assumes the appearance of magnetic iron. Dissolves in muriatic acid by the aid of heat, without effervescing, leaving behind a quantity of silica in flakes.

2. *Analysis*.

By Thomson.

Silica	29·600
Protoxide of iron	68·605
Protoxide of manganese	1·857

3. It is found at Sclavcorrach, one of the Morne mountains, in the north-east of Ireland.

4. Not enough is known concerning the foregoing mineral to pronounce upon its specific character with certainty. It scarcely differs from Yenite except in being attracted by the magnet, and in its infusibility.

ANKERITE. Paratomous Lime-Haloide. Mohs.

Primary form. Rhomboid. P on P = 106° 12′.

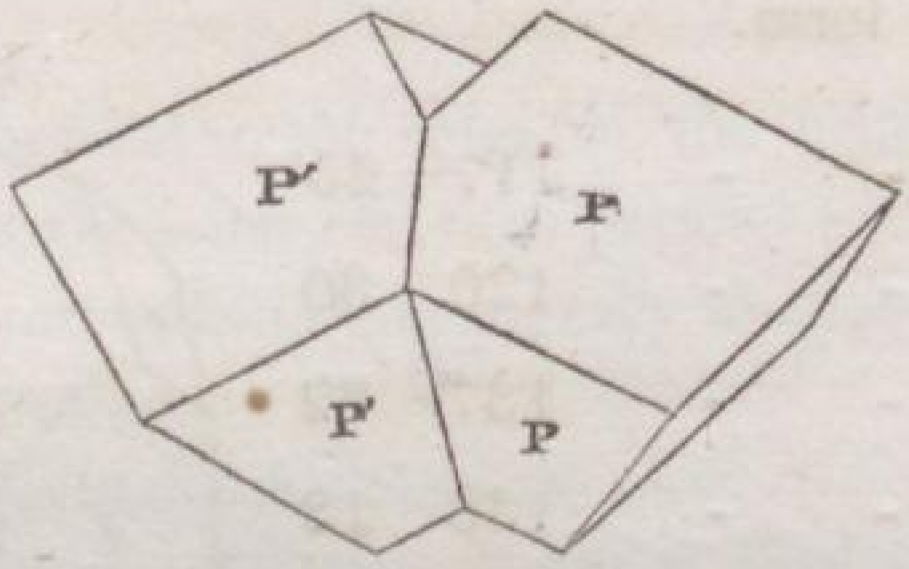
Cleavage parallel with the primary faces perfect. Fracture uneven.

Lustre vitreous, slightly inclining to pearly. Color white, with various tints of grey, red and brown. Streak brown, Translucent, often very faintly.

Brittle. Hardness = 3·5 ... 4·0. Sp. gr. = 3·080.

Compound Varieties. Twin-crystals. Face of composition parallel with the vertical axes.

Fig. 28.



Massive: composition granular, individuals in most cases easily discernible, often mixed with Calcareous Spar. Faces of composition uneven and rough.

1. It becomes black before the blow-pipe without melting, and acts upon the magnetic needle. With borax it melts into a pearl. The color is darkened on the surface by being exposed to the air.

2. *Analysis.*

By Schrötter.

Carbonic acid with oxide of iron	35·308
Lime	50·113
Magnesia	11·846
Oxide of manganese . . .	3·084

3. The Ankerite occurs in the Rathhausberg in Salzburg upon beds in mica-slate, and in many places upon the beds of Heavy Spar, extending from Stiria along the whole chain of the Alps. The Ankerite forms veins in the transition limestone about the city of Quebec, and in the U. States it occurs in connexion with the coal formation at West Springfield, (Mass.)

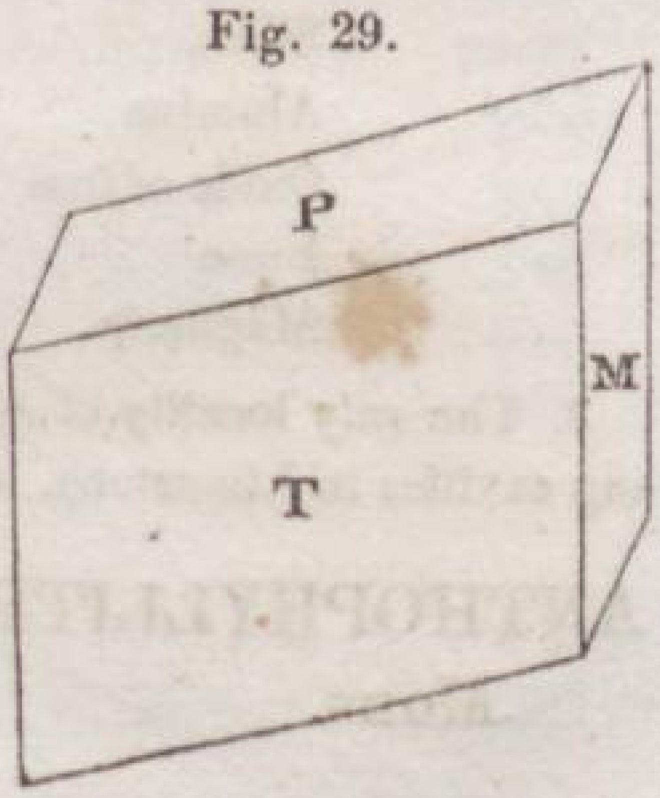
ANORTHITE. Anorthotomous Feldspar.

Partsch.

Primary form. Doubly oblique prism.

M on P	-	94° 12′
M on T	-	117 28
P on T	-	110 57

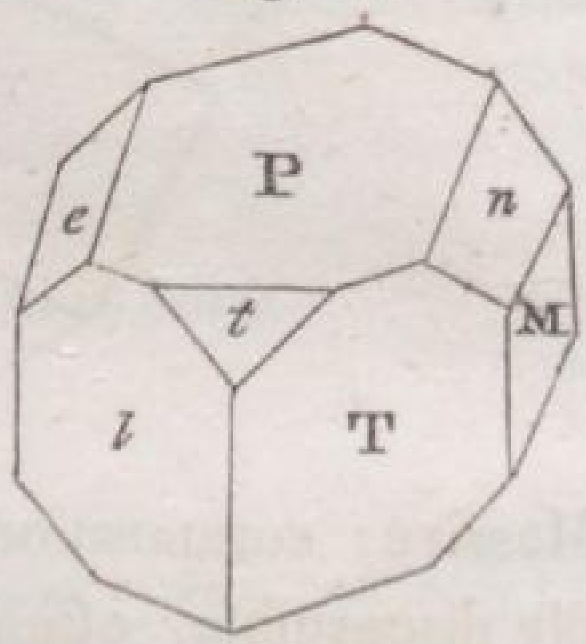
Fig. 29.



Secondary form.

M on *l*	- -	117° 25′
T on *l*	- -	120 30
P on *e*	- -	137 32
P on *n*	- -	133 13
P on *t*	- -	138 46

Fig. 30.



Cleavage, parallel to P and M; none parallel to T.

Fracture conchoidal.

Surface of T more smooth than of *l*.

Lustre pearly upon cleavage planes, vitreous in other directions. Color white. Streak white. Transparent... translucent.

Brittle. Hardness = 6·0. Sp. gr. = 2·763 (massive); = 2·656 (small crystals, apparently not entirely free from Augite.)

1. Before the blow-pipe it behaves like Feldspar, except that with soda it does not give a clear glass. It is entirely decomposed by concentrated muriatic acid.

2. *Analysis.*
By Rose.

Silica	44·49
Alumina	34·46
Oxide of iron	0·74
Lime	15·68
Magnesia	5·26

3. The only locality of Anorthite is Mount Vesuvius. It is found lining cavities in Limestone, along with a green variety of Augite.

ANTHOPHYLLITE. Prismatic Schiller-Spar. Mohs.

Anthophyllite.

Primary form. Oblique rhombic prism. P on P′= 125°.

Cleavage parallel to the sides of the primary form and both its diagonals,—the cleavage parallel to the longer diagonal being more distinct and easily obtained.

Fracture uneven.

Surface streaked parallel to the axis.

Lustre pearly, inclining to metallic, particularly upon the perfect face of cleavage. Color between yellowish-grey and clove-brown. Streak white. Translucent, sometimes, only on the edges.

Brittle. Hardness=5·0 . . . 5·5. Sp. gr.=3·129.

Compound Varieties. Massive; composition columnar, straight, sometimes divergent and rather broad; faces of composition irregularly streaked. They are often aggregated in a second composition, which is angulo-granular and wedge-shaped.

1. Alone before the blow-pipe, it is unalterable except in very thin fragments, when it fuses on the edges into a black slag. With borax, it melts with difficulty into a glass, colored by iron.

2. *Analysis.*

	By John.	By Thomson.	By Gmelin.
Silica	56·00	56·290	56·00
Alumina	13·30	1·545	3·00
Magnesia	14·00	19·665	23·00
Lime	3·33	0·000	2·00
Oxide of iron	6·00	7·280	0·00
Oxide of manganese	3·00	0·000	4·00
Water	1·43	1·685	0·00
Potash	0·00	13·500	12·00

3. Anthophyllite occurs in beds of mica-slate, accompanied by Garnet, Talc, Augite, Iolite, &c.

4. It has been brought from the cobalt and copper mines of Kongsberg and Modum in Norway. It is found with Augite in Greenland; and

with Tourmaline and Iolite at Haddam, (Con.) It also occurs with Quartz in mica-slate, at Chesterfield and Blandford, (Mass.)

ANTHRACITE. Non-Bituminous Mineral-Coal. Mohs.

No regular form or structure. Massive, generally impalpable; rarely vesicular, and sometimes divided into columnar masses, meeting in rough faces.

Fracture conchoidal, often perfect.

Lustre imperfect metallic. Color iron-black, sometimes inclining to greyish black, often beautifully tarnished. Streak unchanged. Opake.

Not very brittle. Hardness = 2·0 . . . 2·5. Sp. gr. = 1·4.

1. The *Columnar Glance-Coal* of Jameson, and the *Mineral Carbon*, or *Mineral Charcoal*, are both varieties of Anthracite. The former is remarkable for its irregular columnar composition, which is probably produced by fissures, and the low degree of lustre in its fracture: the latter occurs in thin layers and massive specimens of a very delicate columnar composition, and presenting a silky lustre.

2. The varieties of the present species do not contain any bitumen, but consist wholly of carbon, occasionally mixed with a small proportion of oxide of iron, silica and alumina. They are inflamed with difficulty, and burn without smoke or bituminous smell and with little or no flame,—leaving a more or less considerable earthy residue.

3. Anthracite is found occasionally in more ancient rocks; but its principal deposits are in secondary strata, consisting of coarse sand stones, greywacke and slate. It is sometimes met with in veins traversing trap rocks.

4. Vast deposits of Anthracite are found in the United States. The most celebrated of these is the anthracite region, so called, of the Susquehanna, situated chiefly in Luzerne county, (Pen.) It is between sixty and seventy miles long, and about five broad, constituting a trough or elongated basin, through which the Susquehanna river and Lackawanna creek, flow. The Anthracite breaks out throughout this region in precipices and hills, forming in some places the beds of the rivers and

smaller streams which descend from the mountains; and the whole of this extent is completely overlaid by coal beds of various thicknesses, repeated again and again with their attendant rocks. The neighboring counties of Schuylkill and Lehigh abound in this species also, where it occurs under similar circumstances. The Anthracite of Pennsylvania is distinguished by its sub-slaty and conchoidal fracture. Very frequently also, it is liable to the most splendid tarnishes which this species ever presents. A second Anthracite region is Rhode Island, where a formation exists at Portsmouth; and a third in Worcester, (Mass.) The Anthracite of these last mentioned districts is remarkable for its irregular columnar composition, dull grey color, and low degree of lustre. This last variety is found on the Meissner in Hessia, forming the uppermost division of a bed of bituminous wood, covered by basalt. It also occurs in Scotland. The slaty Anthracite is found at Schönfield in Saxony, in Savoy, at Kongsberg in Norway, at Staffordshire in England, in Ayrshire Scotland, and at Kilkenny in Ireland.

5. On account of the difficult inflammability of this species of coal, and its scarcity in Europe, it appears to have attracted little attention for economical purposes. Its abundance in this country however, and the cheapness with which it is raised, (it being worked in open quarries,) have brought it into extensive use. At present, it forms the principal fuel in the maritime cities of the northern states, and is applied to nearly every purpose of raising temperature.

Anthrakonite.

An impure Calcareous Spar, which owes its prismatic concretionary form to some species of *Favosites*.

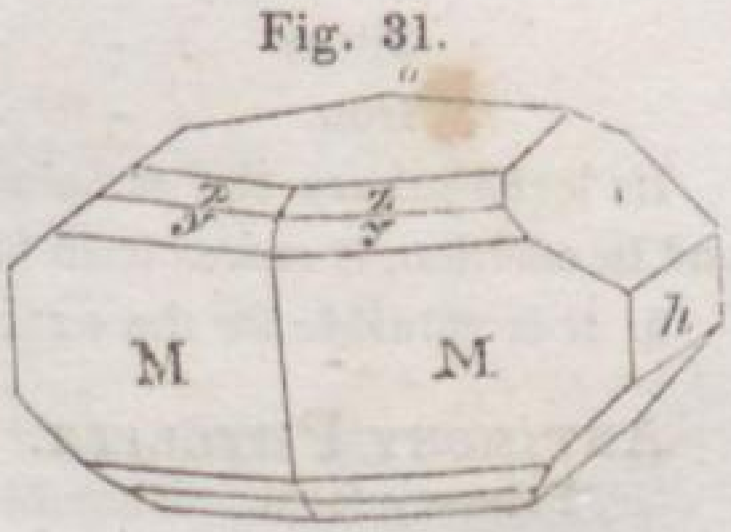
ANTIMONIAL SILVER. Prismatic Antimony. Mohs.

Primary form. Right rhombic prism?

Secondary form.

Fig. 31.

M on M - - - 120° 0′.



Cleavage parallel to *o* and P distinct; cleavage parallel to M imperfect.

Fracture uneven.

Surface in general smooth.

Lustre metallic. Color silver-white, inclining to tin-white. Streak unchanged.

Hardness = 3·5. Sp. gr. = 9·44 . . . 9·8.

Compound Varieties. Twin-crystals like those of Arragonite and White Lead-Ore. Massive: composition granular, individuals of various sizes, and easily separated. Pseudomorphic six-sided prisms.

1. Before the blow-pipe, it yields a globule of silver, while the antimony is driven off.

2. *Analysis.*

Silver	- - - - - -	76·5
Antimony	- - - - - -	23·5

3. It is found accompanied by Native Silver, Native Arsenic, Galena and various other species. Its localities are Altwolfach in Fürstenberg, and Andreasberg in the Hartz.

4. The *Arsenical Silver* is considered as a more or less intimate mechanical mixture of Native Arsenic, or of Mispickel with Antimonial Silver. It possesses the color of Native Silver, but is commonly tarnished externally of a blackish color. It occurs in small, curved lamellar compositions, consisting of very thin crystalline coats. It is harder than Antimonial Silver. Before the blow-pipe, the arsenic and antimony are for the most part volatilized, leaving a globule of impure silver, surrounded by a slag. A specimen from Andreasberg afforded Klaproth,

Arsenic	- - - - - -	35·00
Antimony	- - - - - -	4·00
Silver	- - - - - -	12·75
Iron	- - - - - -	44·25

Its localities are the same as those mentioned for Antimonial Silver, and in addition, it comes from Guadalcaual in Estremadura in Spain.

5. It is valuable for the extraction of silver.

Antimony Phyllite.

Primary form. Rhombic prism. Dimensions unknown, and likewise whether the prism be right or oblique.

Secondary form. A thin, six-sided prism derived from a rhombic prism, through the truncation of the acute edges.

Cleavage parallel with the lateral planes of the primary form, and with its shorter diagonal.

Fracture scarcely observable.

Surface uneven.

Lustre pearly, inclining to adamantine. Color greyish-white. Translucent.

Sectile. Thin laminæ are flexible, like Talc.

Hardness = 1·0 . . . 1·5. Sp. gr. = 4·025.

1. Before the blow-pipe, it conducts like white Antimony. A copious precipitate of oxide of antimony is thrown down from its solution in muriatic acid, by water.

2. But two specimens of this mineral, the one at Dresden and the other at Halle, have been seen; and their locality is unknown.

APATITE. Rhombohedral Fluor-Haloide. Mohs.

Primary form. Regular hexagonal prism.

Secondary forms.

Fig. 32.

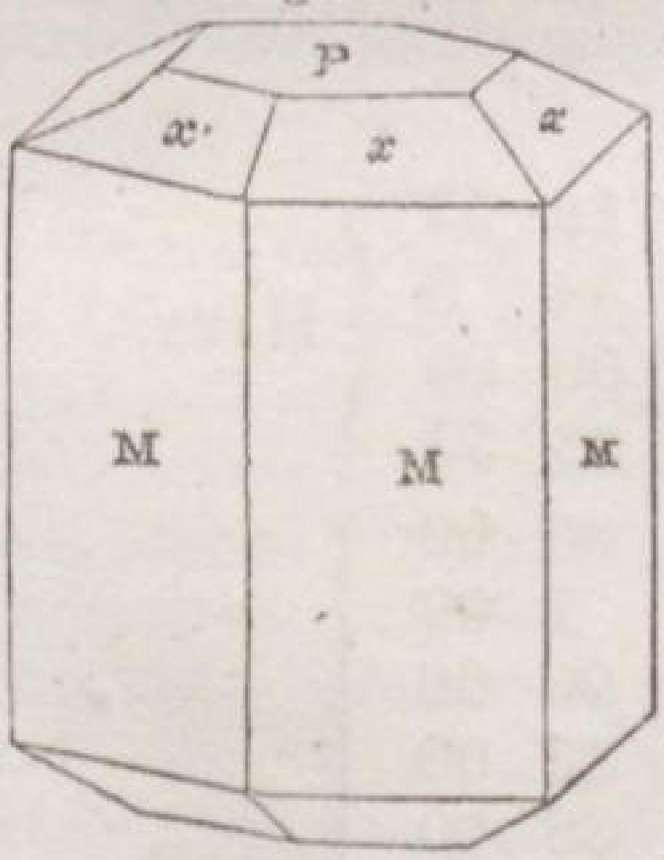
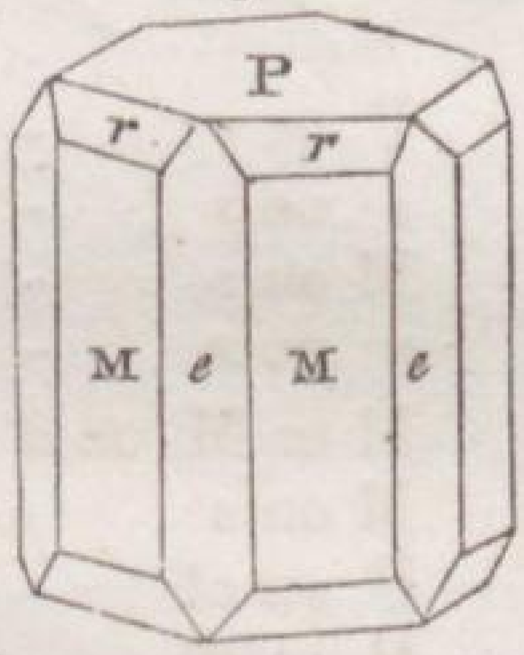


Fig. 33.



M on x	- -	129°	13′	53″	Hauy.
P on x	- -	140	46	7	
x on x	- -	143	7	48	
M on e	- -	150	00	00	Hauy.
M on r	- -	112	12	28	
P on r	- -	157	47	32	

Apatite.

Fig. 34.

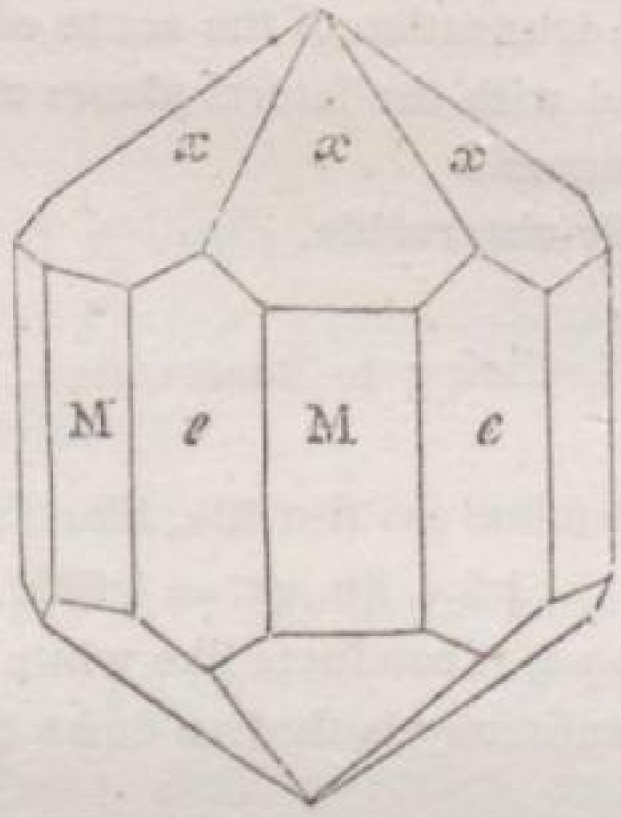


Fig. 35.

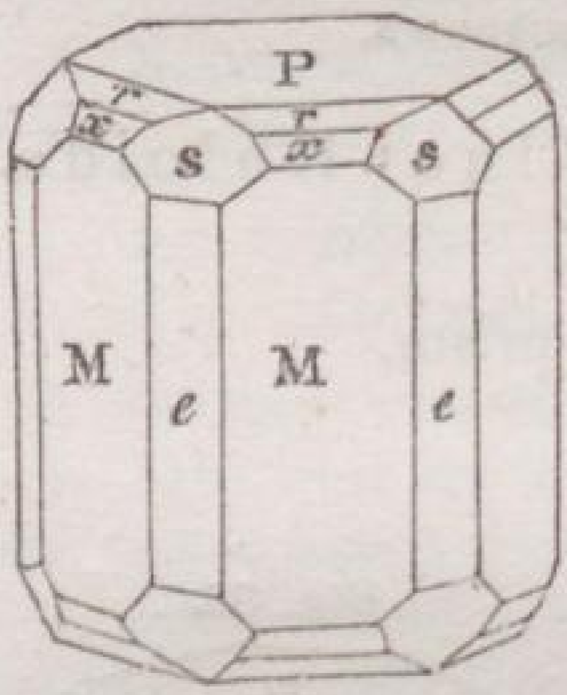
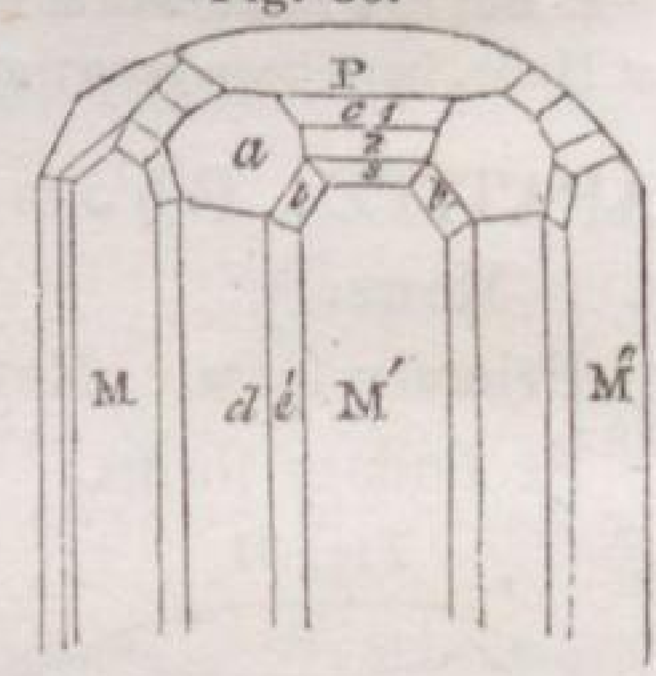


Fig. 36.



P on *s*	- -	125°	15′	52″	Hauy.
e on *s*	- -	144	44	8	
M on *s*	- -	135	00	00	
r on *x*	- -	162	58	33	
M or M′ on *d*	-	150	00	00	Phillips.
M on *e*	- -	169	2	00	
P on *c*1	- -	157	00	00	
P on *c*2	- -	134	43	00	
P on *c*3	- -	120	38	00	
P on *a*	- -	124	16	00	
M on *c*1	- -	112	48	00	
M on *c*2	- -	130	30	00	
M on *c*3	- -	139	48	00	
M′ on *b* or *b*′	-	149	40	00	
b on *a*	- -	162	18	00	

The planes *bb* are rarely seen together on the same crystal.

Cleavage parallel with the planes of the primary form, that parallel with the base obtained with most difficulty.

Fracture conchoïdal, more or less perfect, uneven.

Surface, the secondary faces generally very smooth ; the primary lateral ones striated in a longitudinal direction. Sometimes all the edges are rounded.

Lustre vitreous, inclining to resinous. Color white, frequently violet-blue, mountain-green, or asparagus green ; also yellow, grey red and brown colors, though none of them are bright. Transparent or translucent. A bluish opalescence appears upon the faces parallel to the principal axis in some crystals, particularly the white varieties.

Brittle. Hardness = 5·0. Sp. gr.=3·225 (asparagus-green crystals from Spain) ; =3·180, from Salzburg.

Compound Varieties. Implanted globular and reniform shapes: composition imperfectly columnar; faces of composition rough. Massive: composition granular, individuals of different size, not impalpable; faces of composition uneven or rough.

1. Several varieties of the present species which are decidedly separate from others and connected among themselves, were formerly considered as forming two or even three distinct species. The distinctive marks between them, however, are so slight, that they are incapable of being indicated with certainty, and it would therefore be superfluous to attempt their explanation.

2. Certain varieties are phosphorescent upon ignited charcoal and before the blow-pipe ; in particular those crystals which are terminated by a single plane, some of which phosphoresce when rubbed with hard bodies. In a very strong heat of the blow-pipe, the edges and solid angles are rounded off; but it does not melt without addition. With borax, it dissolves slowly into a clear glass. With salt of phosphorus it dissolves in great quantities, affording a transparent glass, which, when nearly saturated, becomes opake in cooling, and presents crystalline faces, similar, but less distinct than phosphate of lead. Apatite has been artificial-

ly formed by exposing a mixture of phosphoric acid and sulphate of lime to a high temperature. It exhibits a lamellar texture, and shows by heat on opposite ends, opposite kinds of electricity,—a property not hitherto observed in the natural crystals of Apatite.

3. *Analysis.*

	By KLAPROTH.	By VAUQUELIN, from Spain.	By PELLETIER & DONADEI, fr. Spain.
Lime	55·0	54·28	59·0
Phosphoric acid	45·0	45·72	34·0
Carbonic acid	.	.	1·0
Muriatic acid	.	.	0·5
Fluoric acid	.	.	2·5
Silica	.	.	2·0
Iron	.	.	1·0

4. There are examples of Apatite entering as an occasional admixture into the composition of rocks, as granite and limestone. But it more frequently appears in beds and veins, consisting chiefly of ores of iron and tin, or of crystallized varieties of those species of which the rocks themselves are composed. The crystallized variety, called *Asparagus-stone* from Spain, is found in an ancient volcanic rock, along with Specular Iron and compact Calcareous-spar. The compound varieties, called *Phosphorite*, of the same country, form particular beds.

5. Ehrenfriedersdorf in Saxony, Schlackenwald in Bohemia, the Greiner mountain in Salzburg, Cabo de Gata in Spain, Devonshire and Cornwall, are some of the most distinguished localities of this species. Arendal in Norway affords the bluish green and reddish brown crystals, (*Moroxite*); St. Gothard in Switzerland, and Heiligenbluter Tauern in Salzburg, furnish remarkable white, transparent crystals; and Estremadura in Spain, and Schlackenwalk in Bohemia, produce massive varieties, while a pulverulent variety is found at Marmarosch in Hungary. Small yellow crystals occur at Partridge Island in Nova Scotia.

Apatite has been found in many places in the United States; but we possess but one locality which affords it in any considerable quantity, or in well crystallized specimens, and this is at Governeur, St. Lawrence Co. (N.Y.) where it occurs crystallized in granular limestone, the crystals being very abundant, large, (sometimes 4 or 6 inches in length,) well defined, having the form of fig. 35, (except *r*,) and possessing a rich sea-green or mountain-green color. Crystals several inches long, of the primary form have been obtained at Amity, (N.Y.) where it occurs of a green color in white limestone, associated with brown Augite and Scapolite. At Bolton, (Mass.) it occurs crystallized and massive, of a bluish green color, under similar circumstances, with the addition of Petalite and Sphene. Handsome green crystals have been found at Monroe, (Con.) in granite: but they are scarce. Very distinct crystals an inch or more in length, of a reddish brown color, are occasionally met with in a vein of granite at Greenfield, (N.Y.) acccompanied by Chrysoberyl, Tourmaline and Garnet. The following localities of Apatite in small green or yellowish green crystals, imbedded in granite, are quoted in Cleaveland's Mineralogy, viz., near Baltimore, (Maryland,) near Wilmington, (Delaware,) near Philadelphia, New York and New Haven; also the following in Iron Pyrites:—near Green Pond, Morris co. (N.Y.) and at Anthony's Nose in the Highlands of New York.

APHANESITE. Aphanistic Copper-Baryte.

Primary form. Oblique rhombic prism. M on M′= 56°. P on M = 99° 30′.

Secondary forms.

Fig. 37.

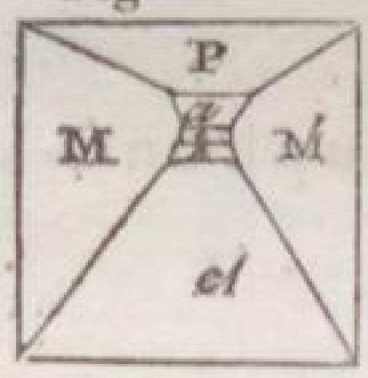


Fig. 38.

P on $a1$	-	-	125° 00′
P on $c1$	-	-	80 30
P on $c2$	-	-	99 30
f on f	-	-	62 30

Lustre pearly upon the face of perfect cleavage. Color dark verdigris-green, inclining to sky-blue, still darker on the surface. Streak verdigris green. Translucent on the edges.

Not very brittle. Hardness = 2·5 . . . 3·0. Sp. gr. = 4·192.

1. Before the blow-pipe it deflagrates and emits arsenical vapors.

2. *Analysis.*
By Chenevix.

Oxide of copper . . .	54·00
Arsenic acid . . .	30·00
Water . . .	16·00

3. It has hitherto been found only in Cornwall, with several other species of the salts of copper, and with Copper Pyrites and Quartz.

APHRITE. (See *Calcareous-Spar.*)

APLOME. (See *Garnet.*)

APHTHITALITE. Prismatoidal Glauber-Salt.

Massive;* mammillary, apparently formed in successive layers.

Lustre vitreous. Color white, with certain bluish or greenish stains. Translucent.

Rather brittle. Hardness = 2·5 ... 3·0. Sp. gr. = 1·731.

Taste saline and bitter, disagreeable.

1. It has not been analyzed, but probably will be found to be a sulphate of potash, with a trace of sulphate and muriate of copper.

2. It occurs at Mount Vesuvius.

APOPHYLLITE. Pyramidal Kouphone-Spar. MOHS.

Primary form. Right square prism.

* The artificial crystals are right rhombic prisms of 112° 8′, having their acute angles replaced so as to form dihedral summits of 106° 46′, and having the lateral edges truncated.

Apophyllite.

Secondary forms.

Fig. 39.

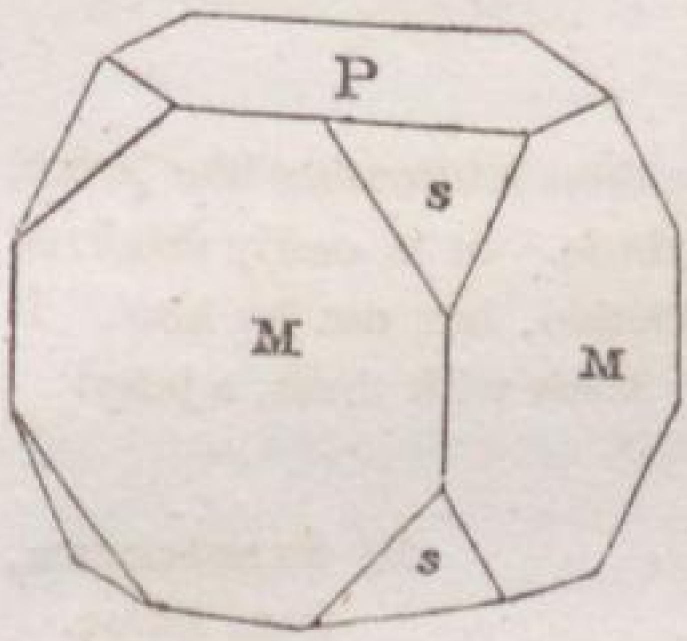


Fig. 40.

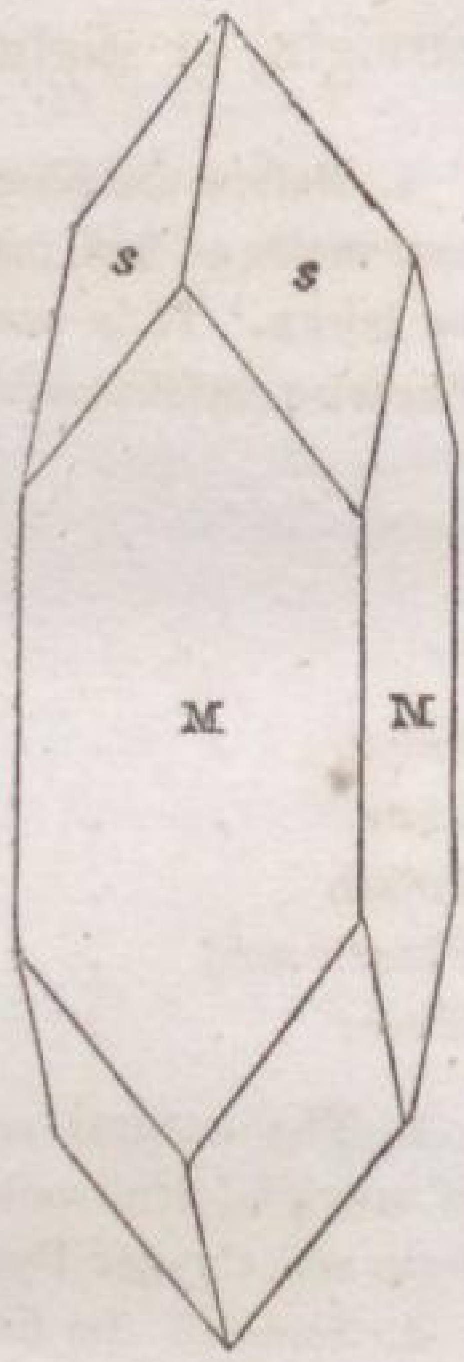


Fig. 41. P

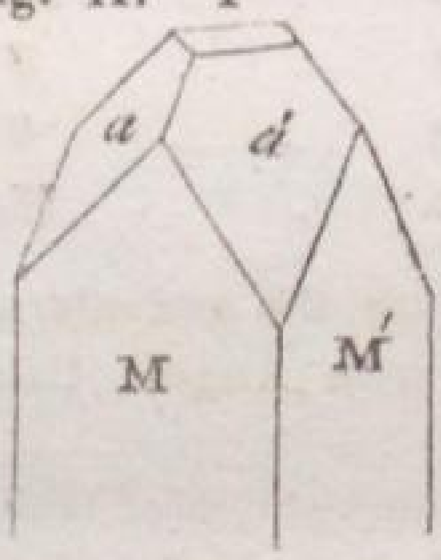
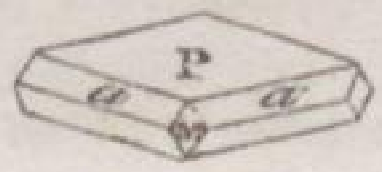


Fig. 42.



M on *s* - - -	127°	59′	Hauy.
P on *s* - - -	119	30	
s on *s* - - -	104	2	
P on *a* - - -	120°	5′	Phillips.
M on *a* - - -	128	20	
a on *a* - - -	104	18	

Cleavage, parallel with the primary faces, most perfect at right angles to the axis.

Fracture uneven.

Surface smooth and shining.

Lustre vitreous. The natural and cleavage face P possess pearly lustre. Color several shades of white, greyish, bluish or reddish. Streak white. Transparent . . . translucent.

Brittle. Hardness = 4·5 . . . 5·0. Sp. gr. = 2·335.

Compound varieties. Massive: composition lamellar, straight, or slightly curved.

1. Before the blow-pipe, it first exfoliates, then intumesces like borax, and melts at last into a white vesicular globule. It is easily dissolved by borax. It is positively electrified by friction, but not by heat. It likewise exfoliates in acids; and its powder forms with them, a jelly.

2. *Analysis.*

	By Berzelius, from Utoen.		By Stromeyer, from Faroe.
Silica	53·13	52·38	51·26
Lime	24·71	24·98	25·20
Potash	5·27	5·27	5·14
Fluoric acid	0·82	0·64	0·00
Water	16·20	16·20	16·04

3. The natural repositories of Apophyllite are the vesicular cavities of amygdaloidal rocks, or metalliferous beds with Augite, Calcareous Spar and Copper Pyrites.

4. Some of the finest varieties are from the amygdaloid of Iceland and the Faroe islands. Likewise near Indore in India. Under similar circumstances it occurs at Mariaberg, near Aussig in Bohemia, and the variety from thence has been called *Albin.* It has been found occupying drusy cavities of a very extensive bed of limestone in gneiss, containing ores of copper, at Czcklowa, near Orawitza in the Bannat. Other localities are New South Shetland, and several iron-mines in Sweden and Norway.

The only known localities in North America are Peter's Point and Partridge Island in the Basin of Mines, Nova Scotia.

ARFWEDSONITE. Peritomous Augite-Spar. Partsch.

Primary form. Oblique rhombic prism. M on M′ = 123° 55′, from cleavage.

Cleavage parallel with the sides of the prism, producing brilliant faces.

Lustre vitreous. Color black. Opake.

Hardness inferior to Hornblende. Sp. gr. =3·44.

1. It melts easily before the blow-pipe into a black globule. With borax, it gives a glass colored by iron; with salt of phosphorus, likewise, but paler, and becoming colorless on cooling, whilst a dark grey silica-skeleton remains undissolved.

2. It occurs along with black Augite and black Sodalite in Greenland, and has generally been considered as a ferruginous variety of Hornblende, from which, however, its brilliant cleavages, the inclination of its lateral faces and inferior hardness, seem sufficiently to distinguish it as a new species.

The mineral generally taken for a variety of Hornblende in a porphyritic trap from Plymouth, (Vt.) appears to agree with the above description.

ARRAGONITE. Prismatic Lime Haloide. Mohs.

Primary form. Right rhombic prism. M on M′ = 116° 10′.

Secondary forms.

Fig. 43.

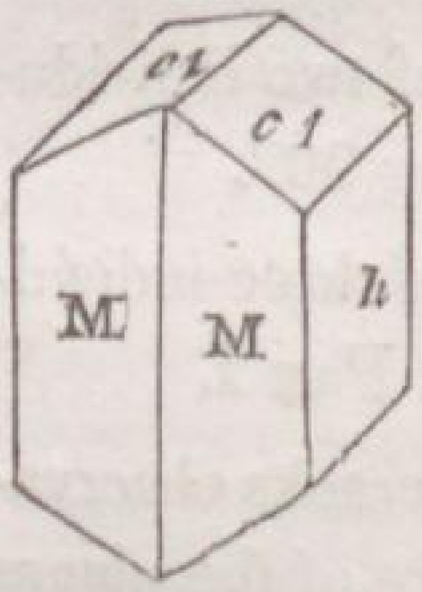
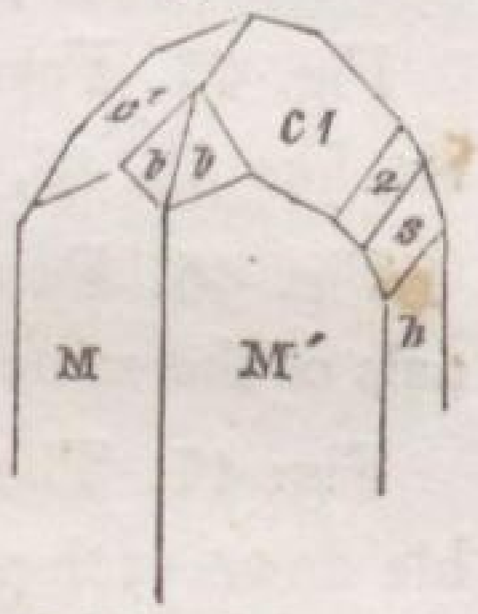


Fig. 44.



M on c1	- -	108° 18′	Bilin, Bohemia. Phillips.
M on M′	- -	116 10	
M′ on h	- -	121 38	
h on c1	- -	125 55	
c1 on c1	- -	108 18	
M on b	- -	144° 00′	Phillips.
c1 on c2	- -	150 30	
c1 on c3	- -	141 00	
c1 on b	- -	136 30	
b on b	- -	129 33	

Cleavage, parallel with the lateral faces of the primary form.

Fracture conchoidal, uneven.

Surface generally smooth. The curvature of the sides parallel to the prismatic axis very often produces acicular crystals, variously aggregated.

Lustre vitreous, inclining to resinous upon faces of fracture. Color white, prevalent; sometimes passing into grey, yellow, mountain-green and violet blue. Streak greyish white. Transparent . . . translucent.

Brittle. Hardness=3·5 . . . 4·0. Sp. gr.=2·931, (the transparent crystals from Bohemia.)

Compound varieties.

Fig. 45. Fig. 46. Fig. 47.

Arragon.

Fig. 45. Formed from the composition of two individuals, like fig. 43, the angle of revolution being 90°.

Fig. 46. Formed from the composition of three individuals of the same form, as explained in § 73. Part I.

Fig. 47. The dotted lines represent the cracks observable down each plane, arising from the contact of the planes forming the dihedral summits of the several individuals of which fig. 46 is composed; and hence the six lateral planes of this apparently regular hexagonal prism are not flat; but each presents a slightly re-entering angle.

Globular, reniform, coralloidal shapes; surface drusy, composition columnar, the individuals being often very delicate, but also occurring of various dimensions; faces of composition irregularly streaked. Massive: composition columnar, either parallel, or divergent, or irregular; and of different sizes of individuals.

1. Thin fragments of transparent crystals decrepitate in the flame of a candle; other varieties lose their transparency, and become friable. It phosphoresces upon red-hot iron, and is soluble in nitric and muriatic acid, with effervescence.

2. *Analysis*.
By Stromeyer.

Carbonate of lime . .	95·2965 .	99·2922
Carbonate of strontites .	0·5090 .	4·1043
Water	0·1544 .	0·5992

The carbonate of strontites does not exist in constant proportions, and has not been found at all in the coralloidal varieties.

3. Imbedded crystals, generally twins, or consisting of a greater number of individuals, are found in compound varieties of Gypsum, mixed and colored with oxide of iron, accompanied by crystals of Quartz, which have likewise suffered a similar admixture. Other varieties occur in the cavities of basalt and other trap rocks, also in irregular beds and veins. It is found in beds of iron-ores, in those coralloidal varieties which have been called *Flos-ferri*, in which the component individuals are so minute that their form and structure is undistinguishable. It is also found in various repositories, along with several species, as Copper and Iron Pyrites, Galena and Malachite. It likewise occurs in lava.

4. The most beautiful crystals occur near Bilin in Bohemia, in a vein traversing basalt, and filled with a massive variety of the same species, consisting of large columnar particles of composition. The varieties of twin-crystals imbedded in Gypsum, are found in the kingdom of Arragon in Spain, from whence the name of the species has been derived. The greenish colored specimens are brought from Marienberg in Saxony, and Sterzing in the Tyrol. The finest varieties of Flos-ferri are found in the mines of Eisen-ertz in Stiria; it also occurs at Schemnitz, St. Marie mines, and in those of Baygorri and Vicdessos in the Pyrennees. In England, the Dufton lead mines furnish beautiful specimens in acicular crystals, and finely columnar masses of a satin lustre. Other localities are Mount Vesuvius, Iglo in Hungary, France, Scotland, Iceland and Silesia.

The Flos-ferri has been met with at Lockport, (N.Y.) coating gypsum in geodes, at Edenville, (N.Y.) lining cavities of Mispickel and Cube ore, and at Haddam, (Con.) and its vicinity, in thin seams between layers of gneiss. A fibrous variety occurs at Scoharie, (N.Y.) It also exists in numerous limestone caves of the south western states.

ARSENIATE OF COBALT. (See *Cobalt-Bloom.*)

ARSENIATE OF COPPER. (See *Aphanesite, Copper-Mica, Erinite, Euchroite, Liroconite* and *Olivenite.*)

ARSENIATE OF IRON. (See *Cube-ore.*)

ARSENIATE OF LIME. (See *Pharmakolite.*)

ARSENIATE OF NICKEL. (See *Nickel-Ochre.*)

ARSENICAL ANTIMONY GLANCE.

In reniform masses, consisting of thin and curved individuals. Fracture uneven.

Lustre shining to faint. Color tin-white to steel-grey.

Hardness = 2·0 . . . 3·0. Sp. gr. = 6·2.

1. Before the blow-pipe it melts, and during fusion emits fumes of Antimony and Arsenic. Decomposed by nitric acid, affording a white precipitate, soluble in muriatic acid.

2. It is found at Przibram in Bohemia, Allemont in Dauphiny, Poullaouen in Brittany, and Andreasberg in the Hartz.

ARSENIC-GLANCE.

Massive, botryoidal; composition columnar, individuals radiating.

Lustre metallic. Color dark lead-grey.

Hardness = 2·0 . . . 2·5. Sp. gr. = 5·2 . . . 5·5.

1. Fragments of it, held in the blaze of a lamp, take fire, and disseminate, amidst continual sparks, a greyish, arsenical vapor. Heated on platina foil, it is surrounded by a ring of crystallized arsenic acid; and as it diminishes perceptibly, the vapor is partly deposited in the form of a blackish-grey powder. Before the blow-pipe, upon charcoal, it burns, at first with a bluish flame, and disappears in a dense smoke. It does not melt, until just before it disappears, when a white metallic globule is obtained. In the matrass it gives, at first crystallized arsenic acid: afterwards, a grey smoke and metallic arsenic, without any perceptible residuum. It is soluble in nitric acid, and the solution (when the acid is

not in excess) gives a white precipitate on the addition of water. With hydriodic acid, it at first gives a blackish brown, and then a citron-yellow, precipitate.

2. *Analysis.*

By Kersten,
from Marienberg.

Arsenic	96·785
Bismuth	3·001

3. It occurs in small quantities only, at Palmbaum in Marienberg, accompanied by Native Arsenic, Red Silver, Fluor, Heavy Spar, Calcareous Spar, Copper Nickel, Native Silver, &c.

4. It is not probable that the bismuth is a necessary ingredient in this mineral, which might with more propriety be included under Native Arsenic.

Asbestus.

Silky varieties of *Hornblende, Pyroxene, Picrosmene* and *Nemolite:* q. v.

Asparagus-stone. (See *Apatite.*)

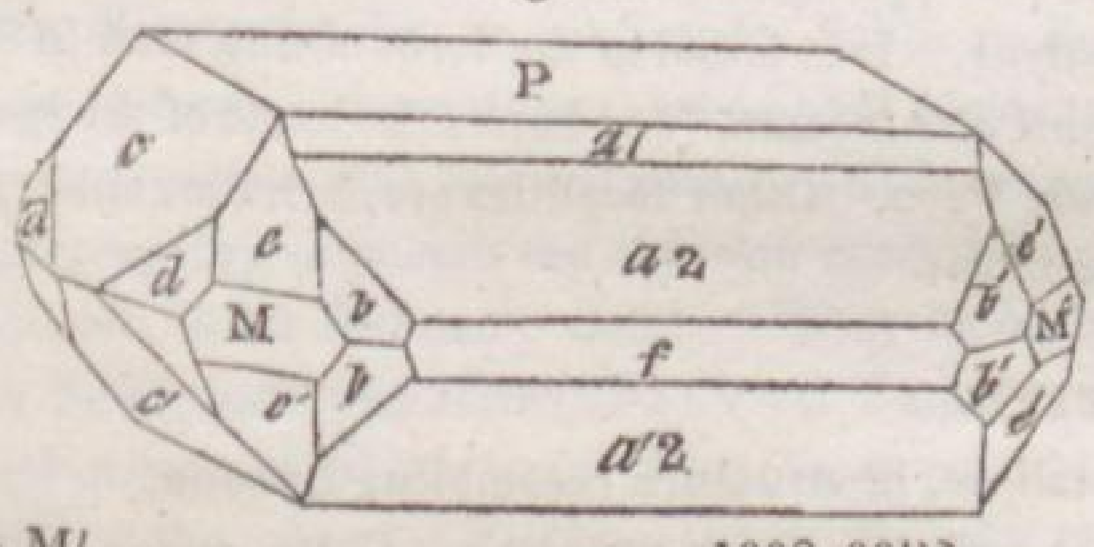
Asphaltum. (See *Bitumen.*)

ATACAMITE. Prismatoidal Habroneme-Malachite. Partsch.

Primary form. Right rhombic prism. M on M′=100°

Secondary form.

Fig. 48.



M on M′	100° 00′?	Phillips.
P on a1	142 40	
P on a2	123 25	
P on c	127 12	
P on e	116 20	
a2 on a′2	112 45	
a2 on c	110 30	
a2 on e	143 25	
c on c′	107 10	
c on d	159 00	
c on e	137 40	
e on e	127 07	

The planes M M′ are the result of cleavage. Among the minute crystals are to be observed some in which the planes $a2$, $a2'$ and c, c' of fig. 48 prevail to the exclusion of the rest, converting them to the form of an octahedron with a square base.

Cleavage parallel to P, less distinct parallel to M and M′.

Colors, olive, leek, grass, emerald, and blackish-green. Streak apple-green. Nearly transparent ... translucent on the edges.

Rather brittle. Hardness = 3·0 ... 3·5. Sp. gr. = 4·43.

1. It communicates bright blue and green colors to the flame of a candle, or if exposed to the blast of the blow-pipe, it develops vapors of muriatic acid, and melts at last into a globule of copper. It is soluble without effervescence in nitric acid.

2. *Analysis.*

	By Proust.	By Klaproth.
Oxide of copper	76·595	73·00
Muriatic acid	10.638	10.10
Water	12·767	16.90

3. It is found at Remolinos in Chili, on Brown Iron-Ore; sometimes with Red Oxide of Copper and Malachite: it occurs also in Peru with some of the ores of silver. It is found in the form of fine sand in the river Lipas, in the desert of Atacama, (and hence the name of the species,) separating Chili from Peru. Other localities are, Schwarzenberg in Saxony, and Mount Vesuvius.

Atelestite.

Crystalline, in structure resembling Sphene.
Lustre resinous to adamantine. Color pure sulphur-yellow.
Transparent to translucent.
Hardness about 3. Heavy.

1. Before the blow-pipe, it affords the indications of bismuth.
2. It is found at Schneeberg.

ATMOSPHERIC-AIR. Pure Atmospheric-gas. Mohs.

Gaseous. Transparent.

Sp. gr. =1·0. Nearly 800 times lighter than distilled water.

1. It is tasteless and without odor, except that of electricity, which it sometimes very manifestly exhibits. Though transparent, it nevertheless reflects a blue color when in large masses, as in the sky above us. The lower atmosphere is contaminated in a greater or less degree by every kind of air or vapor which can be formed by the various bodies that compose the earth's surface. Over the land especially, carbonic acid is mingled with it in a proportion generally equal to 0·001.

2. *Analysis.*

Nitrogen	79·00
Oxygen	21·00

3. Atmospheric-air constitutes the atmosphere, and surrounds the whole globe to the height of forty or forty-five miles.

ATMOSPHERIC WATER. Pure Atmospheric-Water. Mohs.

Liquid. Transparent.

Sp. gr. =1·0.

1. Its form of aggregation is continually liable to fluctuation from changes of atmospheric temperature; and instead of water there appears aqueous vapor, or steam, and ice and snow. Ice is commonly produced with too much rapidity to permit the separate crystals of which its masses are composed, to be distinctly visible. They have been observed, however, by Scoresby and Herincaut de Thury, under the form of hexahedral prisms, of which the terminal faces presented striæ parallel to the faces of the prism, and in some instances with truncated terminal edges. The sp. gr. of ice = ·92. The crystals of snow present an almost endless variety of forms, which are perfect geometrical figures. They are usually lamellar, and transparent; often in regular hexagons, having six points radiating from their centres, with parallel collateral ramifications in the same plane: in slender six-sided needles, or spines; and in combinations of hexagons and spines, producing stelliform, or wheel-shaped compositions. Dr. Brewster has observed quadrangular plates in the hoar-frost crystallized upon leaves and stones; which

leads to the conclusion that the system of crystallization in ice is a quadrangular prism, and not a rhomboid, as was formerly supposed. It is well known that no species in mineralogy, whose primitive form is the rhomboid, presents crystallizations similar to the star-like figures of snow. The hail-stones which fall in the spring have the form of spheric sections, consisting of opake, thin prisms, radiating from the centre: those formed during heavy thunder storms in summer, generally, affect the shape of irregular, flattish globules, consisting of columnar particles of composition, but often perfectly transparent, and sometimes enclosing air bubbles.

2. *Analysis.*
By Berzelius.

Oxygen	88·94
Hydrogen	11·06

When pure, it is destitute of taste or odor. But water which flows within or upon the surface of the earth, contains various earthy, saline, metallic, vegetable, or animal particles, which often materially affect its taste and smell, and sometimes considerably augment its specific gravity. Thus from the accidental presence of salts and acids are formed the different kinds of hard water, of acidulous and bitter waters, and sea water.

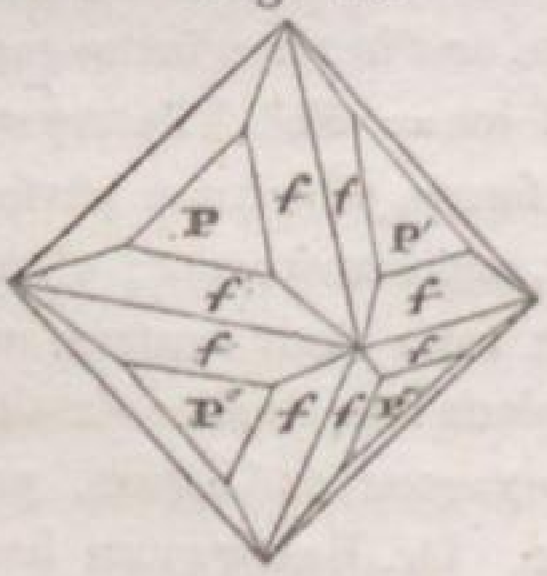
3. Pure atmospheric water descends from the atmosphere in the form of rain, mist, dew, snow or hail; it is also emitted from springs, and accumulated all over the globe in lakes, seas, &c.: in these last instances, however, it is contaminated with variable proportions of saline substances.

AUTOMOLITE. Octahedral Corundum. Mohs.

Primary form. Regular octahedron.

Secondary form.

Fig. 49.



Cleavage parallel with the primary faces.

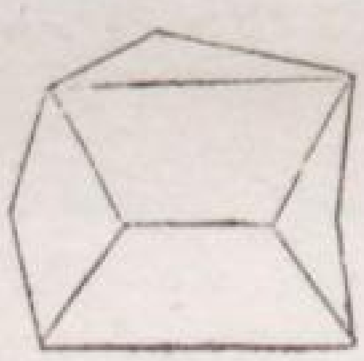
Fracture conchoidal.

Surface rough, sometimes covered with Mica or Blende.

Lustre vitreous, inclining to resinous. Color dirty green tinges, inclining to black and blue. Streak white. Translucent on the edges . . . nearly opake.

Hardness = 8·0. Sp. gr. = 4·232.

Fig. 50.



Compound varieties. Twin-crystals. The octahedral hemitrope. Massive: composition granular.

1. Alone before the blow-pipe, it is infusible, and nearly so with borax, or with salt of phosphorus. With soda, it melts imperfectly into a dark scoria, which being melted again with soda, deposits upon the charcoal an areola of oxide of zinc.

2. *Analysis.*
By Eckeberg.

Alumina	60·00
Oxide of zinc	24·25
Oxide of iron	9·25
Silica	4·75

3. Automolite generally occurs imbedded in talcose slate and quartz, and is accompanied by Galena, Blende, Garnet, Gadolinite, &c. It is thus found at Fahlun and Brodbo in Sweden.

In the United States, it occurs at Haddam, (Con.) along with Chrysoberyl, Garnet and Columbite in granite.

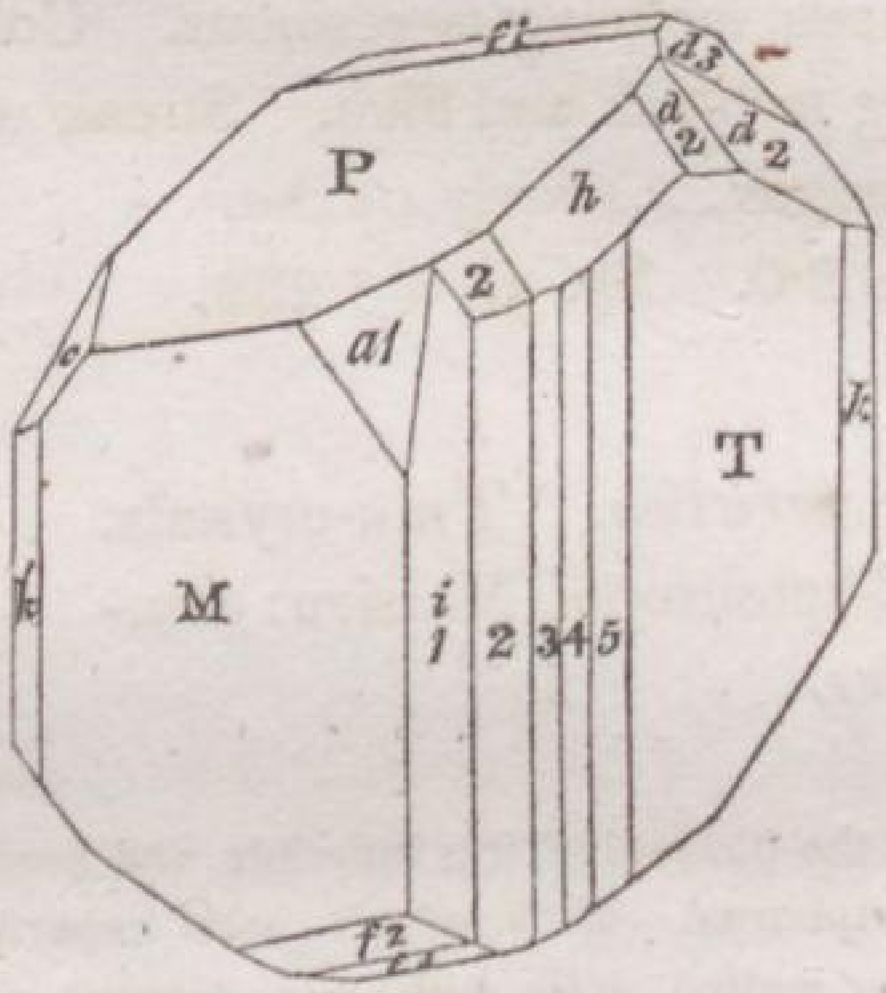
AXINITE. Tetarto-prismatic Axinite.

Primitive form. Doubly oblique prism? P on M= 134° 40′, P on T=115° 17′, M on T=135° 10′ (Phillips.)

Axinite.

Secondary form.

Fig. 51.



M on *a*1 -	179° 00′	M on *f*3 -	90° 18′	Phillips.
M on *a*2 -	150 3	T on *k* -	147 55	
M on *h* -	146 35	T on *h* -	152 5	
M on *d*1 -	130 30	T on *d*1 -	149 30	
M on *d*2 -	100 45	T on *d*2 -	130 5	
M on *d*3 -	72 38	T on *d*3 -	94 12	
M on *i*1 -	179 20	P on *a*1 -	133 25	
M on *i*2 -	174 40	P on *c* -	136 22	
M on *i*3 -	152 25	P on *f*1 -	173 20	
M on *i*4 -	142 28	P on *h* -	143 20	
M on *i*5 -	138 10	P on *d*1 -	139 30	
M on *k* -	120 00	P on *d*2 -	121 30	
M on *c* -	112 25	P on *d*3 -	110 20	
M on *f*2 -	135 12			

Cleavage indistinct and interrupted.

Fracture conchoidal, uneven.

Surface of M and T irregularly streaked. The secondary faces are smooth and shining.

Lustre vitreous. Color clove-brown, various shades inclining to plum-blue and pearl-grey. Green from an admixture of Talc. Streak white. Transparent...translucent, sometimes only on the edges. It exhibits the property of dichroism.

Hardness=6·5...7·0. Sp. gr.=3·271.

Compound varieties. Massive: composition lamellar, generally a little bent; faces of composition irregularly streaked. Sometimes the composition is granular and impalpable.

1. Before the blow-pipe it melts easily, and with intumescence, into a dark-green glass, which becomes black in the oxidating flame. Some varieties are differently electrified by heat, contiguous to opposite ends of the crystals, and in these also a difference has been observed by Hauy.

2. *Analysis.*

	By Klaproth.	By Wiegmann.
Silica	50·50	45·00
Lime	17·00	12·50
Alumina	16·00	19·00
Oxide of iron	9·50	12·25
Oxide of manganese	5·25	9·00
Potash	0·25	0·00
Magnesia	0·00	0·25
Boracic acid	0·00	2·00

3. Axinite occurs in beds and veins in primitive countries. It is accompanied in the former situations by Calcareous Spar, Blende, &c.; in the latter, chiefly by Augite, Quartz, Feldspar and various metallic minerals.

4. It is found in beds at Thum near Ehrenfriedersdorf in Saxony, from whence it has sometimes been called *Thumite* or *Thumerstone.* At Kongsberg in Norway, it occurs in veins with Vitreous Silver. Beautiful crystals are met with in the veins of various places near Bourg d'Oisans in Dauphiny, at Barèges in the Pyrenees, in Savoy, in the county of Gömör in Hungary, and in large, well defined crystals at Botallack in Cornwall. In the latter place, it is found in a massive state, forming a peculiar kind of rock with Garnet and Tourmaline. It is also found at several places in the Hartz.

Azote. (See *Nitrogen.*)

Azurite. (See *Lazulite.*)

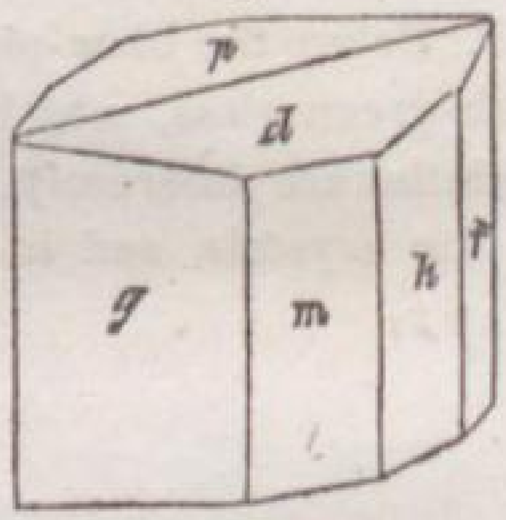
BABINGTONITE. Axotomous Augite-Spar. Partsch.

Primary form. Oblique rhombic prism. Dimensions unknown.

Secondary form.

p on m	- -	92° 34′	Levy.
p on t	- -	88 00	
t on h	- -	155 25	
m on t	- -	112 30	
m on h	- -	137 ·5	
p on d	- -	150 25	
g on m	- -	132 15	
h on g	- -	89 20	

Fig. 52.



Cleavage distinct, parallel to p and t.

Fracture imperfectly conchoidal.

Lustre vitreous. Color black, often greenish; thin splinters are faintly translucent, and of a green color, perpendicular to p, of a brown color parallel to it. In large crystals, it appears opake.

Hardness $= 5{\cdot}5 \ldots 6{\cdot}0$.

1. According to Mr. Children, it is composed of silica, iron, manganese and lime, with a trace of titanium.

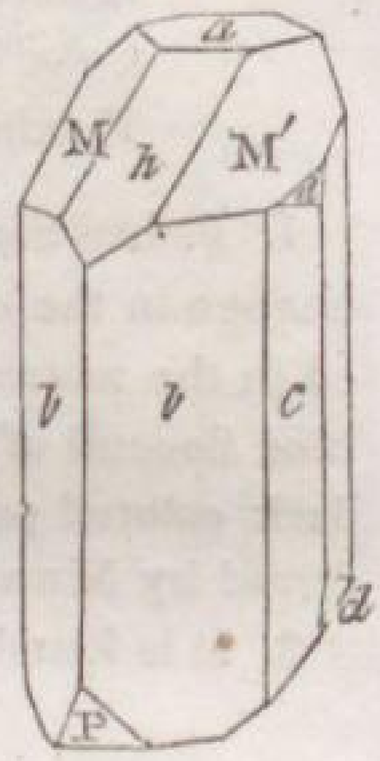
2. It occurs at Arendal in Norway, in small crystals, (resembling dark colored crystals of Pyroxene,) disposed on the surface of crystals of Albite; and at Governeur, (N.Y.) coating crystals of Feldspar.

BARYTO-CALCITE. Hemi-Prismatic Hal-Baryte. Mohs.

Primary form. Oblique rhombic prism. M on M′= 106° 54′.

Secondary form.

Fig. 53.



M on M' - - -	106°	54'
M on P - - -	102	54
b on *b* - - -	95	15
h on the edge between *b* and *b*	119	00
P - - - -	135	00
c on *c* - - -	145	54

Cleavage perfect parallel to M and M'; less easily obtained, though perfect, parallel to P.

Fracture uneven, imperfectly conchoidal.

Surface *h* striated parallel to the edges of combination with M; the vertical planes parallel to the axis.

Lustre vitreous, inclining to resinous. Color white, greyish yellowish, or greenish. Streak white. Transparent... translucent.

Hardness =4·0. Sp. gr. =3·66.

Compound varieties. Massive: composition granular.

1. It does not melt alone before the blow-pipe, but gives a clear globule with borax. Like Witherite, it is soluble in muriatic acid.

2. *Analysis*.

By Children.

Carbonate of barytes . . .	65·9
Carbonate of lime . . .	33·6

It sometimes gives traces of iron and manganese.

3. It occurs at Alston moor in Cumberland, both massive and crystallized.

Batrachite.

Massive, with traces of a rhombic prism of 115°. Composition impalpable.

Cleavage parallel with the sides and shorter diagonal of the above prism, but mostly indistinct. Fracture small conchoidal.
Lustre resinous or vitreous; more inclined to the latter.
Color light greenish-grey, to almost white. Streak white.
Hardness = 5·0. Sp. gr. = 3·038.

1. Before the blow-pipe, it is fusible alone, without any perceptible change in the color of the flame. It affords a little moisture when heated in the matrass. It is slowly dissolved in phosphoric salt, leaving behind flocculi of silica. With soda, it is with difficulty dissolved into a dark colored pearl. From these and other experiments, it has been inferred by MERLET to be a silicate of magnesia.

2. It is found at Rizoni, a mountain in southern Tyrol.

BERGMANITE. (See *Scapolite.*)

BERYL. Rhombohedral Emerald. MOHS.

Primary form. Regular hexagonal prism.

Secondary forms.

Fig. 54.

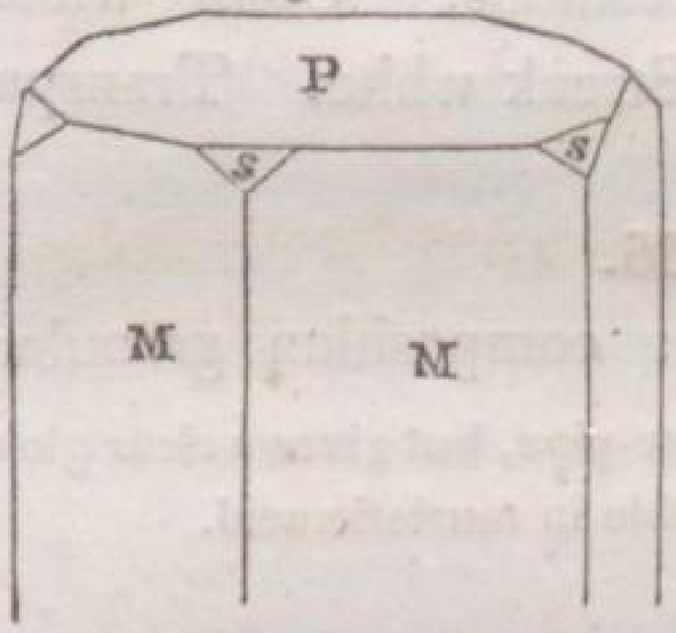
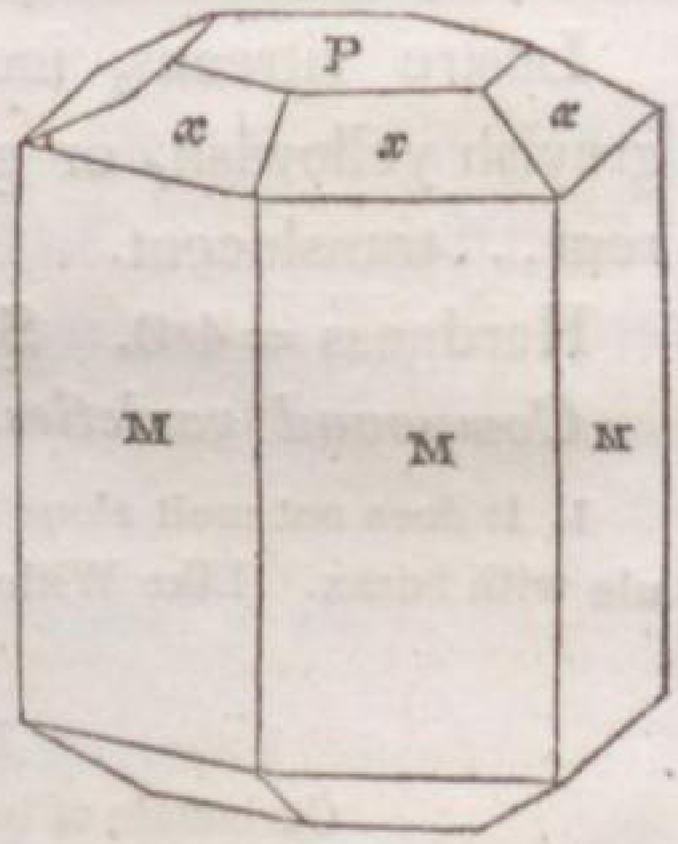


Fig. 55.



P on *s*	- -	135° 00	HAUY.
M on *s*	- -	127 45′ 40″	
P on *t*	- -	150 00	
M on *t*	- -	120 00	

Beryl.

Fig. 56.

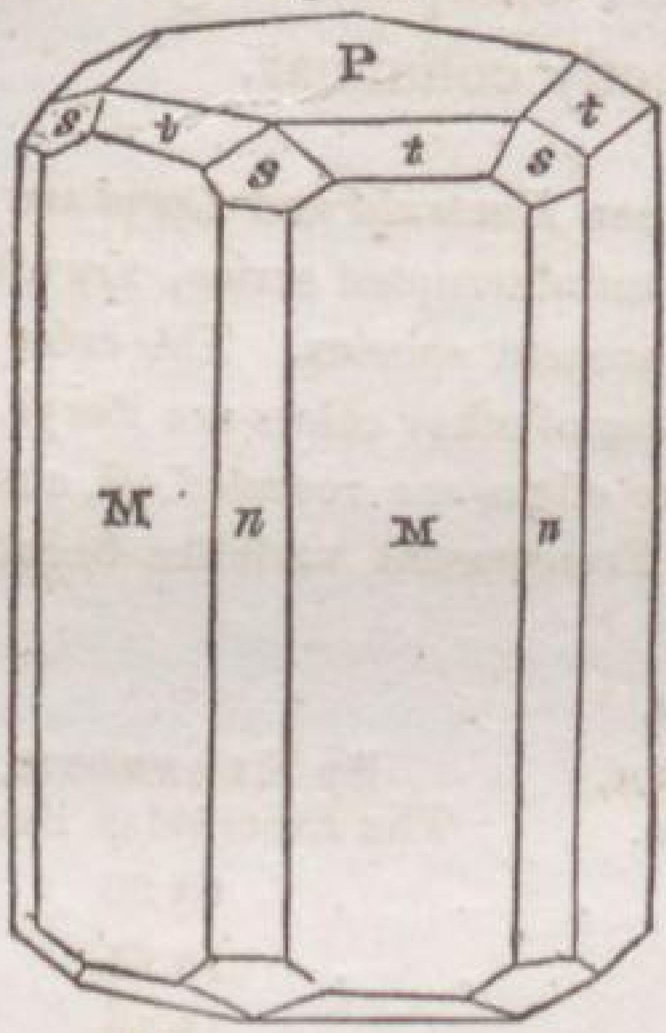
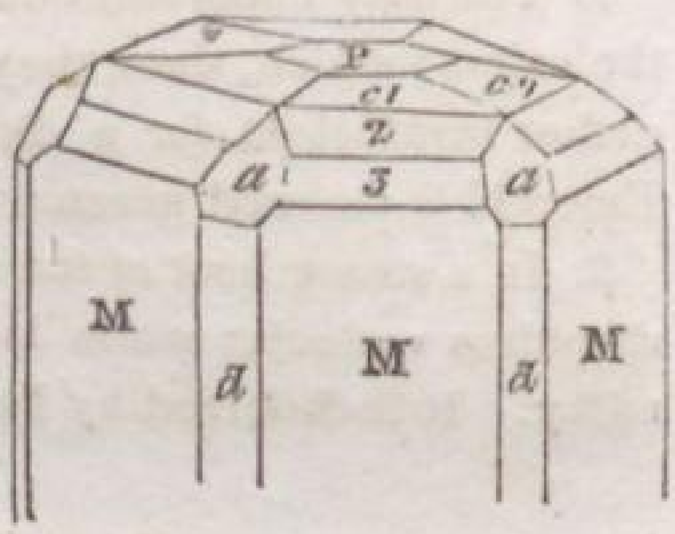


Fig. 57.



M on n - -	150° 00		Hauy.
n on s - -	135 00		
s on t - -	156 42′ 59″		
P on a - -	135 14′		Phillips.
P on $c2$ - -	159 10		
$c1$ on $c'1$ - -	179 40		
M on d - -	150 00		

Cleavage, parallel to all the primary planes, but not distinct.

Fracture conchoidal, uneven.

Surface, the prisms striated parallel to the axis.

The pyramidal faces smooth.

Lustre vitreous. Color green, passing into blue, yellow and white : the brightest of these colors is emerald green ; the greater part of the species, however, exhibits only pale colors. Streak white. Transparent . . . translucent.

Hardness=7·5 . . . 8·0. Sp. gr.=2·732 of a perfectly emerald green variety ; 2·678, of an apple-green crystal.

Compound Varieties. Massive: composition generally large granular, sometimes imperfectly columnar.

1. The only important differences between *Emerald* and *Beryl* are in the colors; which, since they produce an uninterrupted series, are altogether insufficient for a division of the present species. The color of Emerald is emerald green; all the varieties of other colors are Beryl.

2. In a strong heat of the blow-pipe, the edges are rounded off, and a shapeless vesicular scoria is produced. Transparent varieties become milky. It is dissolved by borax.

3. *Analysis.*

	By Berzelius, from Broddbo.	By Klaproth. The Emerald of Peru.
Silica	68·35	68·50
Alumina	17·60	15·75
Glucina	13·13	12·50
Oxide of iron	0·72	1·00
Oxide of columbium	0·27	0·00
Oxide of chrome	0·00	0·30
Lime	0·00	0·25

4. Beryl occurs in imbedded crystals in various rocks, most generally, however, in granite. It is also found in implanted crystals in veins and in beds. It is associated with Feldspar, Chrysoberyl, Topaz, Tin-ore, Garnet, &c. It is met with, likewise, in fractured crystals and rolled masses in secondary repositories.

5. The finest crystals of the emerald-green colors, or the true Emerald, come from Peru, where, according to Humboldt, it forms druses with Calcareous Spar, and occurs in veins traversing hornblende-slate, clay-slate and granite. It is sometimes accompanied by Quartz and Iron Pyrites. Less beautiful varieties are found imbedded in mica-slate in the valley of Heerbach, district of Pinzgau, Salzburg. The ancients procured their Emeralds from Egypt. Their localities have been rediscovered, and are situated in granite and mica-slate, in Mount Zalara, seven leagues from the Red Sea in Upper Egypt. Transparent crystals of bluish-green Beryl (called *Aquamarine*) are found in Siberia and Brazil. In Siberia it occurs in the granitic district of Nertschinsk, on the confines of China in compact ferruginous clay; also in the Uralian and Altai mountains, often in large crystals: in Brazil, it is found in fractured crystals in the sand of rivers. More common varieties are met

with at Limoges in France, near Zwiesel on the Rabenstein in Bavaria, at Finbo and Broddbo in Sweden, and in some of the tin mines of Saxony and Bohemia.

The Beryl is an abundant mineral throughout New England; and many of its localities are distinguished for the size and perfection of the crystals which they afford. The most remarkable of these is Acworth, (N.H.) about fifteen miles from Bellows' Falls. They occur at this place in a powerful vein of granite traversing gneiss. The largest crystals weigh from two to three hundred pounds, and measure four feet in length. Their form is that of tolerably perfect hexagonal prisms. The prevailing color of the large crystals is a pale bluish green: the smaller crystals are pale yellow, rarely a deep honey, or wax-yellow. At Bowdoinham and Topsham, (Me.) this species is found in veins of graphic granite in small but exceedingly regular crystals, of a pale greenish or yellowish white color. They are mostly imbedded in a brown Quartz; and sometimes present the form of fig. 55. A few crystals of the emerald green color have been met with at Topsham. The Albite granite of Goshen and Chesterfield afford small and irregular crystals of pale green colors, some of which are transparent. In Connecticut at Haddam, large crystals of the yellow and yellowish-green varieties, occur at the chrysoberyl vein, many of which contain implanted crystals of Chrysoberyl and Columbite. A seam of Brown Quartz in a vein of mica slate in the same town, has afforded very beautifully transparent crystals of the form represented in fig. 56: the quarries of gneiss in the neighborhood on both sides of the Connecticut river, produce green prisms of the common variety. At Monroe, a vein of graphic granite furnishes uncommonly handsome crystals as respects their regularity and the number of crystals of different sizes implanted within a small mass of the rock.

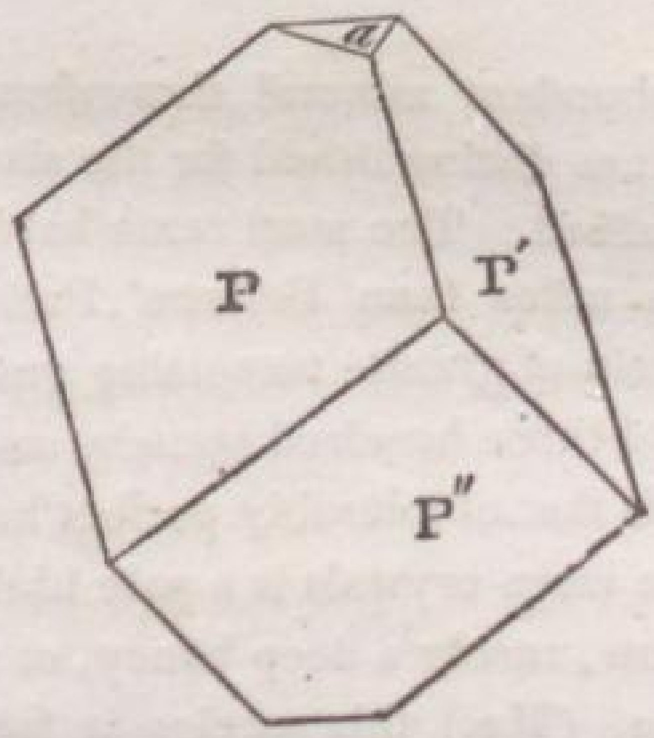
6. Beryl, when clear and transparent, and of a fine emerald green color, is highly valued as a gem: the bluish colored crystals are not so highly prized, but are employed for the same purpose.

BEUDANTITE.

Primary form. Rhomboid. P on P′=92° 30′.

Secondary form.

Fig. 58.



Cleavage parallel with *a*.

Surfaces curved; generally brilliant.

Lustre resinous. Color black; in thin fragments, translucent, and of a deep brown color. Streak greenish-grey.

Hardness = 4·0 . . . 4·75.

Compound varieties. Massive: composition not described.

1. It consists of the oxides of iron and lead.

2. Its locality is Horhausen on the Rhine, where it seems associated with Brown Iron-Ore.

3. The want of a knowledge of the specific gravity of this mineral prevents us from referring it to its natural historical genus. The properties above enumerated, however, prove it with sufficient distinctness to be a peculiar species.

Bi-Seleniuret of Zinc. (See *Rionite*.)

BISMUTH BLENDE. Tetrahedral Bismuth Baryte.

Primary form. Unknown.* Implanted globular shapes. Massive: composition thin columnar, impalpable, also curved lamellar.

* Hartmann gives the Tetrahedron as the primary form of this species, and describes its crystals as occurring in tetrahedra, with their edges deeply bevelled, and like fig. 55, P. I.

Fracture imperfectly conchoidal or uneven.

Lustre resinous. Color dark hair-brown, yellowish-grey and straw-yellow. Streak yellowish-grey. Translucent or opake.

Rather brittle. Hardness = 3·5 . . . 4·0. Sp. gr. = 5·9 . . . 6·0.

1. It decrepitates briskly before the blow-pipe, emits an arsenical odor, and is finally converted into a glass, which effervesces with borax.

2. *Analysis.*

By Hunefeld.

Carbonate of bismuth	58·8
Arsenic acid	2·2
Silica	23·8
Arsenic, cobalt, copper and iron . . .	5·9
Gangue	9·1

3. It occurs with Quartz at Schneeberg in Saxony.

Bismuthic Cobalt-Ore.

The description of this species, as put forth by Kersten, is too defective to enable us to decide whether it is entitled to rank as a distinct species. It is described as massive, having a lead or steel-grey color, a feebly metallic lustre and a sp. gr. from 6·0 . . . 7·8. It is believed to consist of arsenic, cobalt and bismuth. It occurs with other ores of cobalt at Schneeberg in Saxony.

BISMUTHINE. Prismatic Polypoione-Glance.

Primary form. Right rhombic prism. M on M = nearly 91°.

Secondary form.

Fig. 59.

The lines parallel to the plane *f*, represent the striæ constantly observed on the crystals, but which in reality are a series of planes.

Cleavage parallel to the planes P and *f*, most perfect parallel with the latter, and at right angles to *f*, affording the measurement of 90° by the reflective goniometer. Fracture scarcely observable. Surface of the prisms deeply streaked parallel to the axis.

Lustre metallic. Color lead-grey, inclining a little to steel-grey. Streak unchanged.

Rather sectile. Hardness = 2·0 ... 2·5. Sp. gr. = 6·549.

Compound varieties. Massive: composition granular, the individuals being of various sizes; or columnar, individuals straight and aggregated in various directions.

1. It is volatilized before the blow-pipe, and covers the charcoal with a yellow areola. It is easily fusible, and emits continually small drops in a state of incandescence. It is easily soluble in nitric acid, and the solution yields a white precipitate on being further diluted.

2. *Analysis.*

By Sage.

Bismuth	60·00
Sulphur	40·00

3. It occurs principally in veins, but is also found in beds, and is generally associated with Native Bismuth.

4. It is a rare mineral. Its localities are, Altenberg, Schneeberg, Joachimsthal, Rezbanya, Cornwall, Riddarhyttan in Sweden, Beresof in Siberia, at Canock in Cumberland.

It has been noticed at a single spot in the United States, in the celebrated Chrysoberyl locality of Haddam, (Con.)

BISMUTH-OCHRE. Bismuthic Lusine-Ore.

Massive: composition impalpable; earthy and pulverulent. Fracture conchoidal to earthy.

Color straw-yellow, or greyish yellow.

Soft. Sp. gr.=4·36.

1. Upon charcoal, it is easily reduced to the metallic state, attended by a peculiar odor. It is soluble in nitric acid,—the solution throwing down a white precipitate on the addition of water.

2. *Analysis.*

Oxygen	10·13
Bismuth	89·87

It frequently occurs mixed with carbonate of bismuth and iron.

3. It is found in small quantity upon the ores of bismuth, cobalt and nickel, at Schneeberg in Saxony, Joachimsthal in Bohemia, Saint Agnes in Cornwall, Siberia; and at Haddam, (Con.) in the chrysoberyl rock, where it is sometimes accompanied by Bismuthine.

Bitter-Spar. (See *Dolomite.*)

BITUMEN. Black Mineral-Resin. Mohs.

Aggregation solid or fluid, and all the intermediate stages. No regular form. Stalactitic shapes: surface smooth. Massive.

Fracture conchoidal, more or less perfect, uneven.

Lustre resinous. Color black, passing into various brown and red tints. Fluid varieties are sometimes perfectly colorless. Streak commonly unchanged, sometimes lighter than the color. Translucent on the edges, opake; some fluid varieties are transparent.

Sectile, malleable, elastic. Bituminous odor. Hardness = 0·0 . . . 2·0. Sp. gr. = 0·828, brown, malleable; 1·073, black, slaggy; 1·160, hyacinth-red, slaggy.

1. *Mineral Oil* and *Mineral Pitch* have been treated as two species; the former embracing under it as varieties Naphtha and Petroleum, and the latter Earthy Bitumen, Elastic Bitumen, and Compact Bitumen or Asphaltum; but all these varieties differ in nothing except their state of aggregation, which, however, forms an uninterrupted series from those which are perfectly fluid to such as are perfectly solid. The Mineral

Oil is first inspissated, and then it is changed into Mineral Pitch by further exposure to the air. Naphtha embraces yellowish and nearly transparent varieties of the fluid Bitumen, while Petroleum consists of those which have the consistence of tar, together with a black color. Elastic Bitumen is distinguished by its elasticity. Earthy Bitumen has an earthy fracture, while Asphaltum possesses a more or less conchoidal fracture. Still, all these varieties are joined by transitions, which proves that they form but a single natural historical species.

2. Mineral oil is easily inflammable, and burns with a white flame and much smoke. Also the Mineral Pitch is very inflammable, and burns with a bituminous smell; some varieties melt in a higher temperature.

3. *Analysis.*

By Thomson,

	of Naphtha.	of Elastic Bitumen.
Carbon	82·20	52·25
Hydrogen	14·80	7·49
Azote	0·00	0·15
Oxygen	0·00	40·11

4. The fluid varieties of Bitumen ooze out of several rocks, as sandstone, slaty clay, &c., or they are found on the surface of springs and lakes. The elastic variety is found in limestone rocks along with Galena; the earthy in beds with limestone, but associated with members of the coal formation. The Asphaltum is imbedded in nodules in limestone, in agate balls, in veins with Galena, Fluor, &c.; also in beds, and on the shores and waters of certain lakes.

5. Fluid varieties have been found in various districts of Italy, in Sicily, in Zante, in the Caspian Sea, in Persia and other countries in Asia. Elastic Bitumen (sometimes called mineral *Caoutchouk*) occurs at Castleton in Derbyshire. Earthy Bitumen is found near Neufchatel in Switzerland, at Grund in the Hartz, in Dalmatia, &c. Asphaltum forms nodules in limestone at Bleiberg in Carinthia, in sandstone in Albania, in great abundance in the island of Trinidad, and in large pieces on the shores, or floating on the surface of the Asphaltic lake in Judea, called the Dead Sea.

The United States and the Canadas afford numerous localities of the more fluid and soft varieties of Bitumen. Petroleum occurs on the Kenhawa in Virginia, on a spring of water five miles from Scottsville, Allen co. (Ken.) at several places in the western part of Pennsylvania, at Duck

Creek in Munroe co. (Ohio,) and in Liverpool in the same state, where a salt well, while boring, yielded about fifteen gallons per day. In New York, it is found floating upon the surface of Seneca Lake, and is hence known in commerce under the name of *Genesee* or *Seneca*-Oil. In Woodbury, and some other places in Connecticut, the Elastic Bitumen is found in connexion with a bituminous limestone. The black limestone in the vicinity of Quebec affords exudations of Petroleum.

6. The different varieties of Bitumen allow of considerable application for illuminating, for fuel in fire-works, in the manufacture of varnish and of black sealing-wax. Mingled with grease or common pitch, it is used for paying the bottoms of ships. The ancients employed Bitumen in the construction of their buildings; the bricks of which the walls of Babylon are built are cemented with hot bitumen. The Egyptians are also said to have employed it for the embalming of bodies.

BITUMINOUS COAL. Bituminous Mineral Coal. Mohs.

No regular form or structure. Fracture conchoidal, uneven.

Lustre resinous, more or less distinct. Color black or brown, passing in earthy varieties into greyish tints. Sometimes exhibits tarnished colors. Streak unchanged, except that it sometimes becomes shining. Opake.

Sectile, in different degrees. Hardness =1·0...2·5. Sp. gr.=1·223, moor-coal from Teplitz; = 1·270, common brown coal from Eibiswald in Stiria; =1·271, black coal from Newcastle; =1·288, bituminous wood; 1·423, cannel coal from Wigan in Lancashire.

Compound Varieties. Massive: composition lamellar, faces of composition smooth and even, different gradations; granular texture often impalpable, in which case fracture is uneven, even or flat conchoidal. Ligniform shapes, the structure of which resembles that of wood, sometimes very distinct, but often obliterated, with the exception of some slight traces, when the fracture becomes conchoidal across the fibres. There are some earthy varieties of a loose friable texture.

1. The present species is treated by some writers as forming four separate species: viz. *Brown Coal*, *Black Coal*, *Cannel Coal* and *Jet*; and the two first mentioned varieties have been again divided into several sub-species. The color of Brown Coal is brown, as its name imports. It possesses a ligneous structure, or consists of earthy particles. Its varieties are as follows: *Bituminous Wood*, which presents a ligneous texture, and very seldom any thing like a conchoidal fracture, and is without lustre; *Earthy Coal*, consisting of loose friable particles; *Moor Coal*, or *Trapezoidal Brown Coal*, distinguished by the want of ligneous structure, and by the property of bursting and splitting into angular fragments, when removed from its original repository; *Common Brown Coal*, which, though it still shows traces of ligneous texture, is of a more firm consistency than the rest of the varieties, and possesses higher degrees of lustre upon its more perfect conchoidal fracture. The color of *Black Coal* is black, without inclining to brown, and it is destitute of the ligneous texture. Some of its varieties immediately join those of Brown Coal. They are: *Pitch Coal*, of a velvet black color, generally inclining to brown, strong lustre, and presenting in every direction a large and perfect conchoidal fracture; *Slate Coal*, possessing a more or less coarse, slaty structure, which, however, seems to be rather a kind of lamellar composition, than real fracture; *Foliated Coal*, which is similarly compounded, only the laminæ are thinner; *Coarse Coal* has a composition resembling it, only the component particles are smaller, and approach to a granular appearance. *Cannel Coal* is without visible composition, and has a flat conchoidal fracture in every direction, but with little lustre, by which it is distinguished from Pitch Coal. It most resembles the Moor Coal, but the difference in their specific gravity is greater than between almost any other two varieties of coal. Jet occurs in elongated reniform masses, and sometimes in the shape of branches with a regular woody structure. Its lustre is brilliant, and its fracture perfectly conchoidal. All these kinds, however, are united by numerous transitions, so that it continually becomes doubtful to which of them we should refer certain specimens, though they are undoubtedly Bituminous Coal.

2. Bituminous Coal is more or less easily inflammable, and burns with flame and a bituminous smell. Several varieties become soft, and others

coak when kindled. They have a more or less considerable earthy residue.

3. *Analysis.*

By Thomson.

	Newcastle or caking coal.	Cannel Coal.
Carbon	75·28	64·72
Hydrogen	4·18	21·56
Azote	15·96	10·72
Oxygen	4·58	0·00

4. The varieties called slate coal, foliated coal, and pitch coal, occur chiefly in the coal formation; some varieties of pitch coal, also the moor coal, bituminous wood, and common brown coal, are met with in the formations above the chalk; the earthy coal, and some varieties of bituminous wood and common brown coal, are often included in diluvial and alluvial detritus. The coal seams alternate with beds of slaty clay and common clay, sandstone, limestone, sand, &c. They are often associated with vegetable organic remains in slaty clay, sometimes also with shells. Generally there is more or less Iron Pyrites and White Iron Pyrites mingled along with them, and they are sometimes traversed by veins of Galena.

The present species is so universally distributed, that only a few localities can here be mentioned as examples. Bituminous wood is found in considerable quantity in Iceland, and is called *Surturbrand;* in the Meissner mountain in Hessia, in the Westerwald, at Voitsbey in Stiria, and at Bovey in Devonshire. Earthy coal is found at Merseberg, Halle, Bernburg, and at Eislben in Thuringia. Moor coal occurs in the northern districts of Bohemia. Common brown coal occurs in immense quantities on the river Sau, and on the foot of the Schwaneberg Alps. Pitch coal is likewise found in the Meissner, in Saxony, Silesia, on the Rhine, and in France. Slaty coal occurs at Potschappel in Saxony, in Silesia, in Westphalia, and particularly at Newcastle, White haven, and other places in England and Scotland. *Paper Coal,* which occurs in thin paper-like seams, is found in Saxony and Sicily. Cannel coal exists abundantly in Lancashire and Shropshire in England and in Scotland. Jet is brought from the Prussian amber mines, and is met with at a considerable depth, between beds of sandstone, at several places in France.

Bituminous Coal exists in the greatest quantity throughout extensive portions of the States of Pennsylvania, Virginia and Ohio. From Gallipolis to the Falls of the Ohio, coal of the best quality may be bought for ten cents the bushel; and at Pittsburg, where it is most abundant, its price is six cents the bushel. According to Maclure, the independent coal formation extends from the waters of the Ohio to the waters of the Tombigbee. The coal of this region is chiefly a very pure slate coal; and is often beautifully tarnished with the richest iridescence. At some places upon the Ohio, however, extensive deposits of the purest pitch coal are found. The secondary region of the Connecticut river affords occasionally traces of Bituminous Coal, not only in its sandstones and slates, but in its trap; but is no where likely to be found in sufficient quantity to be explored.

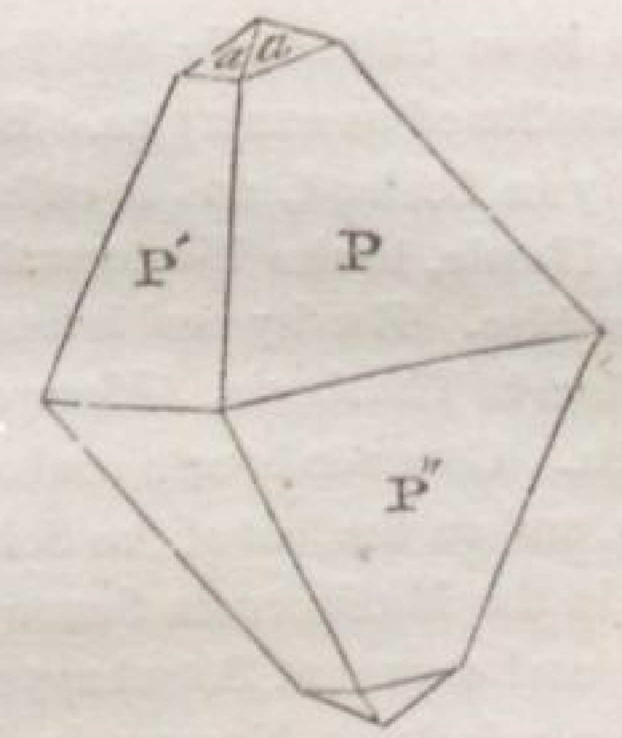
5. The important uses of this species for fuel are well known. Cannel coal and jet are wrought for ornamental purposes.

BLACK MANGANESE. Pyramidal Manganese-Ore. Mohs.

Primary form. Octahedron with a square base. P on P″=117° 30′.

Secondary form.

Fig. 60.



a on *a* - - - 139° 56′

Cleavage, parallel to the base of the primary form perfect; less distinct and interrupted parallel with the octahedral faces.

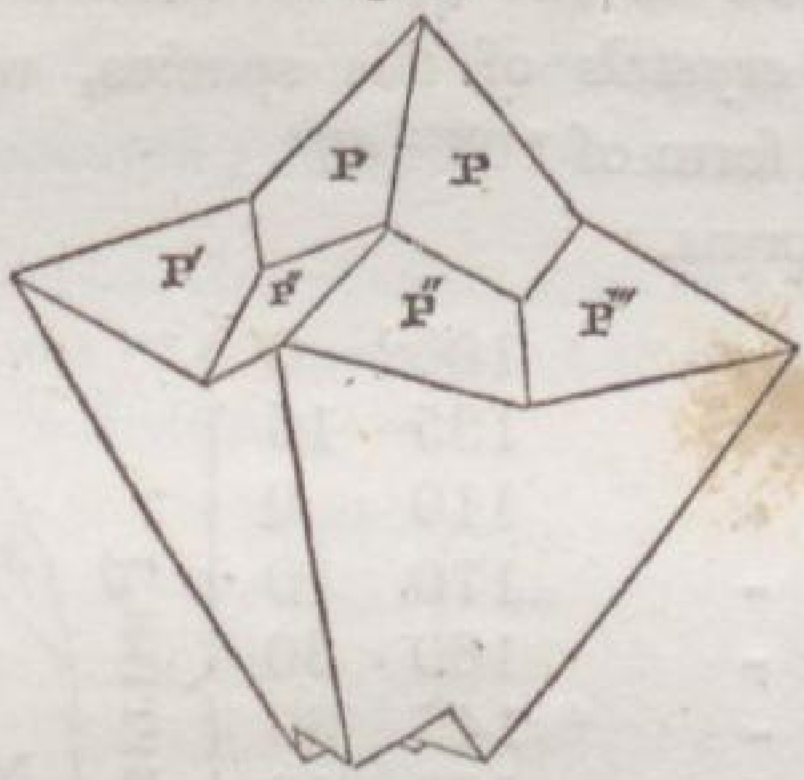
Fracture uneven.

Lustre imperfect metallic. Color brownish black. Streak dark reddish or chesnut-brown. Opake.

Hardness = 5·0 . . . 5·5. Sp. gr. = 4·722 of a crystallized variety.

Compound Varieties. Twin crystals. Common octahedral hemitrope; also repeated a second time,

Fig. 61.



Massive: composition granular, firmly connected.

1. Before the blow-pipe on charcoal, in a strong heat, it fuses on the edges and assumes a blackish-grey color. With borax, it is easily dissolved, giving in the exterior flame an amethystine blue color, and in the interior a feeble tinge of iron. With salt of phosphorus, it dissolves rapidly with effervescence, and attended with a deep blue color, which disappears in the reduction-fire of the instrument.

2. *Analysis*.

It is not absolutely certain that the Black Manganese has as yet been subjected to analysis, although it is extremely probable that the variety of Manganese from Piedmont, analysed by BERZELIUS, belongs to this species. It consisted of

Oxide of manganese	75·80
Silica	13·17
Oxide of iron	4·14
Alumina	2·80

3. It has been found in veins in porphyry, along with other ores of manganese, at Ochrenstock, near Ilmenau in Thuringia, and at Ihlefeld in the Hartz. In the United States, it occurs at Lebanon, (Penn.) It is yet a rare substance.

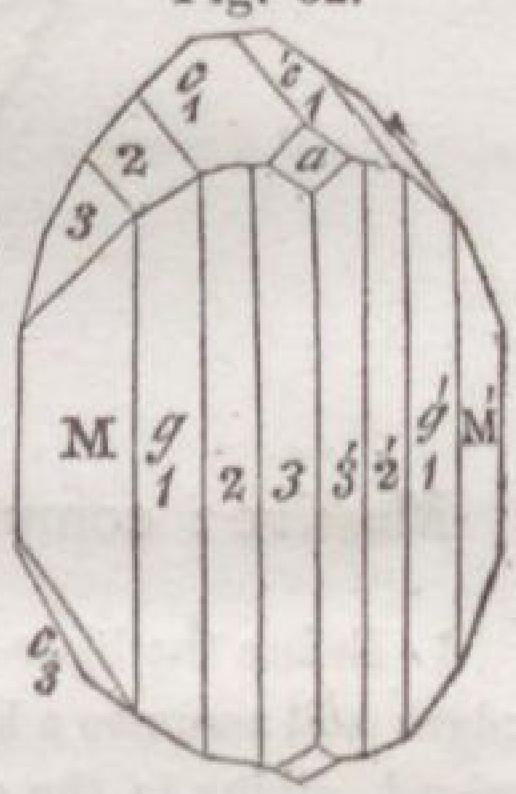
BLACK SILVER. Prismatoidal Polypoione-Glance.

Primary form. Right rhombic prism. M on M′=100° 0′. The dimensions of the primary form, however, cannot be considered as fixed, since LEONHARD and HARTMANN describe crystals of this species, which appear to have a primary form of 107° 47′.

Secondary forms.

M on M′ -	100°	0′	PHILLIPS.
M or M′ on *a* or *a*′	135	15	
M on *c*1 -	110	0	
M on *g*1 -	170	10	
M on *g*2 -	160	30	
M on *g*3 -	146	30	
a on *c*1 -	120	12	
a on *c*2 -	145	24	
a on *c*3 -	143	25	
*c*3 on *c*3 -	122	15	

Fig. 62.

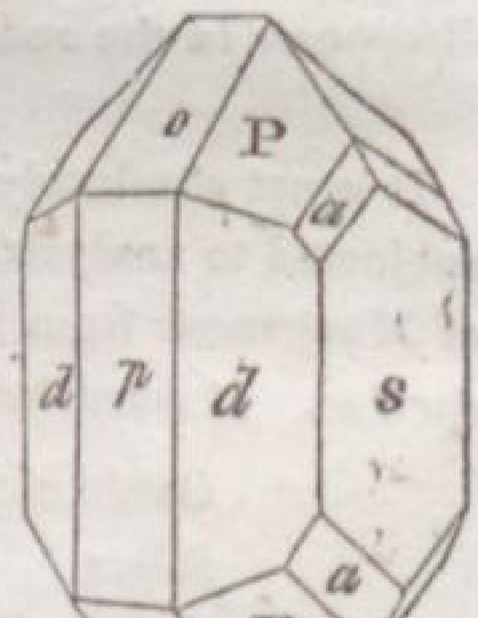


Himmelsfurst mine, Freiberg.

d on *d* over *p* - 72° 13′ HARTMANN.

p, *s* and *o* are tangent planes.

Fig. 63.



Przibram, Bohemia.

The mutual inclinations of the pyramidal faces P, which correspond to the lateral edges of the primary form, are 130° 16′ and 104° 19′. It also occurs in crystals, destitute of the faces *o p* and *a*.

Cleavage parallel to M and M′ easy, and in other directions, of the variety from Freiberg. The variety from Przibram has indistinct cleavages.

Surface of the prisms striated vertically.

Lustre metallic. Color iron-black. Streak unchanged. Sectile. Hardness =2·0 ... 2·5. Sp. gr.=6·269 from Przibram; =5·5, from Freiberg.

Compound Varieties. Twin-crystals like those of Arragonite. (q. v.) Massive: composition granular, individuals strongly connected; fracture uneven.

1. Before the blow-pipe, upon charcoal, it yields a dark colored metallic globule, which may be reduced either with soda and silver, or with nitre. It is soluble in dilute nitric acid.

2. *Analysis.*

	By KLAPROTH.	By BRANDES, from Freiberg.
Silver	66·50	65·50
Antimony	10·00	0·00
Arsenic	0·00	3·30
Iron	5·00	5·46
Sulphur	12·00	19·40
Copper and arsenic	0·50	0·00
Copper	0·00	3·75

3. Black Silver occurs in silver-veins along with other ores of silver, also with Galena, Blende, Copper and Iron Pyrites, Heavy Spar, &c. It is sometimes associated with Native Arsenic and Native Gold. Its compact varieties are often intimately mixed with Galena and with Stibine,—a mixture designated by the name of *White Silver*, the *Weissgeltigerz* of WERNER. The richer it is in silver, the more it approaches in its properties to the pure varieties of Black Silver; while in the contrary cases, it presents more nearly the characters of compact Galena and of compact Stibine, or of a mixture of both. It occurs in the silver veins of Saxony.

4. Black Silver is found chiefly in Saxony, Bohemia and Hungary; in the last of which countries it is called Röschgewächs. Its chief localities in Saxony are the mining districts of Freiberg, Schneeberg, and Johanngeorgenstadt; in Bohemia, those of Przibram and Ratieborzitz; and in Hungary those of Schemnitz and Cremnitz. It is found also in small quantities in Andreasberg in the Hartz; and at Zacatecas in Mexico, and in Peru, as well as in Siberia.

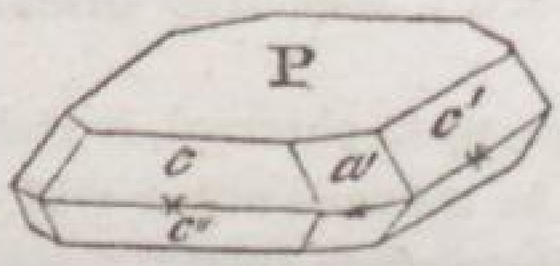
5. On account of the large proportion of silver which it contains, it is a valuable ore for the extraction of that metal.

BLACK TELLURIUM. Prismatic Polypoione-Glance.

Primary form. Right square prism.

Secondary form.

Fig. 64.



x on x	- -	90° 00′	c. g.	Phillips.
x on x'	- -	135 00	c. g.	
P on a	- -	118 35		
P on c	- -	110 00	c. g.	

Cleavage parallel with P, perfect.

Fracture not observable.

Surface P smooth.

Lustre metallic. Color blackish lead-grey. Streak unchanged.

Highly flexible in thin laminæ. Very sectile. Hardness = 1·0 . . . 1·5. Sp. gr. = 7·085.

Compound varieties. Massive: composition granular, of various sizes of individuals, sometimes longish.

1. Before the blow-pipe, upon charcoal, it melts easily, emits white fumes, which are deposited upon the charcoal, and gives a metallic globule. With borax, it gives a bead of gold containing a little silver. It is easily soluble in nitric acid.

2. *Analysis.*
By Klaproth.

Tellurium	32·20
Lead	54·00
Gold	9·00
Silver	0·50
Copper	1·30
Sulphur	3·00

Blende.

3. It has been found only in veins with Native Gold, Galena, Blende and Carbonate of Manganese.

4. Its chief locality is Nagyag in Transylvania, from whence it obtained its old name of *Nagiaker-Erz*. It is found also with Graphic Tellurium at Offenbanya in the same country.

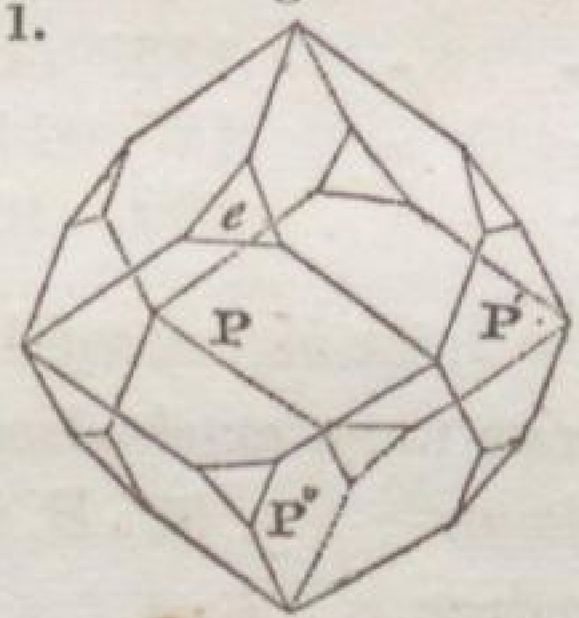
BLENDE. Dodecahedral Sclerone-Blende.

Primary form. Rhombic dodecahedron.

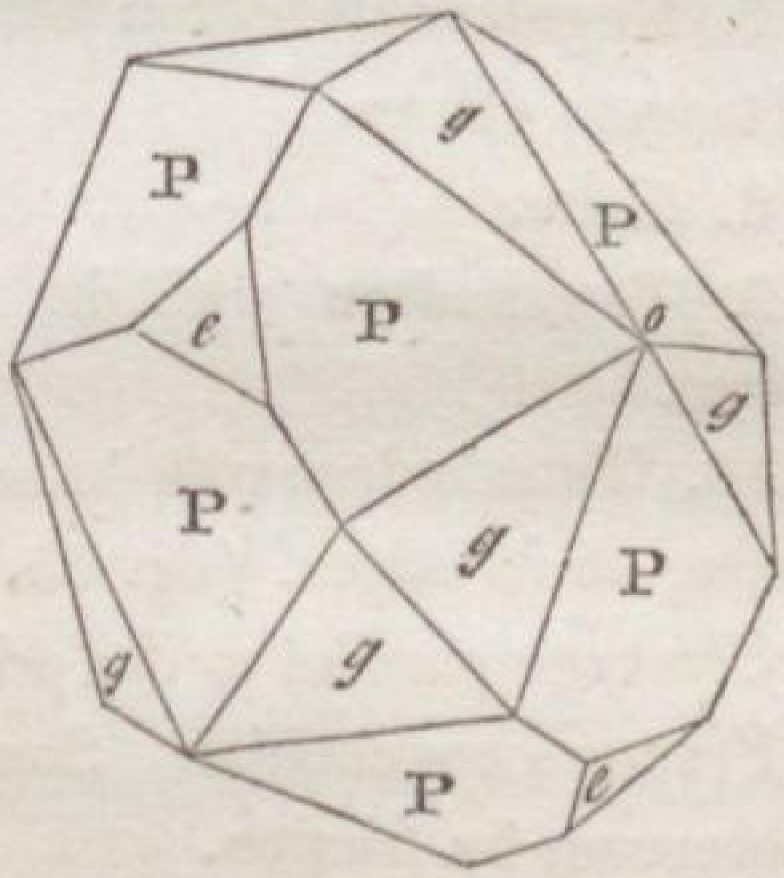
Secondary forms.

Fig. 65.

1.



2. Fig. 66.

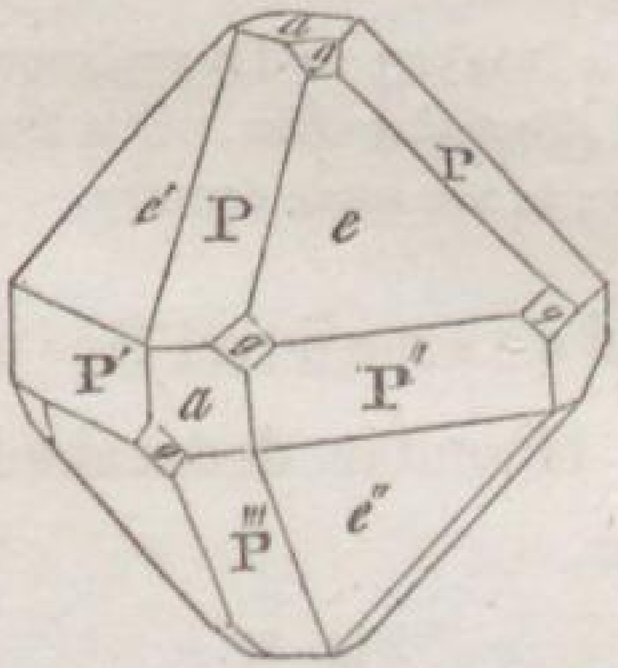


Four of the obtuse solid angles are replaced by tangent planes, while the remaining four are unaltered, except that they are formed from six instead of three plane angles, as may be seen in the angle at *o*.

P on *e* - - -	144° 44′ 08″	HAUY.
g on *g* - - -	129 31 18	

Blende.

3. Fig. 67.



P on *a*	- -	135°	00′	00″	Hauy.
a on *e*	- -	125	15	52	
c on *c*	- -	109	18	16	

4. Dodecahedron with the obtuse solid angles deeply truncated, so as to give rise to an octahedron with its edges replaced by tangent planes. (fig. 62. P. I.)

5. Regular octahedron.

6. Tetrahedron.

7. Regular octahedron with its edges and angles replaced by tangent planes.

8. Cube.

9. Tetrahedron with its angles replaced by tangent planes.

10. Tetrahedron with its angles replaced by three planes resting on its edges. (fig. 55. P. I.)

Cleavage parallel to the primary faces, perfect.

Fracture conchoidal. Some yellow varieties are phosphorescent by friction.

Lustre adamantine. Color green, yellow, red, brown, black, none of these bright. Streak white to reddish-brown, corresponding to the color. Transparent . . . translucent.

Brittle. Hardness = 3·5 . . . 4·0. Sp. gr. = 4·078, a cleavable variety; =4·027, a columnar, compound variety.

Compound Varieties. Twin-crystals. Octahedral hemitrope. (fig. 50.) This composition is repeated, as in fig. 61, and sometimes for a number of times. Reniform and other imitative shapes: surface rough; composition columnar, often almost impalpable; straight, divergent, and frequently producing a second curved lamellar or granular composition. Massive: composition columnar, or granular, sometimes impalpable, often very distinct. The fracture of impalpable compositions is uneven or even.

1. Although the subspecies distinguished by the earlier writers on mineralogy among the varieties of Blende, have been denominated after their colors, yet they do not depend entirely or solely upon these colors. *Yellow Blende* includes the more transparent varieties, whether of a green, yellow or reddish-brown color. *Brown Blende* consists of the more opake red and brown varieties. *Black Blende* is either black and opake, or blood-red. Brown Blende has been further divided into *foliated*, *radiated* and *fibrous* brown Blende: simple varieties and compound ones, consisting of granular individuals, are contained in the first of these divisions; columnar compositions, in which the individuals are still discernible in the second; and very thin columnar or impalpable compositions originating from them, which assume various imitative shapes, are comprehended in the third division. The exact distinction of the above varieties, requires much practice, and can be acquired only empirically; and even then many varieties will occur that render the distinction impossible, which is proof that the distinction itself is useless.

2. When strongly heated in the oxidating flame of the blow-pipe, it gives off vapors of zinc, which form a coating on the charcoal, but it does not melt. It is soluble in nitric acid, during which process sulphuretted hydrogen is evolved.

3. *Analysis.*

	By Thomson.	By Gueniveau.
Zinc	59·09	62·00
Iron	12·05	1.50
Sulphur	28·86	34·00

4. Blende is an abundant and widely diffused ore; but all its varieties are not equally common. It is found in beds and veins, accompanied by Galena, Copper Pyrites, Heavy Spar, Fluor, Spathic Iron, &c. It also occurs in silver veins associated with Native Silver and other ores of that metal.

5. Yellow Blende principally occurs in fine varieties at Schemnitz in Lower Hungary, and at Kapnick in Transylvania; also in Saxony, at Ratieborzitz in Bohemia, at Gummesud in Norway, and other places. Brown Blende is found at Freiberg and other localities in Saxony, Bohemia, the Hartz, Sweden, and in great quantities in Derbyshire, Cumberland and Cornwall in England. The radiated variety, in particular, is found at Przibram; it is this variety in which STROMEYER detected the metal Cadmium. The fibrous Blende occurs at Geroldseck in the Brisgau, and at Raibel in Carinthia. Black Blende comes from Freiberg, Annaberg, Breiten brunn, and Schwarzenberg in Saxony, and many places in Bohemia, Hungary, Silesia and other European countries.

The localities of Blende in the United States are very numerous; a few of these only therefore can be indicated. The yellowish-brown foliated variety is found abundantly along with Galena at North and South Hampton, (Mass.); the black Blende occurs at Monroe, (Con.) associated with Wolfram, Tungsten, Native Bismuth and Arsenical Iron; the yellow Blende in transparent crystals is met with occasionally throughout the secondary limestones of New York and Ohio. The Missouri lead mines, and the Perkiomen lead mine near Philadelphia, abound with the present species.

BLOEDITE.

Crystalline. Primary form unknown. Massive: imperfectly foliated, and stalactitic. Fracture uneven.

Color between flesh and brick red.

Taste sharp bitter and astringent. Becomes moist in the air.

1. *Analysis.*

By JOHN.

Sulphate of soda . . .	33·34
Sulphate of magnesia . . .	36·66
Sulphate of manganese . . .	0·33
Sulphate of iron . . .	0·34
Chloride of sodium . . .	0·33
Water . . .	22·00

2. It is found in the salt mines of Ischel in Lower Austria.

3. The foregoing description is too inadequate to pronounce upon the specific character of Bloedite. If it shall prove to be a new species, it will probably take its systematic place within the genus Glauber-Salt.

4. Under this mineral must be included the *Sulphate of soda and magnesia of Schemnitz*, which occurs in little crystalline fibres or needles, that appear to be rhombic prisms. It is not efflorescent like the Glauber-Salt.

According to BEUDANT, it contains

Sulphuric acid	44·7
Soda	17·6
Magnesia	11·4
Water	25·4
Earthy matter	0·9

5. The *Reussine* of KARSTEN may also be introduced here, until something further is determined respecting its properties. It occurs in six-sided acicular crystals, which probably come from a rhombic prism: also in flakes. Fracture conchoidal. Taste bitter, astringent. It consists of

Sulphate of soda . . .	66·04
Sulphate of magnesia . . .	31·35
Sulphate of lime . . .	0·42
Chloride of magnesium . .	2·19

According to BEUDANT, the Reussine is a mixed mineral, consisting of effloresced Glauber-Salt and small crystalline particles of the double salt of sulphate of soda and magnesia.

BLUE MALACHITE. Azure Copper-Baryte.

Primary form. Oblique rhombic prism. M on M′ = 98° 50′.

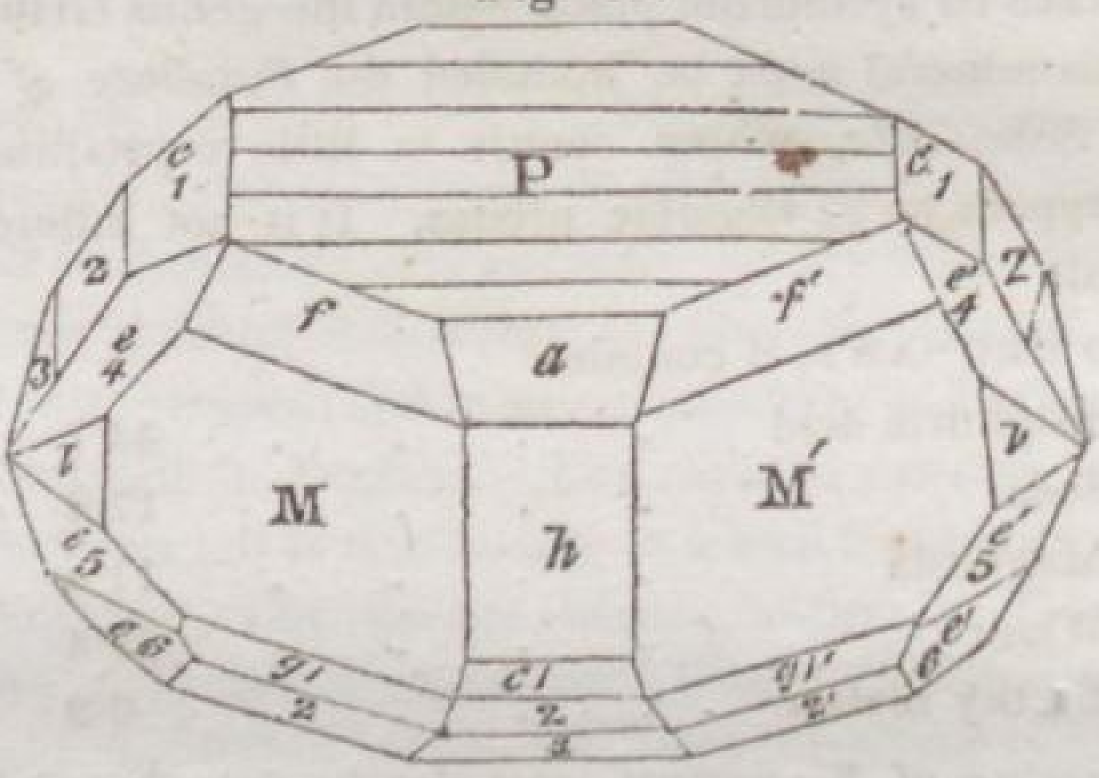
Secondary forms.

1. Primary form. 2. Primary form, having the obtuse terminal edges replaced by single planes. (fig. 95. P. I.) 3. Primary form, having both the obtuse and acute terminal edges replaced by single planes. 4. Form 2d, with the oblique edges of the prisms replaced by tangent planes. 5. Form 2d, with the lateral solid angles replaced by sin-

Blue Malachite.

gle planes. 6. Form 4th, with lateral solid angles replaced by single planes.

Fig. 68.



P on M or M′ .	91°	30′		M on $g1$ or M′ on $g'1$	142	56
M on M .	98	50		M on $g2$ or M′ on $g'2$	131	4
P on a .	135	15		M on h or M′ on h'	139	15
P on $e1$ or $e'1$.	149	20		M on l or M′ on l'	179	26
P on $e2$ or $e'2$.	138	12		a on f or f' .	139	30
P on $e3$ or $e'3$.	119	30		a on h .	136	45
P on $e4$ or $e'4$.	115	30		$e1$ on $e2$.	169	2
P on f or f' .	112	15		$e1$ on $e4$.	141	6
P on h .	92	15	PHILLIPS.	$e1$ on f .	129	00
M or M′ on a .	123	40		$e3$ on $e3'$ over P .	120	30
M on $e1$ or M′ on $e'1$	111	5		$e3$ on $e5$.	157	5
M on $e2$ or M′ on $e'2$	116	55		$g1$ on $g2$.	168	15
M on $e4$ or M′ on $e'4$	149	5		$g1$ on $e6$.	164	24
M on $e5$ or M′ on $e'5$	156	5		h on $c1$.	154	4
M on $e6$ or M′ on $e'6$	138	30		h on $c2$.	134	55
M on f or M on f'	159	50		h on $c3$.	115	00

Cleavage parallel to M and M′ perfect; parallel to P very difficult. Cleavage may be effected also parallel with both diagonals of the primary form.

Surface of P striated in the direction of the longer diagonal.

Lustre vitreous, almost adamantine. Color various shades of azure-blue, passing into blackish blue and berlin-blue. Streak blue, lighter than the color. Transparent ... translucent on the edges.

Brittle. Hardness = 3·5 ... 4·0. Sp. gr. = 3·831, crystals from Chessy.

Compound Varieties. Globular, reniform, botryoidal, stalactitic shapes, implanted and imbedded; surface drusy and rough; composition columnar, more or less perfect and distinct, faces of composition rough. Massive: composition columnar, more rarely granular. Sometimes in an earthy state.

1. Blue Malachite is soluble with effervescence in nitric acid, becomes black if exposed alone to high degrees of temperature, melts upon charcoal, and colors glass of borax green in the oxidating flame.

2. *Analysis.*

	By KLAPROTH.	By VAUQUELIN.
Copper	56·00	56·00
Oxygen	14·00	12·50
Carbonic acid	24·00	25·00
Water	6·00	6·50

3. It is met with in veins and beds, included in rocks of different ages. It is generally accompanied by Green Malachite and some other ores of copper. Occasionally it is so intimately connected with Green Malachite, that crystals of the form of the Blue Malachite consist entirely, or at least with only the exception of a thin film on the surface of the delicate green fibres, of Green Malachite. It is often engaged in ochrey varieties of Limonite, and associated with White Lead-ore, Galena and Cobalt-bloom.

4. The most beautifully crystallized varieties are found in a bed in secondary mountains at Chessy near Lyons in France. Fine crystals are brought from Siberia. Very delicate, but small crystals, are found at Oravitza in the Bannat. Blue Malachite occurs also in Thuringia, Hessia, the Hartz, Silesia, Tyrol, Spain, Chili, Peru, and at several places in England and Scotland.

The United States afford no very interesting deposits of this species. The best specimens are found in Pennsylvania at the Perkiomen lead mine, where it occurs in small crystals along with Galena, Blende and White Lead-Ore.

BLUE SPAR. Prismatoidal Azure-Spar. MOHS.

Primary form. Doubly oblique prism? of unknown dimensions.

Cleavage indistinct, sometimes pretty obvious in one direction, with traces in other directions, making oblique angles with the easily observed cleavage. Massive. Composition granular, often in large individuals; strongly coherent. Fracture uneven, often splintery.

Lustre vitreous, slightly inclining to pearly upon faces of cleavage. Color smalt-blue, inclining sometimes to white and green. Streak white. Translucent on the edges, often nearly opake.

Brittle. Hardness = 5·5 . . . 6·0. Sp. gr. = 3·024.

1. Before the blow-pipe it loses its color, but does not melt. It is slowly and with difficulty dissolved in borax. With boracic acid and iron-wire, it yields a globule of phosphuret of iron.

2. *Analysis.*
By R. BRANDES.

Phosphoric acid . . .	43·32
Silica . . .	6·50
Alumina . . .	34·50
Magnesia . . .	13·56
Lime . . .	0·48
Protoxide of iron . . .	0·80
Water . . .	0·50

3. It occurs in masses, sometimes six or eight inches over; also in large indistinct crystals imbedded in Quartz and mixed with Mica. The rock embracing it, however, has no where been found in place.

4. It is found in the valley of Freschnitz near Krieglach, on the Mürz in Upper Stiria; also at Therenberg at the foot of the Wechsel mountain in Lower Austria.

5. The near agreement of Blue Spar with Sodalite in hardness and specific gravity, and the want of certainty in our knowledge respecting the system of crystallization to which Blue Spar belongs, render it possible that the two substances may hereafter be shown to be identical.

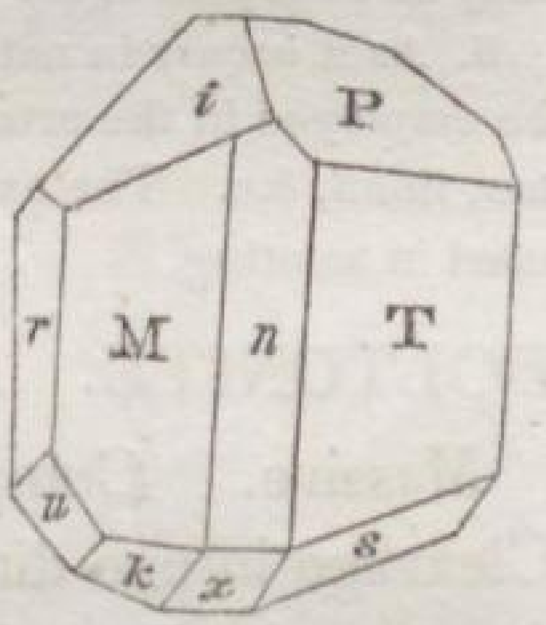
BLUE VITRIOL. Tetarto-Prismatic Vitriol-Salt. MOHS.

Primary form. Doubly oblique prism. P on M 127° 30′. P on T 108°. M on T 123° 10′.

Secondary form.

M on T	- -	123°	10′
r on M	- -	126	40
r on T	- -	110	10
r on *n*	- -	100	41
r on P	- -	103	27
n on P	- -	120	50
P on T	- -	127	40
i on *r*	- -	139	13
K on *n*	- -	109	38
K on *r*	- -	114	57
s on *n*	- -	92	26
s on *r*	- -	139	43

Fig. 69.



Cleavage very imperfect. Fracture conchoidal. Surface: the faces *n* commonly deeply striated parallel to their edges of combination with M and T, which faces are also sometimes striated, though not so generally as *n*.

Lustre vitreous. Color sky-blue, in different shades, commonly deep. Streak white. Semi-transparent ... translucent.

Rather brittle. Hardness =2·5. Sp. gr.=2·213.

Taste astringent and metallic.

1. It is easily soluble in water, and gives a blue solution: a polished surface of iron when immersed in this solution is covered with a film of metallic copper.

2. *Analysis.*

By BERZELIUS.

Oxide of copper	. . .	32·13
Sulphuric acid	. . .	31·57
Water	. . .	36·30

3. Blue Vitriol owes is existence to the decomposition of Copper Pyrites; and is found dissolved in water issuing from mines, and which has received the name of *Water of Cementation*. From this, it deposits itself spontaneously in certain places, and presents itself in large masses, occasionally associated with other ores.

4. Its chief localities are the Rammelsberg near Goslar, Neusohl in Hungary, Anglesey in the Pary's mine, Cornwall at the Consolidated mines, and at the copper mines in Wicklow, Ireland. Its occurrence may be expected at the copperas mine in Stafford, (Vt.)

5. As it occurs in nature, it requires first to be purified, before it can be employed in the arts, where it is used in dyeing, in printing of cotton, linen, &c. The oxide of copper, separated from its acid, is likewise used in painting.

BOLTONITE. Parachrose Tabular-Spar.

Massive. Composition granular: individuals large. Cleavage in one direction pretty distinct, in two others oblique to the first, indistinct, but affording indications of a doubly oblique prism for the primary form. Fracture uneven or small conchoidal.

Lustre vitreous. Color bluish grey, yellowish grey, wax yellow to yellowish white. The darker colors change to yellow on exposure to the weather. Streak white. Transparent or translucent.

Hardness = 5·0 . . . 6·0. Sp. gr. = 2·8 . . . 2·9.

1. This mineral when first discovered was regarded as Pyrallolite. It is believed to be identical with the substance described by Dr. Thomson, (Ann. Lyc. Nat. Hist. of N. York, Vol. III p. 50,) under the name of Bisilicate of Magnesia; and accordingly the analysis there given is here quoted.

2. Alone before the blow-pipe, it becomes white and transparent, but does not melt. With borax, it dissolves slowly into a transparent glass.

3. *Analysis.*

By Thomson.

Silica	56·64
Magnesia	36·52
Alumina	6·07
Protoxide of iron	2·46

4. Boltonite occurs thickly disseminated through white limestone, associated occasionally with Petalite.

5. It is found abundantly at Bolton, (Mass.) and has also been detected in the neighboring quarries of Boxborough and Littleton.

Bombite.

Massive: composition impalpable.

Color bluish black.

Hardness = 7·5.

1. Fusible before the blow-pipe with ebullition into a yellowish glass.

2. *Analysis.*

By Laugier.

Silica	50·0
Alumina	10·5
Oxide of iron	25·0
Magnesia	3·5
Lime	0·5
Carbon	3·0
Sulphur	0·3

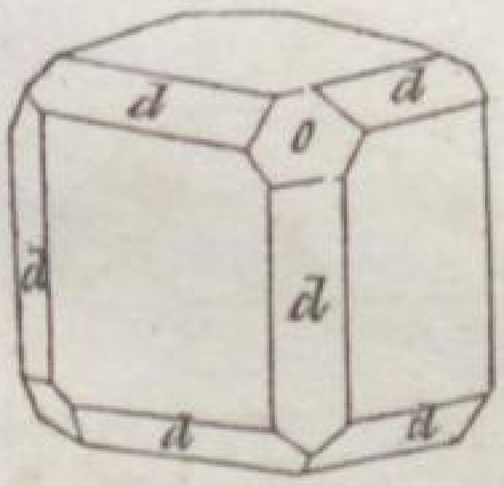
3. Its geological situation is unknown. It has been found only in Bombay. It appears to be a variety of flinty-slate.

BORACITE. Tetrahedral Boracite. Mohs.

Primary form. Cube.

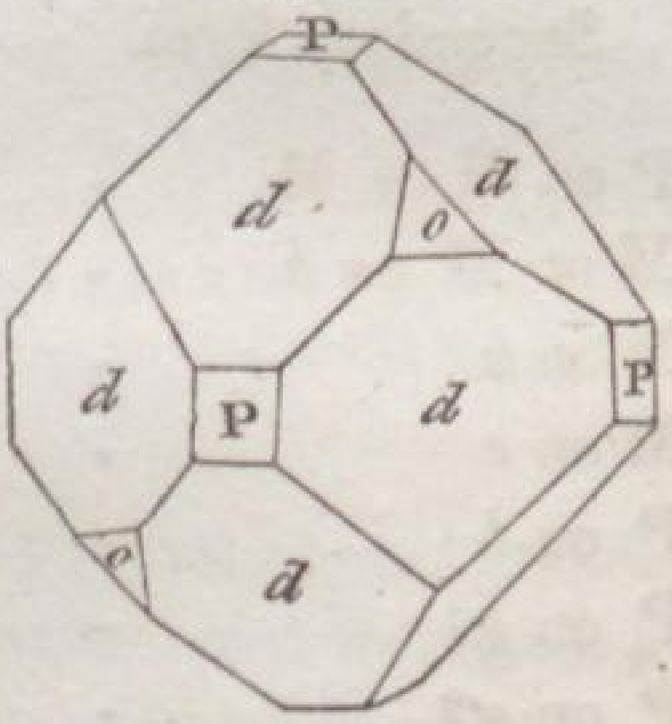
Secondary forms.

Fig. 70.



Segeberg Holstein.

Fig. 71.



Lüneberg.

Cleavage, traces parallel to the faces of the octahedron.

Fracture conchoidal, uneven.

Lustre vitreous, inclining to adamantine. Color white, inclining to grey, yellow and green. Streak white. Semi-transparent, translucent.

Hardness =7·0. Sp. gr. = 2·974 of an isolated crystal.

1. Before the blow-pipe, on charcoal, it intumesces, and melts into a glassy globule, which becomes white and opake on cooling. It is electric by heat, four alternating terminal points of its cubic axes being positive, and those which are opposite to them, negative.

2. *Analysis.*
By Pfaff.

Boracic acid	54·55
Magnesia	30·68
Oxide of iron	0·57
Silica	2·27

3. Boracite is found in remarkably distinct crystals, about the size of a pea and under, imbedded in compound varieties of Gypsum, and rarely in Anhydrite.

4. The only known localities are Lüneberg in Brunswick and Segeberg in Holstein.

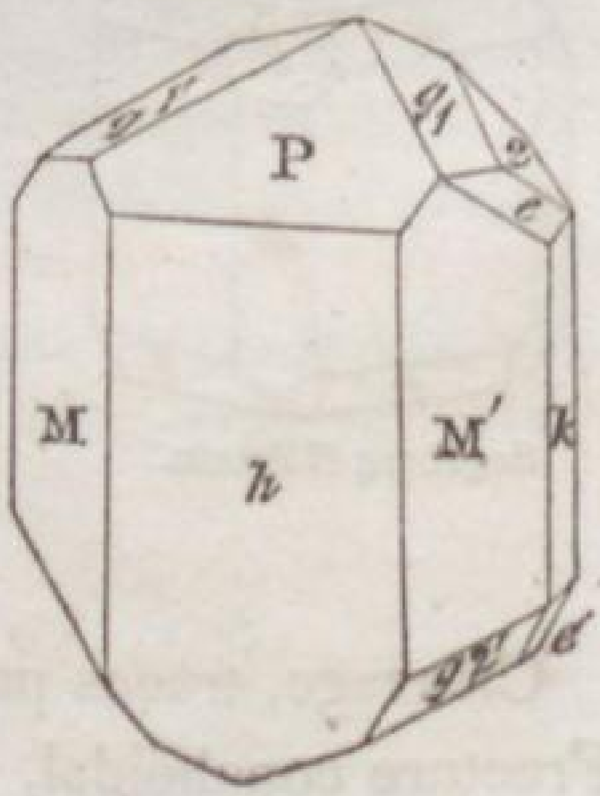
BORAX. Prismatic Borax-Salt. Mohs.

Primary form. Oblique rhombic prism. M on M′ 93° 30′.

Secondary form.

P on M or M′	-	101°	30′
M or M′ on *h*	-	133	20
M on *k*	-	136	45
M on *e*	-	138	12
P on *h*	-	106	30
P on *g*1	-	139	15
P on *g*2	-	115	30
P on *e*	-	114	28
e on *g*2	-	141	52

Fig. 72.



Cleavage parallel to M and M′ perfect, also to both the diagonals of the primary form. Fracture conchoidal.

Lustre resinous. Color white, inclining to grey and green. Streak white. Transparent . . . translucent.

Rather brittle. Hardness = 2·0 . . . 2·5. Sp. gr. = 1·716. Taste sweetish alkaline, feeble.

1. It is soluble in water; the solution changes vegetable blues to green. It intumesces before the blow-pipe, and then melts into a transparent globule.

2. *Analysis.*

Soda	16 7
Boracic acid	36·4
Water	46 9

3. Borax occurs in different districts of Persia and Thibet, where it is found on the surface of the soil, in the vicinity, and sometimes at the bottom, of several lakes, and in a state of solution in the waters of mineral wells. It is found also in Ceylon and at Potosi.

4. The natural salt is employed in manufacturing the artificial one by the addition of a greater quantity of soda. The artificial salt is made use of as a flux, in the production of imitation gems, and in the process of soldering.

5. The natural historical properties above described apply to the manufactured salt: concerning the natural salt but little is known, although perfect crystals of the form here figured are sometimes found among it. In general, it is understood, that it is found mingled up with Common Salt and some excess of boracic acid. The locality in Thibet, which is 15 days from Tisvolumbo, the capital, is a lake supplied by springs, the waters of which contain both borax and common salt. The edges and shallows of this lake are covered with a stratum of Borax, which is dug up from time to time, and the holes thus made are gradually filled by a fresh deposition.

BORNITE. Bismuthic Polypoione-Glance.

Primary form. Rhomboid. Angles not determined.

Cleavage perfect parallel with the primary form.

Lustre metallic. Color pale steel-grey.

Elastic. Not particularly sectile. Soft. Sp. gr. = 8·0.

1. Before the blow-pipe it melts very easily into a globule, that can be entirely volatilized, during which the supporting charcoal is covered with yellow oxide. If dissolved in the state of powder in nitric acid, a precipitate of sulphur is formed.

2. *Analysis.*

	By KLAPROTH.	By WEHLE.
Bismuth . .	95·01 . .	61·15
Sulphur . .	5·00 . .	2·33
Tellurium . .	. . . .	29·74
Silver . .	. . . .	2·07

3. It has been found at Deutsch-Pilsen in Hungary, accompanied by several species of the genus Lime Haloide, Iron Pyrites, &c.

4. Other varieties have been examined from different localities, which require to be mentioned in this place. One from Hungary, for example, has the following properties:

It occurs in imbedded masses, having a general resemblance to 3 and 6 sided prisms. Cleavage perfect in the direction of the bases. Fracture imperfectly conchoidal, uneven, scarcely perceptible. Lustre metallic. Color intermediate between tin-white and steel-grey. Streak unchanged or rather darker; its place becomes shining in the mineral. Opake. Very sectile. Thin laminæ perfectly flexible. Hardness = 1·5. Sp. gr. = 7·408. Before the blow-pipe it gives the reactions of sulphur, tellurium and bismuth. It occurs accompanied by Native Gold and Yellow Copper Pyrites, imbedded in Quartz, at Schemnitz. It contains according to WEHLE,

Bismuth	59 84
Tellurium	35·24
Sulphur	4·92

5. Another variety, examined by BERZELIUS, which had been communicated to him by WEISS of Berlin, was found to contain only tellurium and bismuth.

BOTRYOGENE. Paratomous Vitriol-Salt.

Primary form. Oblique rhombic prism. M on M = 119° 56′.

Cleavage distinct in the direction of M and M′.

Lustre vitreous. Color hyacinth-red. Streak yellow and shining. Translucent.

Hardness =2·0 . . . 2·5. Sp. gr. =2·039.

Compound Varieties. Reniform and botryoidal shapes; the individuals are often regularly terminated at the surface of these shapes. Color ochre-yellow.

1. Before the blow-pipe, in a glass tube, it intumesces, and gives off water, leaving a reddish yellow earth behind. It is very slowly soluble in water, to which it imparts a much more feebly astringent taste than sulphate of iron.

2. *Analysis.*

By Berzelius.

Sulphate of iron . . .	48·3
Sulphate of magnesia . . .	20·8
Water . . .	30·9

3. It is found coating Gypsum and Iron Pyrites, associated with Epsom salt and Copperas in the great copper mine at Fahlun.

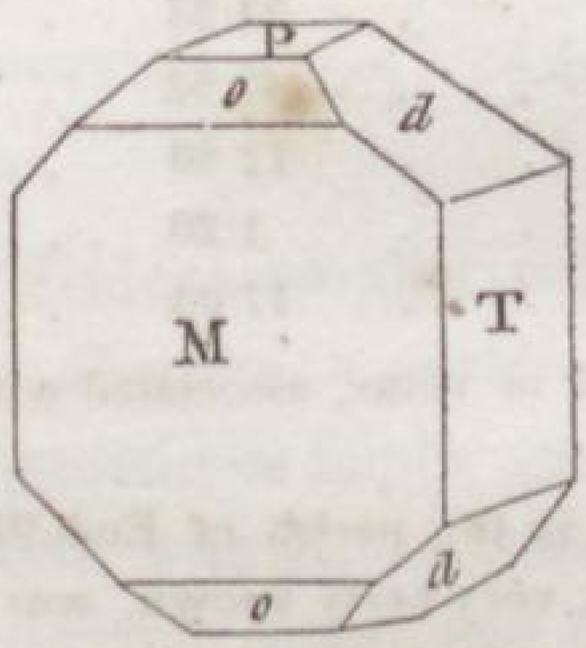
Botryolite. (See *Datholite.*)

BOURNONITE. Diprismatic Copper-Glance. Mohs.

Primary form. Right rectangular prism.

Secondary forms.

Fig. 73.



P on *d*	-	-	-	93° 40′
P on *o*	-	-	-	87 8

Cleavage distinct parallel with M and T, and with both diagonals of the prism. Fracture conchoidal, uneven.

Surface nearly equal, often highly smooth and splendent: longitudinal striæ sometimes visible on the secondary planes, replacing the lateral edges of the prism.

Lustre metallic. Color steel grey, inclining to blackish lead grey or iron black, according to the physical quality of the surface. Streak unchanged.

Brittle. Hardness =2·5 ... 3·0. Sp. gr. =5·763.

Compound Varieties. Twin-crystals: axis of revolution perpendicular, face of composition parallel to M, or the broader face of the primary form. The individuals are generally continued beyond the face of composition. The axes of the individuals cross each other at angles of 93° 40′ and 86° 20′. Massive: composition granular; individuals strongly connected.

1. Before the blow-pipe, it generally decrepitates, emits a white sulphureous vapor; after which there remains a black globule, consisting of a crust of sulphuret of lead, within which is a mass of copper. It is easily soluble in heated nitric acid.

2. *Analysis.*

	By Hatchett.	By Klaproth.
Antimony	24·23	20·769
Lead	42·62	42·50
Copper	12 80	11·75
Iron	1·20	5·00
Sulphur	17·00	18·00

3. Bournonite is found in veins, associated with Stibine, Galena, and Blende.

4. It was first found in the parish of Endellion, Cornwall, at Huel Boys. Another locality, very early known, was Kapnik in Transylvania. It is now known to exist at Neudorf, in Anhalt, in large and magnificent crystals; also at Andreasberg in the Hartz. Still other deposits of this ore are Braũnsdorf in Saxony, Neusohl in Hungary, and Offenbanya in Transylvania.

BRAUNITE. Brachytypous Manganese-Ore. Haidinger.

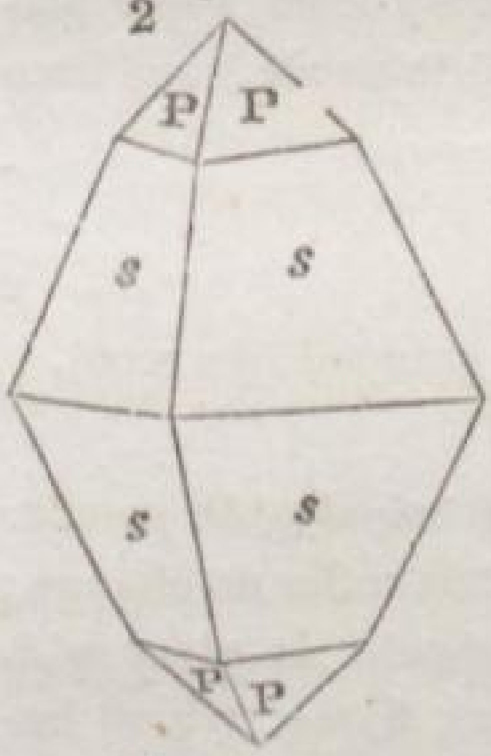
Primary form. Octahedron with a square base. P on P over the base, 108° 39′.

Secondary forms.

1. Primary form, with the summits replaced by tangent planes. Wunsiedel, Bayreuth.

Fig. 75.

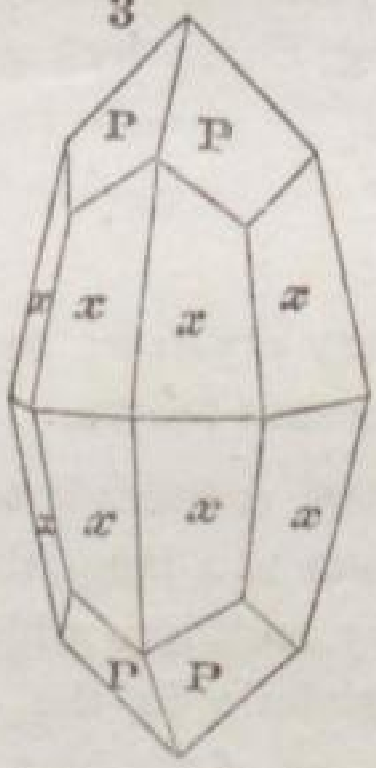
2



Eigersburg.

Fig. 74.

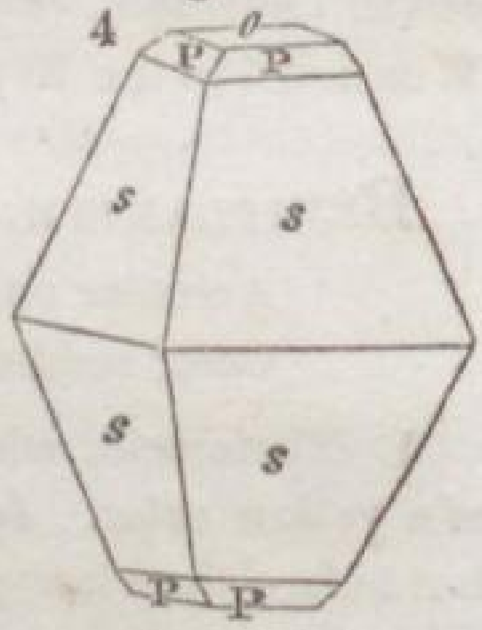
3



St. Marcel, Piedmont.

Fig. 76.

4



Wunsiedel.

s on *s* over the summit	-	96° 33′
s on *s* at the base	-	140° 30′
P on *x* and *x*, alternately	-	144° 4′ and 128° 17′
x on *x* at the base	-	154° 25′

Cleavage very distinct parallel with the primary faces. Fracture uneven. Surface *o* possesses less lustre than P, but is even, and sometimes faintly streaked parallel to the edges of combination with P. Primary faces often a little rounded; faces *s* uneven, rough, and horizontally streaked; faces *x* smooth and even.

Lustre imperfectly metallic. Color dark brownish black. Streak of the same color.

Brittle. Hardness = 6·0 . . . 6·5. Sp. gr. = 4·818.

Compound Varieties. Massive: composition granular individuals strongly coherent.

1. *Analysis.*
By Turner.

Protoxide of manganese	86·940
Oxygen	9·851
Water	0·949
Baryta	2·260
Silica	a trace.

2. It is yet a rare mineral, having been brought only from a few places in Thuringia, (Elgersburg, Ehrenstock and Friedrichsrode,) and from Wunsiedel in the Bayreuth.

Breislakite.

Acicular and capillary crystals; bent and grouped like wool.
Color reddish, or chesnut brown.

1. Nitric acid, when heated, reduces it to a most impalpable powder of a yellow color. In the flame of a lamp, the crystals suffer no change; but before the blow-pipe they melt into a black enamel. It gives with salt of phosphorus a green globule in the oxidating flame, which becomes red in the reducing flame of the blow-pipe, thus indicating a considerable quantity of copper.

2. *Analysis.* Dr. Wollaston is said to have made a chemical examination of this species; the result of which was, that it consisted of silica, alumina, and a little iron.

3. Breislakite lines the small cavities in the lava of Scalla, where it is accompanied by Atacamite and Nepheline. It is also found under similar circumstances in the lava of Olebano, near Pozzuoli.

Breunerite. (See *Rhomb-Spar.*)

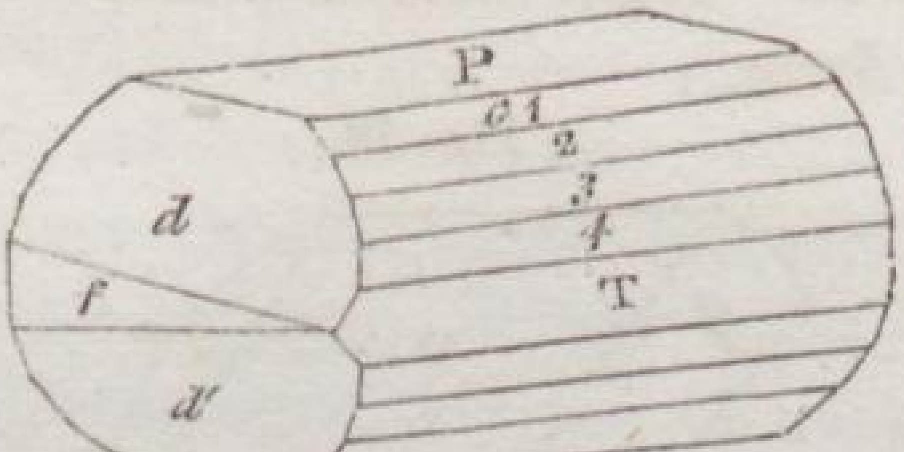
BREWSTERITE. Polyprismatic Kouphone-Spar.

Primary form. Right oblique angled prism. M on T = 93° 40′.

Brewsterite.

Secondary form.

Fig. 77.



P on *d*	-	93° 50′	P on *c*4	-	92° 00′
P on *c*1	-	119 30	*d* on *c*2	-	95 00
P on *c*2	-	114 30	*d* on *d′*	-	175 00
P on *c*3	-	112 00			(172° Haidinger.)

Cleavage, perfect parallel to P, traces parallel to T. Fracture uneven.

Faces slightly streaked parallel to their common intersections.

Lustre vitreous, pearly upon P. Color white, inclining to yellow and grey. Transparent . . . translucent.

Hardness =5·0 . . . 5·5. Sp. gr. =2·12 . . . 2·20.

1. Before the blow-pipe, it loses first its water and becomes opake, then it froths and swells up, but is with difficulty fusible. It gives a skeleton of silica with salt of phosphorus.

2. *Analysis.*

By Thomson.

Silica	- - - -	58·800
Alumina	- - - -	18 912
Lime	- - - -	12·384
Potash	- - - -	1·500
Water	- - - -	11·700
		103·296.

(The excess of 3¼ p. c. was attributed to soda employed in the analysis.)

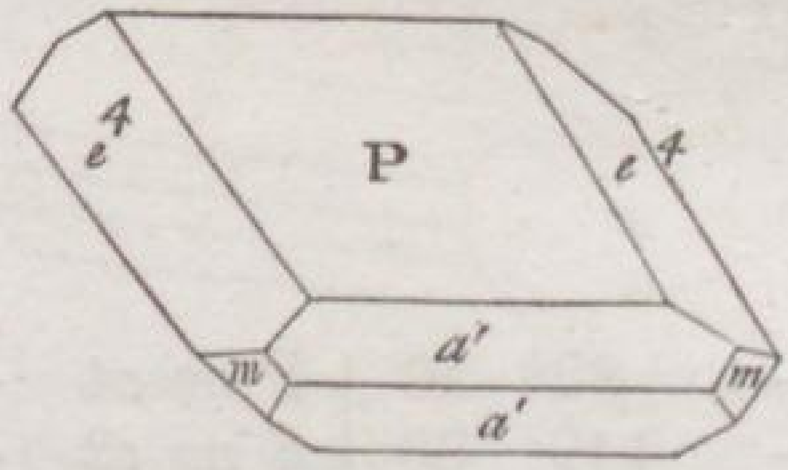
3. It is found lining cavities in a granific rock at Strontian, in Argyllshire in Scotland.

Bright White Cobalt. (See *Smaltine.*)

BROCHANTITE. Prismatoidal Vitriol-Salt.

Primary form. Right rhombic prism. M on M′ 117°.
Secondary form.

Fig. 78.



Cleavage; traces parallel to *m*. Surface *m* blackish and dull, the remaining faces smooth and shining.

Color emerald green. Transparent.

Hardness =3·5 ... 4·0, nearly. Sp. gr. = 3·7 ... 3·8.

1. *Analysis.*
By Magnus.

Sulphuric acid . . .	17·426
Oxide of copper . . .	66·935
Water . . .	11·917
Oxide of tin . . .	3·145
Oxide of lead . . .	1·048

2. It is found in small, but well defined crystals, on Green Malachite, at Ekatherinburg, Siberia; also in a pulverulent form in France and Hungary.

BRONZITE. Hemi-prismatic Schiller-Spar. Mohs.

Primary form. Oblique rhombic prism. M on M′ 94°. C.

Cleavage; parallel with P very perfect, though in general a little curved; and sometimes having almost imperceptible layers of Calcareous Spar interposed between the laminæ. In the direction of M and M′ less distinct; with traces also in to the diagonals of the cleavage form. Fracture uneven and splintery.

Bronzite.

Lustre metallic pearly upon P; for the rest, low degrees of an imperfectly vitreous lustre. Color dirty shades of leek green and blackish green; also liver-brown, hair-brown and clove-brown, greenish and ash-grey. These colors are heightened by a metalloidal appearance upon P, and often incline to pinchbeck-brown. Streak corresponding to the color. Translucent, sometimes only on the edges.

Rather sectile. Hardness = 4·0 . . . 5·0. Sp. gr. = 3·251, a brown variety from Bayreuth.

Compound Varieties. Massive: composition granular, of various sizes of individuals, strongly connected.

1. By the action of fire it assumes a lighter color, and loses its water; but is by itself infusible before the blow-pipe.

2. *Analysis.*

By Kohler.

	From Stempel near Marburg.	Ulten Valley, Tyrol.
Silica	57·193	56·813
Magnesia	32·669	29·677
Lime	1·299	2·195
Protoxide of iron	7·461	8·464
Protoxide of manganese	0·349	0·616
Alumina	0·698	2·068
Water	0·631	0·217

3. Bronzite is found in imbedded crystalline particles, either simple or compound, in serpentine and greenstone rocks. It sometimes presents itself in beds in the serpentine formation, mingled with massive Hornblende.

4. It is found in considerable quantity in and near the Gulsen mountain, in the vicinity of Kraubat in Stiria, where it forms beds in serpentine. It occurs near Hof in Bayreuth, and probably at the Baste in the Hartz, in the Bacher mountain in Lower Stiria, near Marburg, the Ulten Valley in the Tyrol, at Lizard district in Cornwall, and in various other countries.

A variety of this species has been discovered within a few years at Amity, in Orange county, (N.Y.) It occurs in limestone beds, which are associated with serpentine; and is immediately connected with massive and crystallized Hornblende, Augite, and Plumbago. Its color is a fine reddish brown, attended with a metallic lustre. It has been analyzed by Mr. T. G. Clemson, who, under the impression of its being a new species, has bestowed upon it the name of *Seybertite*, after the American analyst, Mr. Seybert. But its identity in form, hardness and sp. gr. with Bronzite, does not appear to justify the attempted distinction. Mr. Clemson found it to consist of

Alumina	37·60
Magnesia	24·30
Lime	10·70
Silica	17·00
Protoxide of iron	5·00
Water	3·60

BROOKITE. Diatomous Eruthrone-Ore.

Primary form. Right rhombic prism. M on M′ 100°.

Secondary form. Low hexagonal prism.

Cleavage parallel with the shorter diagonal.

Lustre metallic adamantine. Color hair-brown, passing into a deep orange-yellow, and some reddish tints. Streak yellowish white. Translucent . . . opake, the brighter colors are observed by transmitted light.

Brittle. Hardness = 5·5 . . . 6·0.

1. It contains oxide of titanium, with traces of iron and manganese; but has not yet been analyzed. The first varieties were noticed among the minerals accompanying Anatase from Dauphiny; but much finer crystals, some of them half an inch in diameter, have lately been found at Snowdon, in Wales. In both places they are accompanied by Quartz; and in Dauphiny, besides Anatase, it is attended by Crichtonite and Albite.

Brown Iron Ore. (See *Limonite*.)

BRUCITE. Hemi-prismatic Tourmaline.

Primary form. Oblique rhombic prism. M on M′ 112°? from cleavage.

Brucite.

Secondary form. In very short prisms, apparently having all the edges and solid angles replaced so as to obliterate the lateral and terminal planes. The secondary terminal planes much rounded; the most distinct crystals affording angles over the summit of between 130 and 140° with the common goniometer.

Cleavage parallel with M, M′ indistinct; that parallel with P very indistinct.

Lustre vitreous, to resinous. Color yellow, brown and red. Transparent . . . translucent.

Hardness = 6·5. Sp. gr. = 3·199.

Compound Varieties. Massive: composition granular, of various sizes of individuals.

1. It is fused with difficulty before the blow-pipe. It loses its color almost entirely, becomes opake, and shows traces of fusion on very thin edges. The brown and grey varieties act upon the magnetic needle, where the double magnetism is employed.

2, *Analysis.*

	By D'Ohsson.	By Seybert.
Silica	38·00	32·666
Magnesia	54·00	54·000
Oxide of iron	5·10	0·000
Peroxide of iron	0·00	2·333
Alumina	1·50	0·000
Potash	0·86	0·000
Fluoric acid	0·00	4·086
Water	0·00	1·000

3. Brucite is found disseminated through Calcareous Spar, associated with Hornblende, Spinel and Mica.

4. It occurs at Ersby in the parish of Pargas in Finland, where it was first discovered: but its most abundant localities are in the U. States, in the adjoining counties of Sussex, (New-Jersey,) and Orange, (New York,) where it exists under the circumstances above described, and also accompanied by Spinel, and rarely by Pyroxene and Bronzite. In Sussex county, it is particularly abundant at Newton; and in Orange county, at Amity and Edenville.

BUCHOLZITE. Prismatoidal Axinite.

Primary form. Oblique rhombic prism. M on M′ 99° 30′? Only the primary crystal with curved faces has been observed; and this without regular terminations.

Cleavage parallel with the longer diagonal perfect; parallel with P and M, visible, but indistinct. Fracture conchoidal to uneven.

Lustre vitreous. Color shades of greyish white and hair-brown; sometimes presenting a metalloidal appearance upon M. Bluish opalescence rarely observed upon cleavage faces parallel to M. Streak white. Translucent.

Brittle. Hardness = 7·5 . . . 8·0. Sp. gr. = 3·2.

Compound Varieties. Massive: composition columnar, consisting of delicate, straight or slightly curvilinear individuals, strongly coherent, and sometimes nearly impalpable. Viewed in the longitudinal fracture the lustre is silky; but in the cross fracture, which is even and splintery, it is resinous.

1. The identity of *Sillimanite* with the present species appears probable, not only from the resemblance in the properties of hardness and specific gravity, but in that of crystalline structure; the perfect crystals of the former often becoming compound and fibrous at one end; and the less impalpable masses of Bucholzite, exhibiting crystals which afford the brilliant cleavage surfaces parallel with the longer diagonal of Sillimanite. The disagreement in chemical composition, it is presumed will disappear on searching for zirconia in future analyses of Bucholzite.

Before the blow-pipe, alone, and with borax, infusible.

2. *Analysis.*

	By Bowen, from Chester, Ct.	By Muir, from Chester, Ct.	By Brandes, from Tyrol.	By Hilton & Mitchell, fr. Chester, Pen.
Silica	42·666	38·670	46·00	46·40
Alumina	54·111	35·106	50·00	52·92
Zirconia	0·000	18·510	0·00	0·00
Oxide of iron	1·999	7·216	2·50	a trace.
Water	0 510	0·000	0·00	0·00
Potash	0·000	0·000	1·50	0·00

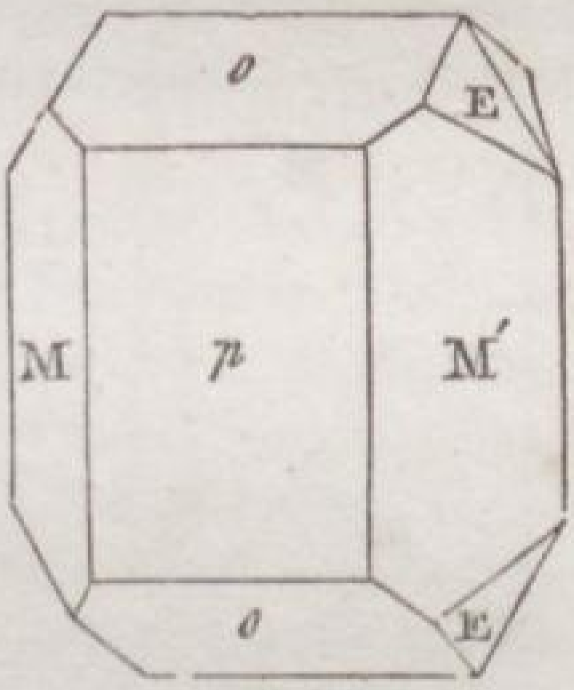
3. The distinctly crystallized variety, or Sillimanite, occurs in veins of Quartz at Chester, (Conn.) in a quarry of gneiss. The compactly fibrous variety was discovered originally in the Tyrol. It exists in the United States, at Chester, (Penn.) near Philadelphia, and at Humphreysville, (Conn.)

BUCKLANDITE.

Primary form. Oblique rhombic prism? M on M 109° 20′.

Secondary form.

Fig. 79.



o on M or M′ . . .	103° 56′
M on M′ . . .	70 40
M on *p* . . .	125 20
o on *p* . . .	114 55
o on *e* . . .	121 30
o on *o* . . .	99 41
o on *e*′ . . .	95 40
M on *e*′ . . .	160 24

Cleavage not observable. Color dark brown, nearly black. Opake. It appears to be harder than Pyroxene.

1. It was discovered in small crystals on a specimen from Neskiel mine, near Arendal in Norway, where it occurs with black Hornblende, Scapolite and Calcareous Spar. It resembles Pyroxene.

2. It is not sufficiently described to settle the question of its specific character.

BUSTAMITE. Staphyline Parachrose-Baryte.

Massive: in reniform and botryoidal groupes.

Color, light grey, passing into a greenish or reddish color. Nearly opake.

Hardness = 6·0 . . . 6·5. Sp. gr. = 3·1 . . . 3·3.

1. *Analysis.*
By DUMAS.

Silica	48·90
Protoxide of manganese . .	36·06
Lime	14·57
Protoxide of iron	0·81

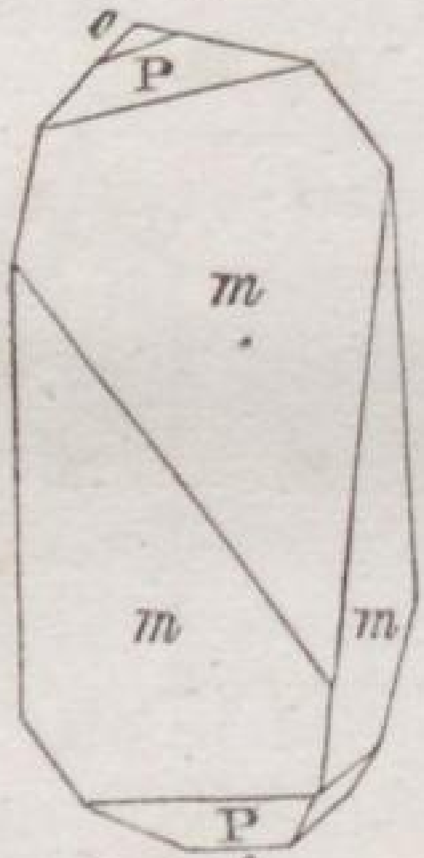
2. It occurs at Real de Minas in Mexico.

CALAMINE. Rhombohedral Zinc-Baryte. Mohs.

Primary form. Rhomboid. P on P′ =107° 40′.

Secondary forms.

Fig. 80.



Rezbanya.

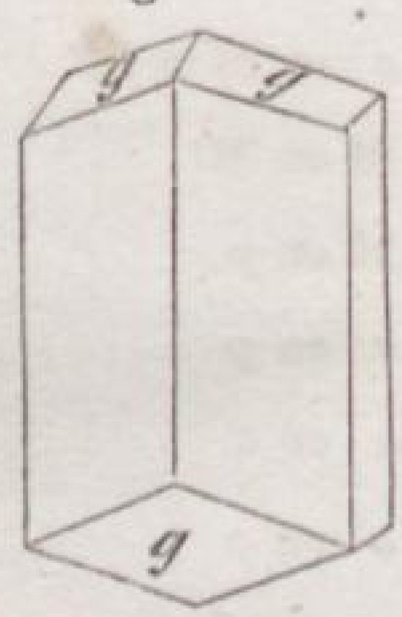
m on m 113° 31′.

Fig. 81.

Siberia.

g on g 137° 8′

Fig. 82.



Cleavage, parallel with the primary form perfect, often curved. Fracture uneven, imperfectly conchoidal. Surface of the primary faces generally curved, and often rough.

Lustre vitreous, inclining to pearly. Color white, though seldom pure: generally grey, green, or brown. Streak white. Semi-transparent . . . translucent.

Brittle. Hardness =5·0. Sp. gr.=4·442.

Compound Varieties. Reniform, botryoidal, stalactitic, and other imitative shapes; surface generally rough, composition columnar. Massive: composition granular, sometimes impalpable; strongly coherent. By decomposition, it becomes friable and earthy. Crystalline coats and pseudomorphoses formed after crystals of Calcareous Spar.

1. Before the blow-pipe it loses its transparency, but is infusible; the carbonic acid is driven off, and the residue acts like pure oxide of zinc. It is soluble in nitric acid with effervescence. It is negatively electrified by friction.

2. *Analysis.*

By Smithson.

Oxide of zinc	65·20
Carbonic acid	34·80

3. Calamine is found, often associated with Electric Calamine, in veins and beds belonging to various classes of rocks, but chiefly in those which are calcareous; and they are usually accompanied by ores of lead, copper, iron and zinc.

4. It occurs in the Bannat of Temeswar in Hungary, at Raibel and Bleiberg in Carinthia, at Tarnowitz in Silesia, at Medziana in Poland, at Aix la Chapelle; also in France, and in Leicestershire, Derbyshire, Flintshire, Somersetshire, in England, and at Wanlockhead and Lead hills in Scotland. Calamine exists in the United States in great abundance, in Jefferson county, Missouri, at a lead mine called Valle's Diggings. Other localities of this species less remarkable, are the Perkiomen lead mine, Pennsylvania, and the iron mine at Franklin, New Jersey: at the latter place, however, it only occurs in a pulverulent form, from the decomposition of Red Zinc-Ore.

Calcareous Heavy Spar.

This mineral, imperfectly distinguished by Breithaupt from Heavy Spar, is described as follows: Crystals, right rhombic prisms, surmounted by pyramids; the lateral planes inclining under angles of 101° 53′. Cleavable parallel with the base with great distinctness, and nearly as much so with the lateral faces of the rhombic prism. Lustre pearly to vitreous. Sp. gr. = 4·02 . . . 4·29. Locality is not mentioned.

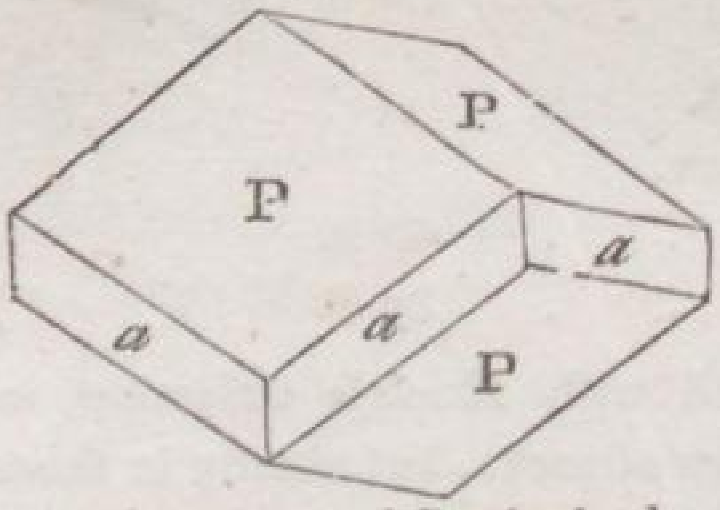
CALCAREOUS SPAR. Rhombohedral Lime Haloide. Mohs.

Primary form. Rhomboid. P on P = 105° 5′.

Calcareous Spar.

Secondary forms.

Fig. 83.



Derbyshire and Cumberland.

Fig. 84.

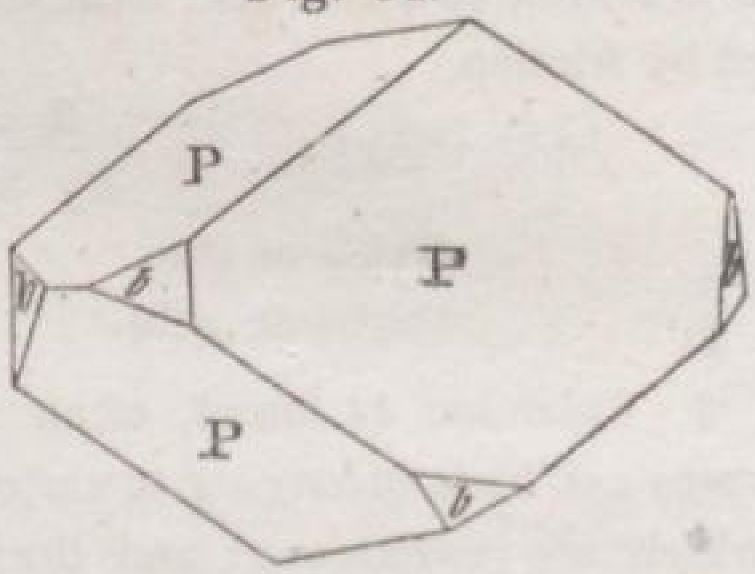
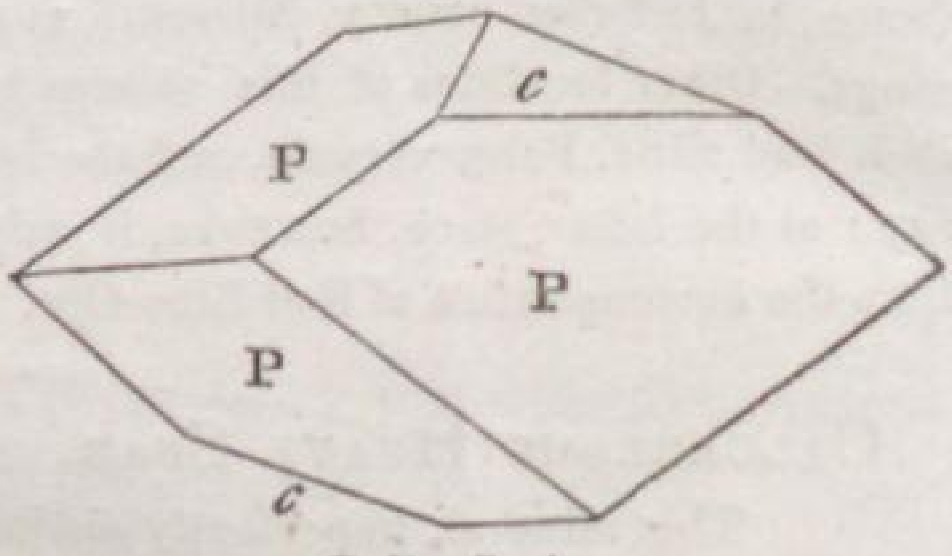


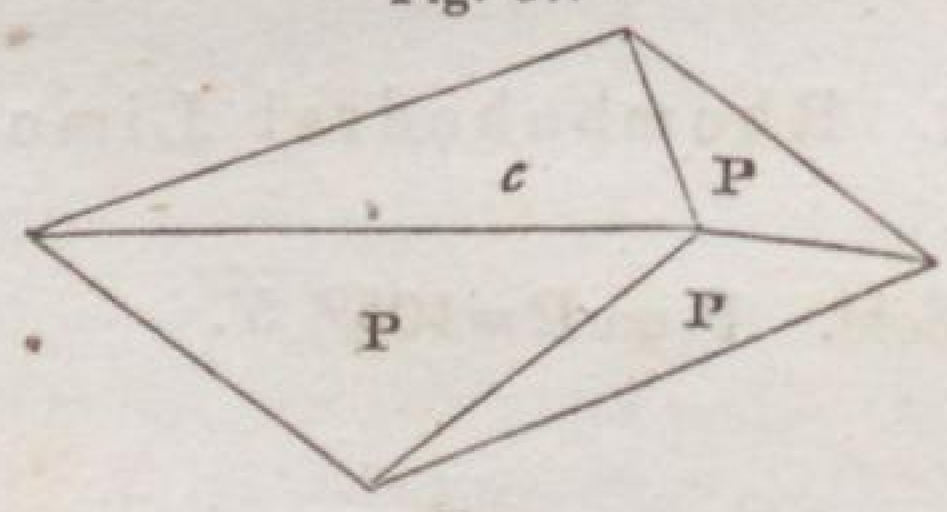
Fig. 85.

Fig. 86.



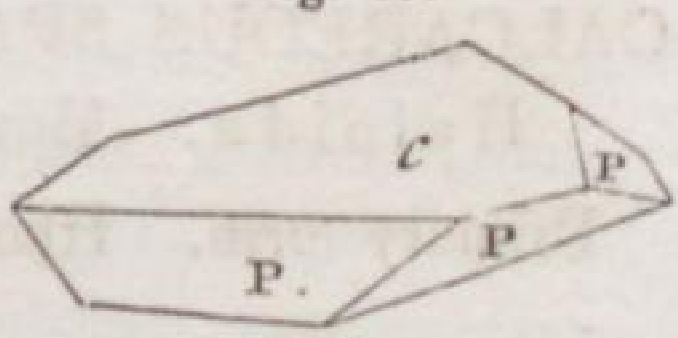
Cadiz, Spain.

Fig. 87.



Hartz.

Fig. 88.



Hartz.

Calcareous Spar.

Fig. 90.

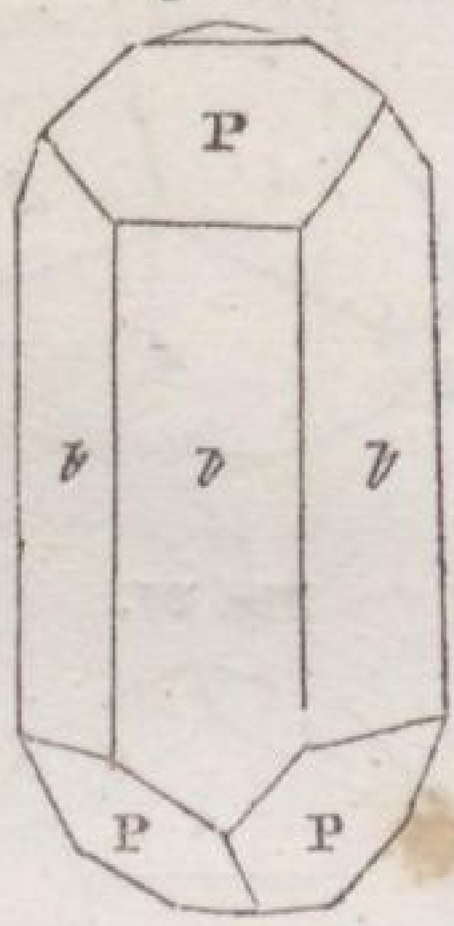


Fig. 89.

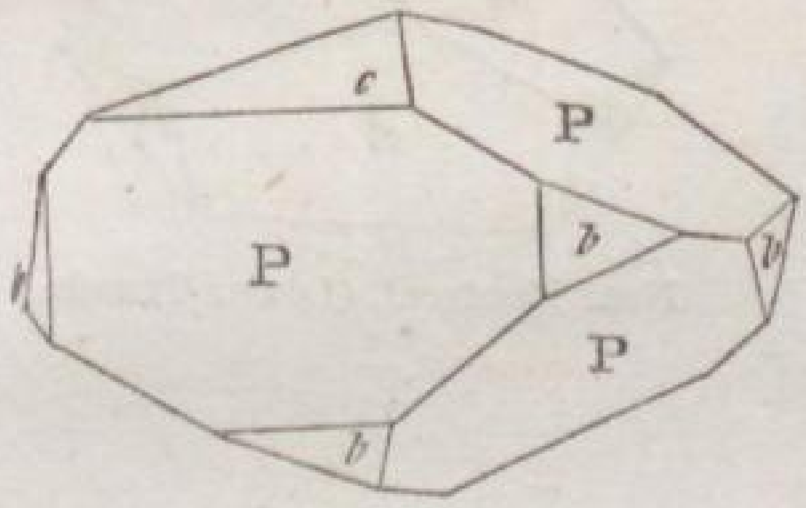
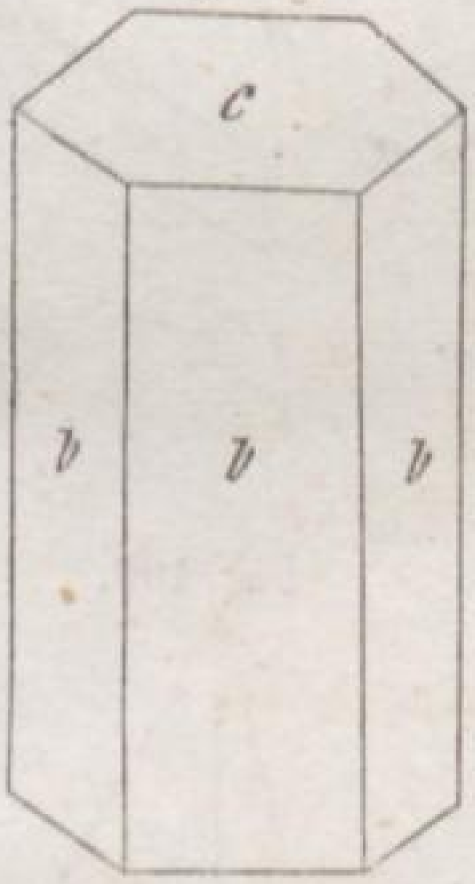
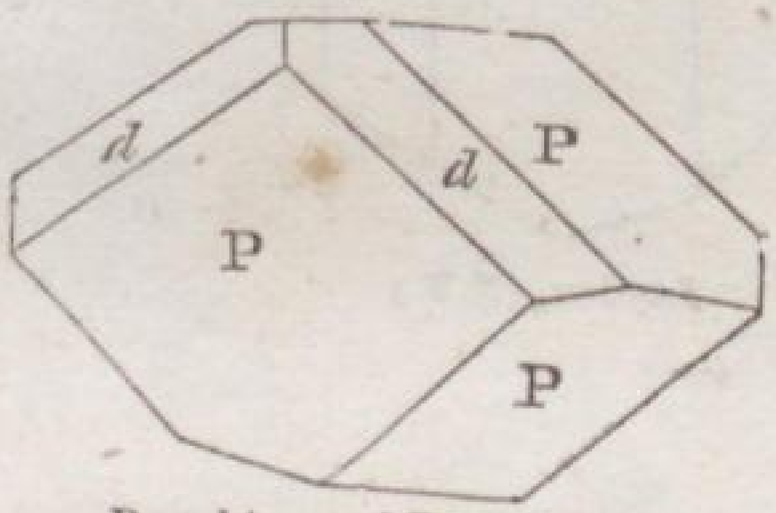


Fig. 91.



Hartz, Cumberland and Derbyshire.

Fig. 92.



Dauphine and Derbyshire.

Fig. 93.

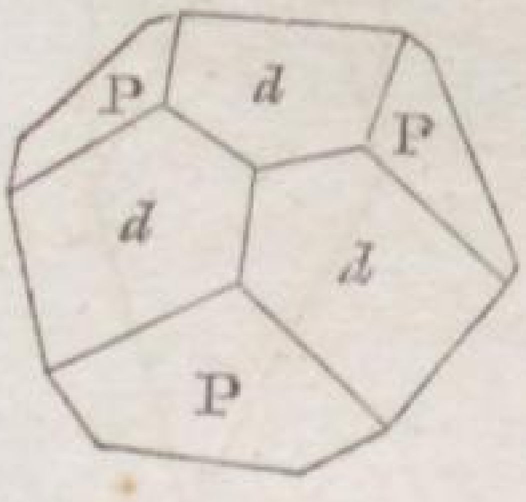
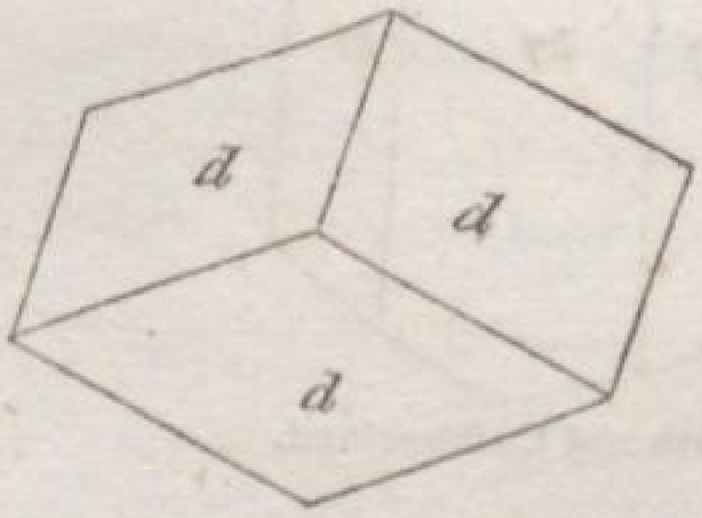


Fig. 94.



Calcareous Spar.

Fig. 95.

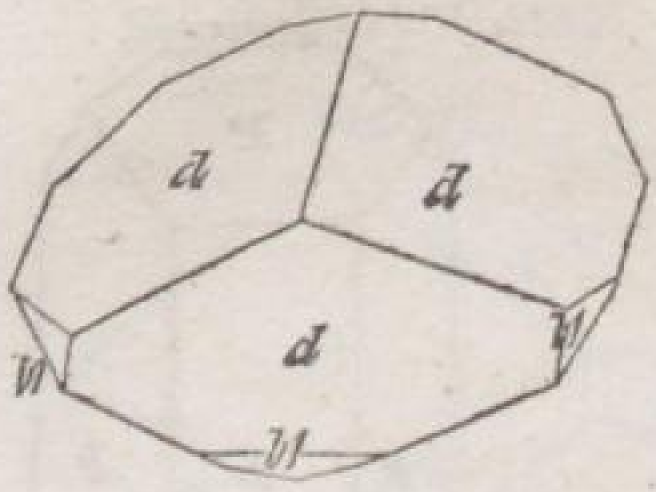
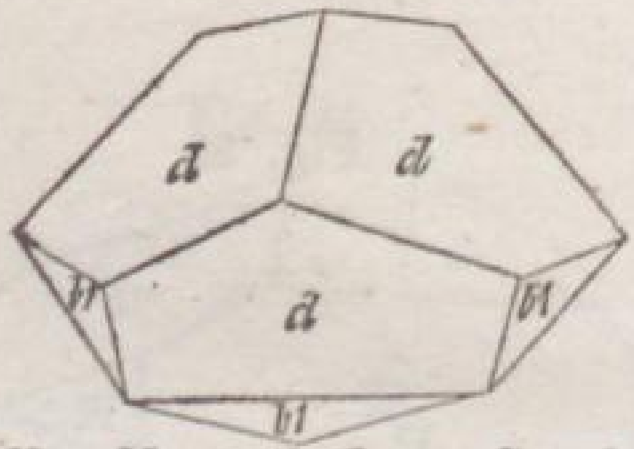
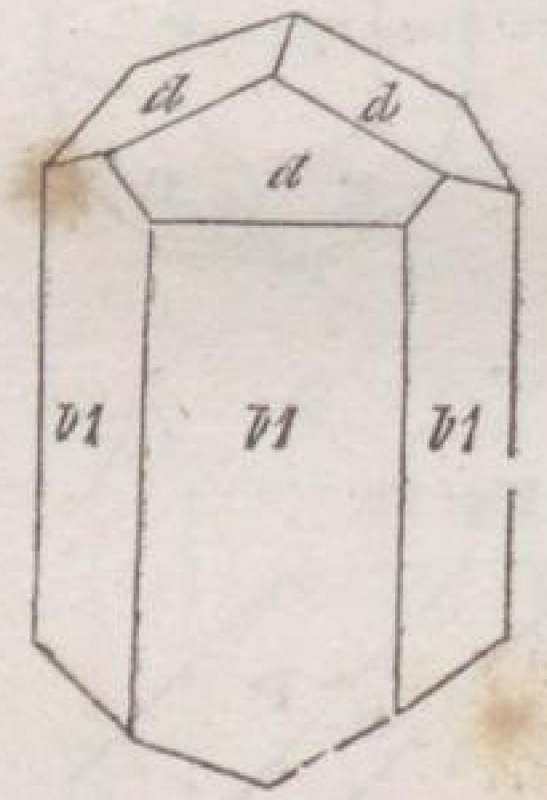


Fig. 96.



Near Montreal, (Lower Canada.)

Fig. 97.



Leyden, (N.Y.)

Fig. 98.

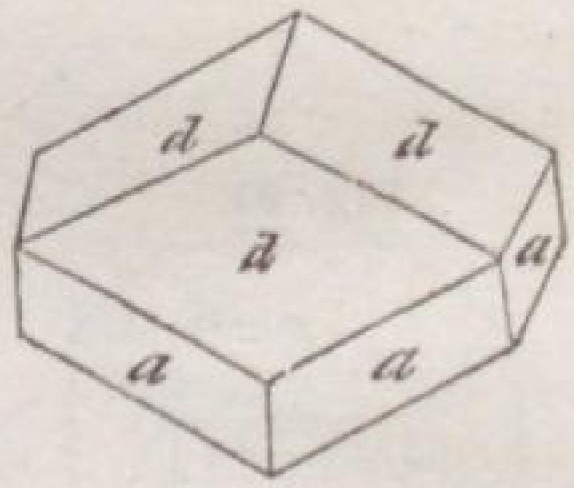
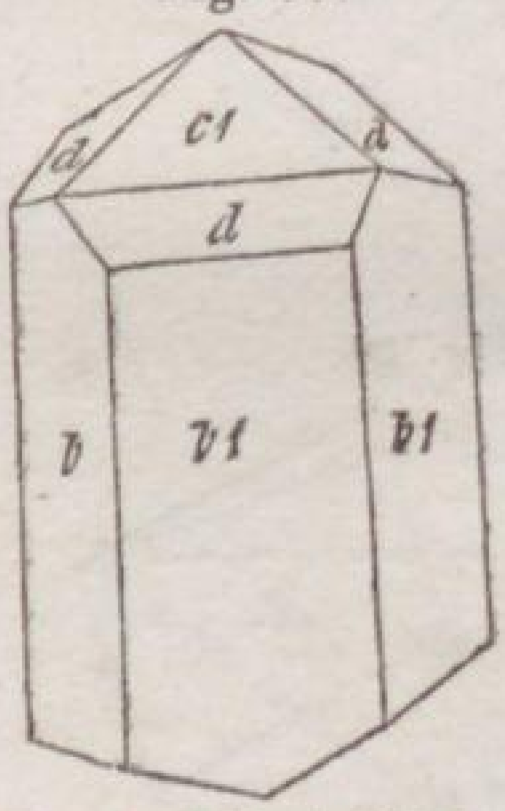
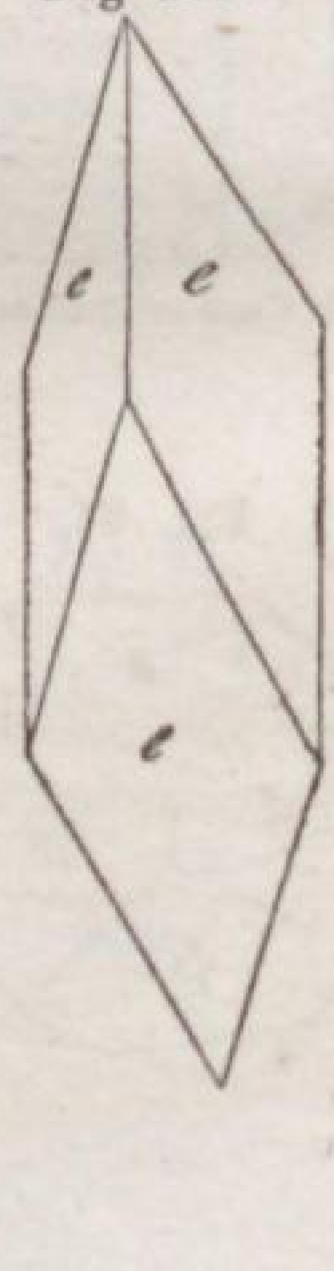


Fig. 99.



Hartz and Cumberland.

Fig. 100.

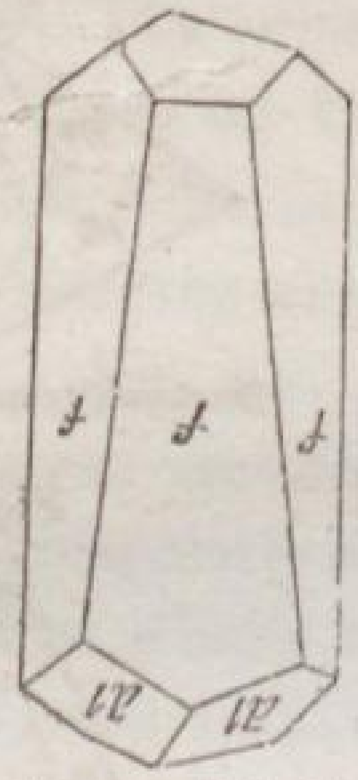


Calcareous Spar.

Fig. 101.

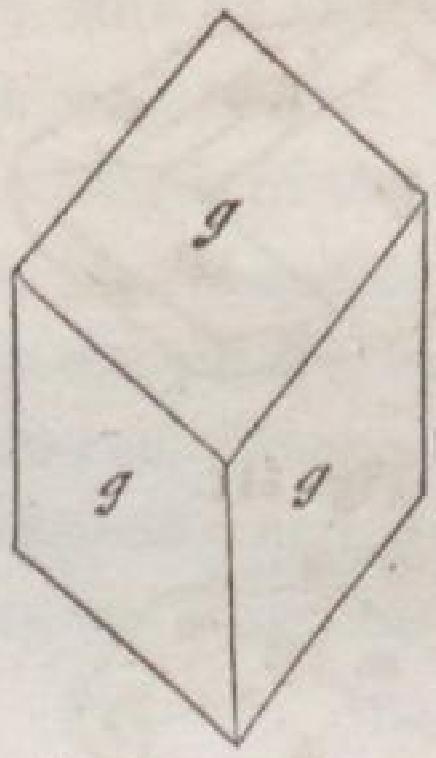
Westmoreland, (England.)

Fig. 102.



Hartz and England.

Fig. 103.



Southbury, (Conn.)

Fig. 104.

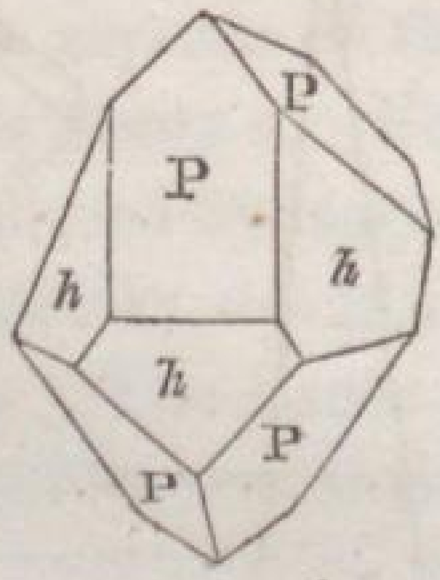


Fig. 105.

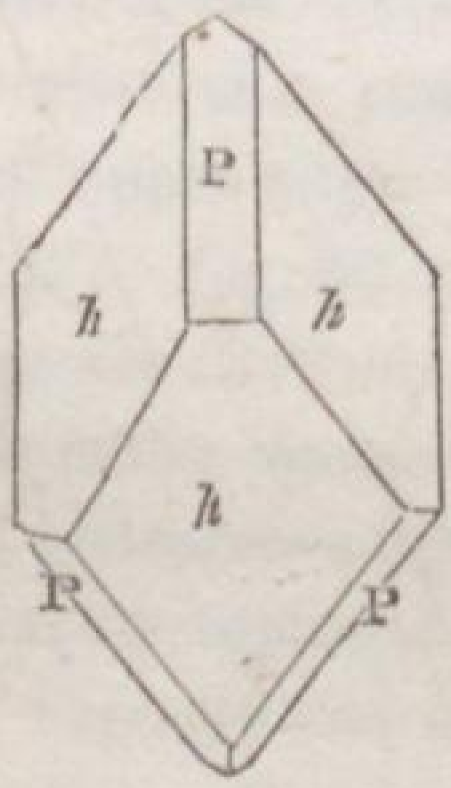


Fig. 106.

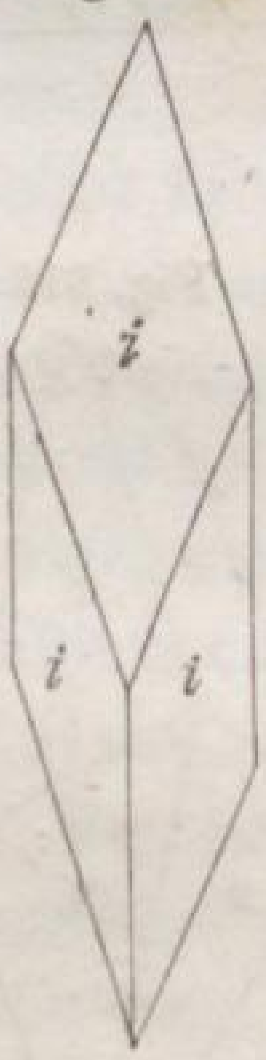


Fig. 107.

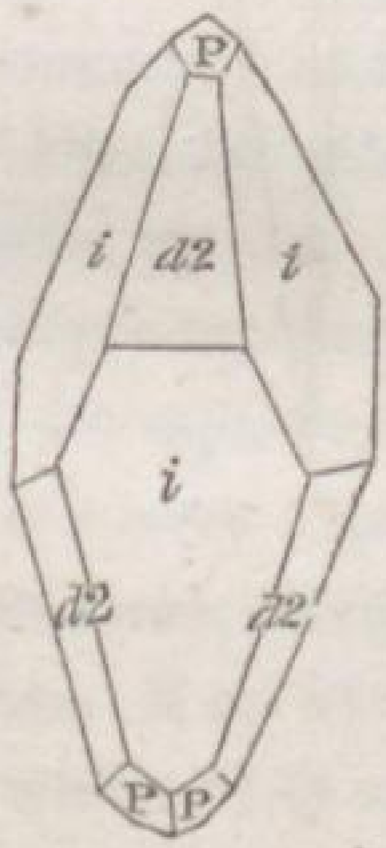


Fig. 108.

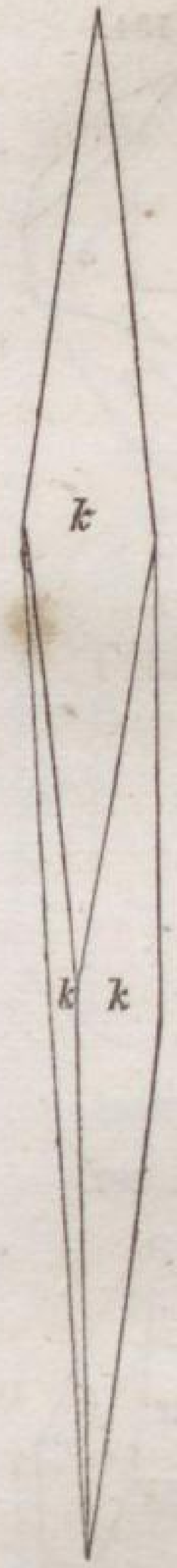


Fig. 109.

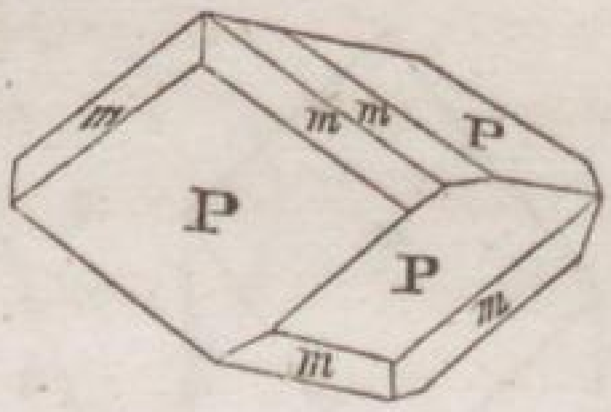
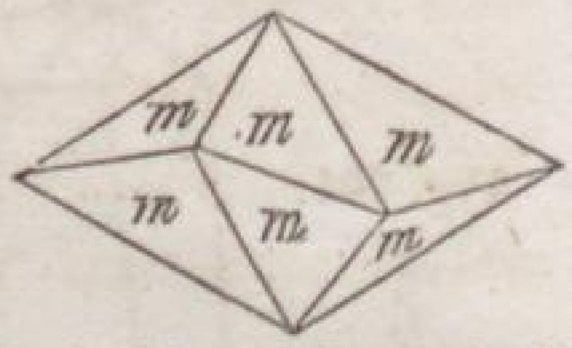


Fig. 110.



Derbyshire and Cumberland.

Fig. 111.

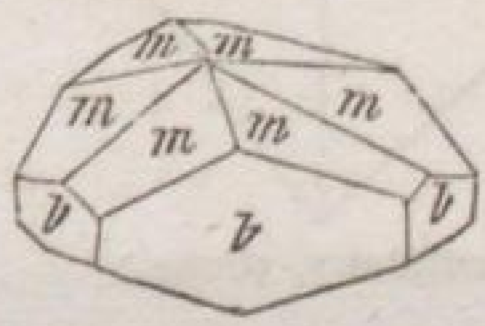


Fig. 112.

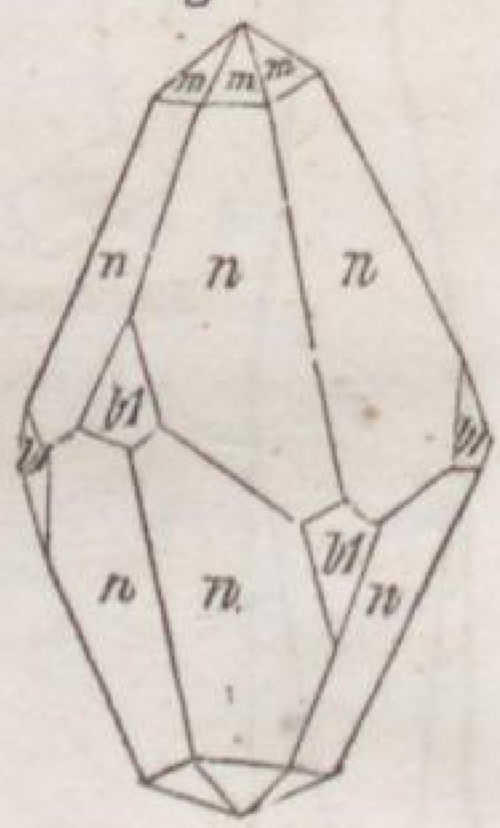


Fig. 113.

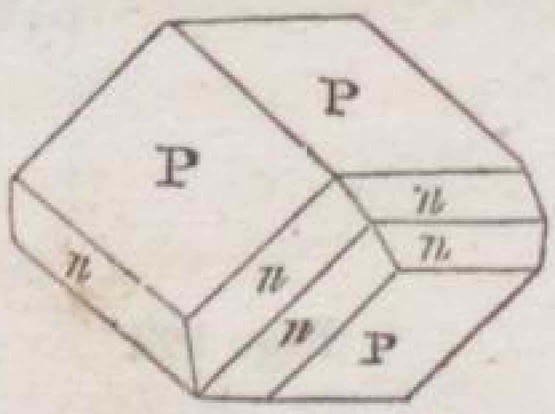


Fig. 114.

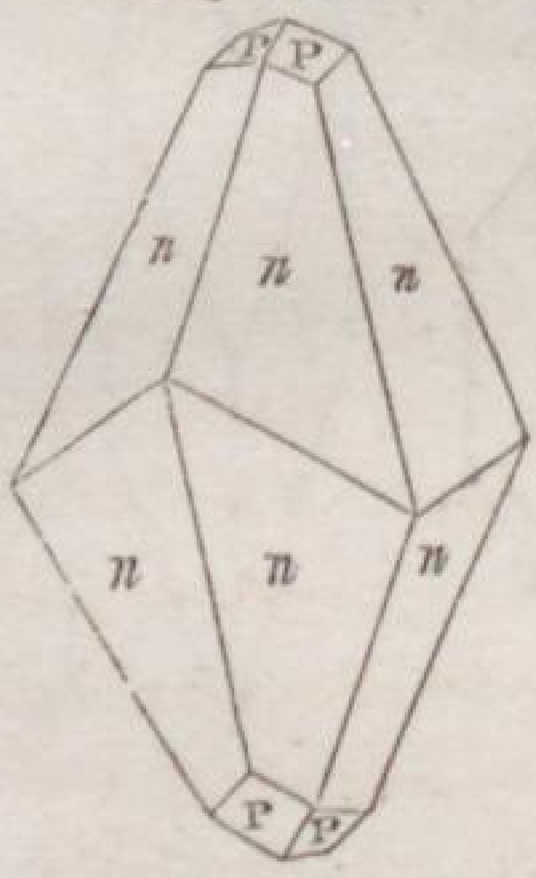
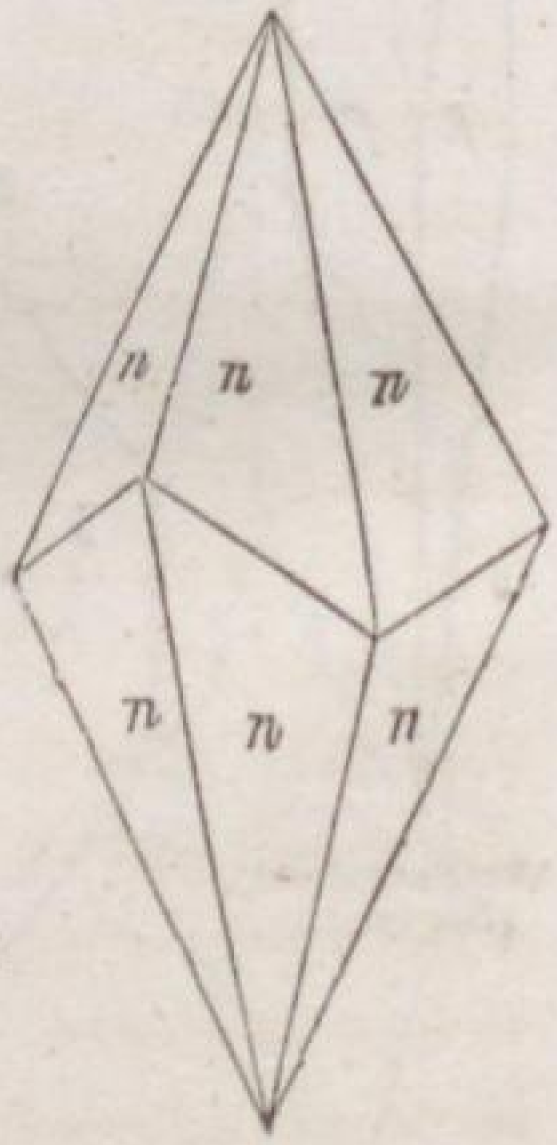


Fig. 115.



Calcareous Spar.

Fig. 83. The primary with its lateral edges replaced by tangent planes, a: P on $a = 135°$. The crystals of this modification differ in the length of the new planes a. Fig. 84. The primary with its lateral angles replaced by tangent planes, b. Fig. 85, has the planes elongated : this is the most common modification of the species. The planes P are often irregularly extended ; and sometimes one or two of them are wholly wanting from each extremity of the prism. P on $b=135°$. Fig. 86. The primary, having its summit replaced by a tangent plane. Fig. 87 and 88, the same, with the new plane more extended : these form the *basées* of HAUY. P on $c=135°$. The faces c are liable to a pearly lustre. Fig. 89 unites the modifications of Figs. 84 and 86. Fig. 90, the same, with the faces b more extended so as to produce an elongated prism. Fig. 91, the regular hexagonal prism, produced from Fig. 90 by the extension of c : the *prismatique* of HAUY. Occasionally, the prism is reduced in length to a mere table. Hartz. Sometimes this modification is affected by the undue enlargement of certain of the lateral faces, so as to convert it into a trihedral, tetrahedral or pentagonal prism. Fig. 92. Primary, with its upper edges replaced by tangent planes. P on $d=149° 2'$. Fig. 93, the same, more deeply replaced. Fig. 94, d on $d=134° 26'$. This is called the equilateral rhomboid : it is the *equiaxe* of HAUY. It is a very abundant form of Calcareous Spar. Fig. 95, the same, having the lateral angles replaced by tangent planes. d on $b1= 116° 34'$. Figs. 96 and 97, the same, in which $b1$ is variously produced. Fig. 98, the equilateral rhomboid, with its lateral edges replaced by tangent planes. These prisms are sometimes elongated. Fig. 99, the same as Fig. 97,

but having the summit replaced by a tangent plane. *d* on *c*1=153° 26′. Four other rhomboids, of the following dimensions: viz. 115° 42′, 129° 54′, 151° 48′, and 156° 24′, derivable from the primary by tangent replacements of its upper edges, the new planes inclining differently to the vertical axis, undergo many of the modifications above described with respect to the primary and the equilateral rhomboids; but their forms are not common.

In addition to the foregoing rhomboids, Calcareous Spar presents a great variety of acute rhomboids, of which Fig. 100 is one of the most common. It is the *contrastant* of Hauy. Its localities are numerous. This rhomboid goes through the modifications above described; and in addition to them, it occurs having the summits replaced by three new planes: in one instance, the new planes resting upon the rhomboidal planes; and which incline under angles of 105° 5′, being portions of the primary form; and in the other, resting upon the edges and inclining towards the axis. *e* on *e*=65° 41′; Fig. 101, a rhomboid still more acute, *f* on *f*=60° 34′. Fig. 102, the same, with the upper edges replaced by tangent planes; the *contractée* of Hauy. *f* on *d*1=112° 9′ 59″. *d*1 on *d*1=134° 25′ 38″. Fig. 103 is a rhomboid slightly acute. *g* on *g*=87° 48. It approaches the cube in form; and is called by Hauy, the *cuboide*. It is not common. It suffers the same modifications as the last described rhomboid. Figs. 104 and 105 explain the passage of the primary into an acute rhomboid, called the inverted rhomboid, in consequence of its being a complete inversion of the primary rhomboid. P on *h*= 129° 13′ 53″. *h* on *h*=78° 27′ 47″. This form is found undergoing all the modifications above described, and many others; amounting in all to more than forty. Fig. 106, a still more acute rhomboid, the cleavage of whose crystals takes place at the summits, directly upon the edges. It is the *mixté* of HAUY. i on i=63° 44′ 55″. It is common. P on i=119° 2′ 11″. Fig. 107 is the same, having the primary planes at the summit, and having the upper edges replaced by the planes $d2$. P on $d2$=149° 2′ 11″, i on $d2$= 149° 2′ 11″, i on $d'2$ 154° 39′ 14″. Fig. 108 is the most acute of all the rhomboids of Calcareous Spar. It is called the *dilatée* of HAUY. It is not very rare, either perfect, or suffering the modifications above described. k on k=60° 24′. Fig. 109 represents the primary rhomboid having its upper edges replaced by two planes,—the commencement of the dodecahedron with scalene triangular planes, as represented in Fig. 110. m on m over the summit =121° 26′. Fig. 111 has the lateral solid angles replaced by tangent planes; and Fig. 112 has in addition, the upper edges of $b1$ replaced by the planes n, which forms the *soustractive* of HAUY. Numerous other faces, in addition to these, occur in some of the varieties. n on $b1$=152° 6′ 52″, n on n =161° 48′ 18″. Fig. 113 is the primary rhomboid, having its lateral edges replaced by two planes n. It is very common in this condition; and with the new planes more extended, as in Fig. 114, it forms the *binaire* of HAUY; and when they are still more so, as in 115, it forms the *metastatique* of the same author. Fig. 113 undergoes more than one hundred modifications. P on n = 151° 2′ 40″. n on n over the summit =48° 22′. n on n over the base= 104° 28′ 40″. n on n over a pyramidal edge = 144° 20′ 26″. $b1$ on n = 152° 6′ 52″.

Calcareous Spar.

Cleavage parallel to the primary rhomboid, easily obtained, even and highly perfect. Fracture, perfectly conchoidal, but difficult to be obtained.

Surface generally even: rarely, curved faces appear in certain rhomboids and pyramids.

Lustre vitreous. The lustre of *c* is sometimes pearly. Color white, prevalent. Also different shades of grey, red, green, yellow; all of them pale. Dark brown and black colors owing to foreign admixtures. Streak greyish white. Transparent . . . translucent; double refraction very considerable, and easily observed.

Brittle. Hardness =3·0. Sp. gr. =2·721, a transparent crystal.

Compound Varieties. Twin-crystals.

Fig. 116.

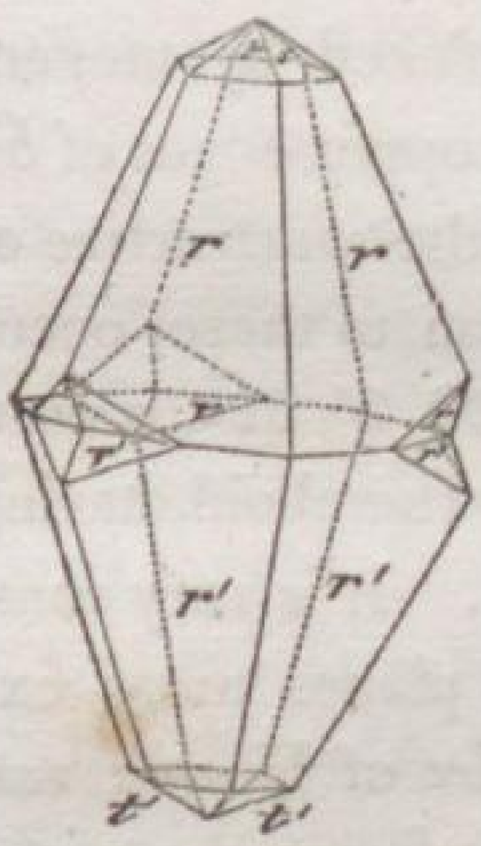


Fig. 117.

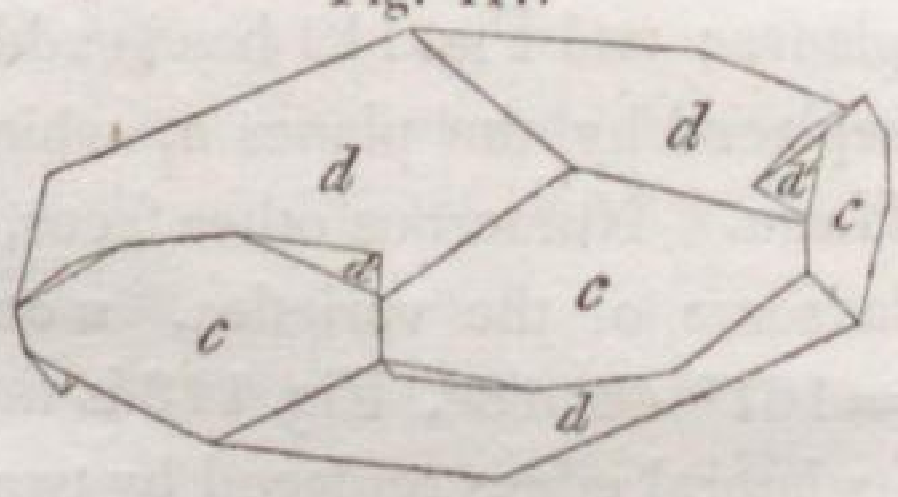


Fig. 118.

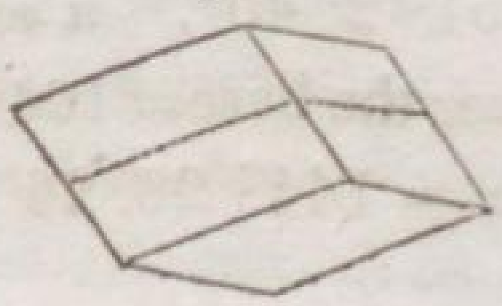


Fig. 119.

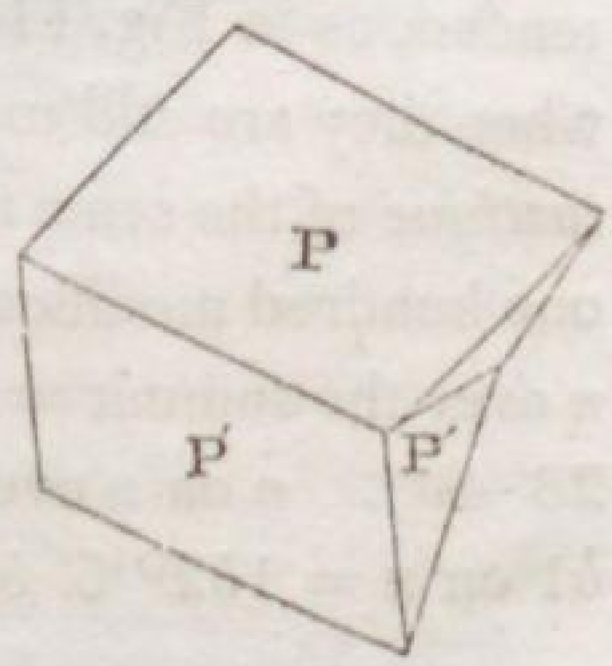


Fig. 120.

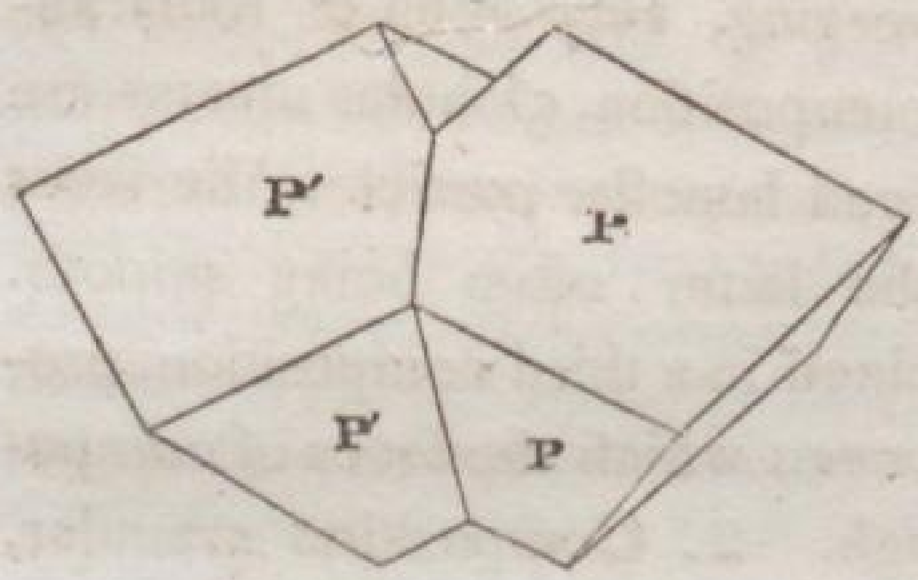
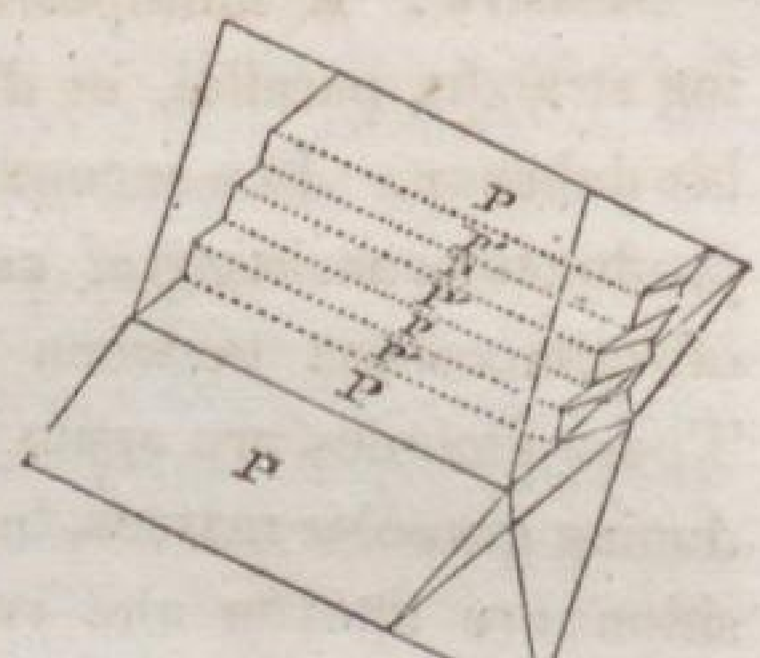


Fig. 121.



In Fig. 116 and 117 the face of composition is perpendicular to the axis of the aggregated crystals; and the angle of Revolution =60°. In Fig. 119 the face of composition is represented by the dotted lines in Fig. 118. In Fig. 120 it coincides with a plane passing through its vertical axis: in both, the angle of revolution = 180°. The regular composition in faces parallel to the plane indicated in Fig. 118, takes place also in massive varieties; and then more or less thick laminæ of the two individuals alternate with each other, as in Fig. 121. The frequent occurrence of those well known striæ (here delineated) upon the faces of cleavage, parallel to the horizontal diagonal of the rhombs, depends upon this mode of regular composition.

Implanted globules; stalactitic, botryoidal, fructicose shapes: surface uneven, drusy, rough or smooth, composition columnar, more or less distinct, straight diverging, and of various sizes. Stalactitic and botryoidal varieties are often composed a second time of curved lamellar particles, conformably to the surface of the imitative shapes, the faces of composition being uneven and rough, or irregularly streaked in a longitudinal direction.

Massive: 1. Composition columnar, the individuals being straight, parallel, or diverging, very often of remarkable delicacy. In a second composition, globular masses are produced, consisting of curved lamellar particles, the faces of composition between the latter often being smooth. These globules are again joined in a third composition, producing granular masses, between which the faces of composition are uneven and rough. 2. Composition granular, the individuals being of various sizes, and even impalpable; faces of composition irregularly streaked, uneven and rough. The individuals cohere more or less firmly. If the composition be impalpable, fracture becomes splintery, uneven, flat, conchoidal, or even; on a large scale it is sometimes slaty. The fracture is earthy in those varieties in which the individuals cohere but slightly. 3. Composition lamellar; the indviduals more or less thin, and often bent; face of composition sometimes rough, and possessing a pearly lustre. Globules formed in cavities; plates, of various kinds of composition.

1. The species of Calcareous Spar, as at present regarded by the majority of mineralogists, probably embraces several distinct species, separated from one another by constant differences of form, hardness and specific gravity. An attempt has been made within a few years by BREITHAUPT, to determine, by some of the nicest mineralogical researches of modern times, a number of such species. But as the differences upon which he founds his conclusions are so slight, in comparison with specific differences in general in the mineraal kingdom, it seems most judicious for the present to introduce his results in the form of an appendix to this species, where they will be found given in sufficient detail to enable the mineralogical student to appreciate their value.

The division of Calcareous Spar into several sub-species and varieties, in the older treatises on the science, depends chiefly upon the mode of composition, and upon admixtures and impurities, with which the individuals have been affected in their formation. Of these *Limestone* represents the greater part of the pure varieties of the species. The simple varieties, and such compound ones in which the indviduals are of considerable size, and easily cleavable, have been called *Calcareous Spar*; compound varieties of granular, still discernible individuals, are *granular Limestone*, both comprehended under the head of *foliated Limestone*. If the granular composition disappear, *compact Limestone* is formed; under which denomination also, Oolite or Roestone was included; the roundish grains, however, of the latter, consist of columnar individuals, disposed like the radii of a sphere, and frequently showing distinct traces of cleavage. *Common fibrous Limestone* is produced by columnar composition in massive varieties; the *fibrous Calcsinter* by the same, but appearing in various imitative shapes. *Pea-stone* or *Pisolite* consists of diverging columnar individuals, collected into curved lamellar ones, forming globular masses, which are again agglutinated by a calcareous cement. Each of the globules generally contains a grain of sand, which is of Quartz or Feldspar. Compact limestone passes into *Chalk*, if the individuals are more loosely connected with each other, so that the whole assumes an earthy appearance; and *Rock milk* or *Agaric mineral* is formed, if the mass contains so many interstices, that it seems to possess but a small degree of specific gravity. *Calcareous tufa*, a recent deposit formed on the surface of the earth, is often cleavable, and thus possesses all the properties of the variety called Calcareous Spar. *Slate-spar* or *Argentine*, is produced by a lamellar composition in massive varieties, in the direction of the face of composition Fig. 119 of twin-crystals, contained in thin parallel layers. *Swinestone*, *Anthracoliite*, *Marl* and *Bituminous Limestone*, are impure and mixed varieties, partly of calcareous spar, partly of compact limestone.

The pure varieties of Calcareous Spar are entirely soluble, with effervescence in nitric or muriatic acid. In the common fire they are infusible, but part with carbonic acid, and become converted into quick-lime.

2. *Analysis.*

According to the analyses of several of the first chemists, Calcareous Spar consists of

Lime	- -	56·0 . . . 57·0
Carbonic acid	- -	43 0 . . . 44·0

The varieties very often contain a small portion of oxide of iron, silica, magnesia, alumina, carbon or bitumen.

3. Calcareous Spar rarely enters into the composition of rocks. In most cases, the more considerable masses of it form particular beds in other rocks, or constitute rocks themselves: the latter consist chiefly of

compact limestone; the former of granular limestone. The simple varieties occur in drusy cavities, more frequently in veins than in beds, accompanied with the varieties of different species. Columnar compositions have been observed to form veins by themselves, and a great number of varieties are met with in the cavities of several rocks. Slate spar is generally a product of beds of granular limestone; calcareous tufa and rock-milk, being of a sintery formation, occur upon the surface, and in fissures of limestone rocks, and rock-milk in particular is generally a very pure carbonate of lime. Stalactitic and pisiform varieties are produced by calcareous springs and other waters. The original repository of Anthracolite is not known, it having as yet been found only in large boulders. The impure varieties occur in particular strata, between those of compound varieties of other species. This species is very common in petrifactions, imbedded in compact varieties of the same species.

4. Calcareous Spar is one of the most widely diffused species. Several of its varieties have a considerable share in the constitution of mountains in many countries. This is particularly true in Switzerland, Italy, Carniola, Carinthia, Salzburg, Stiria, and in several parts of the United States. Beds of granular limestone in gneiss and mica slate, abound in all the New England States; also in New York, New Jersey and Pennsylvania; also, of the compact limestone, in Upper and Lower Canada, upon Lake Champlain, and throughout the vast district contained between the Alleghany mountains, the lakes and the Mississippi. Of crystallized varieties, the most remarkable occur in Derbyshire and Cumberland, in the mining districts of Saxony and Bohemia, in the Hartz, in Carinthia, Stiria, Hungary, and France; and in North America, at Bytown, (Lower Canada,) Kingston, (Upper Canada,) Lockport and Leyden, (New York,) and the Silver mines of Mexico. Iceland is the locality of its finest and most transparent varieties, from whence come the best pieces of the doubly refracting spar. The *crystallized sandstone* of Fontainbleau in France, (*Chaux carbonatée quartzifère of* HAUY,) is a variety of calcareous spar, mechanically mixed with sand. When crystallized, it assumes the form of the inverted rhomboid. Argentine occurs in Saxony, Norway and Cornwall, and in the United States at Williamsburg and Southampton, (Mass.,) in the lead veins, as well as in the iron mine of Franconia, (N. H.) Picrolite is found in Carniola, and at Carlsbad in Bohemia. Anthracolite is found in Salzburg. Calcareous Tufa abounds in the States of New York and Ohio, where its formation at the surface of the ground, or in cavities of compact limestone, is constantly progressing. Stalactitic varieties are particularly abundant

in the caves of Virginia and Kentucky. Most of the varieties are so common as to render the mention of their localities unnecessary.

5. Several varieties of Calcareous Spar are usually employed for various purposes, partly depending upon their mechanical, partly upon their chemical composition. Those used in sculpture, and in ornamental architecture, are called *marble;* the more common or coarse varieties are used for the common purpose of building. A peculiar variety of very fine grained, compact limestone, is used for plates in lithography. The best sort is found near Pappenheim and Sohlenhofen in Bavaria. Quick lime is obtained from the calcination of this species. Carbonic acid for chemical purposes, as well as for the impregnation of artificial mineral waters, is obtained from chalk and from marble powder. Chalk is also used for writing and for whitewashing. Calcareous Spar is likewise a valuable addition in several processes of melting ores, and in producing certain kinds of glass.

Appendix to Calcareous Spar.

i. *Archigonal Carbon-Spar.* Breithaupt.

P on P = 105° 0′.

Cleavage parallel to the primary rhomboid, perfect.

Hardness (scale of Breithaupt) = 4·0 . . . 4·25.

Sp.gr. = 2.7348, a cleavable fragment from Neue Hoffnung Gottes at Bräunsdorf, west of Freiberg.

2·7362, a similar variety, but less cleavable.

2·7426, cleavage forms, from Himmelsfürst in Freiberg.

2·7485, cleavage forms, very clear and beautiful, from the Tunge hohé Birke in Freiberg.

2·7500, dull crystalline fragments, from Himmelsfürst.

Other localities of the Archigonal Carbon-Spar at Freiberg, are the Beschert Glück and Himmelfahrt mines. Besides, it occurs at Johann Georgenstadt, at Schneeberg in the Erzgebirge, and at Przibram in Bohemia; and on the whole is a frequently occurring species.

ii. *Kouphone Carbon-Spar.* Breithaupt.

P on P = 105° 2′ 30″.

Cleavage parallel to the primary rhomboid, perfect.

Hardness (scale of Breithaupt) = 3·75.

Sp. gr. = 2·6788, cleavage forms, from Kornial-Hole at Trieste, in mountain limestone.

Color, brick-red, like the Heulandite from Fassa, Tyrol.
Its only locality is Trieste.

iii. *Eugnostic Carbon-Spar.* BREITHAUPT.

P on P = 105° 5′.
Cleavage parallel to the primary rhomboid, very distinct.
Hardness (scale of BREITHAUPT) = 3·75 . . . 4·00.
Sp. gr. = 2·7170, a clear cleavage crystal from Iceland.
2·7171, a clear cleavage crystal, but of a flesh-red color, from Iberg in the Hartz.
2·7177, a clear cleavage crystal, from the same place.
2·7179, a cleavage crystal, from Rotluf in Chemnitz, in the Erzgebirge.
2·7190, a clear crystal, from Ahren in Tyrol.
2·7190, three clear cleavage crystals, from Boiza in Siebenbürgen.
2·7203, cleavage crystal, from a beautiful white Calcareous Spar from Moderstolln, *Schemnitz*.

h. A variety analyzed by STROMEYER, from Iceland, contained

Carbonic acid - - - -	43·70
Lime - - - -	56·15
Oxide of manganese and iron -	0·15

iv. *Polymorphous Carbon-Spar.* BREITHAUPT.

P on P = 105° 8′.
Cleavage parallel to the primary rhomboid very distinct.
Hardness = (scale of BREITHAUPT) = 0·4.
Sp.gr. = 2·7088, locality not known.
2·7089, a cleavage crystal. Maxen at Dresden.
2·7100, a cleavage crystal. Braunsdorf in Tharand.
2·7110, a cleavage crystal, of a pale wine-yellow color, locality unknown.
2·7111, a cleavage crystal, of a pale wine-yellow color, from Derbyshire.
2·7122, a cleavage crystal, milk-white to blue, from Cziklowa in the Bannat.
2·7125, a cleavage crystal, white and transparent, from Stanowski Gorni in Karczowka.

The following varieties probably belong to this species.

Sp.gr. = 2·7081, milk-white, translucent Calcareous Spar, from Scheibenberg in the Erzgebirge.
2·7084, milk-white, from Krodendorf in the Erzgebirge. Lustre resinous, or oily.

This is the most abundant species of the family; and occurs in formations of nearly every age. A variety from Andreasberg, analyzed by STROMEYER, afforded

Carbonic acid - - -	43·5635
Lime - - -	55 9802
Oxide of manganese and iron -	0·3563
Water - - -	0·1000

v. *Meroxene Carbon-Spar.* BREITHAUPT.

P on P = 105° 11′.

Cleavage perfect parallel with the primary rhomboid.

Hardness (scale of BREITHAUPT) = 4·0.

Sp.gr. = 2 6895, a fragment of a crystal, from Tharaud in Dresden.
2·6903, cleaved from massive variety, associated with Natrolite, from Mariaberg in Aussig, Bohemia.

Most of the zeolitic druses from Iceland are supposed to contain this species.

vi. *Haplotypous Carbon-Spar.* BREITHAUPT.

P on P = 105° 13′ 40″.

Cleavage, less perfect than in the foregoing species.

Hardness (scale of BREITHAUPT) = 4·25.

Sp.gr. = 2·7280, } fragments of crystals of a wine-yellow color,
2·7294, } from the galleries of Verlorne Hoffnung and Neue Hoffnung Gottes at Braunsdorf, west from Freiberg.

The following Calcareous Spars have a similar specific gravity and a similar hardness:

2·7259, greyish white, in large compact masses from Alten August in Freiberg.

2·7260, translucent, yellowish white, cleavage masses intermingled with Vitreous Copper, from Sangerhausen, Thuringia.

2·7272, smoke-grey, large crystals, from Neu Glück in Schneeberg in the Erzgebirge.

2·7284, white cleavage crystals, at Zaukerode near Dresden.
2·7300, a crystal from Northumberland.

The most of these varieties are too imperfectly cleavable to admit of accurate measurement.

vii. *Melinous Carbon-Spar.* BREITHAUPT.

P on P = 105° 17′.
Cleavage perfectly obtained parallel with the primary rhomboid.
Hardness (scale of BREITHAUPT) = 4 . . . 4·25.
Sp.gr. = 2·6958, honey yellow, cleavage crystals from Neudorf at Borna.
2·6968, from Mont Martre near Paris.

It is found in green-sand and in plänerkalkstein in Saxony. It also occurs at Cotta, at Naundorf in Borna, and again on the lower portions of Zehista in the region of Pirna. Under similar circumstances at Dux in Bohemia.

viii. *Diastatic Carbon-Spar.* BREITHAUPT.

P on P = 105° 43′.
Cleavage parallel with primary rhomboid perfect.
Hardness (scale of BREITHAUPT) = 4 . . . 4·25.
Sp.gr. = 2·7698, massive variety from Seegen Gottes, Freiberg.
2·7758, cleavage crystals from Habacht, Freiberg.
2·7870 common fibrous limestone, from Adam Heber in Schneeberg.

ix. *Plumbo-Calcite.* TURNER. Carbonate of Lime and Lead.

P on P = 104° 53′ 30″.
Hardness. It is scratched by Iceland Spar.
Surface of crystals slightly rounded.
Lustre pearly. Sp. gr. = 2·82.
Massive and opake.

Heated in a platina crucible, or in a glass tube, it decrepitates, and after some time assumes a brownish, or pale reddish tint. It consists of

Carbonate of lime	92·2
Lead	7·8

x. *Prunnerite.* ESMARK.

The violet blue variety of Calcareous Spar, occurring with Apophyllite in the Island of Hestoe, one of the Faroes, and hitherto arranged as a variety of cuboidal Calcareous Spar, has been established into a distinct species by ESMARK; the grounds of this distinction however, are not as yet made known.

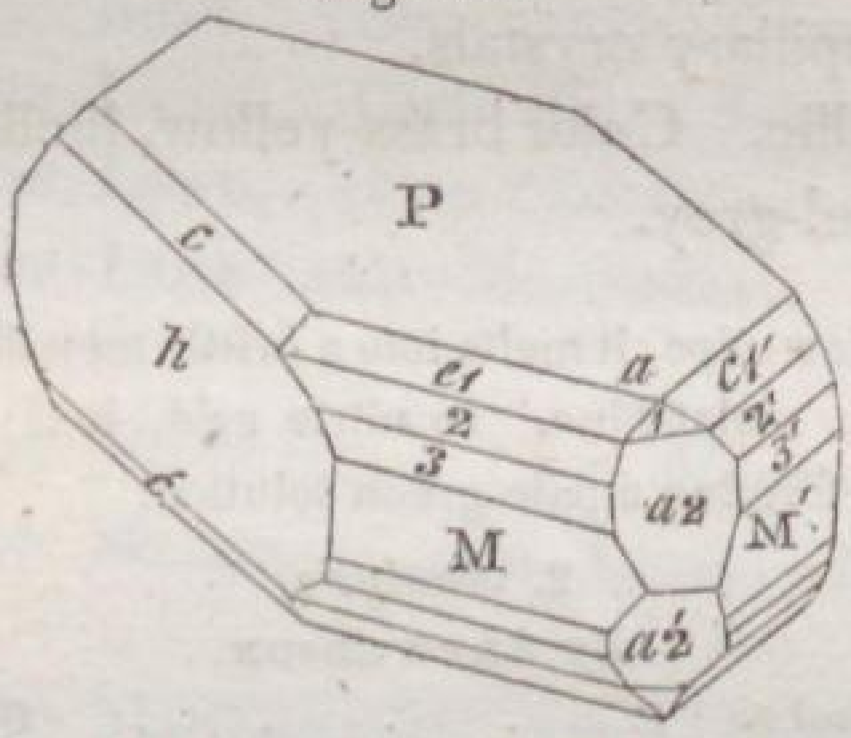
CALCEDONY. (See *Quartz.*)

CALEDONITE. Cupreous Lead-Baryte.

Primary form. Right rhombic prism. M on M′=95°.

Secondary form.

Fig. 122.



M on M′	95° 00′	BROOKE.	M on $e1$	144° 00′
P on M or M′	90 00		M on h	132 30
P on $a2$	108 00		$a2$ on $a2'$	143 42
P on c	126 00		$a2$ on $e2$	140 40
P on $e1$ or $e1'$	126 00		c on h	144 30
P on $e2$ or $e2'$	115 30		$e1$ on $e1'$	108 00
P on h	90 00		$e2$ on $e2'$	128 35

Cleavage, parallel to M and T indistinct, but parallel to *h* more obvious. Fracture uneven. Surface streaked.

Lustre resinous.

Color deep verdigris-green; inclining to mountain-green, if the crystals are very delicate. Streak greenish-white. Translucent.

Rather brittle. Hardness =2·5 ... 3·0. Sp. gr.=6·4.

1. *Analysis.*
By BROOKE.

Sulphate of lead . . .	55·8
Carbonate of lead . . .	32·8
Carbonate of copper . . .	11·4

2. It is found along with other ores of lead at the Lead Hills of Scotland.

Cannel Coal. (See *Bituminous Coal.*)

Caoutchouc Mineral. (See *Bitumen.*)

CAPILLARY PYRITES. Capillary Chlorone-Pyrites.

Delicate, capillary crystals.

Lustre metallic. Color brass-yellow, inclining to bronze-yellow and steel-grey.

1. Before the blow-pipe, it melts into a brittle metallic globule; it colors glass of borax, violet-blue. In nitric acid, it is dissolved without leaving a residue, forming a pale green solution.

2. *Analysis.*
By Arfwedson.

Nickel	64·35
Sulphur	34·26

3. It occurs at Johanngeorgenstadt in Saxony, Joachimsthal in Bohemia, St. Austle in Cornwall, and in the Westerwald, accompanied by several species of Pyrites, and by Calcareous Spar.

Carbocerine.

The composition of this mineral, as carbonate of cerium, given by Berzelius, is all the information we possess concerning it.

Carbonate of Barytes. (See *Witherite.*)

Carbonate of Bismuth.

Earthy.

Color grey and brown.

Sp. gr. = 4·3.

1. *Analysis.*
By McGregor.

Carbonic acid . . .	51·50
Oxide of bismuth . . .	28·80
Oxide of iron . . .	2·10
Alumina . . .	7·50
Silica . . .	6·70
Water . . .	3·60

2. It was found at St. Agnes in Cornwall.

3. From the inconsistency of the chemical results obtained above, with the known laws of chemical combination, it seems probable that some mistake has been committed in the analysis.

Carbonate of Copper. (See *Blue Malachite* and *Green Malachite.*)

Carbonate of Iron. (See *Spathic Iron.*)

Carbonate of Lead. (See *White Lead-ore.*)

Carbonate of Lime. (See *Calcareous Spar.*)

Carbonate of Lime and Magnesia. (See *Dolomite.*)

Carbonate of Magnesia. (See *Magnesite.*)

Carbonate of Magnesia and Iron. (See *Rhomb Spar.*)

Carbonate of Manganese. (See *Diallogite.*)

Carbonate of Soda. (See *Natron* and *Trona.*)

Carbonate of Soda and Lime. (See *Gay-Lussite.*)

Carbonate of Strontian. (See *Strontianite.*)

Carbonate of Zinc. (See *Calamine.*)

CARBONIC-ACID. Aeriform Carbonic-Acid. Mohs.

Gaseous. Transparent.

Sp. gr. =1·51961. Biot and Arago. Taste slightly acidulous; pungent.

1. It extinguishes burning bodies of all kinds, and is incapable of supporting the respiration of animals. It reddens the vegetable blues; but the original color is restored by heating, or exposure to the air. Lime and barytic-water, become turbid when brought into contact with it; and it is absorbed by recently boiled water at the common pressure and temperature, in a quantity equal to the volume of the water. Under a pressure of 36 atmospheres, carbonic acid becomes converted into a liquid.

2. *Analysis.*

By Berzelius.

Carbon	27·40
Oxygen	72·60

3. It is found in the largest quantity and highest degree of purity upon the surface of *carbonated* springs, and in caves; in which cases it issues directly from the earth. Of the most remarkable of these sources of the present species in the United States, are the springs of Saratoga and Ballstown near Albany. An ingenious hypothesis to account for the origin of the carbonic acid in these localities, and many others of less importance in the vicinity, has been proposed by Prof. Eaton. The rock through which the waters rise is an argillite, containing large quantities of iron-pyrites and carbonate of lime. The iron-pyrites, he conceives, is decomposed by water, the sulphuric acid thus formed being in contact with the carbonate of lime, gypsum is produced, and carbonic acid disengaged; which being situated at great depths in the earth, and consequently under great pressure, combines with water in large proportions; and when the waters thus charged issue from the earth, the pressure being removed, they part with their superabundant carbonic acid. The well known mineral springs of Tunbridge and Carlsbad are remarkable for the evolution of this acid gas. It issues from a small cave in the side of a mountain near Naples, the floor of which, to the depth of a foot or more, is covered with a stratum of this noxious fluid, into which, if a dog be introduced, he is immediately suffocated. It has hence been called the *grotto del cane*. Another cave of a similar character exists in the Büdös hegy, a porphyry mountain in Transylvania. Carbonic acid is also emitted from certain marshes, and from the solfataras. In addition to the foregoing sources of this species, it is formed abundantly by the combustion of all substances that contain carbon, the respiration of animals, and the spontaneous changes to which dead animal and vegetable matter is subject. Accordingly, it is always present in the atmosphere, even at the highest elevations. All kinds of spring and well-water contain it dissolved in them, and to the presence of which they are partly indebted for their agreeable flavor. Where carbonic acid is evolved in low situations, it is liable from its gravity to accumulate; a circumstance which often happens in deep mines and wells, in which it forms an atmosphere known in English by the name of *choke-damp*, in German by the name of *Schwaden* or *Swath*.

4. Carbonic acid is applied to a variety of purposes in medicine and the arts.

CARBURETTED HYDROGEN. Empyreumatic Hydrogen Gas. Mohs.

Amorphous. Transparent. Expansible.
Sp. gr.=0·5707. Odor empyreumatic.

1. It burns with a bright flame, sometimes tinged with blue.

2. *Analysis.*

Carbon	74·87
Hydrogen	25·13

3. It is developed from marshes and stagnant pools, and is also found in volcanic countries. But its greatest source is certain coal mines and salt springs.

4. It is particularly abundant at Newcastle and Liège, where it is denominated fire-damp. Numerous localities of it might be cited in Ohio and New York; the more remarkable of which, however, is Fredonia, 40 miles from Buffalo, where it was first observed to bubble up from a small stream; but on boring a hole 1½ inch in diameter through a soft fetid limestone rock, of no great thickness, the gas left the stream, and was discharged by this orifice. The brilliancy of the flame led to its being adopted as a means of illuminating the village. A gazometer collects 80 cubic feet in 14 hours.

Carburet of Iron. (See *Plumbago.*)
Carnelian. (See *Quartz.*)
Cavolinite. (See *Nephiline.*)
Ceylanite. (See *Spinel.*)

CELESTINE. Prismatoidal Hal-Baryte. Mohs.

Primary form. Right rhombic prism. M on M′ = 104°.

Secondary forms.

Fig. 123.

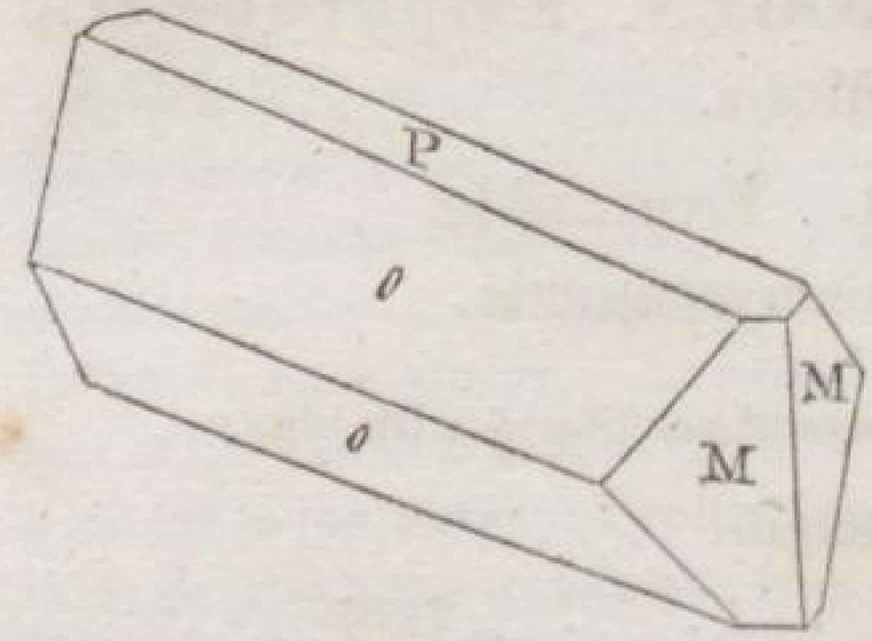


Fig. 124.

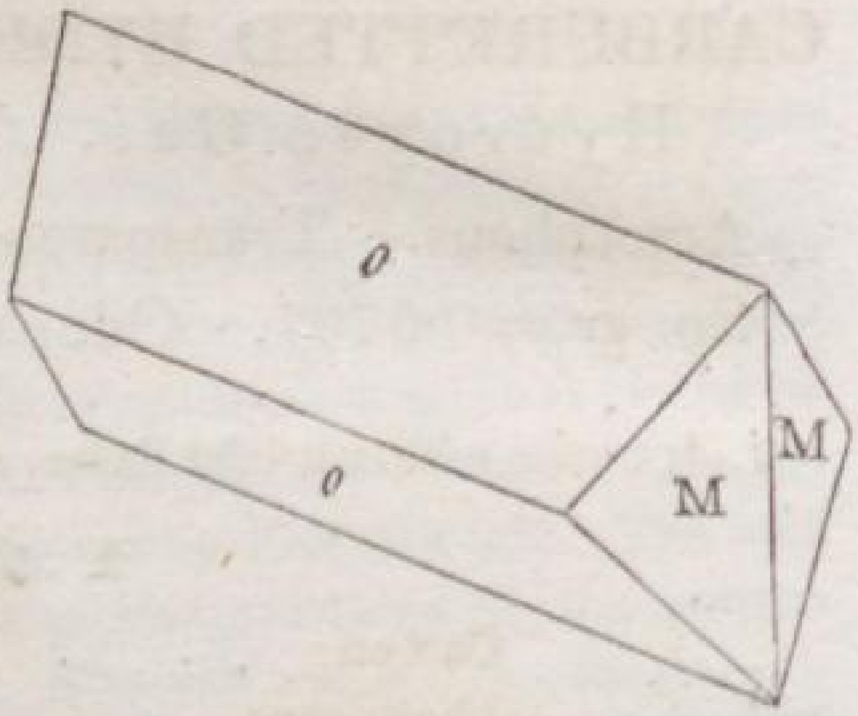


Fig. 125.

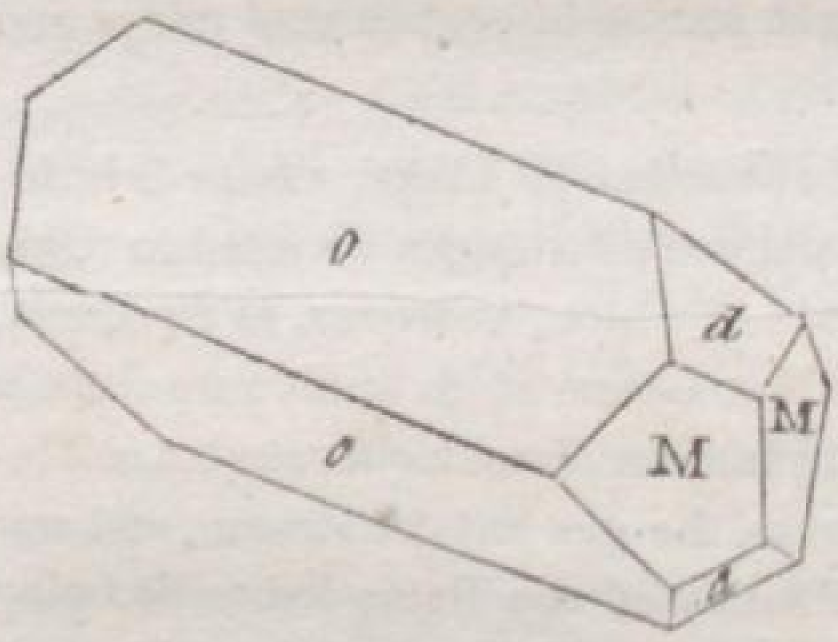


Fig. 126.

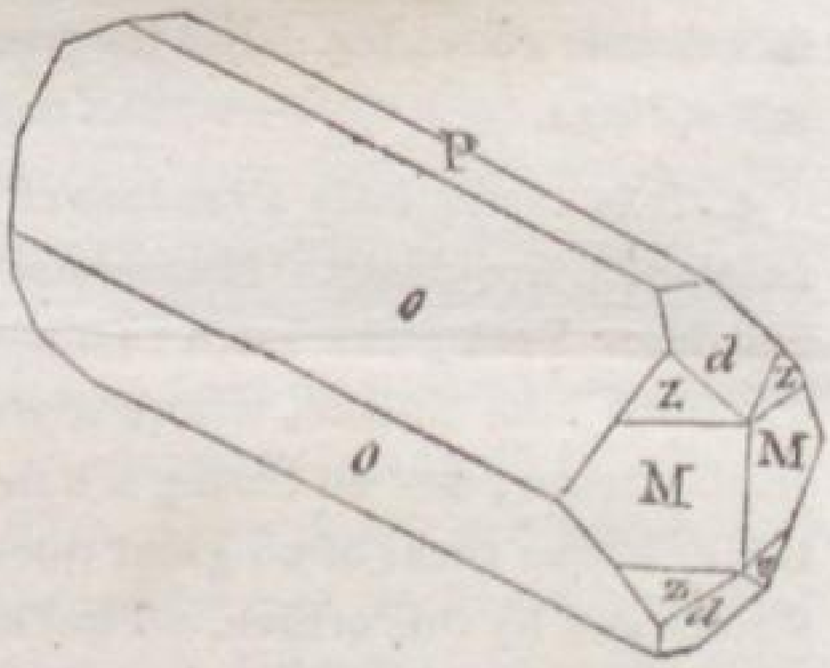


Fig. 123, the primary with its acute solid angles replaced by single planes. P on $o=128°\ 31'$. Fig. 124, the same, in which the terminal plane of the primary is extinguished. o on $o=102°\ 58'$; o on o over the summit$=77°\ 2'$. Fig. 125, like Fig. 124, but having the obtuse solid angles replaced by planes d; d on $d=78°\ 28'$. Fig. 126, P on $d=140°\ 46'$; M on $z=154°\ 6'$.

Cleavage parallel to the sides of the primary form, highly perfect; that of the bases less distinct. Fracture imperfectly conchoidal, uneven.

Lustre vitreous, inclining to resinous; sometimes also, a little to pearly on the perfect faces of cleavage. Color white prevalent, passing into bluish-grey, sky-blue and smalt-blue. Also reddish-white and flesh-red. Transparent ... translucent.

Brittle. Hardness = 3·0 ... 3·5. Sp. gr. = 3·858, a white translucent, cleavable variety, from the Tyrol.

Compound Varieties. Imperfect globular shapes, surface drusy, composition columnar. Plates more or less thin: surface rough, composition columnar, thin and parallel. Massive: composition either lamellar and aggregated into larger granular masses; or columnar, generally straight and divergent; or granular, the individuals being of various sizes. Faces of composition smooth, rough or irregularly streaked.

1. The varieties of the present species have been variously divided in the mineralogical systems into subspecies and kinds, notwithstanding they are connected among themselves by immediate transitions. Tabular crystals, and lamellar compound masses, were called *foliated Celestine;* others of columnar crystallizations and compositions, *prismatic Celestine.* Among the massive varieties were distinguished *radiated Celestine*, consisting of thin columnar compositions, radiating from a centre; *fibrous Celestine*, comprehending the thin plates, formed by delicate columnar particles of composition; and compact Celestine, which is a mechanical mixture of Celestine and Calcareous Spar.

Before the blow-pipe, Celestine decrepitates and melts, without perceptibly coloring the flame, into a white friable enamel. It loses its transparency on being heated, and acquires a caustic taste different from that of Heavy Spar under similar circumstances. Reduced to powder, it phosphoresces upon red hot iron.

2. *Analysis.*

By KLAPROTH.

Strontia	56·00
Sulphuric acid	44·00

3. Celestine is rarely found in greywacke: its usual localities are in transition limestone, sandstone and trap rocks; in which it occurs in single kidney-shaped masses, in large massive concretions, and in vesicular cavities. Other deposits are in gypsum beds, alternating with marl and clay, and associated with sulphur.

4. The handsomest prismatic-shaped crystals, and massive columnar varieties, occur in the Sulphur mines of Sicily; also under the same circumstances at Bex in Switzerland, and Conil near Cadiz in Spain. Tabular crystals and lamellar compositions are found in beautiful varieties at Monte Viale, near Verona, and in the Bristol Channel in England. Fine varieties occur in the Seiseralpe in the Tyrol. The blue varieties occur in greywacke at Leogang in Salzburg, and at Meudon, near Paris. The blue columnar varieties occur at Dornburg near Jena. The compact is found in the tertiary of Montmartre near Paris. Magnificent crystallizations of Celestine of a delicate blue color have been found in the secondary limestone bordering on lake Erie: particularly at a place called Strontian Island in that lake. Columnar, as well as lamellar, varieties, are found under similar circumstances at Lockport and Scoharie, (N.Y.)

Cereolite. (See *Kerolite.*)

Cerine. (See *Allanite.*)

CERITE. Uncleavable Eruthrone-Ore.

Regular forms and cleavage unknown.

Lustre adamantine. Color intermediate between clove-brown and cherry-red, passing into grey. Streak white. Translucent on the edges.

Brittle. Hardness = 5·5. Sp. gr. = 4·912.

Compound Varieties. Massive: composition granular, individuals not distinguishable; fracture uneven and splintery.

1. Alone before the blow-pipe, it is infusible; but with borax forms an orange-yellow globule, which becomes paler on cooling. With soda it does not perfectly dissolve; but forms a semi-fused, dark yellow mass.

2. *Analysis.*
By Hisinger.

Oxide of cerium - - -	68·59
Silica - - -	18·00
Oxide of iron - - -	2·00
Lime - - -	1·25
Water and carbonic acid - -	9·60

3. This rare mineral occurs in a bed of gneiss at the copper mine of Nya Bastnaes, near Riddarhyttan, Westmoreland, in Sweden. It is accompanied by Bismuthine and Mica.

CHABASIE. Rhombohedral Kouphone-Spar. Mohs.

Primary form. Rhomboid. P on P = 94° 46′.
Secondary forms.

Fig. 127.

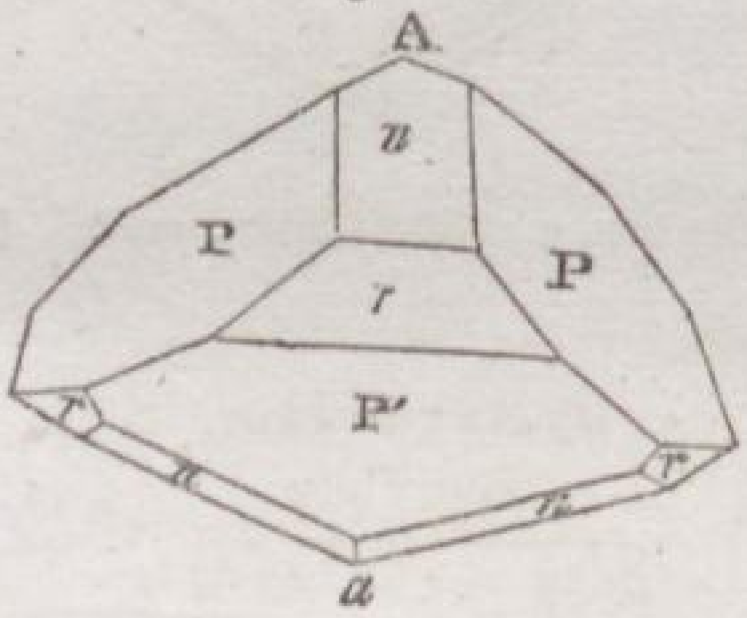


Fig. 128.

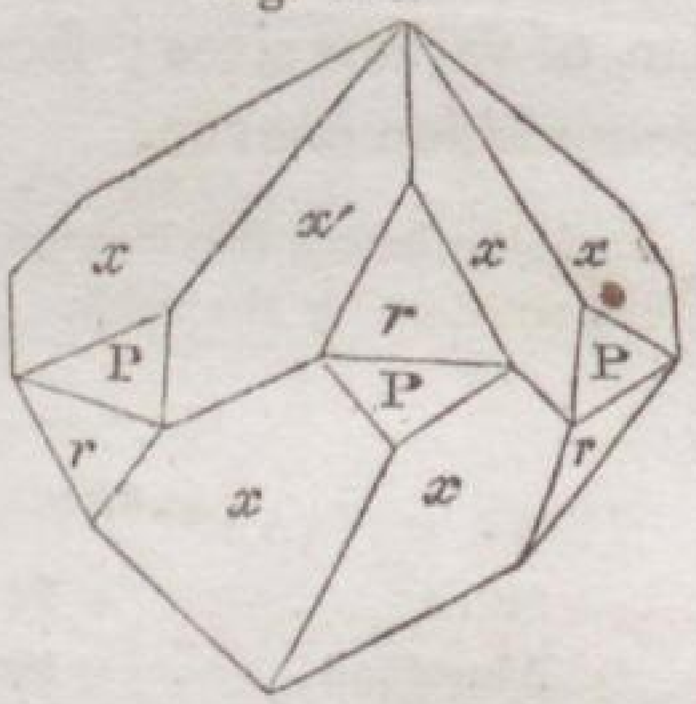


Fig. 127, the primary, having the upper edges and the lateral angles replaced by tangent planes. P on *r* = 120° 5′. *n* on *r*=143° 59′. Fig. 128, the same, in which the edges between P and *r* are replaced by the planes *x*. *x* on *x*′=173° 32′. *x* on *x*′ (over the base) =96° 40′. P on *x*=175° 30′.

Cleavage parallel to the primary rhomboid, but not distinct. Fracture uneven. The faces P are generally striated parallel with the upper edges of the rhomboid.

Chabasie.

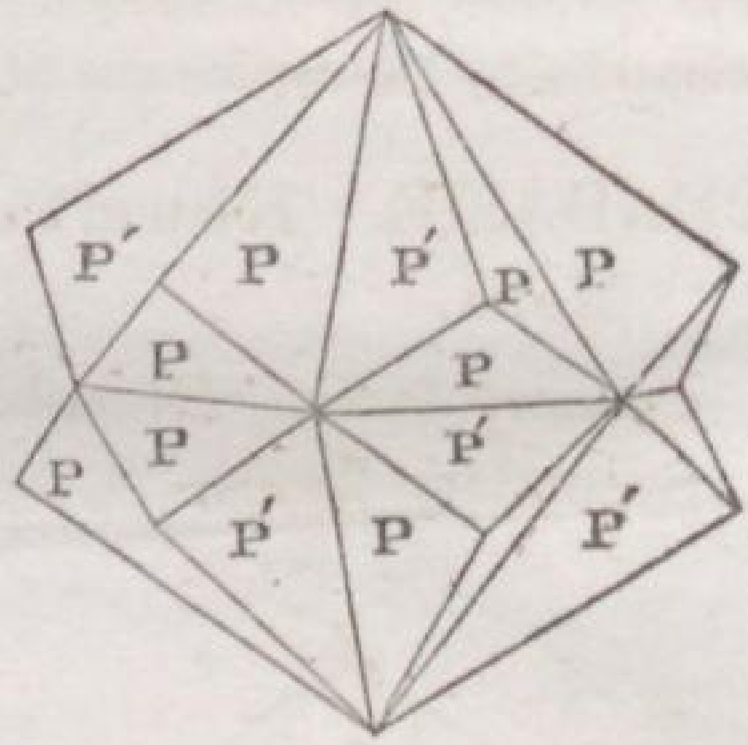
Lustre vitreous. Color white or reddish white: rarely yellowish white. Streak white. Semi-transparent . . . translucent.

Brittle. Hardness =4·0 . . . 4·5. Sp. gr.=2·100, crystals from Bohemia.

Compound Varieties. Twin-crystals.

In this figure the face of composition coincides with the vertical axis; and the angle of revolution = 80°. Fig. 127, in place of the primary, sometimes enters into composition in the same way. Massive: composition granular, of various sizes; faces of composition uneven.

Fig. 129.



1. Alone before the blow-pipe, it melts into a white blebby mass. It is not acted on by the acids.

2. *Analysis.*

	By BERZELIUS, from Gustavusberg.	By ARFWEDSON, from Fassa.	
Silica	50·65	48·38	49·07
Alumina	17·90	19·28	18·90
Water	19·90	21·40	19·73
Lime	9·37	8·70	
Potash	1·70	2·50	12·19 with soda.

3. Chabasie chiefly occurs in the cavities of amygdaloidal rocks. It has been found also in seams between the layers of gneiss and mica-slate. It is accompanied by Stilbite, Laumonite, Calcareous Spar and Quartz.

4. The largest and most distinct crystals are found in Iceland, the Faroe islands, and the vicinity of Aussig in Bohemia. Other localities are Altenberg near Oberstein in Saxony, Talisker in the isle of Skye, Glen Fary in Perthshire in the north of Ireland, and near Swan's creek in the Basin of Mines, Nova Scotia. At this last named place it occurs of a

wine yellow or flesh-red color, in crystals of various sizes, and often highly modified: they exist in the cavities of amygdaloidal rocks, accompanied by Analcime, Calcareous Spar and Heulandite. In the United States, Chabasie is occasionally met with in the trap region of the Connecticut river; also in seams between the layers of a mica slate rock at Chester, (Mass.) and at Baltimore, (Maryland,) under similar circumstances. It occurs on gneiss with Stilbite, at Hadlyme, (Ct.)

CHALKOLITE. (See *Uranite.*)

CHALKOPYRITE. (See *Yellow Copper-Ore.*)

CHALKOSIDERITE.

In very thin tabular crystals: stalactitic and drusy. Fracture fibrous and foliated. Color green, mostly yellowish. Lustre pearly. "Half-hard." Sp. gr. = 3·392.

CHALKOSINE. (See *Vitreous Copper.*)

CHALKOTRICHITE.

The capillary variety of *Red Copper-ore.* q. v.

CHAMOISITE.

Massive; composition impalpable, or oolitic.
Color greenish-grey.
Scratched by the point of a knife. Sp. gr. = 3·0 ... 3·4.

1. It yields moisture when heated in a glass tube, at the same time assuming a blacker color, and becoming more magnetic. It dissolves in the strong acids, leaving behind a portion of gelatinised silica.

2. *Analysis.*

By BERTHIER.

Silica	14·3
Alumina	7·8
Protoxide of iron	60·5
Water	17·4

In addition to the above, it contains variable proportions of carbonate of lime and magnesia.

3. It occurs in beds of moderate thickness in the limestone mountain of Chamoison in the Vallais, France.

4. It is explored with profit as an ore of iron.

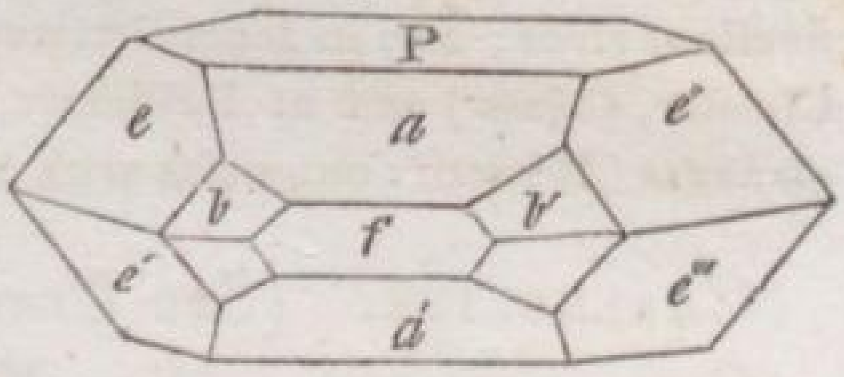
5. The Chamoisite appears to be an impure variety of Magnetic Iron-Ore.

CHILDRENITE.

Primary form. Right rhombic prism. M on $M' = 92° 48'$.
Secondary form.

P on e or e''	- -	114° 50′
P on a	- -	152 10
P on f	- -	90 00
e on e'	- -	130 20

Fig. 130.



Cleavage, imperfect, parallel to P. Fracture uneven.

Lustre vitreous, inclining to resinous. Color yellowish white, wine-yellow, ochre-yellow, and pale yellowish-brown.

Streak white. Translucent.

Hardness = 4·5 . . . 5·0.

1. Dr. WOLLASTON found this mineral to be a compound of phosphoric acid, alumina, and iron.

2. It has hitherto been found only in the neighborhood of Tavistock, disposed in rough crystals and crystalline coats on Spathic Iron, Iron Pyrites and Quartz, occasionally accompanied by Fluor.

3. Childrenite approaches in several of its properties the species Lazulite, the planes a a of whose crystals may be considered as corresponding to M M of Childrenite.

CHLORITE. (See *Talc.*)

CHLOROMELAN. (See *Cronstedite.*)

CHLOROPAL. (See *Opal.*)

CHLOROPHÆITE.

Massive: in small grains, imbedded in basalt or trap, and sometimes hollow. Fracture conchoidal . . . nearly earthy.

Color pistachio green, and translucent or opake; but soon turning into brown and black on being exposed to the air, without losing its lustre: the same effect takes place in a longer time, to the depth of an inch or two, into the rock.

Brittle. Hardness, scratched by a quill. Sp. gr. = 2·020.

1. Before the blow-pipe, it remains nearly unchanged, altering neither its color nor transparency. Besides silica, it contains iron and a little alumina. It occurs in Scuirmore cliff in the island of Rum, also in Fife-

shire and in Iceland. It has been found at several places in the United States, among which may be mentioned those of Gill, (Mass.) and Southbury, (Conn.)

2. It appears to be decomposed Mesotype.

CHONDRODITE. (See *Brucite.*)

CHRISTIANITE. (See *Anorthite.*)

CHROMATE OF LEAD. (See *Red Lead-Ore.*)

CHROME-OCHRE. Chromic Lusine-Ore.

Massive: composition impalpable: earthy and pulverulent.

Color dark green.

1. Infusible before the blow-pipe, but changes to a lighter green. With borax, it gives a fine green color.

2. *Analysis.*

Oxygen - - - - - -	29·89
Chrome - - - - - -	70·11

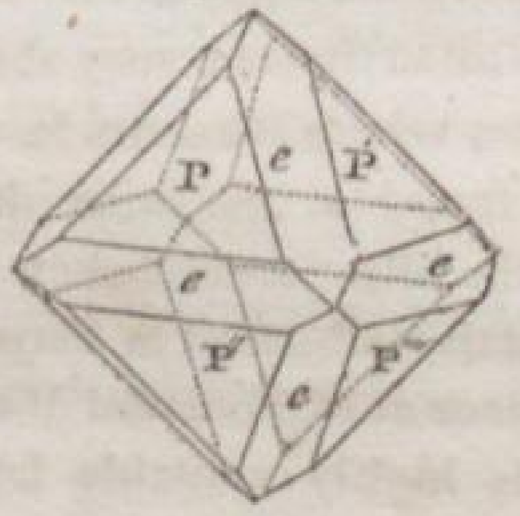
3. It sometimes occurs pure, but more frequently mingled with earthy matters, as in the mountains of Ecouchets, between Conches and Creuzot, Saone and Loire. Also with Feldspar at Elfdalen in Dalecarlia, and in serpentine rocks in the Alps of Savoy and Piedmont.

CHROME-ORE. Chromated Iron-Ore.

Primary form. Regular octahedron.

Secondary form.

Fig. 131.



Hoboken, (New Jersey,) and Bare Hills, (Maryland.)

Cleavage parallel with the primary form rather imperfect. Fracture uneven, or imperfectly conchoidal.

Lustre imperfectly metallic. Color between iron-black and brownish-black. Streak brown. Opake.

Brittle. Hardness = 5·5. Sp. gr. =4·498, a variety from Stiria.

Compound Varieties. Massive: composition granular, the individuals being of various sizes, and generally firmly connected.

1. Alone before the blow-pipe, it is infusible, but acts upon the magnetic needle after having been exposed to the reducing flame. It is with difficulty wholly soluble in borax, to which flux it imparts a beautiful green color.

2. *Analysis.*

	By Vauquelin.	By Klaproth.
Oxide of chrome	43·00	55·50
Protoxide of iron	34·70	33·00
Alumina	20·30	6·00
Silica	2·00	2·00

3. The varieties of Chrome-Ore have been hitherto found only in serpentine, in irregular veins and beds, which appear to be of contemporaneous formation with the rock itself.

4. This species was first found in the department of du Var in France, where it formed nodules and kidney shaped masses. In Stiria it occurs in the Gulsen mountain near Kraubat, in serpentine, in very irregular veins. Other localities are, Portsoy in Banffshire, and at Buchannan in Stirlingshire, in Scotland; in the latter place imbedded in limestone: at Unst and Fetlar in the Shetland isles, in Silesia, Bohemia and the Uralian mountains. In the United States a very abundant deposit exists at the Bare Hills near Baltimore, where it occurs in veins or masses in serpentine. The crystals are found at the same place in channels worn by water about the base of the hill. At Hoboken in New Jersey, it is found both massive and in crystals, imbedded in Serpentine and Dolomite; and under similar circumstances at Milford and West Haven, (Conn.)

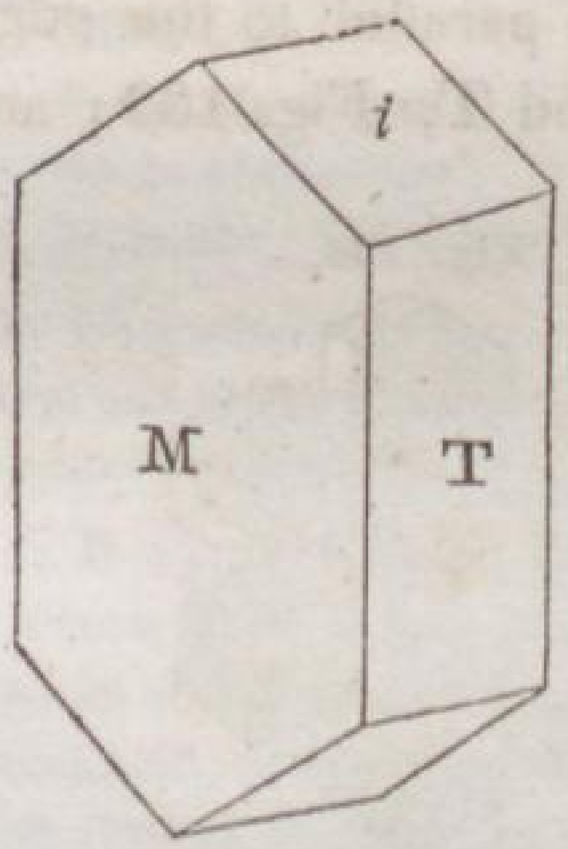
5. The Chrome-Ore is highly valuable for extracting the oxide of chrome, which is employed either alone, or in various combinations with the oxides of other metals, as cobalt, lead, mercury, &c., both for painting on porcelain, and for painting in oil. It yields green, yellow and red pigments.

CHRYSOBERYL. Prismatic Emerald.

Primary form. Right rectangular prism.

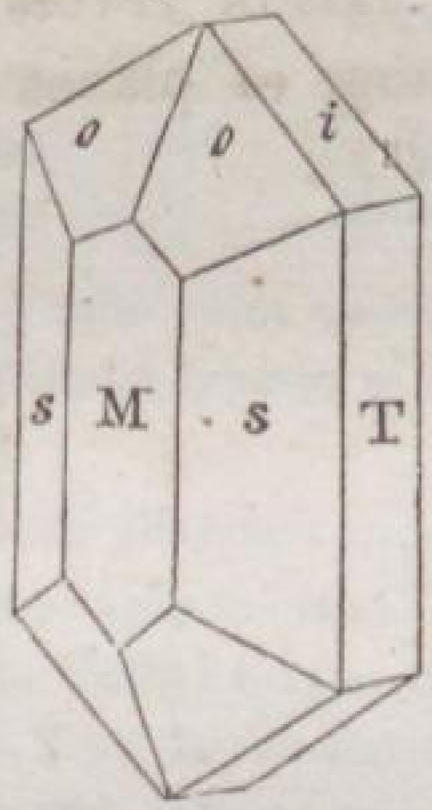
Secondary forms.

Fig. 132.



Haddam, (Conn.)

Fig. 133.



Siberia.

Fig. 134.

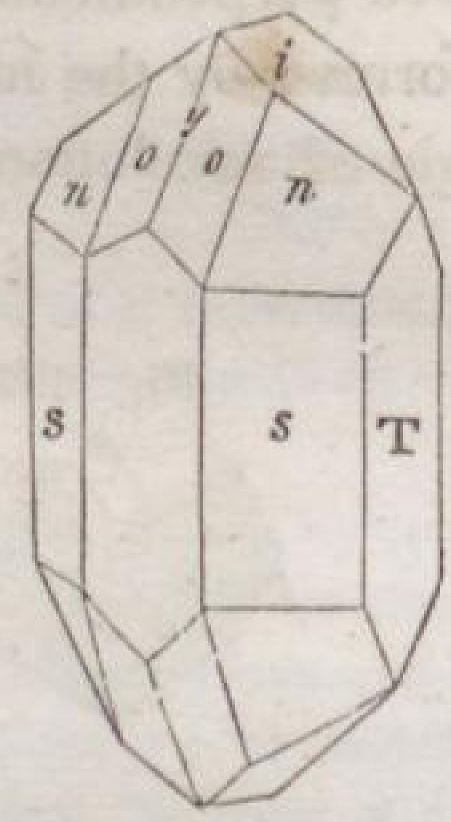


Fig. 132, the primary having the terminal plane obliterated by the extension of the planes *i*, which replace the shorter terminal edges. *i* on *i* = 120°, *anamorphique* of Hauy.—Fig. 133, in addition to the new planes *i*, the terminal angles and the lateral edges are replaced. *o* on *i* = 133° 19′, H. *o* on M = 136° 41′, H. M on *s* = 125° 16′.—Fig. 134 is the *octovigésimale* of Hauy. *n* on *o* = 163° 53′ H. T on *n* = 126° 8′ H.

Cleavage distinct parallel to the primary form; effected with ease parallel to M, but with difficulty in the direction of T and P. Traces of a diagonal cleavage. Fracture conchoidal. Surface, the vertical planes striated longitudinally; the remaining ones generally smooth and even.

Lustre vitreous. Color asparagus-green, passing into greenish-white, olive green, and yellowish-grey. Streak white. Transparent ... translucent: sometimes exhibiting a bluish opalescence when viewed perpendicular to the narrow lateral plane of the primary.

Hardness=8·5. Sp. gr. =3·754, a transparent variety.

Compound Varieties. Twin-crystals: face of composition perpendicular, axis of revolution parallel to the edge formed by the meeting of planes *i* and T, Fig. 132; angle of revolution=60°.

Fig. 135.

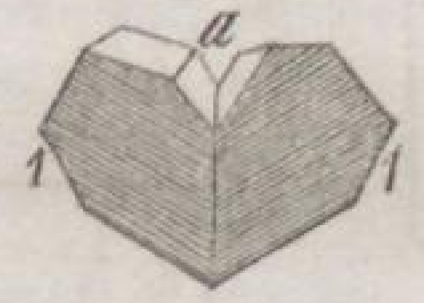
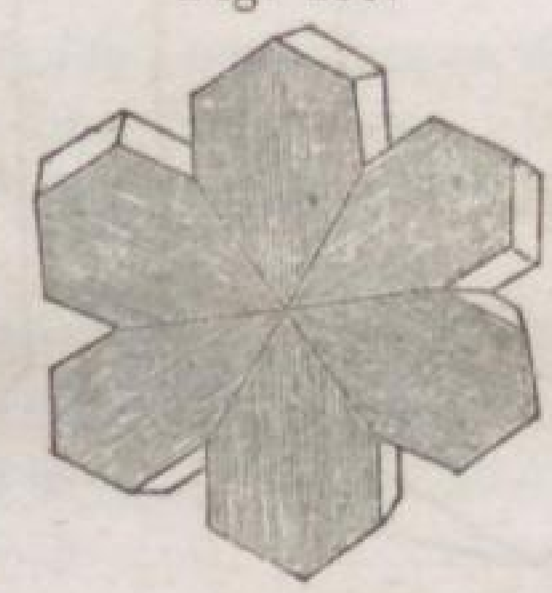


Fig. 136.



In Fig. 135, the crystals project beyond the face of composition only at one extremity; it is rare to find them projecting at both extremities, although these do sometimes occur at Greenfield, (N.Y.) Occasionally the sides 1 are so deeply replaced as to convert the macle into a triangular prism; and when this is the case, the re-entering angle at *a* is not visible, the composition being detected only by the striæ. In Fig. 136, three prisms cross each other, or the composition is repeated; and the prisms project at each end beyond the faces of composition. Rarely crystals are found, in which they project only at one end, in which case the form which results is represented by the upper half of Fig. 136; and still more rarely they are found in which they project at neither extremity, when a regular hexagonal table is produced.

1. It remains unchanged, if exposed alone or with soda to the heat of the blow-pipe, only the surface in the latter case becomes dull. It is with difficulty fusible with borax and salt of phosphorus.

2. *Analysis.*

	By Seybert, fr. Haddam.		By Seybert, fr. Brazil.		By Thomson and Muir, fr. Brazil.
Alumina -	73·60	-	68·666	-	76·752
Glucina -	15·80	-	16·000	-	17·791
Silica -	4·00	-	3·999	-	0·000
Protoxide of iron	3·38	-	4·733	-	4·494
Oxide of titanium	1·00	-	2·666	-	0·000
Moisture -	0·40	-	0·666	-	0·480

3. Chrysoberyl is found in granite veins associated with Tourmaline, Beryl and Garnet: also in the alluvial deposits of rivers, along with other species of gems.

4. It occurs in Brazil along with Diamond and Topaz, also in Ceylon; in which places it has been found only in sand. The most interesting deposits of this species are in the United States, at Haddam, (Conn.) and Greenfield, near Saratoga, (N.Y.) At the former place it is associated with Garnet, Beryl, Automalite and Columbite; and at the latter with Tourmaline, Garnet and Apatite. In both cases it exists in granite, traversing gneiss in veins.

CHRYSOCOLLA. Staphyline Malachite-Haloide.

Regular forms unknown. Cleavage none. Fracture conchoidal.

Color emerald-green, pistachio-green, asparagus-green, passing into sky-blue. If they incline to brown, the mineral is impure. Streak white, a little shining. Semi-transparent . . . translucent on the edges.

Rather sectile. Hardness = 2·0 . . . 3·0. Sp. gr. = 2·031, a semi-transparent variety.

Compound Varieties. Botryoidal, reniform shapes or massive varieties: composition impalpable; fracture more or less perfectly conchoidal. Pseudomorphoses in the shape of Red Copper-Ore and of Copper-Mica. Impure varieties are often earthy.

Chrysocolla.

1. Before the blow-pipe, upon charcoal, it first becomes black; and in the inner flame, red, without melting. With borax, it melts into a green glassy globule, and is partly reduced, as the metallic particles which this globule contains, evince. If pure it is soluble in nitric acid, without effervescence, and leaves a residue of silica.

2. *Analysis.*

	By KLAPROTH.	By JOHN.	By BOWEN, from N. Jersey.
Copper	40·00	42·00 }	45·175
Oxygen	10·00	7·63 }	
Silica	26·00	28·37	37·250
Water	17·00	17·50	17·000
Carbonic acid	7·00	3·00	0·000
Sulphate of lime	0·00	1·50	0·000

3. The natural repositories of Chrysocolla are those of other ores of copper, where it is found along with them, and also with Brown Iron-Ore and Quartz.

4. It occurs at Saalfield in Thuringia, at Lauterberg in the Hartz, at Saska and Moldawa in the Bannat, at Herrengrund in Lower Hungary, at Falkenstein and Schwatz in the Tyrol, in the Lizard district in Cornwall; in Norway, Siberia, Mexico and Chili. In the United States, at a copper mine in Sommerville, (New Jersey,) Chrysocolla is found accompanying Red Copper-Ore, Native Copper, and Green Malachite. In Nova Scotia, at the Basin of Mines, associated with other ores of copper, and with Brown Iron-Ore.

CHRYSOLITE. (See *Olivine.*)

CHRYSOPRASE. (See *Quartz.*)

CHUSITE. (See *Olivine.*)

CIMOLITE.

A pearl, or reddish grey clay, tender to the feel, and falling to pieces in water. It consists, according to KLAPROTH, of

Silica	63·00
Alumina	23·00
Water	12·00
Oxide of iron	1·25

It is not known from the decomposition of what mineral it is derived. It occurs at Argentiera, (Cimolis,) an island in the Grecian Archipelago.

CINNABAR. Peritomous Melacone-Blende.

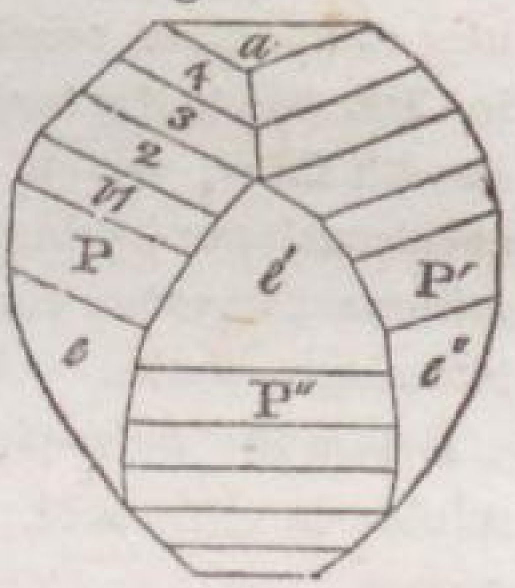
Primary form. Rhomboid. P on P′ =72°.

Secondary form.

P on P′	- - -	71°	48′
P on *b*2	- - -	157	20
P on *b*3	- - -	152	8
P on *e*	- - -	159	18
a on *b*1	- - -	127	5
a on *b*2	- - -	133	25
a on *b*3	- - -	138	34
a on *b*4	- - -	146	31
e on *b*1	- - -	142	55
e on *b*3	- - -	131	26

HAUY.

Fig. 137.



Cleavage parallel to the primary form, highly perfect. Fracture conchoidal. Surface of the crystals horizontally streaked, sometimes very deeply.

Lustre adamantine, inclining to metallic in dark colored varieties. Color several shades of cochineal-red, the darker varieties inclining to lead-grey. Streak scarlet-red. Semi-transparent . . . translucent on the edges.

Sectile. Hardness=2·0 . . . 2·5. Sp. gr. =8 098, the cleavage variety from Neurmarktel.

Compound Varieties. Twin-crystals. like Fig. 84, of the compound varieties of *Calcareous Spar*. Rarely in some indistinct imitative shapes. Massive: composition granular, of various sizes of individuals, generally small and often impalpable. In the last case, fracture becomes uneven, even, or flat conchoidal. Plates, superficial coatings. There is sometimes a tendency to thin columnar composition, the mass being friable, and the color scarlet red.

1. The *Hepatic Cinnabar* is a compound variety of Cinnabar, which is impure, and having on that account a streak inclining to brown. The *dark red* Cinnabar includes the crystals, and those compound varieties in which the individuals are still discernible; it is generally cochineal-red. The *bright red* Cinnabar is friable, and of a scarlet-red color. The *compact* Hepatic Cinnabar contains reniform massive varieties of a granular composition, consisting of impalpable individuals. The *slaty* Hepatic Cinnabar is the same thing, only interrupted by irregularly streaked smooth faces, which possess a slaty appearance. These however are accidental, not having any relation to the composition itself. The *Bituminous Cinnabar* consists of Cinnabar, intermixed with coarse coal or bituminous shale.

Before the blow-pipe, the pure varieties are easily volatilized. It is soluble in nitric acid. On being sublimated, it crystallizes in columnar masses.

2. *Analysis.*

By Klaproth.

Mercury	84·50	85·00
Sulphur	14·75	14·25

3. Cinnabar chiefly occurs in beds, accompanied by Native Mercury, Native Amalgam, and sometimes only by Calcareous Spar and Quartz. Some of its varieties have been found in veins, where they occur along with several ores of iron.

4. It occurs in beds in gneiss, at Richenaw in Upper Carinthia, and at Hartenstein in Saxony; also at Dumbrawa in Transylvania, in greywacke. It is found included in irregular veins, situated in beds of limestone, at Harmagor, Windisch-Kappel, and other places in Carinthia, but particularly at Neumarktel in Carniola, the Palatinate, and Almaden in Spain. At Idria, it occurs in beds of bituminous shale, with Bitumen and dark grey sandstone, associated with limestone. Other localities are Schemnitz, Cremnitz, and Rosenau in Hungary, at Horzowitz in Bohemia, in the Erzberg, near Eisenerz in Stiria. The Hepatic Cinnabar has been found only at Idria; the bright-red Cinnabar at Wolfstein in the Palatinate. Cinnabar likewise abounds in Mexico and Peru, in China and Japan.

5. It is used for the extraction of mercury; if very pure, it is employed as a pigment in its natural state.

CLAUSTHALITE. Paratomous Polypoione-Glance.

Massive: individuals granular: the larger ones having one bright cleavage; also in minute lamellar masses.

Lustre metallic. Color lead-grey, with a tinge of blue. Streak dark grey.

Hardness, below Galena. Sp. gr. = 6·8.

1. Heated in a glass tube before the blow-pipe, the selenium sublimes and fills the upper part of the tube with crystals of selenic acid. Upon charcoal it smokes, and tinges the flame of the blow-pipe blue. Cold nitric acid, after some time, causes the mass to assume a red color in consequence of the separation of selenium.

2. *Analysis.*

	By Rose.	By Stromeyer.
Lead	72·3	70·98
Selenium	27·7	28·11
Cobalt	00·0	0·83

3. It is found in the eastern part of the Hartz, at several places not far apart, one of which is Lorenz, near Klausthal; another is near Zorge, in the veins of iron-ore which traverse the argillite; and another still is near Tilkerode. The mineral is contained in a dolomite or argillite, accompanied by Malachite and Quartz.

Appendix to Seleniuret of Lead.

i. *Seleniuret of Lead with Seleniuret of Cobalt.*

Sp. gr. = 7·697. Found by Rose to contain

Lead	63·92
Cobalt	3·14
Selenium	31·42
Iron	0·45
Loss	1·07

It is found near Klausthal, engaged in dolomite.

ii. *Seleniuret of Lead with Seleniuret of Copper.*

Sp. gr. = 5·0 . . . 7·0. Analysis by Rose.

Selenium	29·96
Iron with traces of lead	0·44
Lead	59·67
Iron	0·33
Copper	7·86
Undecomposed and loss	1·74

Another sample gave,

Selenium - - -	34·26
Copper - - -	15·45
Lead - - -	47·43
Silver - - -	1·29
Oxide of lead and iron - - -	2·08

From Tilkerode, in veins of dolomite with Malachite.

iii. *Seleniuret of Lead and Mercury.*

Sp. gr. = 7·3.

Selenium - - -	24·97
Lead - - -	55·84
Mercury - - -	16·94
Loss - - -	2·25

It gives when heated in an open tube a yellow sublimate of the seleniate of mercury.

It is found at the mine Tilkerode, engaged in dolomite.

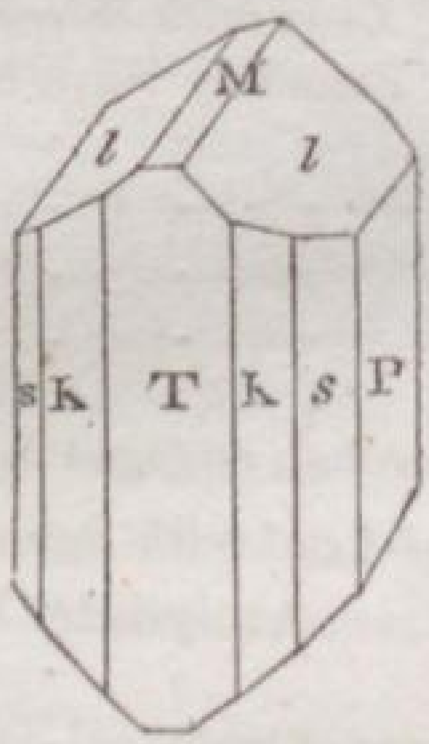
Cleavelandite. (See *Albite.*)

COBALT-BLOOM. Diatomous Cobalt-Mica.

Primary form. Right oblique-angled prism. M on T = 124° 51′.

Secondary form.

Fig. 138.



The greater terminal edges are replaced by single planes, and the lateral edges by two planes. *k* on *k* = 130° 10′. *s* on *s* = 94° 12′. *l* on *l* = 118° 23′.

Cleavage, parallel to P perfect: that parallel with M and T scarcely visible. Surface, P and T streaked vertically.

Lustre upon P pearly, particularly if produced by cleavage. The rest of the faces possess adamantine lustre inclining to vitreous.

Color, crimson-red, cochineal-red, peach blossom-red, sometimes pearl-grey or greenish grey. The red tints of the former, by transmitted light, incline much more to blue if seen in a direction perpendicular to P. Streak corresponding to the color, though a little paler. If the mineral be crushed into powder in a dry state, this powder possesses a deep lavender-blue tinge, which is not the case if the powder be comminuted in water. Transparent to translucent on the edges. Crystals are least transparent in a direction perpendicular to P.

Sectile; thin laminæ are flexible in one direction. Hardness=1·5 . . . 2·0; the lowest degrees are upon P. Sp. gr. =2·948, a red crystallized variety from Schneeberg.

Compound Varieties. Implanted globular and reniform shapes; surface drusy; composition more or less perfectly columnar of various sizes of individuals, faces of composition either smooth or rough. Massive, composition columnar, often stellularly divergent, and aggregated in a second granular composition, faces of composition rough. Sometimes in a state of powder, as a coating upon other minerals.

1. Alone, before the blow-pipe, it assumes a darker hue. Upon charcoal, it emits copious arsenical fumes, and melts in the inner flame, into a bead of arseniuret of cobalt. With borax and other fluxes, it yields a fine blue colored salt.

2. *Analysis.*
By Bucholz.

Oxide of cobalt - - - -	39·00
Arsenic acid - - - -	37·00
Water - - - -	22·00

3. Cobalt-bloom occurs in veins, traversing rocks of various ages, and also in beds. It is accompanied by Copper Nickel, Smaltine, Native Bismuth, Malachite, Quartz and Calcareous Spar.

4. The principal localities of this species are Schneeberg and Annaberg in Saxony, and Platten in Bohemia, where it occurs in veins in primitive rocks; Saalfeld in Thuringia, Riegelsdorf and Bieber in Hessia, where it is found in veins in secondary mountains. Other locatities are Würtemberg in Prussia, Tyrol, Norway, Sweden, Cornwall and Scotland.

5. When in sufficient quantity, it is employed in the manufacture of smalt.

COBALTINE. Hexahedral Eruthleucone-Pyrites.

Primary form. Cube.

Secondary forms.

1. Cube with its angles replaced by tangent planes.
2. Regular octahedron.
3. Regular octahedron with its solid angles replaced by tangent planes.

Fig. 139.
4.

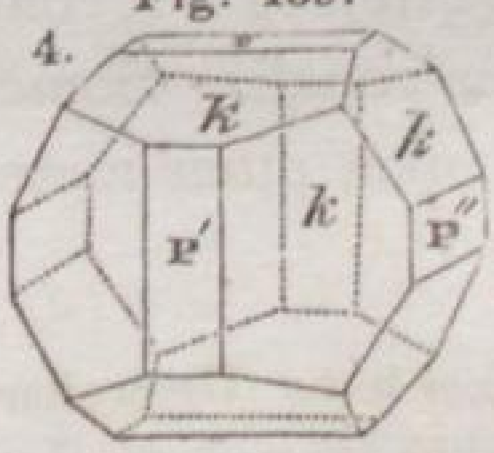


Fig. 140.
5.

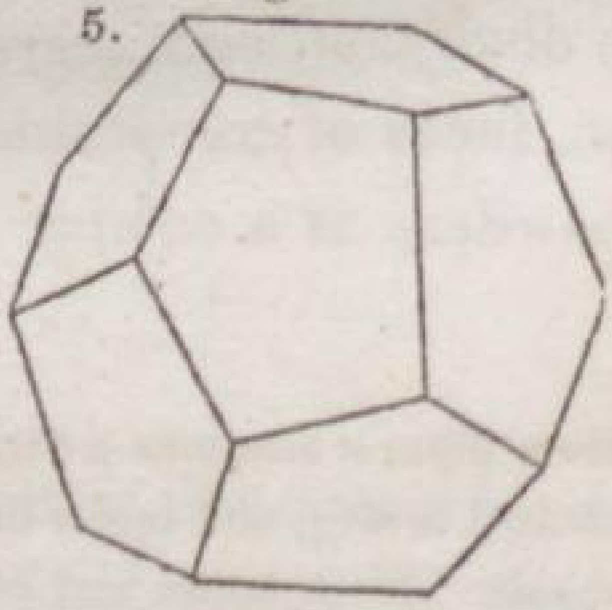
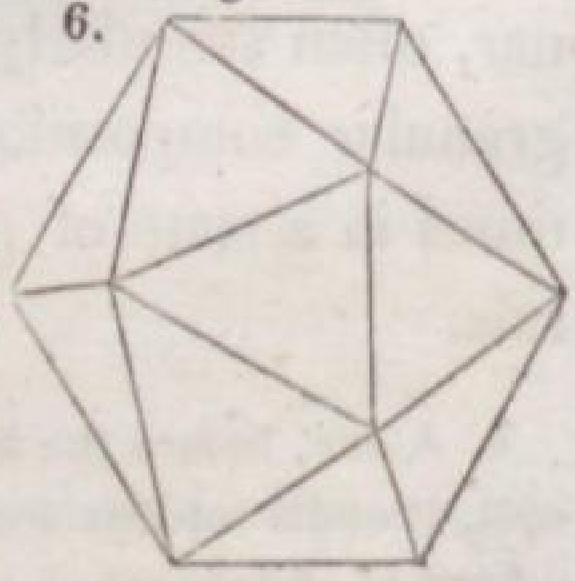


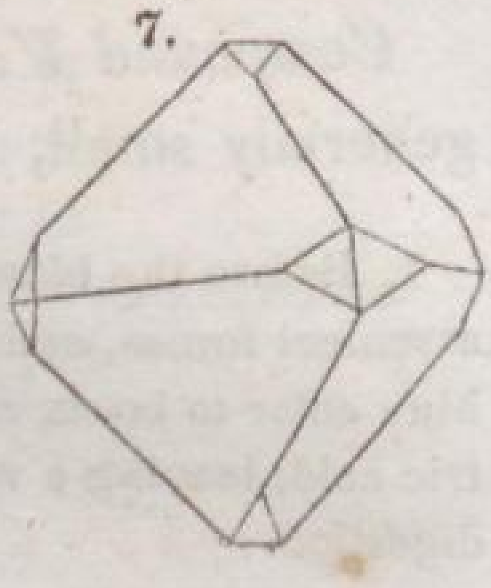
Fig. 141.
6.



Cobaltine.

Fig. 142.

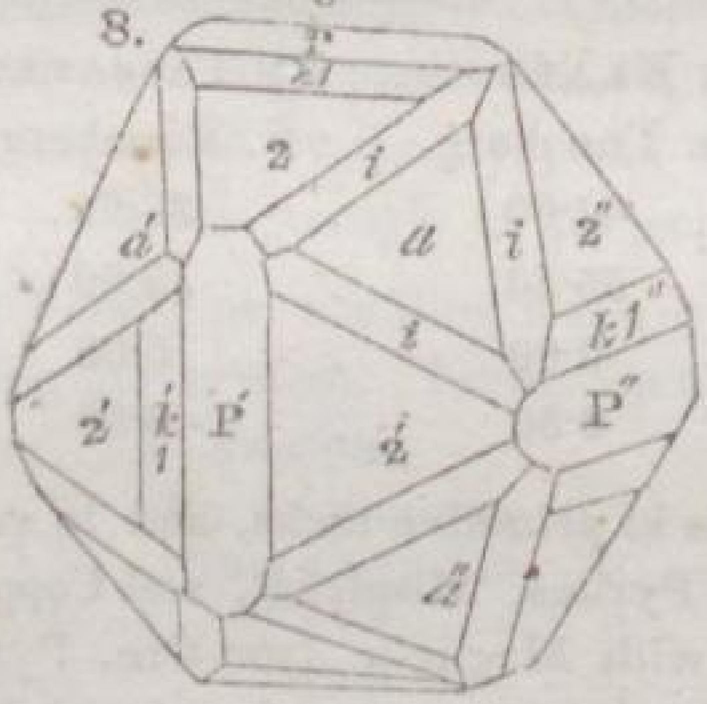
7.



Differing from fig. 139 by the reduction of the irregularly six-sided planes *k*, to small triangles.

Fig. 143.

8.



P on P' or P'' . . .	90°	00'	00''	00'''	H.
a on *a'* or *a''* . . .	109	28	16	00	P.
P' or P'' on *a* . .	125	15	52	00	P.
P on *k*1, P' on *k*1', or P'' on *k*2''	166	30	00	00	P.
P on *k*2, P' on *k*2', or P'' on *k*2''	153	26	5	30	H.
a or *a'* on *k*2 . . .	140	46	17	00	P.
a on *i* . . .	163	27	00	00	P.
*k*2' on *k*2' . . .	126	52	11	00	H.

The above crystals, all from Tunaberg, (Sweden.)

Cleavage parallel with faces of the cube, perfect. Fracture imperfectly conchoidal, uneven. Surface, the faces of the cube streaked in three directions perpendicular to each other. The remaining faces smooth.

Lustre metallic. Color silver-white, inclining to red. Streak greyish-black.

Brittle. Hardness = 5·5. Sp. gr. = 6·298.

Compound Varieties. Massive: composition granular, generally small, but easily discernible.

1. Before the blow-pipe, upon charcoal, it gives a large quantity of arsenical fumes, and melts only, after having been roasted. It imparts a blue color to borax and other fluxes. It affords a pink solution with nitric acid, leaving a white residue, which is itself dissolved on further digestion.

2. *Analysis.*

	By KLAPROTH, fr. Tunaberg.	By TASSAERT, fr. Tuuaberg.	By STROMEYER, fr. Modum.
Cobalt	44·00	36·00	33·10
Arsenic	55·50	49·00	43·46
Iron	0·00	5·66	3·23
Sulphur	0·50	6·50	20·08

3, It occurs in beds in primitive rocks, and in veins. It is accompanied chiefly by Iron Pyrites, Mispickel, and Copper Pyrites; in beds, it is also associated with Magnetic Iron-Ore, Pyroxene, Hornblende, and Feldspar; in veins it is sometimes found with limestone and Heavy-Spar. The crystals found in beds are terminated on all sides.

4. This species occurs in the parish of Modum in Norway, at Tunaberg in Südermanland in Sweden, at Querbach in Silesia, and Bottallack near St. Just in Cornwall.

5. It is a valuable ore of cobalt, which metal is employed for painting in porcelain and the manufacture of smalt.

COBALT VITRIOL. Staphyline Vitriol-Salt.

Stalactitic and coralloidal shapes: composition columnar, in most cases impalpable. Friable.

Lustre vitreous: in very thin columnar compositions, it becomes pearly. Color flesh-red and rose-red ... reddish white. Semi-transparent ... translucent.

Taste astringent.

1. It communicates to borax a blue color; and is soluble in water.

2. *Analysis.*
By Kopp.

Oxide of cobalt . . .	38·71
Sulphuric acid . . .	19·74
Water . . .	41·55

3. It occurs in the rubbish of old mines at Bieber in the neighborhood of Hanau.

Coccolite. (See *Pyroxene.*)

Collyrite.

Massive: composition impalpable. Color white. More or less translucent. Fracture conchoidal, with resino-vitreous lustre. Easily impressed by the nail, and shining when cut with the knife. Adheres strongly to the tongue.

1. Infusible before the blow-pipe, affording water by calcination, and at the same time becoming pulverulent. Forms a jelly in the acids.

2. *Analysis.*

	By Klaproth, from Chemnitz.	By Berthier, from Esquera.
Silica . . .	14·0	15·0
Alumina . . .	45·0	44·5
Water . . .	42·0	40·5

3. It occurs in narrow seams in porphyry at Schemnitz, in the lead mines of Esquera in the Pyrenees, and at Weissenfels in Saxony.

Colophonite. (See *Garnet.*)

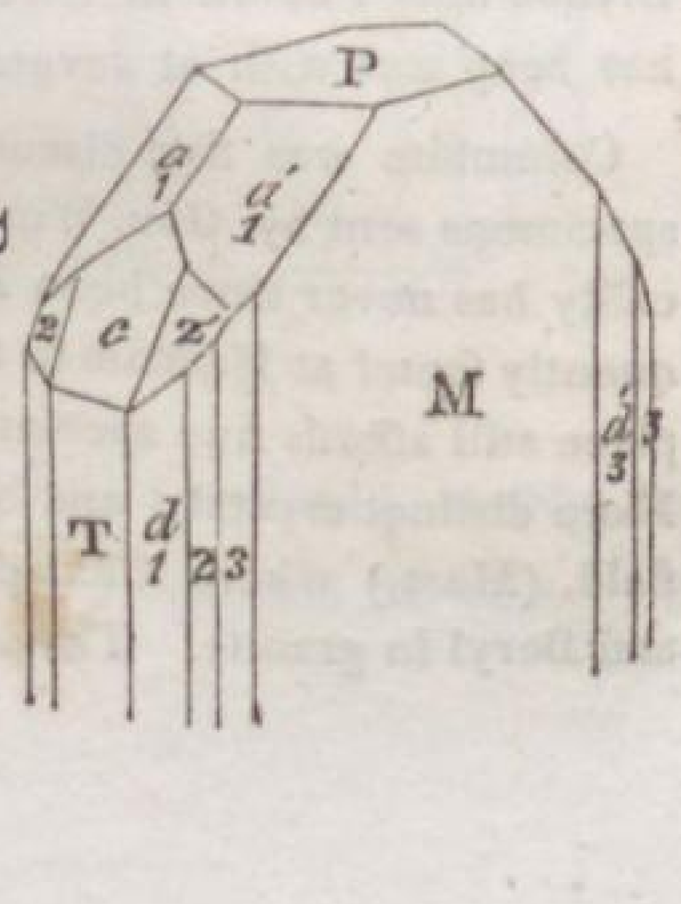
COLUMBITE. Pyramidal Baryte-Ore.

Primary form. Right rectangular prism.

Secondary form.

P on M or T	-	90° 00′	Brooke.
M on T	-	90 00	
P on $a1$ or $a1'$	-	136 30	
P on c	-	120 00	
T on $d1$	-	156 30	
T on $d2$	-	114 30	
T on c	-	150 00	

Fig. 144.



Cleavage parallel with M and T rather distinct, especially that of M: the cleavage parallel with P less obvious. Fracture imperfectly conchoidal, uneven. Surface, M and T vertically streaked.

Lustre imperfectly metallic. Color greyish and brownish-black. Streak dark brownish-black, on the file a little shining. Opake.

Brittle. Hardness = 6·0. Sp. gr. = 6·038.

Compound Varieties. Massive: composition granular.

1. Upon charcoal, it suffers no change before the blow-pipe, but it melts with borax, and is partly soluble in heated sulphuric acid.

2. *Analysis.*

	By Berzelius. fr. Kimito.	By Berzelius. fr. Finbo.	By Berzelius. fr. Brodbo.	By Vogel. fr. Bodenmais.	By Borkowsky, fr. Bodenmais.
Columbic acid	83·2	66·99	68·22	75·00	75·00
Tungstic acid	0·0	0·00	6·19	0·00	0·00
Protoxide of iron	7·2	7·06	8·60	17·50	20·00
Protoxide of manganese	7·4	7·44	6·62	1·09	4·00
Oxide of tin	0·6	16·75	8·26	1·00	0·50
Lime	a trace.	2·40	1·19	0·00	0·00

The Columbite of Chesterfield, (Mass.) consists of the oxides of columbium, tin, iron and manganese, with a trace of lime.

3. Columbite occurs in granite veins, usually attended by Beryl.

4. It is found at Bodenmais in Bavaria, associated with Beryl and Uranite, where it exists in very distinct crystals. Also at Finbo and Brodbo near Fahlun in Sweden, with Topaz, Albite, and Quartz. It has been met with at several other places in Sweden and Finland.

Columbite was first discovered near New London, (Conn.) and the specimens sent by Gov. Winthrop to Sir Hans Sloane. The original locality has never since been re-discovered; but the mineral was subsequently found at Haddam in the well known Chrysoberyl deposit, which place still affords fine specimens of it, though in very limited quantity. More distinct crystals, and of greater magnitude, come from Chesterfield, (Mass.) where it exists along with variously colored Tourmalines and Beryl in granite. The most perfect crystals, as well as the largest of this species which the United States have afforded, have been found at Acworth, (New Hampshire,) but the locality appears to be exhausted.

APPENDIX TO COLUMBITE.

Brown Tantalite of Kimito. BERZELIUS.

Sp. gr. = 7·9. Powder cinnamon-brown.

When heated with borax, in a very fine powder, it is with difficulty dissolved. The glass does not possess the color of the oxides of iron, except a dark green color, which exists only during the experiment. With salt of phosphorus, it is readily dissolved. It becomes minutely divided with soda, but does not dissolve, giving in the reduction flame a little tin, and upon platina-foil the reaction of manganese.

2. *Analysis.*

By BERZELIUS.

Columbic acid . . .	82·56
Protoxide of iron . . .	14·41
Protoxide of manganese . .	1·79
Oxide of tin . . .	0·56
Silica . . .	0·72

It is probable that future researches may render it necessary to divide the species Columbite, but at present our knowledge of the properties of its varieties do not justify the procedure.

COMMON SALT. Hexahedral Rock-Salt. MOHS.

Primary form. Cube.

Secondary forms.

Fig. 145.

1.

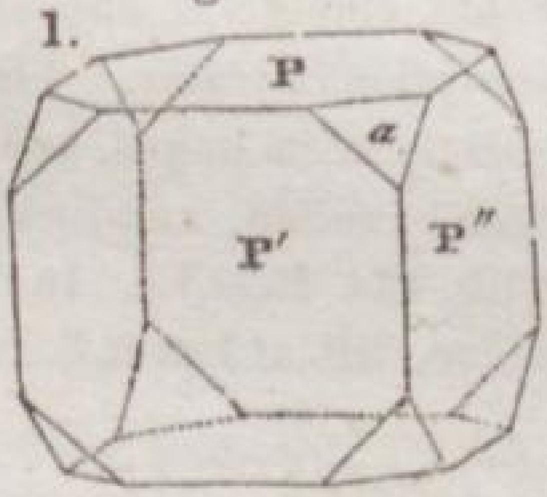
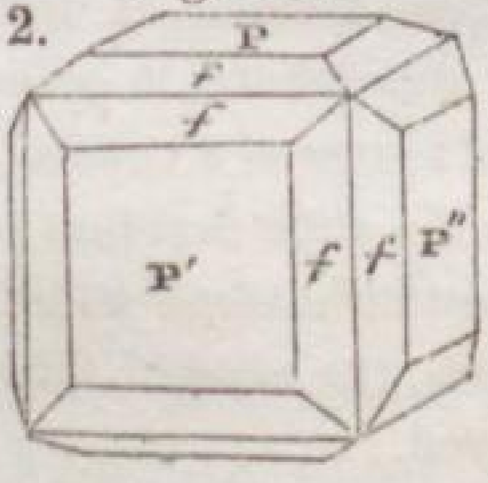


Fig. 146.

2.



3. Octahedron.

Cleavage, parallel with the cube, perfect; rarely also the crystals cleave parallel with the diagonals of this form.

Fracture conchoidal. Surface generally smooth.

Lustre vitreous, somewhat inclining to resinous. Color generally white, passing into yellow, flesh-red and ash-grey. Sometimes beautifully violet, berlin or azure-blue. Streak white. If scratched with the nail, it does not yield any powder, but receives an impression, and becomes a little shining. Transparent . . . translucent.

Rather brittle. Hardness = 2·0. Sp. gr. = 2·257, a yellowish-white transparent variety. Taste saline.

Compound Varieties. Dentiform and some other imitative shapes, rare. Commonly massive. Composition granular or columnar, the latter in most cases parallel, sometimes curved. Size of the component individuals various. Faces of composition rough.

1. Several varieties in the geological relations, and some differences in the chemical composition, have given rise to the subdivision of Common Salt into subspecies in the older books. Thus the varieties found in beds have been called *Rock-salt;* such as are found at the bottom of salt lakes, or on their shores, *Sea-salt;* and the former again have been divided into *foliated* and *fibrous* Rock-salt, according to their granular or columnar mode of composition.

Common salt is very easily soluble in water. It remains unaltered, if exposed to the dry atmosphere, and decrepitates upon glowing charcoal, or before the blow-pipe. It crystallizes, both from solutions in water, and from fusion. It undergoes a remarkable change if exposed to a moist atmosphere, in consequence of the absorption of water. The solution of a mass of a cubical shape begins regularly at its edges, and transforms the cube first into a cube with its edges bevelled, and finally into the icositetrahedron with triangular faces. (fig. 124. Part I.) In the latter form, the mass of the salt diminishes in size, till at last it is entirely dissolved.

2. *Analysis.*

By Henry. [*Rock-salt* variety.]

Muriate of soda . . .	983 25
Sulphate of lime . . .	6·50
Muriate of magnesia . . .	0·19
Muriate of lime . . .	0·06
Undissolved matter . .	10·00

3. Common salt occurs chiefly in beds, some of which are of considerable dimensions, though commonly of an irregular form, and is met with in secondary rocks, accompanied by gypsum, sandstone and clay. It is likewise found at the bottom and in the vicinity of salt lakes, in the waters of which it is dissolved. It is contained in the waters of salt springs, of several mineral wells, and of the sea, though in variable quantities. It occurs upon certain varieties of lava, and in some volcanic lakes.

4. In the solid state, it exists in large quantity in Poland, Hungary, Transylvania, Moldavia, and Walachia, in Stiria, Upper Austria, Salzburg, the Tyrol, Bavaria, Würtemberg and Switzerland; also in England and Spain, and numerous other countries in and out of Europe. In several of these countries, and also in several of the United States, Common Salt exists abundantly in salt springs, from which it may be obtained by means of evaporation. The variety sea-salt is found in the Crimea, in the deserts of the Caspian Sea, in Egypt, and in several places in Southern Africa and America.

5. The employment of common salt for culinary purposes, in different arts and manufactures, is too familiar to need enumeration.

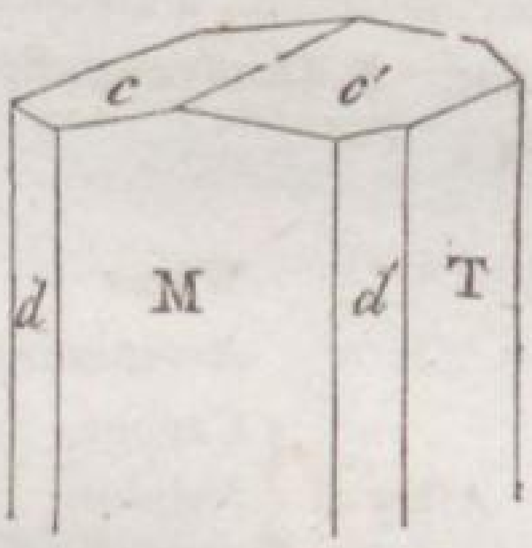
COMPTONITE. Vesuvian Kouphone-Spar.

Primary form. Right rectangular prism.

Secondary form.

M on T	-	90°	00′	PHILLIPS.
T on *c*′	-	93	00	
c on *c*′	-	107	05	
M on *d*′	-	135	35	

Fig. 147.



Cleavage parallel to T and M, the first a little more distinct; also parallel to the diagonal. Fracture small conchoidal, uneven. Surface *d* striated parallel to the edges of combination with M and T. The remaining faces smooth.

Comptonite.

Lustre vitreous. Color white. Streak white. Transparent . . . semi-transparent.

Hardness =5·0 . . . 5·5.

1. Before the blow-pipe it gives off water, intumesces a little, and becomes opake; then it melts imperfectly into a vesicular glass. The globule obtained with borax is transparent, but vesicular; that obtained with salts of phosphorus contains a skeleton of silica, and becomes opake on cooling. With a little soda, it melts imperfectly; but with a larger quantity, it becomes infusible. The glass, with solution of cobalt, is dirty bluish-grey. It forms a gelatine when exposed in the state of powder to the action of nitric acid.

2. It occurs in the cavities of an amygdaloidal rock, along with Harmotome, at Mount Vesuvius.

Condurrite.

Massive: composition columnar, dividing into irregular portions like starch. Fracture flat conchoidal.

Lustre metallic. Color brownish-black. Sometimes highly polished, with a tinge of blue. In powder, soot black.

Hardness, does not scratch glass; is brittle, but yields to the knife, leaving a polished metallic-looking surface nearly of a lead-grey color.

1. A fragment placed on a red-hot coal, affords a copious white vapor, leaving behind a metallic substance, in a semi-fluid state of a yellowish color. It dissolves entirely in nitric acid.

2. *Analysis.*

By Faraday.

	Water	8·98
	Arsenious acid	25·944
Alloy of	Copper	60·498
	Sulphur	3·064
	Arsenic	1·504
	Iron	a trace.

It is probably a mechanical mixture of metallic arsenic, arseniate of copper, oxide of copper, and a little Copper Pyrites, one or more of these substances being in combination with water. Should this suggestion prove correct, it will not deserve to be ranked among the species of mineralogy.

3. It was discovered in the Condurrow mine at Cornwall.

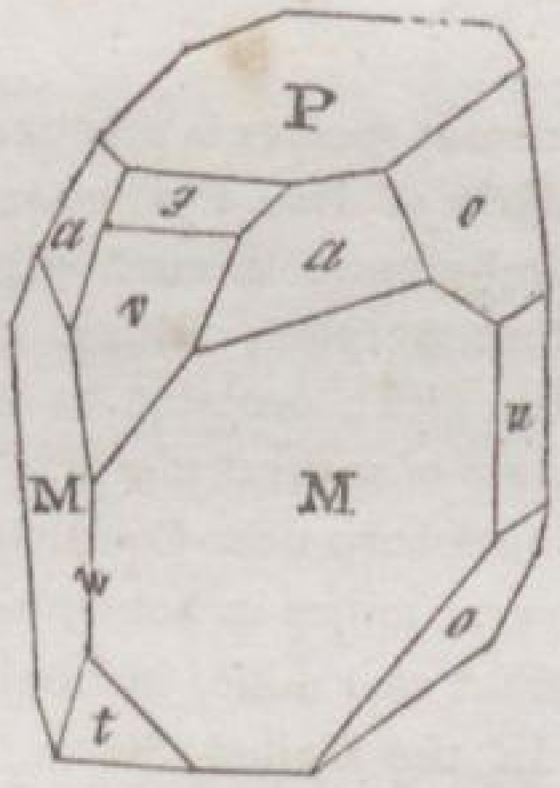
CONITE. (See *Dolomite.*)

COPPERAS. Hemi-Prismatic Vitriol-Salt. MOHS.

Primary form. Oblique rhombic prism. M on M′= 82° 20′. P on M or M′=99° 20′.

Secondary forms. The primary is almost invariably affected by slight replacements of the acute and obtuse solid angles, as well as of the acute and obtuse terminal edges. More rarely the lateral edges are removed also.

Fig. 148.



Cleavage, parallel to P perfect; that parallel to M less perfect. Fracture conchoidal. Surface generally smooth.

Lustre vitreous. Color, several shades of green, passing into white. Streak white. Semi-transparent...translucent. A faint bluish opalescence sometimes observable parallel to the faces M.

Rather brittle. Hardness =2·0. Sp. gr. =1·832 of a variety containing about 0·1 of sulphate of copper. Taste sweetish astringent and metallic.

Compound Varieties. Stalactitic, botryoidal, reniform: composition columnar; if the particles become very thin, the lustre approaches to pearly. Massive: composition granular. Pulverulent.

1. Before the blow-pipe it becomes magnetic, and colors glass of borax, green. It is easily soluble in water, and the solution becomes black on being mixed with tincture of galls. If exposed to the open air, it soon becomes covered with a yellow powder, which is persulphate of iron.

2. *Analysis.*

By Berzelius.

Oxide of iron	25·7
Sulphuric acid	28·9
Water	45·4

3. In most cases, the present species is produced by the decomposition of other minerals, particularly of Iron Pyrites and White Iron Pyrites; and it is therefore commonly found in such places, in which artificial heaps, constructed for that purpose, mines, or other circumstances brought about by art, have given occasion to its formation. It is also found dissolved in the waters of several mines.

4. It occurs in the Rammelsberg near Goslar in the Hartz, at Schwarzenberg in Saxony, in several mines in Schemnitz in Hungary; also in Sweden, in Spain, in different coal mines in England; at Hurlet in Renfrewshire in Scotland. In the United States, numerous localities of Copperas have been discovered, especially in New England, in which section of the country it exists in the form of crusts upon the surfaces of those mica-slate rocks, which happen to abound in Iron Pyrites.

5. Both the natural and the artificial Copperas are used in dyeing, in making ink and Prussian blue, and also for producing sulphuric acid; the residue from the distillation being red oxide of iron, is employed as a color, and for a polishing substance.

COPPER MICA. Rhombohedral Euchlore-Mica. Mohs.

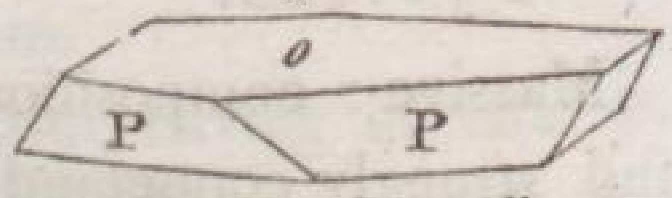
Primary form. Rhomboid. P on P=69° 30′.

Copper Mica.

Secondary form.

The annexed figure is the primary, having the summits replaced by single planes.

Fig. 149.



Tingtang, Cornwall.

Cleavage, parallel with P, or the primary, only in traces; but parallel with *o*, with great ease. Surface, *o* smooth, sometimes striated in triangular directions. P often a little uneven.

Lustre pearly upon *o*, both as faces of cleavage, and as faces of crystallization. The faces P possess a lustre intermediate between vitreous and adamantine. Color, emerald-green and grass-green. Streak emerald-green to apple-green, rather paler than the color. Transparent ... translucent.

Sectile. Hardness =2·0. Sp. gr. =2·5488.

Compound Varieties. Massive: composition granular of various sizes of individuals; faces of composition uneven and rough.

1. Before the blow-pipe, it loses both color and transparency, emits fumes of arsenic, and is changed into a friable scoria, containing some white metallic globules. With borax it yields a green globule, and is partly reduced. In nitric acid, it is soluble without effervescence.

2. *Analysis.*

By Chenevix.

Oxide of copper . . .	49·00
Arsenic acid . . .	14·00
Water . . .	35·00

3. The present species occurs in copper veins, along with various other ores of copper, particularly with the Liroconite, and with Brown Iron-Ore and Quartz.

4. It is found only in some of the copper mines near Redruth in Cornwall; and in minute crystals at Herrengrund in Hungary.

COPPER NICKEL. Cupreous Eruthleucone-Pyrites.

Massive: composition granular, individuals being small, and strongly connected: reniform, composition columnar, generally impalpable. Fracture uneven.

Lustre metallic. Color copper-red. Streak pale brownish-black.

Brittle. Hardness =5·0 ... 5·5. Sp. gr. =7·655.

1. Before the blow-pipe, it melts upon charcoal, and emits an arsenical smell. The remaining metallic bead is white and brittle. In nitric acid, it soon becomes covered with a green coating. It is soluble in nitro-muriatic acid.

2. *Analysis.*

By Pfaff.

Nickel	44·206	(with a little cobalt.)	48·96
Arsenic	54·726		46·42
Iron	0·337		0·34
Lead	0 320		0·56
Sulphur	0·401		0·80

3. The Copper Nickel chiefly occurs in veins in various classes of rocks, occasionally occurring in them as beds. It is almost always accompanied by Smaltine; sometimes also by ores of silver and lead, and often invested by Nickel-ochre.

4. The present species is found in veins at Schneeberg, Annaberg, Marienberg, Freiberg, Gersdorf and other places in Saxony; at Joachimsthal in Bohemia; at Saalfeld in Thuringia; at Riegelsdorf in Hessia; in the Hartz and Black Forest; also at Allemont in Dauphiny, and in several of the mines of Cornwall. In beds, it occurs at Schladming in Upper Stiria, and in the neighborhood of Orawitza, in the Bannat. It occurs in the United States at Chatham in Connecticut, accompanied by Smaltine in gneiss.

5. Doebereiner has observed that the metallic alloy, consisting chiefly of arsenic and nickel, which is obtained from the process of fabricating smalt, often crystallizes in four-sided tabular crystals, and is in every respect similar to Copper Nickel.

Cordierite. (See *Iolite.*)

CORNEOUS LEAD. Kerasine Lead-Baryte.

Primary form. Right square prism.

Secondary form. The primary form having its lateral and terminal edges replaced by single planes.

Cleavage, parallel to the lateral planes of the primary; cross fracture conchoidal.

Lustre adamantine. Color white and pale tints of grey, yellow and green. Streak white. Transparent to translucent.

Sectile. Hardness below 3·0. Sp. gr. =6·056.

1. Before the blow-pipe, it melts quickly into a yellow globule, which becomes white and crystallizes upon the surface, when cooling. Upon charcoal, it is reduced.

2. *Analysis.*

By Klaproth.		By Berzelius, fr. Mendip.	
Oxide of lead	85·5	Lead	25·85
Muriatic acid	8·5	Oxide of lead	57·07
Carbonic acid	6·0	Carbonate of lead	6·25
Chlorine	0·0		8·84
Silica	0·0		1·46
Water	0·0		0·54

3. It is found at the Mendip hills in Somersetshire, at Matlock in Derbyshire, Hausbaden near Badenweiler in Germany, and in the United States at Southampton, (Mass.)

CORUNDUM. Rhombohedral Corundum. Mohs.

Primary form. Rhomboid. P on P′=86° 4′.

Secondary forms. 1. Regular six-sided prism. 2. The same, having the terminal edges replaced. 3. Dodecahedron with isosceles-triangular faces, the upper pyramid inclining to the lower under 121° 34′. 4. The same, with the summits replaced by single planes.

Corundum.

Fig. 150.

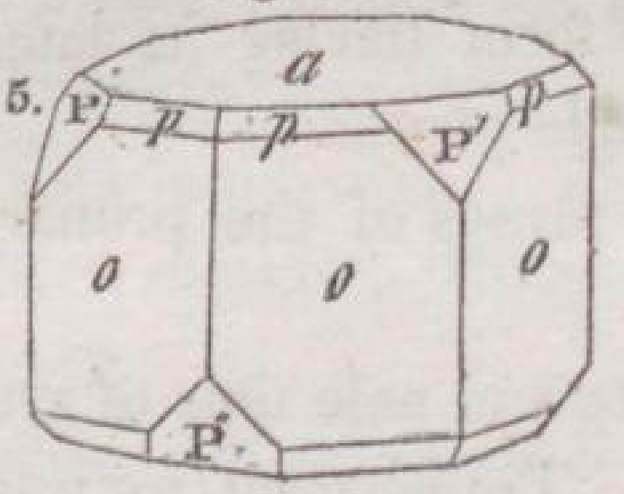
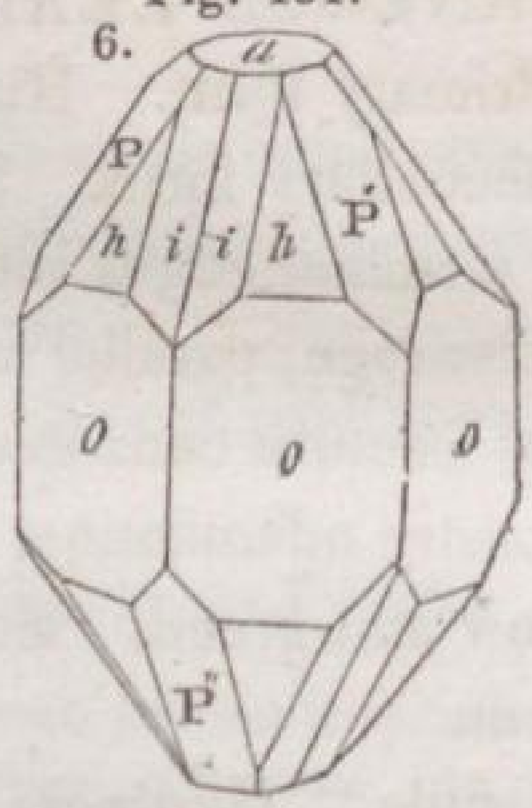


Fig. 151.



P on P′	- -	= 86°	4′	Phillips.
P on *a*	- -	122	30	
P on *o*	- -	137	30	
p on *o*	- -	151	30	
p on *a*	- -	118	30	
o on *a*	- -	90	00	
p on P	- -	154	7	
h on *h*	- -	128	20	
h on *a*	- -	118	56	
h on *o*	- -	151	17	
P on *h*	- -	154	2	

Cleavage parallel with *a* perfect : but sometimes interrupted by conchoidal fracture. The faces obtained in the direction of P are commonly the result of composition. The faces of cleavage and regnlar composition are striated parallel to their common edges of intersection. Fracture conchoidal to uneven. Surface *a* striated parallel to the edges of combination with P. The isosceles pyramids are often deeply striated in a horizontal direction.

Lustre vitreous, much inclining in some varieties to pearly upon *a*. Color, blue, red, green, yellow, brown, grey and white. Some of the blue, red and yellow colors, very lively and beautiful. Streak white. Transparent . . . translucent. In several varieties, if cut round, a six-sided opalescent star is observable in the direction of the axis.

Hardness = 9·0.

Sp. gr. =3·979, blue, transparent (Sapphire.)
3·949, green, translucent (Corundum.)
3·921, brown, faintly translucent (Adamantine-Spar.)
3·909, red, transparent (Ruby.)

Compound Varieties. Regular composition parallel to one or more faces of P, repeated in parallel layers, very frequent. Massive: composition granular, often impalpable, and then the fracture becomes splintery and uneven.

1. Most of the transparent simple varieties have been designated *Sapphire*, while the compound ones have been called *Emery*. The varieties of Sapphire, generally possess an indistinct cleavage, and a conchoidal fracture; the surface of its crystals is smooth, though not always even. The remaining varieties differ almost only in color,—*Corundum*, comprehending those whose color is green, blue or red, and in most cases inclining to grey, while those of *Adamantine-Spar* are hair-brown and reddish-brown. Both of them are easily cleavable, or at least show faces of composition parallel to the primary form; and the crystals possess a rough and uneven surface. There are many crystals, part of which is Sapphire and part Adamantine-Spar.

Before the blow-pipe it is infusible, whether alone or with soda; it is with difficulty soluble in borax, and if previously reduced to powder, also, in salt of phosphorus. It is not acted upon by acids.

2. *Analysis.*

	By Klaproth.		By Tennant.
	Sapphire.	Corundum.	Emery.
Alumina	98·50	89·50	86·00
Silica	0·00	5·50	3·00
Oxide of iron	1·00	1·25	4·00
Lime	0·50	0·00	0·00

3. Corundum is found in imbedded crystals, and in massive varieties. Sapphire is chiefly met with in the sands of rivers, and is accompanied

by crystals and grains of Magnetic Iron-Ore, and several species of gems. The variety Corundum occurs in imbedded crystals in a rock, which consists, according to BOURNON, of Feldspar and Fibrolite, several species of gems and Magnetic Iron-Ore. Adamantine-Spar occurs with Magnetic Iron-Ore and Fibrolite (Kyanite) in a sort of granite, containing no Quartz. Some varieties have been found imbedded in compact Feldspar, Magnetic Iron-Ore, Calcareous-Spar and talcose-slate.

4. The finest varieties of Sapphire come from Pegu, where they occur in the Capelan mountains near Syrian. It has also been found at Hohenstein in Saxony, at Bilin in Bohemia, at Puy in France, and in several other countries. Corundum occurs in the Carnatic in the East Indies; Adamantine-Spar in the neighborhood of Canton in China, and on the coast of Malabar. In St. Gothard, red and blue varieties exist imbedded in dolomite. Those from Gellivara in Sweden, imbedded in Magnetic Iron-Ore, are of a yellowish-white color. Emery is found in the higher part of Saxony, in the mountain called Ochsenkopf near Schneeberg, and is of a dark blue color, inclining to grey; it approaches to the appearance of blue Corundum, whenever its individuals are of considerable size. In the island of Naxos, and in several other islands of the Greek Archipelago, also at Smyrna, Emery is found in large boulders on the surface of the earth, mixed with other minerals.

Very beautiful blue Corundum is found at Newton, (N.J.) disseminated through an aggregate of brown Hornblende, Mica, Feldspar, Tourmaline, Iron Pyrites, Talc and Calcareous-Spar, the whole of which is connected wlth an extensive bed of white limestone. The majority of the specimens are found in detached boulders of various sizes, distributed through the soil in a kind of basin, or valley of moderate extent, between two small limestone ridges. The crystals of Corundum are often several inches in length, though deficient in perfection of form. They are also found loose in the soil. Very well defined crystals of Corundum of a bluish, and also of a pink color, are found under somewhat similar circumstances in the vicinity of Warwick, (N.Y.) where they sometimes occur in cavities of large crystals of Spinel. Pale blue crystals of this species occur in Connecticut at West Farms, near Litchfield, associated with Kyanite; and single crystals have been found loose in the soil in the State of North Carolina.

5. The pure and transparent varieties of Corundum, when finely colored, are in great estimation as ornamental stones. The red varieties are most highly valued; and go by the name of *Oriental Ruby*. The violet-blue are called *Oriental Amethyst*, the green *Oriental Emerald*,

the yellow *Oriental Topaz*, and the blue *Oriental Sapphire*. *Asteria* is a variety of Sapphire, not perfectly transparent, and shewing a star-like opalescence in the direction of the axis, if cut in oval. Much use is made of Corundum and Adamantine-Spar, particularly in India and China, for cutting and polishing steel and gems, and it is said even of Diamond, which has given occasion to the name of Adamantine-Spar. Emery yields a well known polishing material.

Cottunite.

In acicular crystals.
Lustre adamantine, shining.
Color white.

1. Before the blow-pipe, on charcoal, it melts very easily, coloring the flame blue, and affords a white smoke, which adheres to the coal, turns into greenish yellow flakes, and is chiefly converted into metallic lead. Heated in a matrass, it melts and sublimes. It dissolves in water; and the nitrate of silver throws down from the solution, a precipitate of chloride of silver.

2. *Analysis.*

Chlorine	25·48
Lead	74·52

3. Its locality is believed to be Mount Vesuvius.

4. Additional information is requisite before we can pronounce with confidence as to its specific rank.

Couzeranite.

Primary form. Oblique rhombic prism. M on M = 96°. P on M = 92 or 93°.
Cleavage parallel with the shorter diagonal.
Lustre vitreous. Color greyish black, black and indigo-blue.
Hardness = 7·0. Sp. gr. = 2·6 . . . 2·7.

1. Heated before the blow-pipe, it fuses into a white enamel.

2. *Analysis.*
By Dufresnoy.

Silica	52·37
Alumina	24·02
Lime	11·85
Magnesia	2·40
Potash	5·52
Soda	3·96

3. It is found in many places in the Pyrenees, but chiefly comes from the valley of Vicdessos, passage of Aulus, at the bridge of the Taule, &c.

4. Further investigation is necessary to establish it as a distinct species. It resembles Feldspar.

CRICHTONITE. Axotomous Iron-Ore. MOHS.

Primary form. Rhomboid. P on P = 85° 59′.

Secondary forms.

Fig. 152.

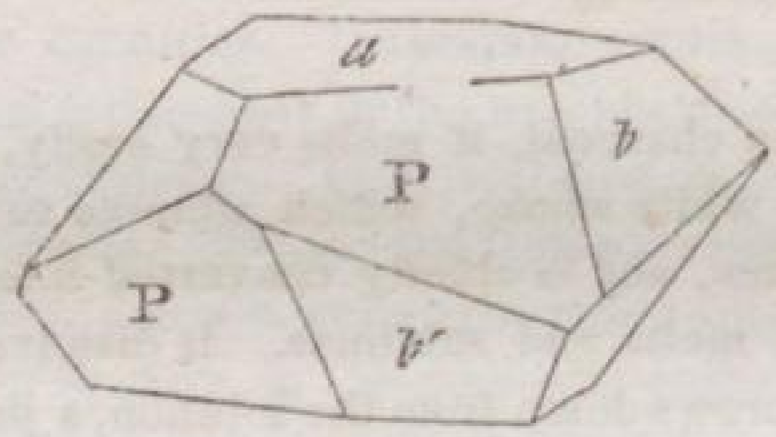


Fig. 154.

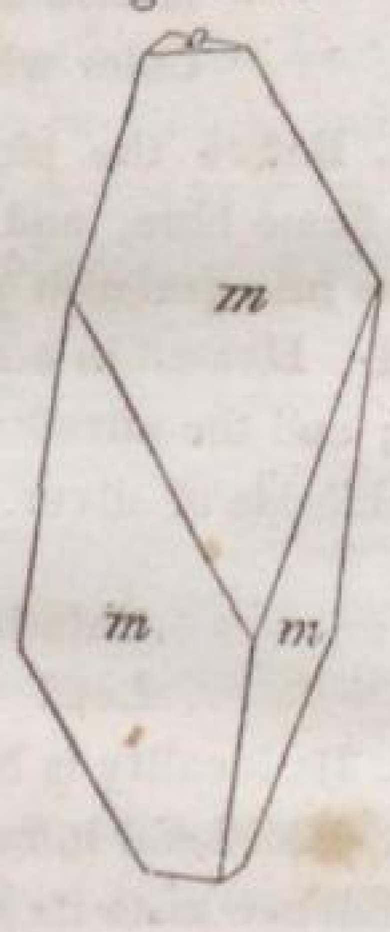
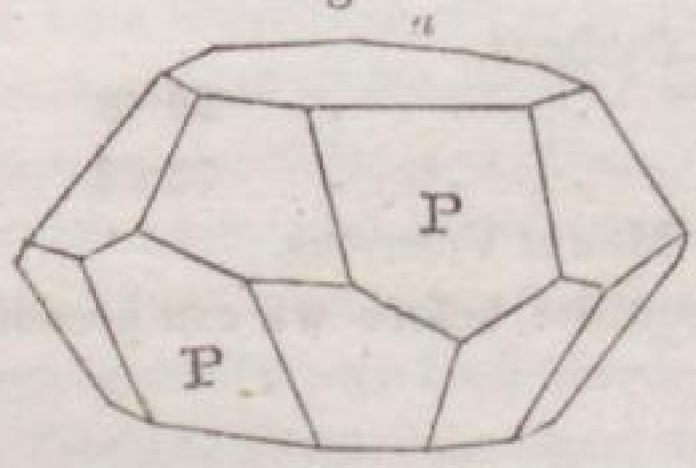


Fig. 153.



P on P	-	-	-	85° 59′
P on *a*	-	-	-	127 40
P on *b*	-	-	-	128 1
P on *b′*	-	-	-	122 28
m on *m*	-	-	-	61 20
m on *o*	-	-	-	97 12

Irregular forms and grains.

Cleavage, perfect parallel to *a*, less distinct parallel with P, and not always observable. Fracture conchoidal. Surfaces generally more rough than smooth, and nearly all of them alike.

Lustre imperfectly metallic. Color dark iron-black. Streak black. Opake.

Brittle. Hardness =5·0 ... 5·5 Sp. gr. = 4·661.

Compound Varieties. Twin-crystals: axis of revolution perpendicular, face of composition parallel to *a*: angle of revolution = 60°. (See fig. 129.)

The compositions of this kind hitherto observed are not quite regularly formed, but consist generally of several alternating laminæ. The situation of the individuals is, however, recognizable from the direction of their faces.

1. The foregoing description is principally derived from the species *Axotomous Iron-Ore* of Mohs, under which it is believed that the *Crichtonite* falls; and within the present species also must be included the *Ilmenite* of Prof. Kupffer, who describes it as occurring in variously modified oblique four-sided prisms, and as having a black color, brownish streak, shining lustre and a conchoidal fracture; without cleavage, fragments sharp-edged and opake. Hardness = 4. Sp. gr. = 4·75.

2. Alone before the blow-pipe, it does not suffer any alteration whatsoever. With the fluxes it acts in general like pure oxide of iron; but when dissolved in salt of phosphorus and the glass is reduced, there appears as the color of the oxide of iron vanishes, a more or less distinctly red color, the depths of the color depending upon the relative quantity of the titanium in the variety employed.

3. *Analysis.*

Variety *Ilmenite.*

Titanic acid	46·67
Oxide of iron	47·08
Oxide of manganese	2·39
Magnesia	0·60
Lime	0·25
Oxide of chrome	0·38
Silica	2·80

4. It occurs in imbedded grains and crystals, in several varieties of Mica and dolomite, in the valley of Gastein in Salzburg, and frequently along with the crystals of Rutile, over which it often forms a black coating, as at Kluttau in Bohemia, in the gold streams of Ohlapian in

Transylvania, &c. The only locality of the *Crichtonite* variety is the department of the Isère in France, where it occurs in narrow veins along with Anatase.

The variety Ilmenite is found in the Ilmen mountains in the Urals.

The black metallic crystals found accompanying the Spinel, Brucite, Rutile, &c., imbedded in Serpentine and white limestone at Amity, (N.Y.) belong to the present species. They have the form denominated *Fer oligiste imitatif* by HAUY. They are distinguished from Specular Iron by color, fracture, streak, and a diminished specific gravity. It also occurs in broad laminated, imperfectly hexagonal masses, at Washington, (Conn.) imbedded in a vein of Quartz, traversing primitive rocks, and likewise in the eastern part of the same state.

5. The Crichtonite presents us in its crystallization a nearer approximation to perfect isomorphism with Specular Iron, than exists between any other two species where the composition is equally diverse.

CRONSTEDITE. Rhombohedral Iron-Mica.

Primary form. Rhomboid, of unknown dimensions.

Secondary form. Hexagonal prism.

Cleavage, parallel with terminal planes of the hexagonal prism perfect; with the lateral, imperfect.

Lustre vitreous. Color brownish-black. Streak dark leek-green. Opake.

Thin laminæ are elastic. Hardness =2·5 nearly. Sp. gr. = 3·348.

Compound Varieties. Reniform and massive: composition columnar.

1. Before the blow-pipe, it froths a little without melting: with borax, it yields a black, opake and hard bead. Reduced to powder, it gelatinizes in concentrated muriatic acid.

2. *Analysis,*

By STEINMANN.

Silica	22·452
Oxide of iron	58.853
Oxide of manganese	2·885
Magnesia	5·078
Water	10·700

3. It occurs at Przibram in Bohemia, in veins containing silver-ores, along with Brown Iron-Ore, Spathic Iron, White Iron-Pyrites and Calcareous Spar. It has also been found at Wheal Maudlin in Cornwall.

CRYOLITE. Prismatic Cryone-Haloide. Mohs.

Primary form. Right-rectangular prism. C.

Cleavage, parallel with P perfect, with M and T less perfect, or coherent. Fracture imperfect or conchoidal, uneven.

Lustre vitreous, a little inclining to pearly upon the faces of P. Color white, sometimes verging upon red or yellowish-brown. Streak white. Semi-transparent . . . translucent. On account of its low refractive power, it appears more transparent when immersed in water.

Brittle. Hardness = 2·5 . . . 3·0. Sp. gr. = 2·963 of a white variety.

Compound Varieties. Massive: composition granular, the individuals being of considerable size.

1. It is very fusible, and melts even in the flame of a candle. Before the flame of the blow-pipe, it is first perfectly liquified; but soon becomes hard again, and assumes at last a slaggy appearance. It is insoluble in water, though it suffers cleavage more readily after having been immersed in it for some time.

2. *Analysis.*

	By Klaproth.	By Vauquelin.
Alumina	21·0	24·0
Soda	32·0	36·0
Fluoric acid and water	47·0	40·0

3. It occurs at Arksut-fiord, (West Greenland,) in two small layers in gneiss, one of which contains only the white varieties, whereas the other contains the colored ones, accompanied by Galena, Iron-Pyrites, Spathic Iron and Feldspar.

CUBE-ORE. Hexahedral Malachite-Haloide.

Primary form. Cube.

Secondary forms.

1. The cube with the alternate solid angles replaced by triangular planes.

2. The same, but replaced by four planes, three of which rest upon the primary edges, the fourth upon the apex of the new planes.

3. The cube with its edges and angles truncated.

Cleavage, parallel with the primary form difficult and imperfect. Fracture conchoidal, uneven. Surface of the cube sometimes streaked parallel to the edges of the secondary faces situated upon the solid angles. The other faces, with the exception of the secondary planes situated upon the edges of the cube, often curved.

Lustre adamantine, not very distinct. Color olive-green, passing into yellowish-brown, bordering sometimes upon hyacinth-red and blackish-brown; also into grass green and emerald green. Streak, olive-green ... brown, commonly pale. Translucent on the edges.

Rather sectile. Hardness = 2·5. Sp. gr. = 3·000.

Compound Varieties. Massive: composition granular, rare.

1. Exposed to a gentle heat, its color is changed into red. In a higher degree of temperature, it intumesces, gives little, or no arsenic, and leaves a red powder. Upon charcoal, it emits copious fumes of arsenic, and melts in the inner flame into a metallic scoria, which acts upon the magnetic needle.

2. *Analysis.*

	By Chenevix.	By Vauquelin.
Oxide of iron	45·50	48·00
Arsenic	31·00	18·00
Oxide of copper	9·00	0·00
Silica	4·00	0·00
Carbonate of lime	0·00	2·00
Water	10·50	32·00

3. Cube-Ore is chiefly found in veins of copper ores in the older classes of rocks, where it is accompanied by Vitreous Copper, Fahlerz, White Iron-Pyrites and Quartz.

4. It is principally found in Cornwall, in several copper-mines, in the neighborhood of Redruth, but has also been found at St. Leonhard in France, and at Schwarzenberg in Saxony.

In the United States, it has been met with in drusy coatings, along with Mispickel, Iron, and Copper Pyrites, at Edenville in Orange county, (N.Y.) where these minerals exist in gneiss; and under similar circumstances in Derby, (Conn.)

CUMMINGTONITE. Hemi-prismatic Wavelline-Spar?

Massive: composition thin columnar, scopiform and stellular, rather incoherent; fibres somewhat curved.

Cleavage parallel to an oblique rhombic prism.

Lustre silky, color ash-grey. Translucent to opake.

Brittle. Hardness =6·5. Sp. gr. =3·2014.

1. Alone before the blow-pipe, it is infusible, except on very thin edges. With carbonate of soda it fuses with effervescence into a dark glass. With borax it fuses into a black glass.

2. *Analysis.*

By Muir.

Silica - - - - -	56·543
Protoxide of iron - - -	21.669
Protoxide of manganese - -	7·802
Soda - - - - -	8·439
Volatile matter - - - - -	3·178

3. Cummingtonite is found at Plainfield and Cummington, (Mass.) in mica-slate, associated with Garnet and White Iron-Pyrites.

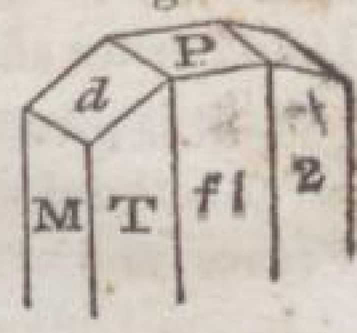
CUPREOUS ANGLESITE. Cupreous Lead-Baryte.

Primary form. Right oblique-angled prism. M on T =102° 45′.

Secondary form.

M on T - - -	102° 45′	Brooke.
P on $f1$ - - -	90 00	
T on $f1$ - - -	161 30	
M on d - - -	120 30	

Fig. 155.



Cleavage, parallel to M and T very perfect. Surface generally smooth and shining, some of the faces rough.

Lustre, adamantine.

Color deep and beautiful, azure-blue. Streak, pale blue. Faintly translucent.

Rather brittle. Hardness =2·5 . . . 3·0. Sp. gr.=5·30 . . . 5·43. Brooke.

1. *Analysis.*

By Brooke.

Sulphate of lead - - -	74·4
Oxide of copper - - -	18·0
Water - - -	4·7

2. It is found along with other ores of lead, at Lead Hills in Scotland: also at Linares in Spain.

CUPREOUS BISMUTH. Prismatoidal Polypoione-Glance.

Crystalline. Primary form not known; probably prismatic. Massive: composition columnar, the individuals being long and slender; also impalpable.

Cleavage, in one direction parallel with the prismatic axis. Fracture uneven, or imperfectly conchoidal.

Lustre metallic. Color steel-grey, light copper-red, passing to yellowish. Streak blackish grey.

Hardness =2·0 . . . 2·5. Sp. gr. =6·125.

1. It melts very easily before the blow-pipe, coloring the flame of the lamp, blue; and leaving, after the fumes have subsided, a whitish, or sul-

phur, yellow slag, which, on being heated with soda, yields metallic copper. The powder is dissolved in nitric acid, with evolution of red fumes, and the precipitation of sulphur and sulphate of lead. The solution affords with water a white precipitate of oxide of bismuth, or with sulphuric acid, one of sulphate of lead.

2. *Analysis.*

	By John, from Ecatherineburg.	By Klaproth, from Baden.
Sulphur	11·58	16·3
Bismuth	43·20	27·0
Lead	24·32	33·0
Copper	12·10	0 9
Nickel	1·58	0·0
Tellurium	1·32	0·0
Silver	0·00	15·0
Iron	0·00	4·3

3. It is found in the mines of Pyschminskoi and Klutschefskoi in the district of Ecatherineburg in Siberia, in Quartz, accompanied by Native Gold and Galena. The variety analyzed by Klaproth occurs in Quartz and Fluor, with Iron Pyrites, Copper Pyrites and Galena, at Schapbach in Baden.

Appendix to Cupreous Bismuth.

i. *Cupreous Sulphuret of Bismuth.*

Crystalline in fibrous masses and capillary crystals.

Lustre metallic. Color light steel-grey to tin-white. Streak white.

1. *Analysis.*

By Klaproth.

Sulphur	12·58
Bismuth	47·24
Copper	34.66

2. It occurs at Gallenbach in the principality of Fürstenberg, in a disintegrated granite with Heavy Spar, Native Bismuth and Copper Pyrites.

CUPREOUS MANGANESE. Staphyline Manganese-Ore.

Small reniform and botryoidal groupes, massive. Composition impalpable. Fracture imperfectly conchoidal.

Lustre resinous. Color bluish-black. Streak unchanged. Opake.

Hardness =3·5. Sp. gr. = 3.197 . . . 3·216.

1. Before the blow-pipe, it becomes brown, but is infusible. To borax and salt of phosphorus, it communicates the colors of copper and manganese.

2. *Analysis.*

By LAMPADIUS.

Black oxide of manganese	. .	82·00
Brown oxide of copper	. .	13·50
Silica	. . .	2·00

BERZELIUS found it to contain a considerable quantity of water.

3. It occurs in the tin mines at Schlaggenwald in Bohemia, and at Armarilla in Chili.

CYANITE. (See *Kyanite.*)

CYMOPHANE. (See *Chrysoberyl.*)

CYPRIN. (See *Idocrase.*)

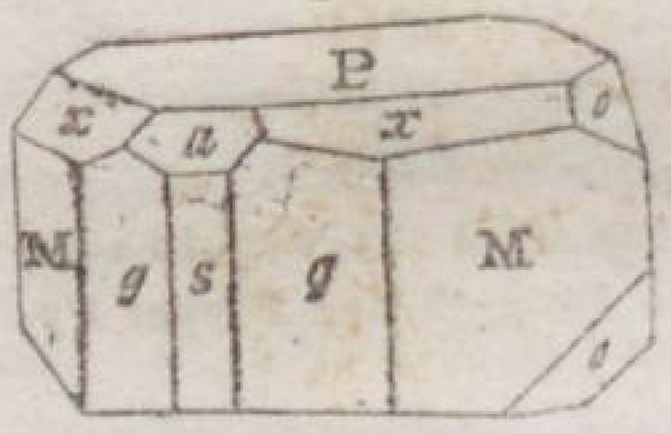
DAVYNE. (See *Nephiline.*)

DATHOLITE. Prismatic Dystome-Spar. MOHS.

Primary form. Right rhombic prism. M on M′ = 102° 30′.

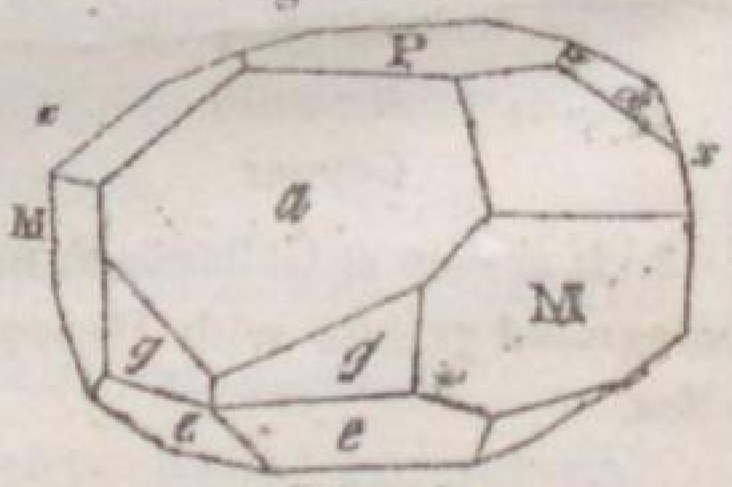
Secondary forms.

Fig. 156.



Arendal.

Fig. 157.



Seiseralp.

M on M	-	= 77°	30′	*x* on *x*	-	122°	00′
g on *g*	-	116	9	*x* on *d*	-	115	45
P on *s*	-	90	00	*x* on *o*	-	177	04
P on *a*	-	136	04				

Datholite.

Cleavage, very indistinct parallel to *s*, but somewhat more easily observed parallel to P. Fracture uneven, imperfectly conchoidal. Surfaces, several faces much streaked, and others altogether rough.

Lustre vitreous, and particularly in the fracture inclining to resinous. Color white, inclining to green, yellow, and grey; sometimes of a dirty olive green, or honey-yellow tinge. Streak white, more or less translucent.

Brittle. Hardness = 5·0 . . . 5·5. Sp. gr. = 2·989, a variety from Arendal.

Compound Varieties. Botryoidal and implanted globular shapes, surface drusy, composition columnar. Massive: composition columnar, consisting of delicate, straight and generally diverging individuals, radiating from a centre; also granular, of various sizes of individuals, faces of composition rough and irregularly streaked.

1. Owing to the variation of position in which the crystals of this species were at first described, they were referred to two different species, *Datholite* and *Humboldtite*, the latter of which is now abandoned. Still another species or sub-species, according to some authors, the *Botryolite*, requires also to be united with Datholite. It embraces the reniform and globular shapes, consisting of thin individuals; but specimens have lately been discovered, which clearly prove, by transition, their connexion with Datholite.

Exposed to the flame of a candle, it becomes friable; before the blowpipe, it loses its transparency, intumesces, and melts into a glassy globule. It is easily soluble in nitric acid, and leaves a siliceous jelly.

2. *Analysis.*

By Klaproth.

	of *crystals.*	of *Botryolite.*
Silica	36·50	36·00
Lime	35 50	39·50
Boracic acid	24·00	13·50
Oxide of iron	0·00	1·00
Water	4·00	6·50

3. It occurs in beds of iron-ore, in primitive rocks, accompanied by Calcareous Spar; sometimes also by Fluor, Hornblende, Quartz and Prehnite: with the latter species, and several others of the Zeolite family, it is found in agate balls and irregular veins in trap-rocks.

4. Upon the beds of iron-ore at Arendal in Norway, are found the varieties of Datholite and Botryolite. The Humboldtite occurs in agate balls in the Seiseralp in the Tyrol, and in irregular veins in greenstone in Salisbury-craig near Edinburgh.

In the United States, in New Jersey at Paterson, the Datholite has been met with in large and well defined forms, in trap; and at Middlefield in Connecticut, the variety Humboldtite occurs under similar circumstances, and in cavities; also on Mt. Carmel, at Hamden, (Conn.) with Prehnite.

DERMATIN. (See *Kerolite.*)

DEWEYLITE. (See *Kerolite.*)

DIALLOGITE. Macrotypous Parachrose-Baryte. MOHS.

Primary form, a rhomboid. P on P=106° 51′.

Secondary form, the primary having the upper edges replaced by tangent planes.

Cleavage, parallel to the primary form. Fracture uneven, imperfectly conchoidal. Surface streaked parallel with the edges of the new planes, thus producing lenticular crystals.

Lustre vitreous, inclining to pearly. Color various shades of rose-red, partly inclining to brown. Streak white. Translucent in different degrees.

Brittle. Hardness =3·5. Sp. gr. =3·592 of the crystallized variety from Kapnik.

Compound Varieties. Globular and botryoidal shapes: surface sometimes smooth, at other times rough; composition columnar, often indistinct. Massive: composition granular, sometimes small, and even impalpable; sometimes it is columnar.

Diallogite.

1. The varieties of the present species have often been confounded with other minerals, one of which has been proposed by BREITHAUPT as a distinct species, an account of which will be given at the close of this description.

Before the blow-pipe, its color is changed into grey, brown and black, and it decrepitates strongly; but is infusible without addition. It is easily fusible in glass of borax, which thereby becomes of a violet blue color. If exposed to the air, its natural color is changed into brown. Many bright rose-red varieties become paler on being exposed in a similar manner. It effervesces briskly in nitric acid.

2. *Analysis.*

	By DuMenil.	By Berthier, fr. Nagyag.
Oxide of manganese	54·60	56·00
Carbonic acid	33·75	38·60
Oxide of iron	1·87	0·00
Silica	4·37	0·00
Lime	2·50	5·40

3. It occurs for the most part in metalliferous veins, with various ores of Iron and Copper, and with Quartz. It is also found in beds with other minerals containing manganese.

4. It is found in several of the Saxon mines, particularly in the neighborhood of Freiberg; also at Nagyag and Kapnik in Transylvania, near Elbingerode in the Hartz, and in other countries.

i. *Manganeseous Carbon-Spar.* BREITHAUPT.

P on P = 107° 30′.

Cleavage parallel to the primary, easily effected.

Hardness (scale of BREITHAUPT) = 5·75 . . . 6·0. Sp. gr. = 3·592.

BREITHAUPT includes in this species the mineral from Kapnik only. This variety was analyzed by BERTHIER, and found to contain,

Carbonic acid	30·4
Protoxide of manganese	41·0
Lime	4·3
Quartz	21·0
	96·7

DIAMOND. Octahedral Diamond. MOHS.

Primary form. Regular octahedron.

Secondary forms.

1. Primary form, having its solid angles replaced by tangent planes.

2. Primary form, having its edges replaced by tangent planes.

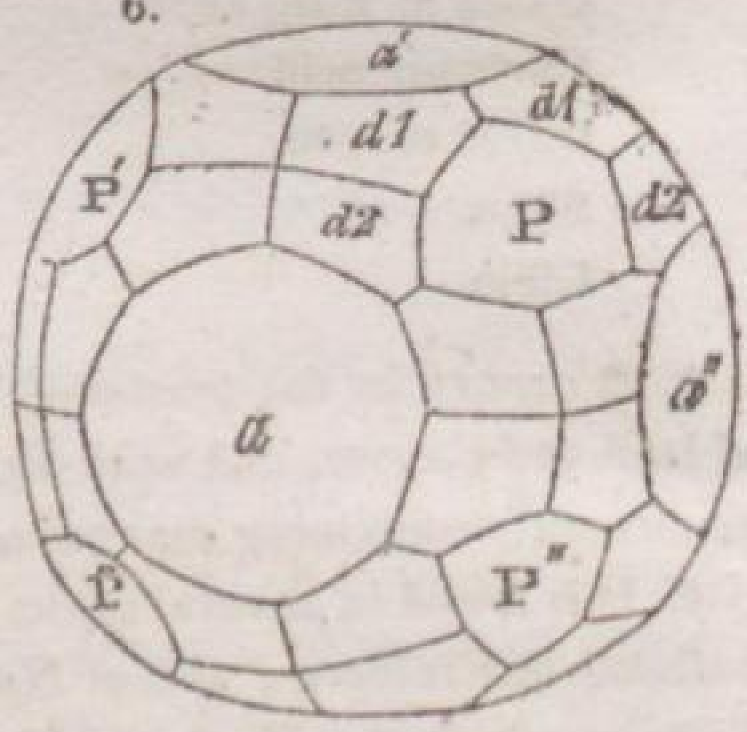
3. Cube.

4. Cube, having its edges replaced by tangent planes.

5. Rhombic dodecahedron.

Fig. 158.

6.



The annexed figure represents in planes P P′ P″ and P‴ the primary faces of the octahedron, and in *a a′ a″* those of the cube, which are generally flat and brilliant. The numerous faces *d*1 and *d*2, are uniformly convex; each of which is, in reality, a series of planes, as is manifest on other crystals, but in no instance sufficiently perfect for the use of the reflective goniometer.

Irregular forms and grains.

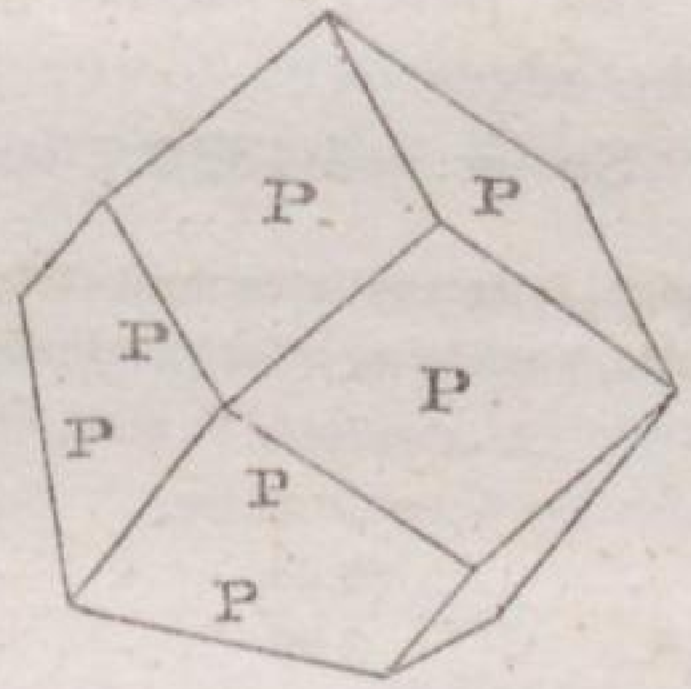
Cleavage, parallel with the primary octahedron, perfect. Fracture, conchoidal. Surface, the octahedron sometimes faintly streaked parallel to its edges of combination, but in general very smooth. Also the dodecahedron, if often streaked, rough and uneven; the tetraconta-octahedron, curved and smooth. Grains possess a rough and granulated surface.

Lustre bright adamantine. Color white, prevalent; also various shades of blue, red, yellow, green, brown, grey, and even black. Generally pale. Streak white. Transparent . . . translucent, dark colored varieties only on their edges. If cut and polished, it shows a most lively play of color.

Hardness =10·0. Sp. gr.=3·520, of a white variety.

Compound Varieties. Twin-crystals. Axis of revolution perpendicular to a face of the octahedron; angle of revolution =60°. (See fig. 50.) Also, axis of revolution parallel to one of the axes of the rhombic dodecahedron which passes through the obtuse solid angles. (See the annexed figure.) Angle of revolution =60°.

Fig. 159.



1. Diamond is perfectly combustible at a temperature of about 14° Wedgewood, and yields with oxygen, carbonic acid gas. It is not acted upon by acids or alkalies.

2. The rocks hitherto considered as the gangue of Diamond are secondary ones, as several kinds of sandstone, consisting of aggregated quartz pebbles. It is also found in strata of iron-shot sand and clay, and in the loose sand of plains and rivers. In a specimen from Brazil, in the possession of Mr. Heuland, it is associated with Skorodite, and imbedded in a compact variety of Brown Iron-Ore.

3. The Diamond was first discovered in the East Indies, where it has been worked for many centuries, and in Brazil. They are found in various places on the eastern coast of the British peninsula in India, but particularly between Golconda and Masulipatam; also near Panna in Bundelcund. It also occurs in the peninsula of Malacca, and the isle of

Borneo. In Brazil, they occur in the district of Serro do Frio in the capitania of Minas Geraes, and were first discovered in the Riachò Fundo, then in the Rio do Peixe, and also in the Terra de St. Antonio.

4. Diamond is the most valuable of all the gems. It is employed also in cutting glass, and for engraving, cutting and polishing other hard stones, and the Diamond itself.

DIASPORE. Tetarto-prismatic Wavelline-Spar?

Primary form. Doubly oblique prism, according to PHILLIPS. M on T=64° 54′. P on T=101° 20′. P on M=108° 30′. According to MOHS, it is a rhombic prism of about 130°.

Lustre vitreous and pearly. Color greenish-grey.

Translucent on the edges.

Scratches glass. Sp. gr.=3·4324.

1. Before the blow-pipe, it decrepitates most violently, and splits into many small scaly particles, possessing a feeble alkaline reaction.

2. *Analysis.*

	By VAUQUELIN.	By CHILDREN.
Alumina	80·00	76·06
Protoxide of iron	3·00	7·78
Water	17·30	14·70

BERZELIUS is of opinion that besides these, it also contains some alkaline substance.

3. Its locality is unknown.

4. Its reference to the genus Wavelline-Spar is made with hesitation, from the limited knowledge possessed of its properties. Unless some clue to the discovery of its locality shall ere long be made, it will become doubtful whether it is not an artificial production.

DICHROITE. (See *Iolite.*)

DIOPSIDE. (See *Pyroxene.*)

DIOPTASE. Rhombohedral Copper-Baryte.

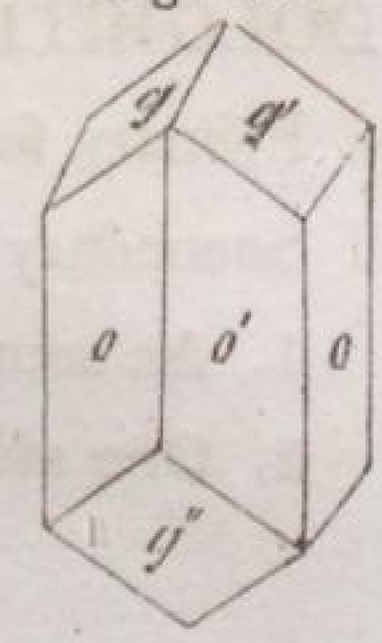
Primary form. Rhomboid. P on P=126° 17′.

Dioptase.

Secondary form.

g on g'	- -	95° 33′
o' on o or o	- -	120 04
g on o, or g' on o'	-	173 00

Fig. 160.



Cleavage, parallel with the primary form, perfect. Fracture conchoidal, uneven.

Lustre vitreous, inclining to resinous. Color emerald green, also blackish-green, and verdigris-green. Streak green. Transparent . . . translucent.

Brittle. Hardness =5.0. Sp. gr. =3·278.

1. It decrepitates before the blow-pipe, and upon charcoal it becomes black in the exterior flame, and red in the interior one, without melting. It is easily soluble in glass of borax, and imparts to it a green color. It is soluble without effervescence in muriatic acid.

2. *Analysis.*

		By Lowitz.		By Vauquelin.
Oxide of copper	- -	55·00	- -	25·57
Carbonate of lime	- -	0·30	- -	42·85
Silica	- -	33·00	- -	28·57
Water	- -	12·00	- -	0·00

3. It has been found accompanied by Green Malachite and Calcareous Spar, but the nature of its original repositories is not known. It occurs in the Kirghese steppes in Siberia. Minute crystals are said to accompany the Electric Calamine of Rezbanya in Hungary.

Diploite. (See *Latrobite.*)

Dipyre. (See *Scapolite.*)

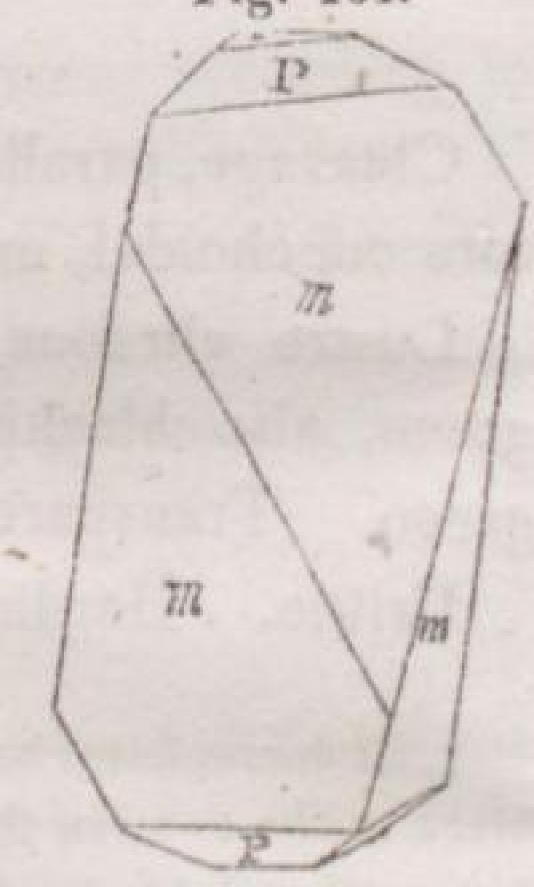
DOLOMITE. Macrotypous Lime-Haloide.

Primary form. Rhomboid. P on P = 106° 15′.

Secondary forms.

1. An acute rhomboid of 79° 36′ from Gotha in Saxony.
2. One still more so, of 66° 7′, from Hall, Tyrol.

Fig. 161.



3. The same, having its summits surmounted by three pyramidal faces of the primary rhomboid, whose apices are replaced by tangent planes, as in the annexed figure.

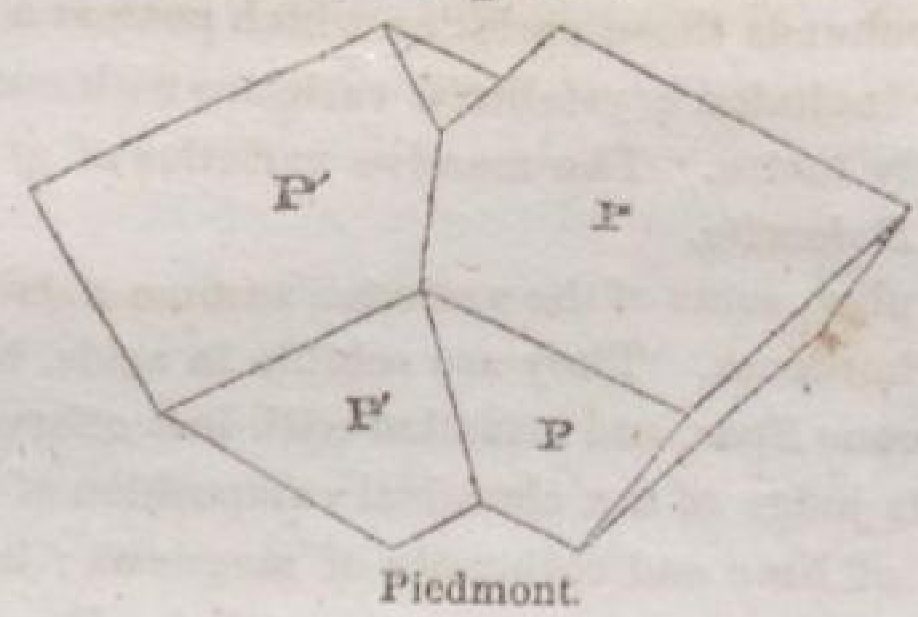
Cleavage, parallel with the primary rhomboid, perfect, with traces of a cleavage at right angles to the vertical axis. Fracture conchoidal. Surface, faces *m* streaked parallel to the edges of combination with P. The rest of the faces generally smooth, and of nearly the same physical quality.

Lustre vitreous, inclining to pearly in several varieties. Color white, seldom pure, generally inclining to red or green. Various shades of red, among which is a fine rose-red. Also green, brown, grey, black, very often owing to foreign admixtures. Streak, greyish-white. Semi-transparent . . . translucent.

Brittle. Hardness = 3·5 . . . 4·0. Sp. gr. = 2·884, a greenish white cleavable variety, from Mexico.

Compound Varieties. Twin-crystals.

Fig. 162.



Piedmont.

Sometimes variously repeated. Implanted globules; botryoidal, fructicose, and other imitative shapes: surface drusy and rough, composition columnar. Massive: composition granular, of various sizes of individuals, generally easily distinguishable, and often but slightly cohering. The composition is often columnar, also of different sizes of individuals. These compositions are again variously compounded, as the granular composition in a coarser kind of granular composition, of which the component particles may be easily separated, and present an uneven surface. It occurs often in crystalline coatings upon other crystals, impressions, &c.

1. The remark which was made under Calcareous Spar, respecting its comprehension of several distinct species, separated from one another by constant differences of form, hardness and specific gravity, may be applied to Dolomite with nearly the same propriety. And the mineralogist there referred to, who has attempted to distinguish those species, has occupied himself also with the varieties of the present species. Some account of his labors will be introduced as an appendix to Dolomite.

The division of this species into sub-varieties and sub-species, according to the older mineralogists, depended upon slight variations of composition, color, lustre, and upon chemical and mechanical mixtures. *Rhomb-spar* and *Bitter-spar* are the names applied to crystallized varieties, provided their faces are not curvilinear or unusually pearly; also to large grained and easily cleavable varieties, chiefly of greenish colors. *Brown-spar* comprehends those varieties which possess a reddish brown color. *Pearl-spar* included crystallized varieties with curved faces, and possessed of a pearly lustre. The massive varieties of granular composition were called *Dolomite.*

Before the blow-pipe, some of the varieties assume a darker color, and a higher degree of hardness. They are soluble in acids, but much more slowly than Calcareous Spar, and attended with less effervescence.

2. It is difficult to judge of the chemical composition of Dolomite. It contains carbonate of lime and carbonate of magnesia; but the relative quantity of the two has not been accurately settled. From several analyses by KLAPROTH, the proportion appears to be nearly as 54·18 : 45·82, which corresponds to

Lime - - - -	30·56
Magnesia - - - -	22·18
Carbonic acid - - - -	47·26

Several analyses of brown-spar give very similar results; others deviate more or less from them. In general, brown-spar seems to contain more oxide of iron and manganese, than either the old varieties dolomite or rhomb-spar.

3. The different varieties of Dolomite differ in respect to their localities. The granular variety (dolomite) constitutes beds in other rocks, and therefore belongs, itself, to the class of rocks. Rhomb-spar occurs in imbedded crystals and compound masses, in several kinds of rocks, particularly in common Talc, and less frequently in compact varieties of gypsum that are mixed with clay. Brown-spar is principally found in metalliferous veins.

4. The variety called Dolomite occurs in St. Gothard, in the Appenines, and in Carinthia; Rhomb-spar in various districts of Salzburg, the Tyrol and Switzerland, at Miemo in Tuscany, (from which the name of *Miemite* has been derived,) and in many other countries; beautiful crystals at Traversella in Piedmont. Brown-spar and Pearl-spar are very frequent at Schemnitz in Hungary, Kapnik in Transylvania, Freiberg and elsewhere in Saxony, at Clausthal in the Hartz, in Norway and Sweden, at Alston Moor in Cumberland, in the greywacke quarries of the same country, in Derbyshire, Baeralston and other places in Devonshire.

In the U. States the Rhomb-spar variety or bitter-spar, occurs abundantly at numerous places in R. Island, Massachusetts and Vermont, imbedded in common Talc or its variety, steatite; as at Roxbury, (Vt.) where it occurs in large, yellow, transparent crystals, imbedded in greenish transparent Talc; at Smithfield, (R. I.) where it occurs in large grained, easily cleavable individuals, associated with white Talc in Calcareous Spar or limestone, and rarely in very perfect implanted rhomboids of small dimensions. The Pearl-spar exists abundantly both of a white color, and with a delicate pink tinge, at Lockport, (N.Y.) where it is associated with Calcareous Spar, Celestine, and Gypsum in geodes, occurring in transition limestone. The brown-spar is found at numerous places in New York and Ohio, where it occurs in greywackes and secondary limestones, in the form of veins and seams. The massive variety of Dolomite constitutes extensive beds in Litchfield county, (Conn.) and in the south western towns of Massachusetts.

5. Dolomite is often employed as a marble, and rarely in the production of quick lime.

Appendix to Dolomite.

i. *Eumetric Carbon-Spar.* Breithaupt.

P on P = 106° 11′.
Cleavage parallel with P uncommonly perfect and easy.
Hardness = 5·0, (scale of Breithaupt.)
Sp. gr. = 2·9177, a cleavage crystal.

The Eumetric Carbon-Spar embraces only the beautiful twin-crystals, above alluded to, from Traversella in Piedmont.

ii. *Tautoklinous Carbon-Spar.* Breithaupt.

P on P = 106° 10′ 40″.
Cleavage parallel with P perfect.
Hardness = 4·75 . . . 5. (scale of Breithaupt.)
Sp. gr. = 2·9633. } Fragments of cleavage crystals from the
2·9644. } mine of Beschert Glück in Freiberg.
Color reddish, or greyish-white.

It occurs at Freiberg, Johann-Georgenstadt, and probably the brown-spar of Schneeberg belongs to the present species.

iii. *Kryptose Carbon-Spar.* Breithaupt.

P on P = 106° 19′.
Cleavage parallel with P, but not very perfect.

Hardness = 4·50 . . . 4·75. (scale of BREITHAUPT.)

Sp. gr. = 2·809, reddish-white, cleavage crystal.
2·810, brownish red, cleavage crystal.
2·827, dark brownish red and brown, with delicate black stripes; both from Freiberg.

2. It consists, according to KARSTEN, of

Carbonate of lime	- - - - -	96·40
Carbonate of protoxide of manganese	- -	2·10
Carbonate of iron	- - - - -	0·95
Water and loss	- - - - -	0·55

It is found only at two mines in Freiberg.

iv. *Isometric Carbon-Spar.* BREITHAUPT.

P on P = 106° 19′.

Cleavage parallel with P perfect.

Hardness = 5·50 . . . 5·75. (scale of BREITHAUPT.)

Sp. gr. = 2·847, minute, ash-grey crystals in gypsum, from Hall in Tyrol.
2·849, greenish white masses of a compound variety, from Koloseruck in Bilin, (Bohemia,) where it occurs in seams in basalt.
2·853, minute, but possibly not perfectly pure cleavage crystals, of the above variety, from Hall.
2·857, minute, pure, and white cleavage crystals, from Dinz.
2·859, asparagus green, cleavage crystals, from Schweinsdorf. (Tharaudite.)

The variety from Hall afforded, to KLAPROTH,

Carbonate of lime	- - - - -	68·0
Carbonate of magnesia	- - - - -	25·5
Carbonate of protoxide of iron	- - - - -	1·0
Water	- - - - -	2·0
Foreign matter	- - - - -	2·0

DYOXYLITE. Prismatoidal Lead-Baryte. HAIDINGER.

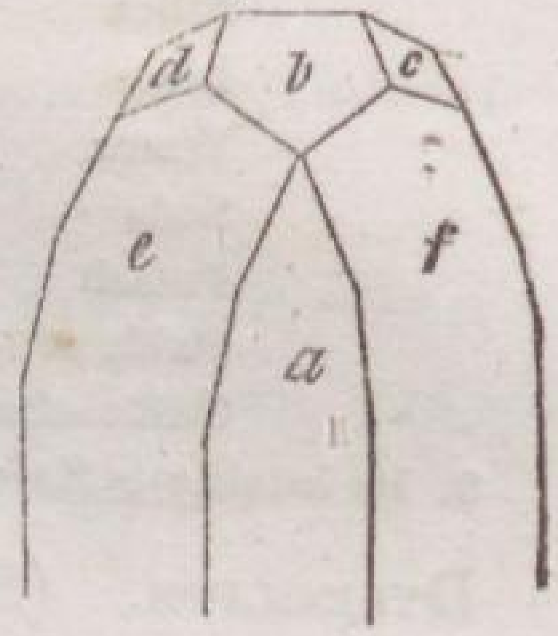
Primary form. Right rhombic prism. M and M′ = 120° 45′.

Dyoxylite.

Secondary form.

a on *b*	- -	111° 00′	PHILLIPS.
b on *b*	- -	130 00	
a on *c*	- -	106 45	
a on *d*	- -	73 45	
a on *e*	- -	123 20	
c on *f*	- -	133 00	
d on *e*	- -	136 54	

Fig. 163.



Cleavage parallel with M and P, but more perfectly parallel with the shorter diagonal. The laminæ resulting from cleavage are flexible, like Gypsum.

Lustre adamantine, inclining to resinous, pearly upon the perfect face of cleavage. Color greenish-white, or yellowish white, sometimes inclining to grey. Streak white. Translucent.

Sectile. Hardness =2·0...2·5. Sp. gr.=6·8...7·0.

1. *Analysis.*
By Brooke.

Carbonate of lead - - -	46·9
Sulphate of lead - - -	53·1

The effervescence while dissolving in nitric acid is scarcely perceptible.

2. It is found in columnarly aggregated crystals, at the Lead hills in Scotland.

Dysclasite.

Massive; imperfectly fibrous; the fibres sometimes divergent.

Lustre vitreous. Color white. Translucent. It possesses double-refraction.

Tough. Hardness above Fluor. Sp. gr. = 2·362.

1. Heated to redness, it emits moisture. Before the blow-pipe, it fuses only on the edges. With soda it forms a semi-transparent glass, and with borax and salt of phosphorus it gives colorless glasses. It gelatinizes readily with muriatic acid.

2. *Analysis.*

By CONNELL.

Silica - - - -	57·69
Lime - - - -	26·83
Water - - - -	14·71
Soda - - - -	0·44
Potash - - - -	0·23
Oxide of iron - - - -	0·32
Oxide of manganese - - -	0·22

3. Its locality is Faroe.

DYSKOLITE. (See *Saussurite.*)

DYSLUITE.

Primary form. Regular octahedron.

Secondary form. Regular octahedron, with its edges truncated.

Cleavage parallel with the primary-rather imperfect. Fracture sub-conchoidal. Surface rough.

Lustre vitreous, inclining to resinous. Color yellowish-brown or greyish-brown. Streak paler than the color. Translucent on the edges . . . to opake.

Hardness = 7·5 . . . 8·0. Sp. gr. 4·0 . . . 4·6.

1. Before the blow-pipe, it is infusible.

2. It is found in small quantity, at Sterling, (New Jersey,) disseminated through laminated Calcareous Spar, and associated with Franklinite and Troostite.

3. There is nothing but the unimportant property of color to distinguish this mineral from Automalite, to which it should, without doubt, be referred.

DYSODILE.

Massive; compact or laminated. Extremely fragile.

Fracture earthy.

Soft, scratched by the nail. Sp. gr. = 1·1 . . . 1·2.

Color greenish and yellowish, to liver-brown. Streak vitreous. Macerated in water, it becomes translucent, and its laminæ acquire elasticity. When breathed upon, it emits an argillaceous odor.

1. It burns with a considerable flame and smoke, and an almost insupportably fetid odor, leaving a residue of nearly half its weight, and unal-

tered in form. It occurs at Melili, near Syracuse in Sicily, in the form of a bed of inconsiderable thickness, between beds of a secondary limestone.

2. It probably belongs to the species Bitumen, so far as it is a simple mineral.

EARTHY COBALT. Cobaltic Lusine-Ore.

Pulverulent, investing ores of iron and of cobalt, and intermingled with these, and with earthy matters.

Color black.

1. Heated upon charcoal, it gives no arsenical odor; and fused with soda, gives no indication of manganese. With borax, it forms a very intensely blue glass.

2. BEUDANT suggests its composition to be,

Oxygen - - - -	28·90
Cobalt - - - -	71·10

3. It is probably derived from the decomposition of the arseniurets of cobalt, being found in small quantity with these ores.

4. Its principal localities are Würtemberg, Saalfeld, Joachimsthal and the Tyrol.

5. The *botryoidal* and the *stalactitic Earthy Cobalt,* whose sp. gr. = 2·24, and which afford moisture when heated, and the smell of arsenic, appear to be mixtures of the above mineral with Brown Iron-Ore, some of the ores of cobalt and of manganese, together with accidental earthy ingredients; of which character appear to be the following minerals:

From Riechelsdorf.

Analyzed by KLAPROTH.

Peroxide of cobalt with oxide of manganese - -	97·0
Oxide of manganese - - - - - - -	80·0
Oxide of copper - - - - - - -	1·0
Water - - - - - - -	85·0
Silica - - - - - - -	124·0
Alumina - - - - - - -	102·0

From Saalfeld.

Analyzed by DOBEREINER.

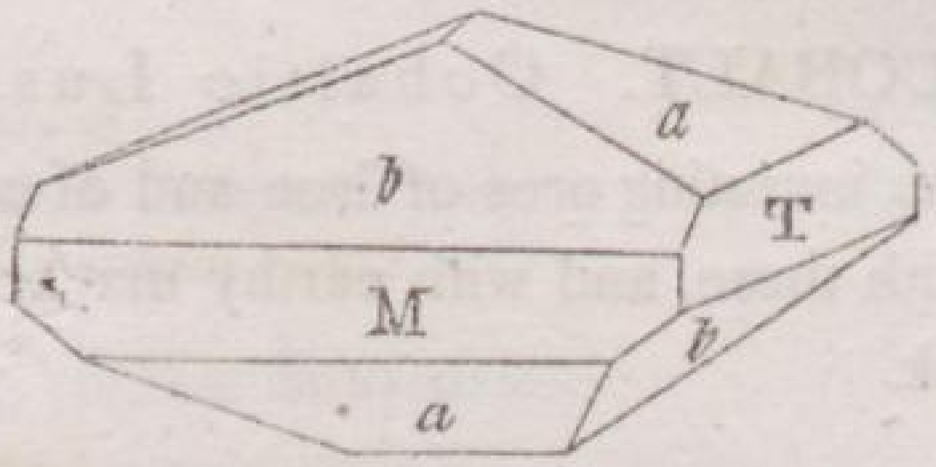
Oxide of cobalt and of manganese - - - - -	76·9
Water - - - - - - - - -	23·1

EDINGTONITE. Pyramidal Dystome-Spar.

Primary form. Right rectangular prism?

Secondary form.

Fig. 164.



Cleavage, pretty distinct parallel to the primary faces. In other directions a small and conchoidal fracture. Surface, M and T generally smooth, the rest curved and without lustre.

Lustre vitreous. Color greyish white. Semi-transparent, but oftener translucent. Streak white.

Hardness =4·0 . . . 4·5. Sp. gr. =2·71.

1. It yields moisture when calcined. It is fusible before the blowpipe into a transparent glass. It gelatinizes in the acids.

2. *Analysis.*

By Turner.

Silica	35·09
Alumina	27·69
Lime	12·68
Water	13·32

3. It occurs at Kilpatrick near Dumbarton, (Scotland,) where it is accompanied by Harmotome and Thomsonite, being implanted upon the latter mineral in crystals, the largest of which is only two lines in diameter.

Ekebergite. (See *Scapolite.*)

Elaolite. (See *Nepheline.*)

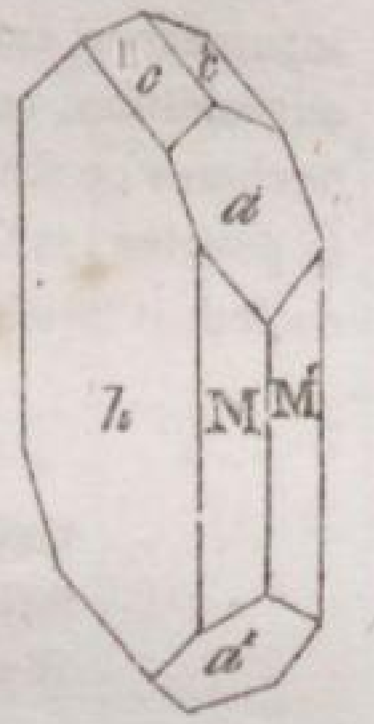
ELECTRIC CALAMINE. Prismatic Zinc-Baryte. MOHS.

Primary form. Right rhombic prism. M on M=102° 35′.

Secondary form.

M on M	102° 30′	PHILLIPS.
M on *a*	132 35	
a on *h*	128 40	
a on *c* or *e*	115 00	
c on *c′*	126 36	

Fig. 165.



Cleavage, parallel with the primary lateral planes, perfect; traces of cleavage parallel with the terminal planes. Fracture uneven. Surface of lateral planes streaked parallel with their common intersections. The rest of the faces generally smooth, sometimes rounded.

Lustre vitreous, inclining to pearly, sometimes to adamantine upon curved faces of crystallization. Color white, prevalent: occasionally blue, green, yellow or brown. Streak white. Transparent . . . translucent.

Brittle. Hardness = 5·0. Sp. gr. = 3·379, crystals from Rossegg in Carinthia.

Compound Varieties. Globular, botryoidal shapes: surface drusy. Massive: composition either granular or columnar; the former of them often impalpable and strongly coherent, and then the fracture becomes uneven; the latter straight and divergent.

Electric Calamine.

1. In some of the crystals of Electric Calamine, dissimilar modifications have been observed upon the opposite extremities of the same crystals, as in Tourmaline; attended also with the evolution of different kinds of electricity, as in that mineral. Like the Tourmaline, the electric excitation is occasioned by common changes of atmospheric temperature; and is not destroyed in the crystals, even after their exposure to a red heat.

Before the blow-pipe, it decrepitates a little, loses its transparency, intumesces, and emits a green phosphorescent light. It is infusible without addition, but is dissolved by borax into a clear glassy globule, which becomes opake on cooling. It is phosphorescent by friction. Reduced to powder, it is soluble in heated sulphuric or muriatic acid, and when cooled, it forms a jelly.

2. *Analysis.*

	By Berthier.	By Berzelius.
Oxide of zinc	66·00	66·37
Silica	25·00	26·23
Water	9·00	7·40

This species has been found artificially produced, lining the throats of iron furnaces, in Salisbury, (Conn.) where the ore employed is the Brown Iron-Ore. The furnaces are constructed of mica-slate. The mineral presents itself in coatings, quarter of an inch in thickness, having botryoidal shapes with drusy surfaces. Its color is a delicate straw-yellow.

3. Electric Calamine is found along with Calamine in veins belonging to various classes of rocks, but chiefly calcareous ones. It is usually associated with Blende and Galena.

4. Considerable quantities occur at Bleiberg and Raibel in Carinthia, Rezbanya in Hungary, Freiburg in Brisgau, Altenberg near Aix-la-Chapelle, near Tarnowitz in Silesia, at Olkuzk and Medziana Gora in Poland and in Siberia. It occurs in Leicestershire, Derbyshire, Flintshire, Somersetshire, &c., in England; at Wanlockhead and Lead-Hills in Scotland.

In the United States, it has of late been discovered in Jefferson co. (Missouri) at a lead mine called Valle's diggings, where it is associated with Calamine.

Emerald. (See *Beryl.*)

Emery. (See *Corundum.*)

ENDELLIONE. (See *Bournonite.*)

EPIDOTE. Prismatoidal Augite-Spar. MOHS.

Primary form. Right oblique-angled prism. M on T =115° 40′.

Secondary forms.

Fig. 166.

Franconia, (N.H.)

M on T	- -	115°	36′
T on *b*	- -	128	35
b on M′	- -	116	26
a on *a*	- -	109	24
a on *b*	- -	125	32

Fig. 167.

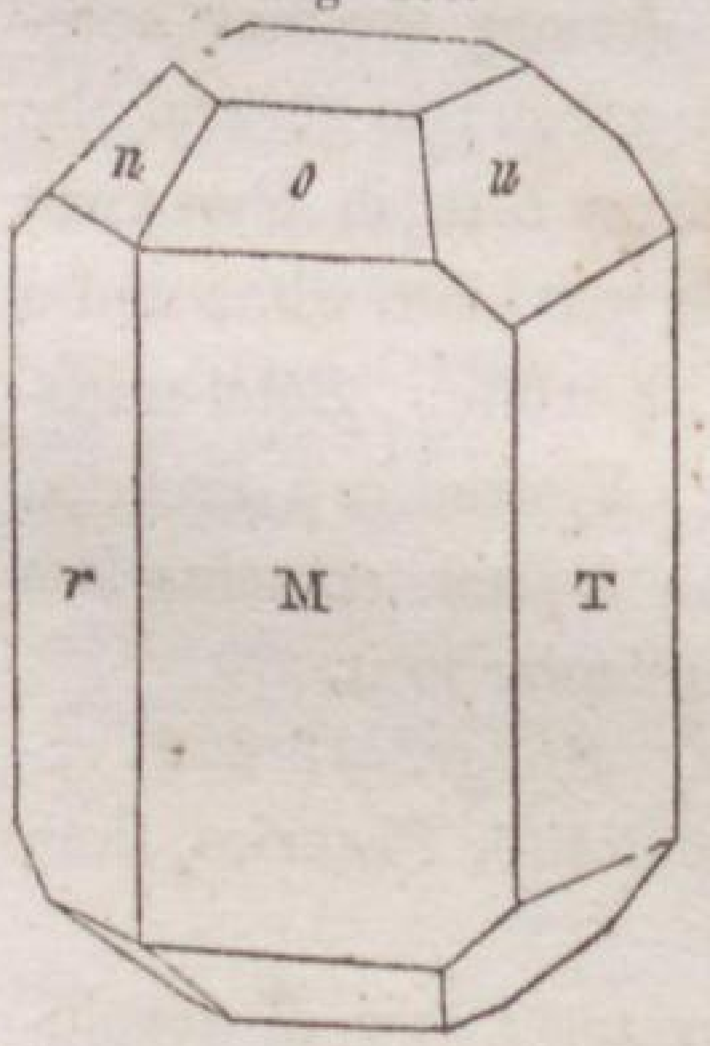
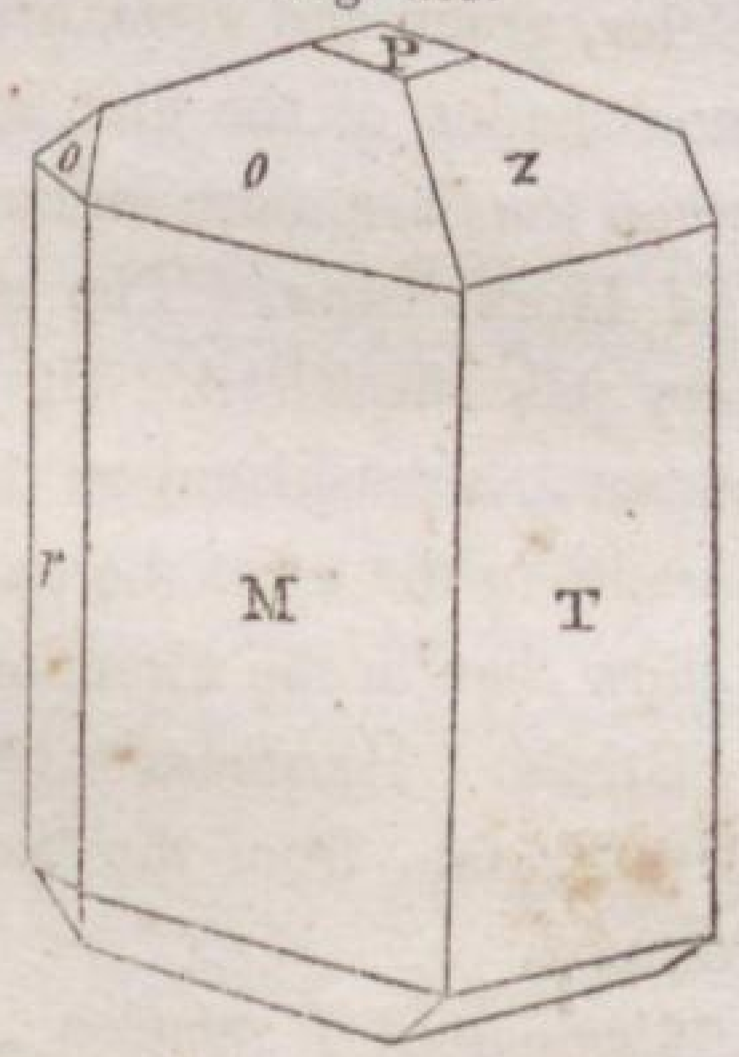


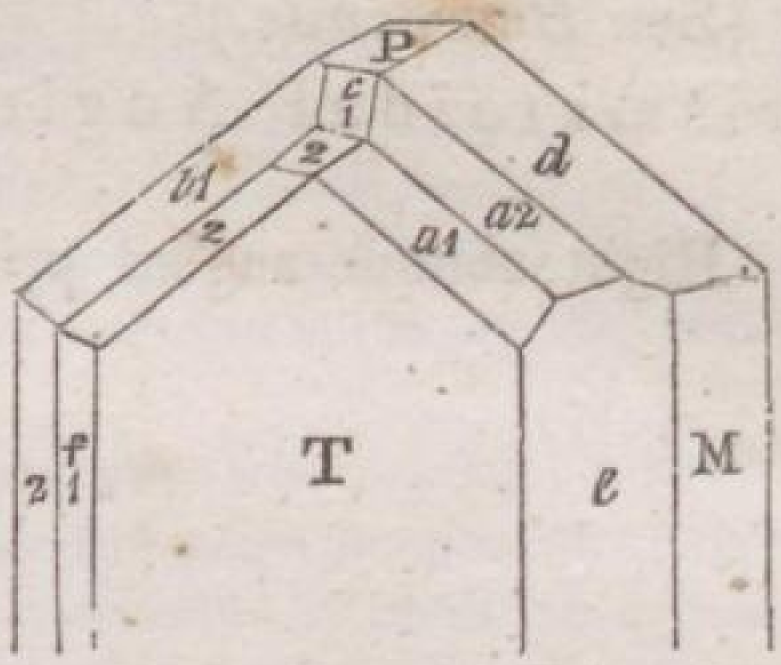
Fig. 168.



M on *o*	-	121° 23′	HAUY.	P on *o*	-	148° 37′
M on *r*	-	116 40		P on *u*	(fig.167)	125 35
T on *u*	-	144 25		P on *z*	-	145 3

Epidote.

Fig. 169.



M on *e*	-	150°	15′	PHILLIPS.	P on *d*	-	145° 6′
T on *e*	-	145	24		P on *c*1	-	148 30
T on *f*1	-	145	39		T on *c*1	-	121 50
T on *f*2	-	114	40		T on *b*1	-	104 30
M on *d*	-	125	2		T on *b*2	-	142 35

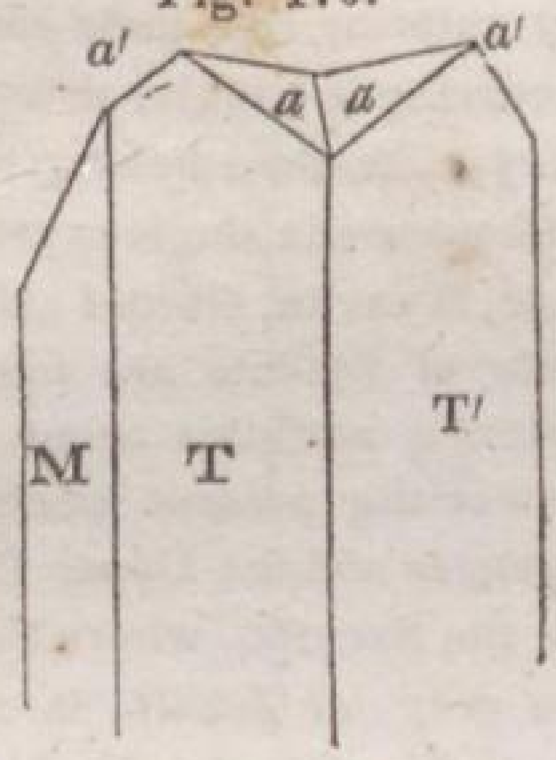
Cleavage, perfect parallel to M; less so parallel to T. Fracture, uneven. Surface, the lateral planes sometimes streaked vertically: in general, the faces are smooth.

Lustre vitreous, inclining to pearly upon perfect faces of cleavage, and the corresponding faces of crystallization. Color, green and grey, prevalent. Among the most common shades of the first, is pistachio-green; in general, the green tints are more inclined to yellow than in Pyroxene and Hornblende. The grey colors pass into white and a very pale flesh-red. Streak greyish-white. Semi-transparent . . . translucent on the edges. Viewed in a direction parallel to the axis, the color of the crystals contains less yellow than in the directions perpendicular to it.

Brittle. Hardness =6·0 . . . 7·0. Sp. gr. =3·269, variety Zoisite, from the Saualpe; =3·425, Pistazite, from Arendal.

Compound Varieties. Twin-crystals: axis of revolution parallel to the prismatic axis, as represented in the annexed figure; angle of revolution = 180°.

Fig. 170.



Franconia, (N. H.)

M on T	-	115° 36′	*a* on *a'* -	109° 24′
T on T′	-	129 35		

Several varieties consist of concentric coats, the outer ones of which being pealed off, leave a crystal with smooth faces. Massive: composition granular, of various sizes of individuals, sometimes impalpable, strongly connected: columnar, straight, and either parallel or divergent, or irregular, and of various sizes of individuals.

1. Epidote includes *Zoisite*, or the grey and whitish colored varieties of the present species, and which by some mineralogists have been treated of, as constituting a separate species. The light reddish-black variety from Piedmont, called the Manganesian Epidote, is Zoisite tinged by oxide of manganese.

2. Before the blow-pipe, the varieties of Epidote intumesce, and partly exfoliate, but are with difficulty brought to the condition of a transparent glass. Those with much iron are more easily fused than the rest. With borax, Epidote first intumesces, and then yields a clear globule.

3. *Analysis.*

	By Klaproth, fr. the Saualpe. *Zoisite.*	By Descotils, fr. Dauphiny. *Epidote.*	By Vauquelin, fr. Norway. *Epidote.*
Silica	45·00	37·00	37·00
Alumina	29·00	27·00	21·00
Lime	21·00	14·00	15·00
Oxide of iron	3·00	17·00	24·00

4. Epidote is found variously disseminated in nearly all the primitive rocks, without however entering into their composition as a regular ingredient, but rather occurring in single, drusy cavities, narrow seams and veins. The finer crystallizations belong to beds of Magnetic Iron-Ore. The variety Zoisite occurs in single crystals and crystalline masses in beds, with Hornblende, Kyanite, Garnet and Zircon.

5. Magnificent crystals of Epidote are found in the iron-mines of Arendal, Norway. Similar varieties occur also in Sweden. Very handsome crystallizations of the present species are found in Switzerland, Piedmont, the Pyrenees and the Upper Palatinate. Less remarkable varieties come from the Saualpe, where the transition of the green colored crystals into the grey, or Zoisite, is observed. The grey colored Epidote, or Zoisite, is found in the Bache mountain and Schwamberg Alpe in Lower Stiria; in the Fichtelgebürge, and in the Tyrol. The red manganesian varieties occur at St. Marcel in the valley of Aosta in Piedmont.

Crystals, resembling in size, color and form, those from Norway and Sweden, occur in the iron-mine of Franconia and in its vicinity, in the state of New Hampshire. Very beautiful grey crystals, though of small diameter compared with their length, have been found at Hawley, penetrating small beds of quartz in hornblende-rock. The pistachio-green crystals occur at Cumberland, (R. I.) in veins and drusy cavities, in a species of trap-rock. A variety precisely similar to that from Piedmont has been found in small quantity at Haddam, (Con,) forming a vein in gneiss about one inch wide. But the greyish white colors, or Zoisite varieties, are the most frequent in the U.S. These occur in columnar compositions, in which the individuals are large, at Wardsborough, (Vt.) Milford, (Conn.) but particularly at Goshen and Williamsburg, (Mass.) In the last mentioned places they exist in veins and beds of quartz situated in mica slate. In the eastern part of Maine, a radiating variety has been discovered, which is purplish red at the centres of the fibrous masses, but assumes the pistachio-green where the fibres diverge most. A variety of Zoisite in long, nearly impalpable fibres, of a dark bluish grey color, occurs with Calcareous Spar in mica slate, at Montpelier, (Vt.)

EPISTILBITE. Diplogenous Kouphone-Spar. Mohs.

Primary form. Right rhombic prism. M on M=135° 10′.

Epistilbite.

Secondary forms.

Fig. 171.

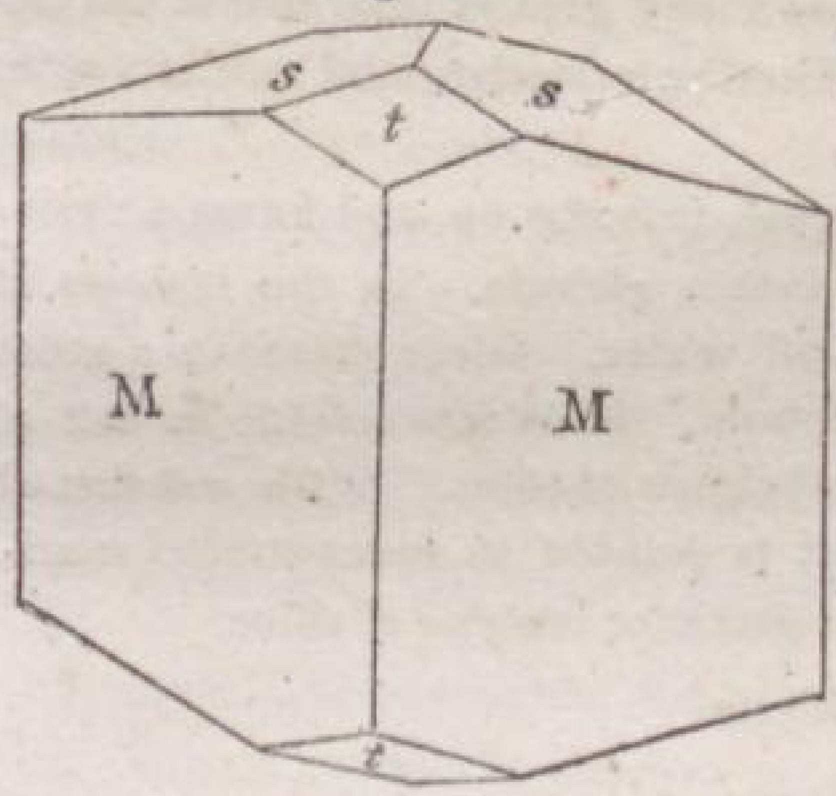
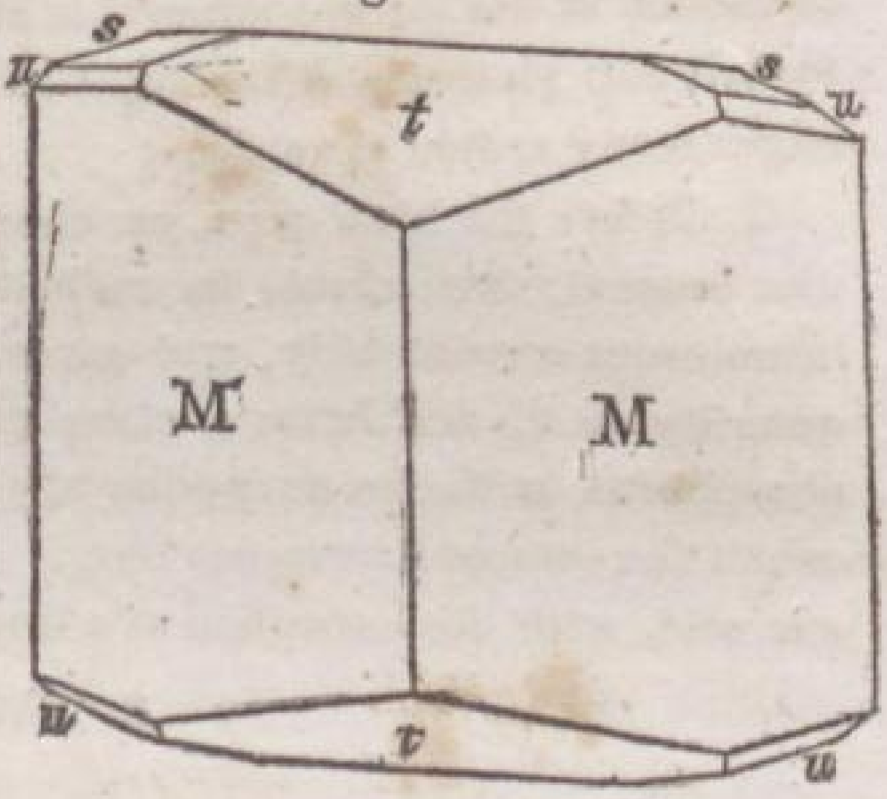


Fig. 172.



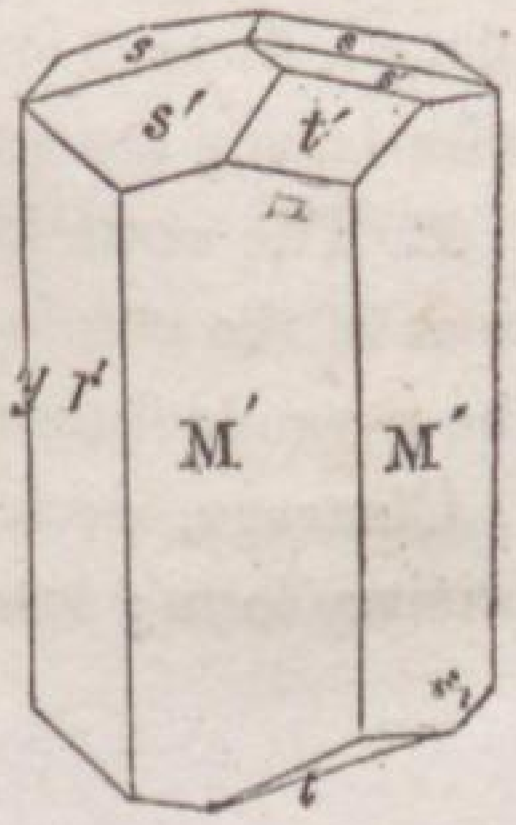
M on *t*	- - - -	122° 9′
t on *t*	- - - -	109 46
t on *u*	- - - -	154 51
t on *s*	- - - -	141 47
s on *s*	- - - -	147 40

Cleavage, perfect parallel with the shorter diagonal of the prism. In other directions only an uneven fracture. Surface, the faces M shining, but uneven, not admitting of the use of the reflective goniometer; the faces *s* are dull; *t* are smooth and shining.

Lustre, on M vitreous; that of *r* pearly. Color, white. Transparent, to translucent on the edges.

Hardness = 4·5. Sp. gr. = 2·249 . . . 2·50.

Fig. 173.



Compound Varieties. Twin-crystals: axis of revolution perpendicular: face of composition parallel to one of the primary lateral faces: angle of revolution = 180°. Massive: composition granular.

1. Epistilbite, according to Dr. Brewster, is destitute of the two systems of colored rings, which are visible in Heulandite. The double refraction of the former mineral is also vastly greater than that of the latter; it also gives the white light of fixed polarization, and exhibits at its edges many orders of colors.

2. Before the blow-pipe, on charcoal, it froths up, and forms a vesicular enamel, but cannot be melted into a globule. In the matrass, it intumesces considerably, and gives off water. Borax dissolves a great quantity of it, and forms a clear globule. It is also soluble in salt of phosphorus, with the exception of a skeleton of silica. With solution of cobalt the enamel becomes blue. It is soluble in concentrated muriatic acid, with the exception of a fine granular residue of silica.

3. *Analysis.*

By Rose.

Silica	58·59
Alumina	17·52
Lime	7·56
Soda	1·78
Water	14·48

4. It occurs in amygdaloidal rocks in Iceland and the Faroe Islands, along with Heulandite, and at Poonah in India.

EPSOM SALT. Prismatic Epsom-Salt. Jamieson.

Primary form. Right rhombic prism. M on M′=90° 30′.

Secondary forms.

1. The primary, having the terminal edges deeply replaced, so as to form pyramids at each extremity, and likewise having the acute lateral edges truncated.

2. The same form, with the addition of tangent truncations of the obtuse lateral edges, and of the upper edges of the pyramidal terminations.

Cleavage, perfect parallel to the shorter diagonal of the primary form; less so, parallel with the faces formed by the truncation of the pyramidal edges. Fracture, conchoidal. Surface, crystals striated vertically upon their lateral planes.

Lustre vitreous. Color white. Streak white. Transparent . . . translucent.

Rather brittle. Hardness 2·0 . . . 2·5. Sp. gr.=1·751. Taste saline and bitter.

Compound Varieties. Botryoidal, reniform, and in the shape of crusts: composition columnar, if the particles are very delicate, the lustre becomes pearly. Pulverulent.

1. It deliquesces before the blow-pipe, but is with difficulty fusible, if its water of crystallization has been driven off. It dissolves very readily in water.

2. *Analysis.*

By Vogel.

Water	48·0
Sulphuric acid	33·0
Magnesia	18·0

3. It effloresces from several rocks, both in their original repositories, and in artificial walls. It forms the principal ingredient of certain mineral waters.

4. It occurs in Freiberg, and in its neighborhood, efflorescent upon gneiss; likewise in Scotland, in the Hartz, in Berchtesgaden, in Salzburg, at Idria in Carniola, in Bohemia and in Hungary.

It abounds in the limestone caves of Kentucky and Indiana, whose floors are often covered with it in delicate crystals, intermingled with dry earth to a considerable depth. In New York also, ten miles from Coeymans, on the east face of the Helderberg, it effloresces from the calcareous sandstone.

5. After having been purified, it is employed in medicine, as well as for the production of magnesia.

ERINITE. Dystome Copper-Baryte.

Highly crystalline: the individuals arranged in concentric coats, with rough surfaces, produced by the termination of exceedingly minute crystals; the layers often not firmly cohering, so that they may easily be separated from one another. These layers themselves are very compact, exhibiting an uneven or imperfectly conchoidal fracture, and traces of cleavage.*

Color, a beautiful emerald green, slightly inclining to grass-green. Streak green, but paler. It is slightly translucent on the edges.

Brittle. Hardness =4·5 ... 5·0. Sp. gr.=4·043.

1. *Analysis.*
By TURNER.

Oxide of copper . . .	54·44
Alumina . . .	1·77
Arsenic acid . . .	33·78
Water . . .	5·01

2. It is associated with other species of arseniate of copper, and occurs in the county of Limerick in Ireland.

ERLAN.

Massive: composition granular, also impalpable and slaty. Fracture splintery and uneven.

Color greenish grey. Lustre feebly vitreous to dull. Streak white, and possessing a resinous or oily lustre.

Hardness = 5·5 ... 6·5. Sp. gr. = 3·0 ... 3·1.

1. *Analysis.*
By GMELIN.

Silica	59·8
Alumina	15·9
Lime	15·7
Oxide of manganese . . .	5·6
Soda	3·0

2. It occurs associated with Mica at Schwarzenberg in Saxony, forming a mountain mass.

* These plates form crest-like aggregations. A circumstance which greatly increases the difficulty of observing the regular forms, is the want of lustre; the surface of the concentric layers being quite dull, while there is only a slight degree of resinous lustre on the fracture.

3. From the foregoing description, Erlan would appear to be only a variety of argillite.

ESSONITE. (See *Garnet.*)

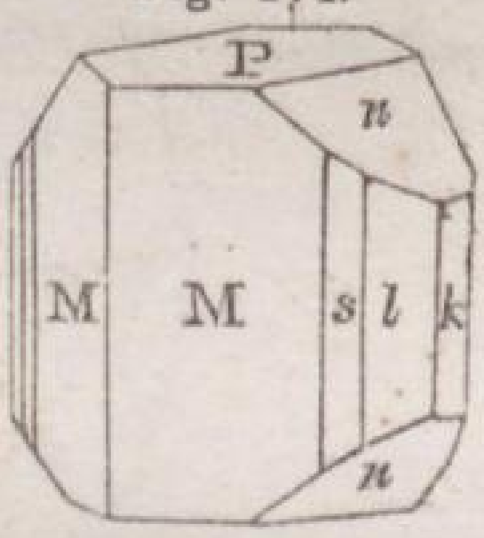
EUCHROITE. Peritomous Copper-Baryte.

Primary form. Right rhombic prism. M on M=117° 20′.

Secondary form.

M on M	- -	117° 20′	HAIDINGER.
l on *l*	- -	78 47	
s on *s*	- -	95 12	
n on *n*	- -	87 52	

Fig. 174.



Cleavage, parallel to the primary lateral planes, distinct; indistinct parallel to *n*.

Fracture small conchoidal, uneven. Surface, the vertical faces of the prism streaked parallel to their common edges of combination.

Lustre vitreous. Color bright emerald-green. Streak pale apple-green. Double refraction considerable. Transparent . . . translucent.

Rather brittle. Hardness = 3·5 . . . 4·0. Sp. gr. = 3·389.

1. In the matrass, it loses its water, and becomes yellowish green and friable. When heated to a certain point upon charcoal, it is reduced in an instant with a kind of deflagration, leaving a globule of malleable copper, with white metallic particles dispersed throughout its mass, which are entirely volatile upon a continued blast.

2. *Analysis.*

By TURNER.

Peroxide of copper	47·85
Arsenic acid	33·02
Water	18·80

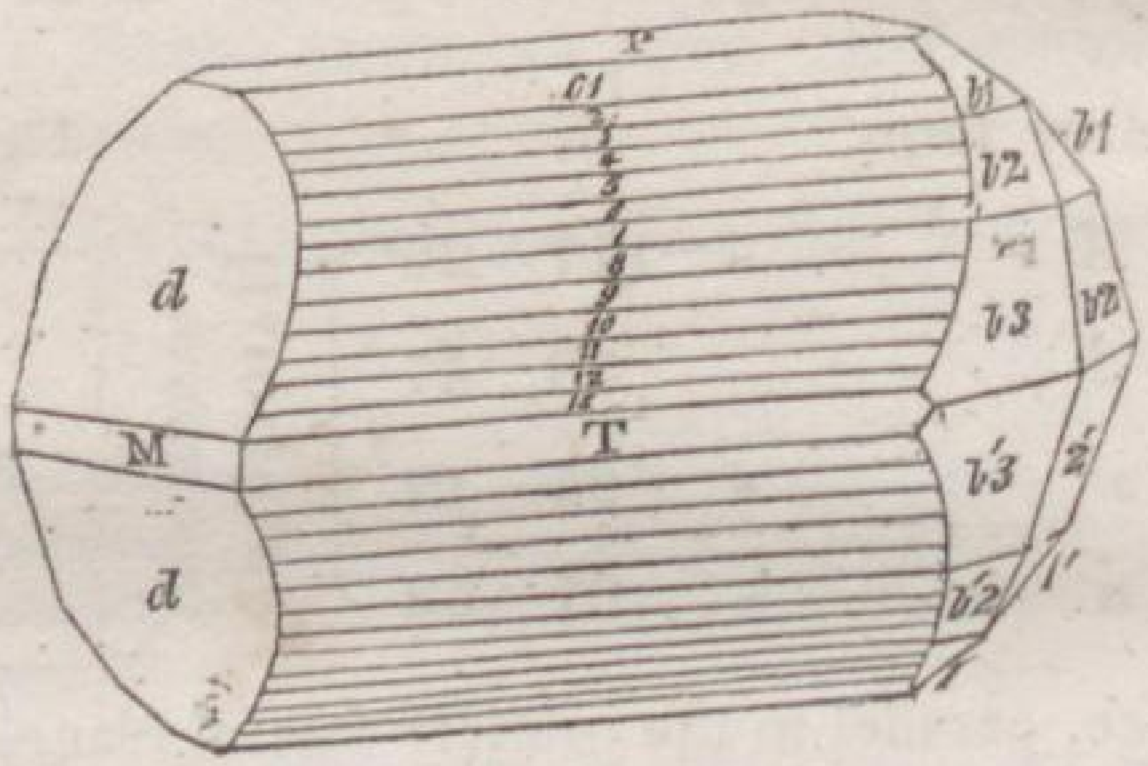
3. It was discovered at Libethen in Hungary, in quartzose mica slate.

EUCLASE. Prismatic Emerald. Mohs.

Primary form. Right oblique-angled prism. M on T= 130° 50′.

Secondary form.

Fig. 175.



P on M or T	90°	0′		P on *c*12	103°	38′
M on M or T	130	52		P on *c*13	100	50
*b*1 on M or T	98	50		P on *b*1	123	10
*b*2 on M or T	100	00		P on *b*2	108	24
P on *c*	124	30		P on *b*1	130	10
P on *d*	124	24		P on *b*2	112	50
P on *c*1	122	28		P on *b*3	139	18
P on *c*2	121	30		*b*1 on *b*2	165	18
P on *c*3	120	10	Phillips.	*b*2 on *b*2′	143	32
P on *c*4	116	05		*b*1 on *b*2	162	20
P on *c*5	112	50		*b*2 on *b*3	169	45
P on *c*6	111	50		*b*2 on *b*1	143	20
P on *c*7	109	40		*d* on *d*	105	20
P on *c*8	108	46		*c*1 on *d*	140	00
P on *c*9	107	20		*c*1 on *b*1	148	10
P on *c*10	106	22		*c*1 on *b*1	115	20
P on *c*11	105	14				

Cleavage, highly perfect, and very easily obtained parallel to P; less distinct parallel to T. Fracture perfectly conchoidal, and very easily obtained. Surface, the faces between T and P streaked parallel to their common intersection.

Lustre vitreous. Color mountain-green, passing into blue, and white, always pale. Streak white. Transparent . . . semi-transparent, generally the first.

Very brittle and fragile. Hardness = 7·5. Sp. gr. = 3·098, a greenish-white crystal.

1. Before the blow-pipe, it intumesces in a strong heat, and becomes white. If the heat be still farther increased, it melts into a white enamel.

2. *Analysis.*
By BERZELIUS.

Silica	43·22
Alumina	30·56
Glucina	21·78
Oxide of iron	2·22
Oxide of tin	0·70

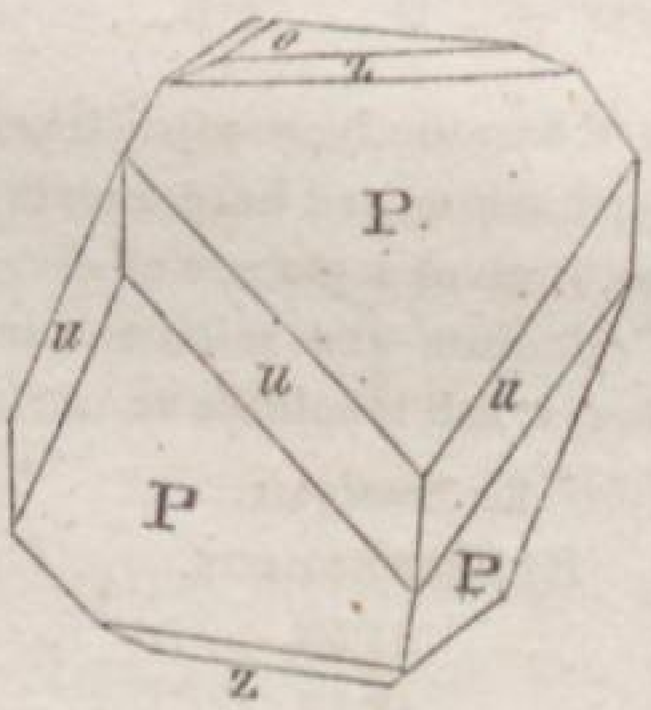
3. Nothing as yet is known with sufficient accuracy, of the mode of its occurrence in nature. The first varieties of it were brought by DOMBEY from Peru. It was afterwards found at Capao in the mining district of Villa-Ricca in Brazil, where it occurs in beautifully crystallized varieties in a chloritic slate, resting on sandstone, along with Topaz. It is generally brought to Europe in fractured crystals.

EUDYALITE. Rhombohedral Petaline-Spar.

Primary form. Rhomboid. P on P = 73° 40′.

Secondary form.

Fig. 176.



P on *u* - 106° 36′ | P on *z* - 126° 13′

Cleavage, parallel to *o* distinct; parallel to *z* less so: traces of cleavage parallel with the faces of the primary rhomboid. Fracture conchoidal or uneven. Surface smooth, but often rather uneven.

Lustre vitreous. Color brownish-red. Streak white. Translucent on the edges . . . opake.

Hardness =5·0 . . . 5·5. Sp. gr. =2·898.

1. Before the blow-pipe, it melts into a leek-green scoria. If reduced to powder, it gelatinizes with acids.

2. *Analysis.*

By Stromeyer.

Silica	52·00
Zirconia	10·89
Lime	10·14
Soda	13·92
Oxide of iron	6·85
Oxide of manganese	2·57
Muriatic acid	1·03

3. It is found in Greenland, mixed with Sodalite, Hornblende, and a mountain green variety of Feldspar.

EUKAIRITE. Selenious Polypoine-Glance.

Massive: composition granular or impalpable.

Lustre metallic. Color lead-grey. Streak white, when impressed with the nail.

Ductile. Hardness =2·0 . . . 2·5.

1. When heated alone before the blow-pipe, it emits a strong smell of selenium, and yields greyish white, and hard metallic globules. Heated with lead upon bone-ashes, it gives a globule of silver. In an open tube, it affords a precipitate of selenium and selenious acid. It prevents the reaction of copper with fluxes, and is soluble in nitric acid.

2. *Analysis.*

By Berzelius.

Selenium	31·58	26·00
Silver	43·16	38·93
Copper	25·26	23·05
Earthy matters	0·00	8·90

3. It occurs disseminated through Calcareous Spar, in the mine of Skrickerum in Smoland.

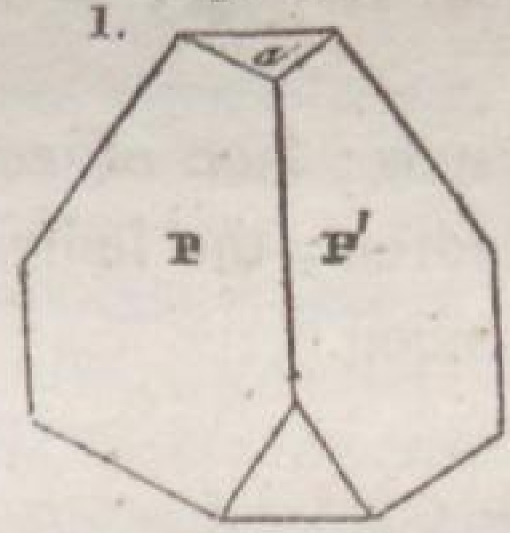
FAHLERZ. Tetrahedral Copper-Glance. Mohs.

Primary form. Tetrahedron.

Secondary forms.

Fig. 177.

1.



Kapnik.

Fig. 178.

2.

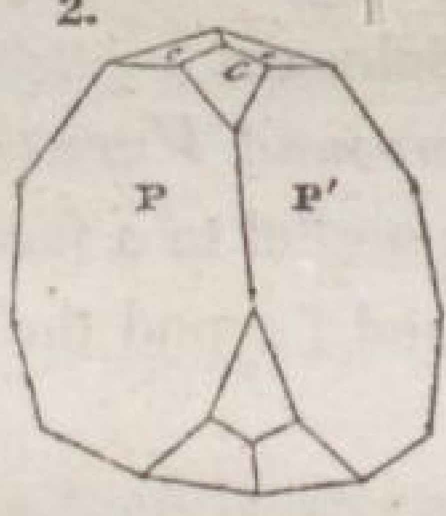
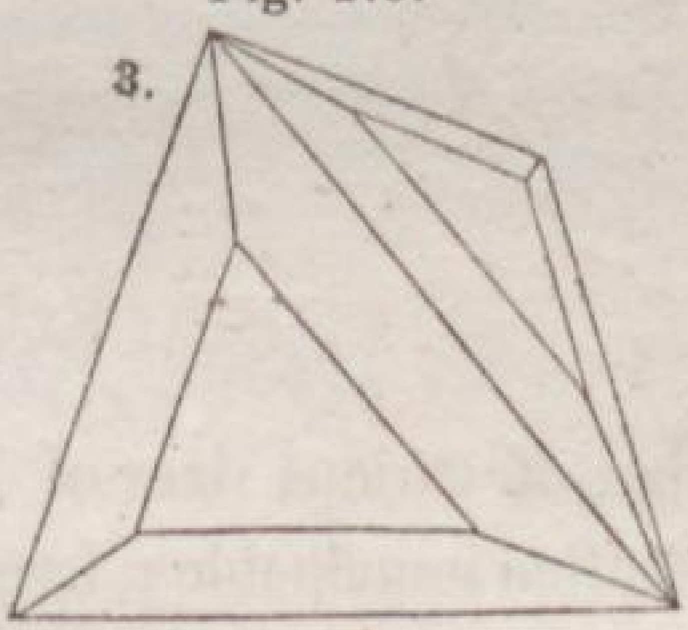


Fig. 179.

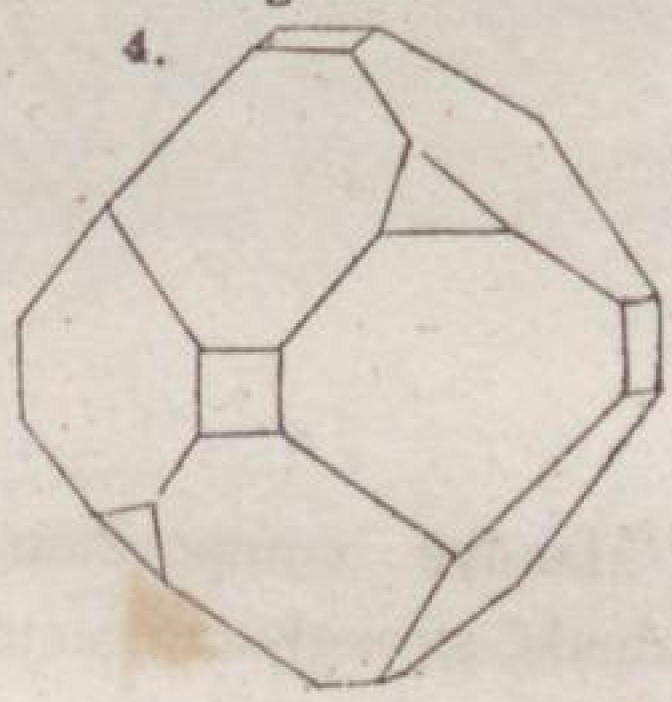
3.



Kapnik.

Fig. 180.

4.



Schwatz, (Tyrol.)

5. Rhombic dodecahedron.

6. Icosatetrahedron.

7. Trigonal dodecahedron, resulting from the extension of the bevelling planes in Fig. 179.

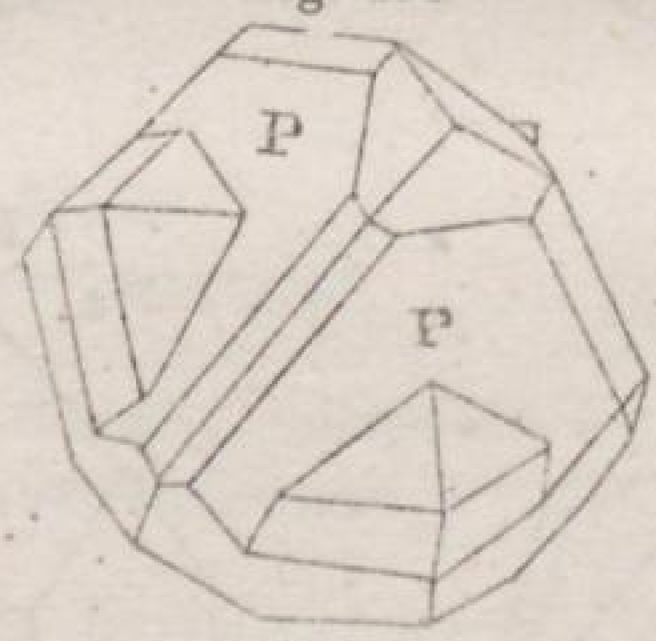
Cleavage, not visible, except traces of the octahedron. Fracture conchoidal, of different degrees of perfection Surface, the tetrahedron and the trigonal dodecahedron generally streaked irregularly, parallel to their common edges of combination, not rough; the dodecahedron sometimes a little rough. Some varieties are subject to tarnish.

Lustre metallic. Color steel-grey . . . iron-black. Streak unchanged, sometimes inclining to brown.

Rather brittle. Hardness = 3·0 . . . 4·0. Sp. gr. = 4·104, from Cremnitz; = 4·950 from Kapnik; = 4·798, from Schwatz.

Compound Varieties. Twin-crystals: face of composition parallel to a face of the octahedron; the individuals continued beyond the face of composition.

Fig. 181.



Dillenburg.

Massive: composition granular, of various sizes of individuals, strongly connected, and often impalpable; fracture uneven.

1. Schwarzerz has been distinguished as a subspecies under Fahlerz, but differs only in having a deeper black color, and a more conchoidal fracture.

The varieties of the present species differ somewhat in their behavior before the blow-pipe, arising chiefly, it may be concluded, from accidental mixtures, depending upon the substances with which they occur associated. Some yield arsenic when roasted, others antimony, and the residue melt in different ways. After roasting, they yield a globule of copper.

2. *Analysis.*

By Klaproth.

	of Fahlerz.	of Schwarzerz.
Copper	48·00	40·25
Arsenic	14·00	0·75
Antimony	0·00	23·00
Sulphur	10·00	18·50
Iron	25·50	13·50
Silver	0·50	0·30

Other varieties contain the same ingredients in other proportions. Some, moreover, contain zinc, mercury, or lead; and in some varieties as much as 13½ p. c. of silver has been discovered: in others again, a small quantity of gold is detected.

3. Fahlerz is found in beds and veins. It is accompanied by Copper Pyrites, Spathic Iron, and Quartz.

4. The varieties of a steel-grey color are found in veins near Freiberg in Saxony, and in beds in Anhalt in the county of Gömör in Hungary, in Stiria, &c.; varieties called Schwarzerz are met with in veins at Schwatz and other places in Tyrol, at Kapnik in Transylvania, at Cremnitz in Hungary; also at Clausthal and Andreasberg in the Hartz. It occurs also in the neighborhood of Dillenburg; in Mansfield; in small quantities at Airthrie, and other places in Scotland; in Cornwall, and in South America.

FAHLUNITE. Peritomous Petaline-Spar.

Primary form. Oblique rhombic prism. M on M= 109° 28′. M on P=101° 30′. Reniform massive.

Cleavage parallel to the primary form. Fracture conchoidal . . . uneven, splintery.

Lustre vitreous. Color olive-green and oil green, passing into yellow, grey, brown, and black. Streak greyish-white. Feebly translucent on the edges . . . opake.

Hardness =6·0 . . . 6·5. Sp. gr. =2·61 . . . 2·66.

1. Before the blow-pipe, it becomes pale-grey, and melts on its thinnest edges. It is but slowly dissolved in glass of borax, and communicates to it the color produced by oxide of iron.

2. *Analysis.*

By Trolle-Wachtmeister.

	A black massive var. Sp. gr. =2·68.	Crystallized grey var. Sp. gr. =2·74	Blackish grey var. Sp. gr. =2·79
Silica	43·51	44·60	44·95
Alumina	25·81	30·10	30·70
Oxide of iron	6·35	3·86	7·22
Magnesia	6·57	6·75	6·04
Protoxide of manganese	0·00	0·00	1·90
do. mixed with ox. of iron	1·72	2·24	0·00
Soda	4·45	} 1·98	0·00
Potash	0·94		1·38
Fluoric acid with silica	0·16	0·00	0·00
Lime	0·00	1·35	0·95
Water	11·66	9·35	8·05

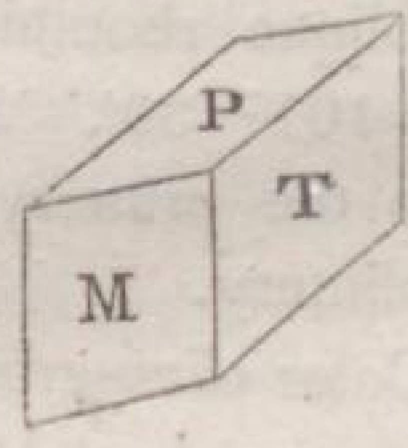
3. It occurs at Fahlun in Sweden, in a talcose or chloritic slate, with Galena and Copper Pyrites.

Fassaite. (See *Pyroxene.*)

FELDSPAR. Orthotomous Feld-spar. Mohs.

Primary form. Doubly oblique prism.* M on T = 120°. P on M = 90°. P on T = 67° 15′.

Fig. 182.

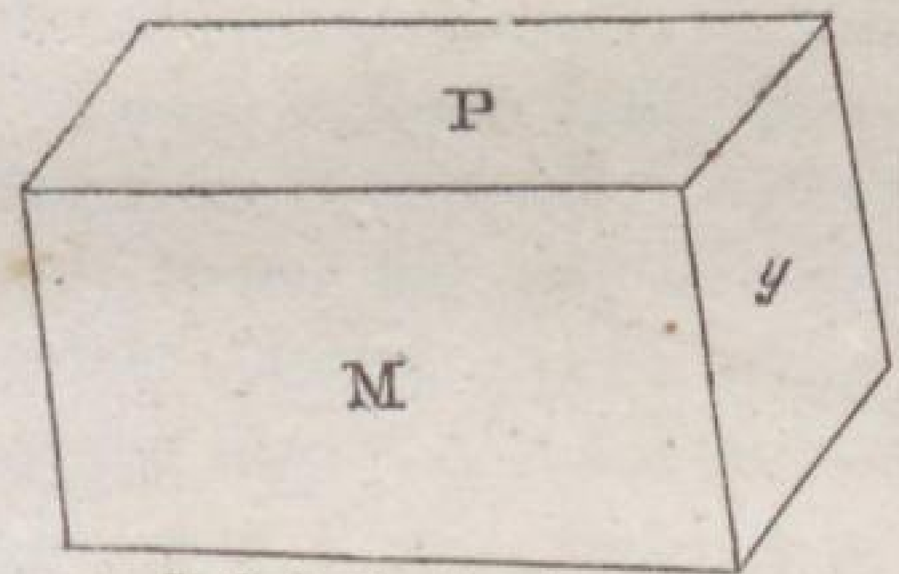


* In the description of this species, it has been found the most convenient to represent the crystals after the method of Haüy, in preference to that of Brooke, whose projections have generally been adopted in the present work.

Feldspar.

Secondary forms.

Fig. 183.



St. Gothard.—Rossie, (N.Y.)

Fig. 184.

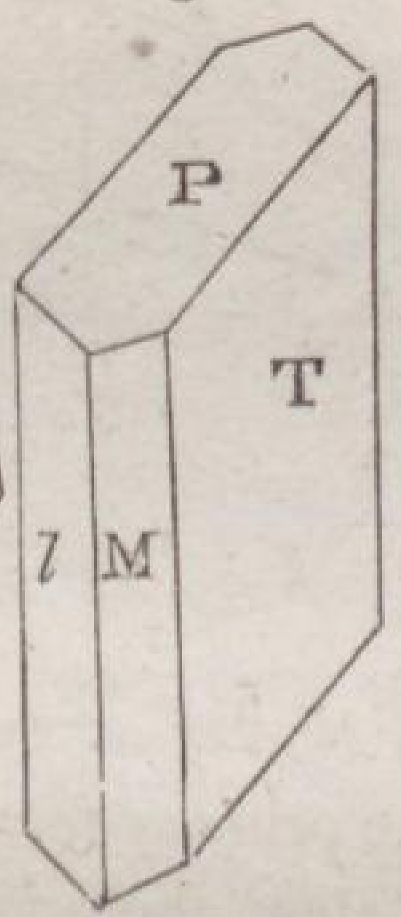


Fig. 185.

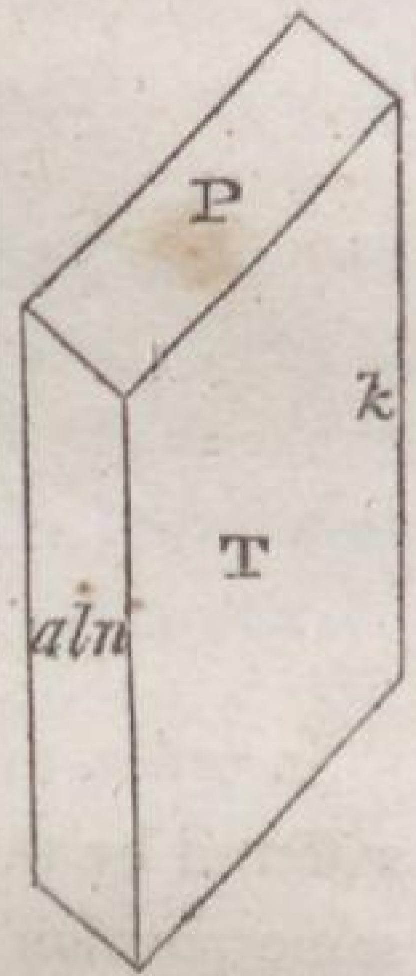
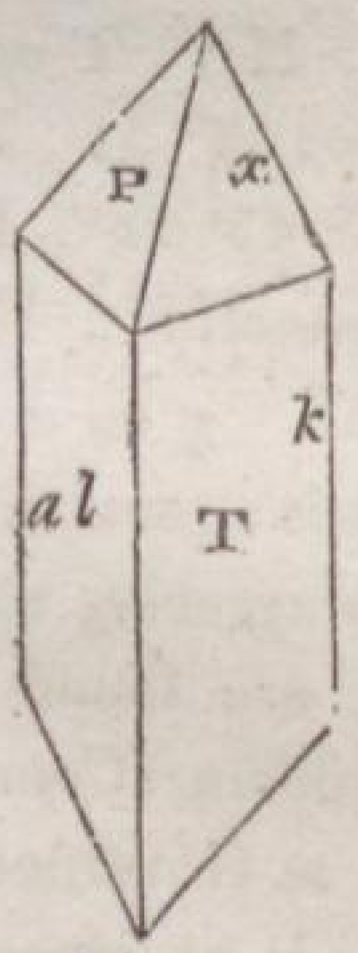


Fig. 186.



Isère.

Fig. 187.

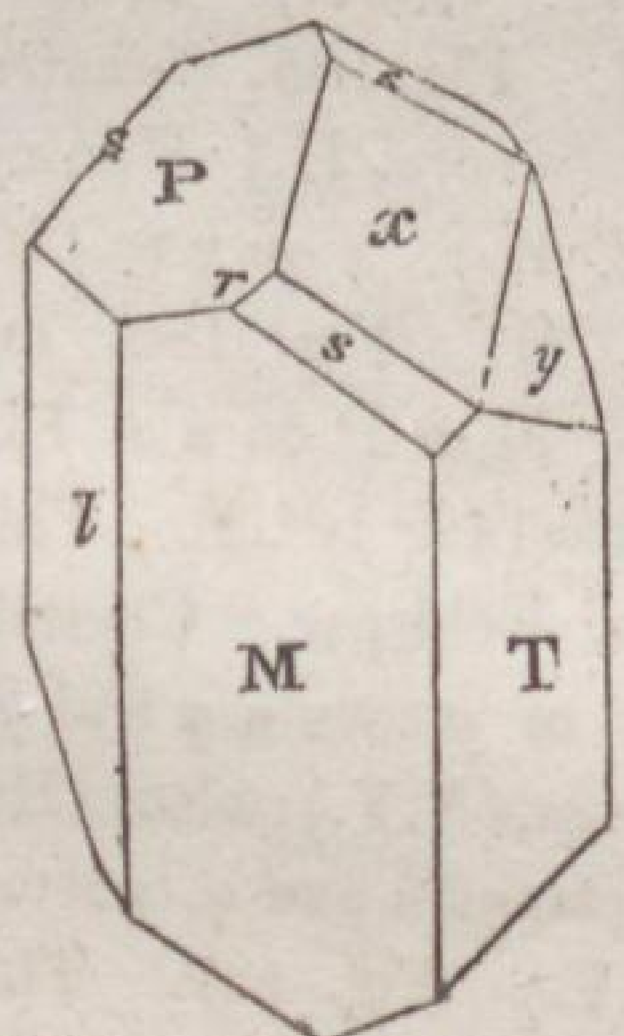
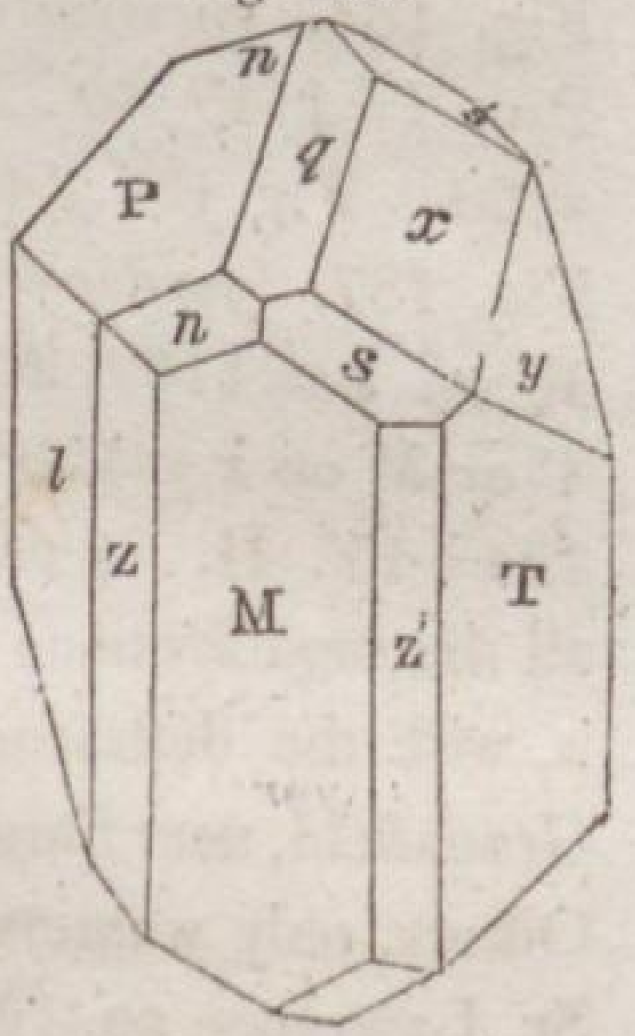


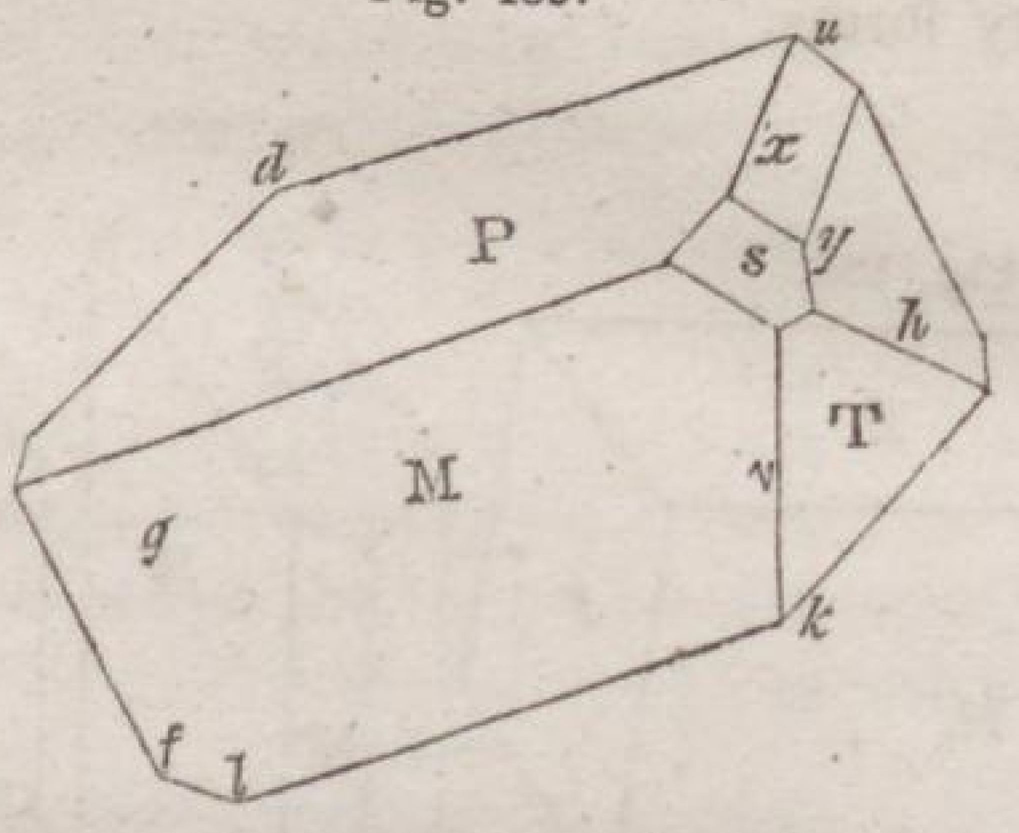
Fig. 188.



Middlefield and Becket, (Mass.)

Feldspar.

Fig. 189.



In order to render more easily intelligible the changes suffered by the primary form, the planes M and T have the same position given them in the secondary forms, as in the figure by which the primary is illustrated. Fig. 183. (*unitaire.* HAUY.) M on $y=90°$. H. P on $y=99° 29'$. H. Fig. 184. (*prismatique* HAUY.) M on $l = 120°$. H. P on $l=111° 40'$. H. Fig. 185. (*binaire.* H.) T on $l =60$. Fig. 186. (*ditetràedre.* H.) P on $x=128° 51'$. H. Fig. 187. (*sexdécimal.* H.) x on $y = 150° 45' 28''$. H. M on $s = 116° 20'$. H. Fig. 188. (*synoptique.* H.) T or M on $z =150°$. M or P on $n = 135°$. q on $x = 164° 40'$. H. q on $s=149° 10'$. P. This is a reunion of all the modifications of Feldspar. Crystals agreeing with it, with the deficiency of planes n q and y, are found at Greenfield, near Saratoga, (N.Y.); also at Haddam, (Conn.) Others, only wanting planes n and q, occur at Governeur, St. Lawrence co. (N.Y.) Fig. 189. This is an elongation of Fig. 187, in the direction of the edge between P and M. Fig. 188, suffers the same elongation in the direction of the plane n.

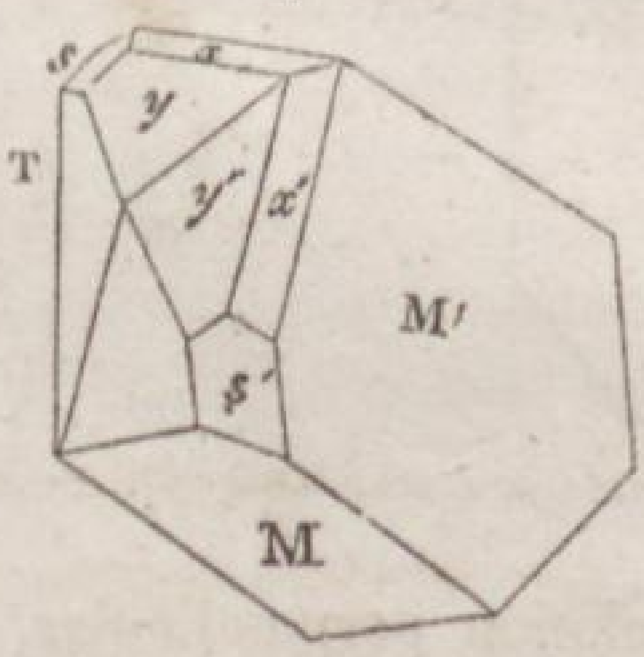
Cleavage, parallel with P highly perfect, and easily obtained; parallel with M perfect, with T obscure, though sometimes obvious. Fracture conchoidal to uneven. Surface frequently streaked in a horizontal direction; most of the other faces are smooth.

Lustre vitreous, sometimes inclining to pearly upon perfect faces of cleavage. Color white, prevalent, inclining to grey, green and red; sometimes grey, flesh-red, verdigris green. Streak greyish white. Transparent, translucent on the edge. A bluish opalescence observable in the direction of T, most distinctly in transparent varieties. The variety called moonstone, from Ceylon, appears considerably more red, and of a lower degree of transparency, if viewed perpendicularly to T, than in any other direction.

Brittle. Hardness = 6·0. Sp. gr. = 2·558, a white transparent variety; limits of the species 2.53 . . . 2·60.

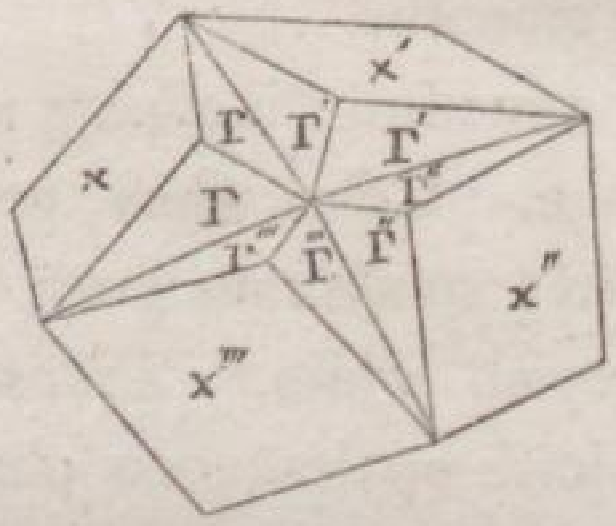
Compound Varieties. Twin-crystals. 1. Face of composition parallel with the edge between P and M. (Fig. 189.) Axis of revolution perpendicular to the plane *d g f l k h u* of the same figure. Angle of revolution = 180°. See annexed figure.

Fig. 190.



If this mode of composition be repeated on all the faces of the same form, four sided prisms, consisting of four individuals, will be formed, which are nearly rectangular, and bounded on their extremities by the faces P P and x x. This composition is seen in the annexed figure.

Fig. 191.



It is a frequent form, from St. Gothard.

2. Two crystals, like Fig. 187, excepting planes x and s. Axis of revolution parallel to the principal axis, face of composition parallel either to the right (Fig. 192.) or to the left faces (Fig. 193.) of M.

Fig. 192.

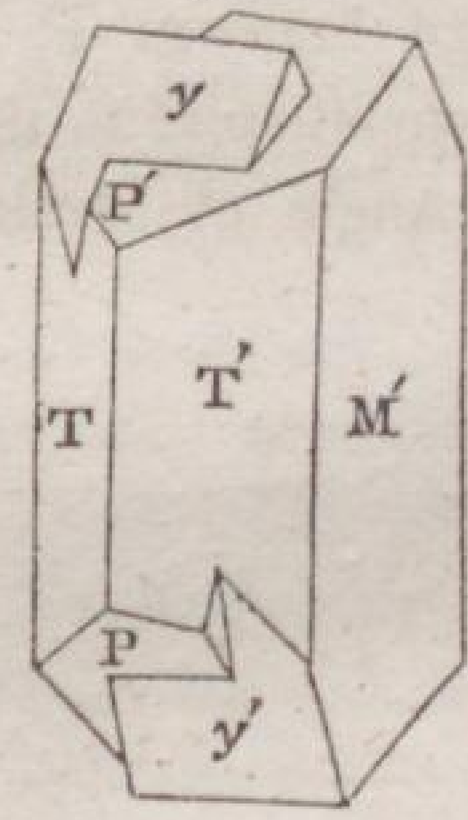
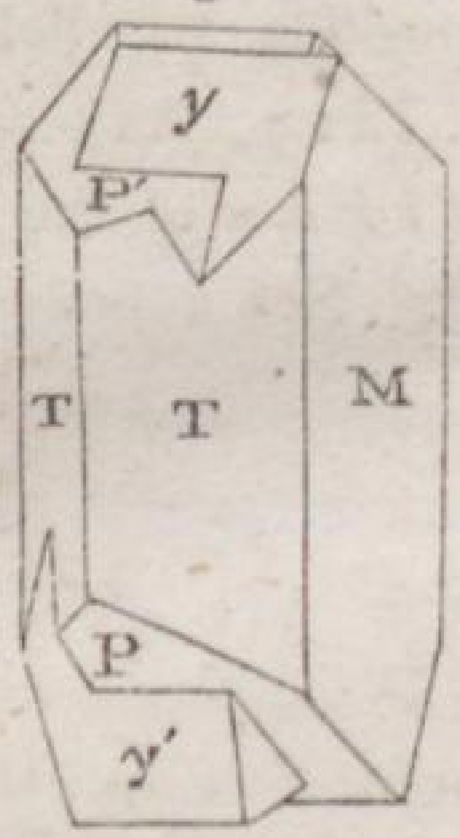


Fig. 193.

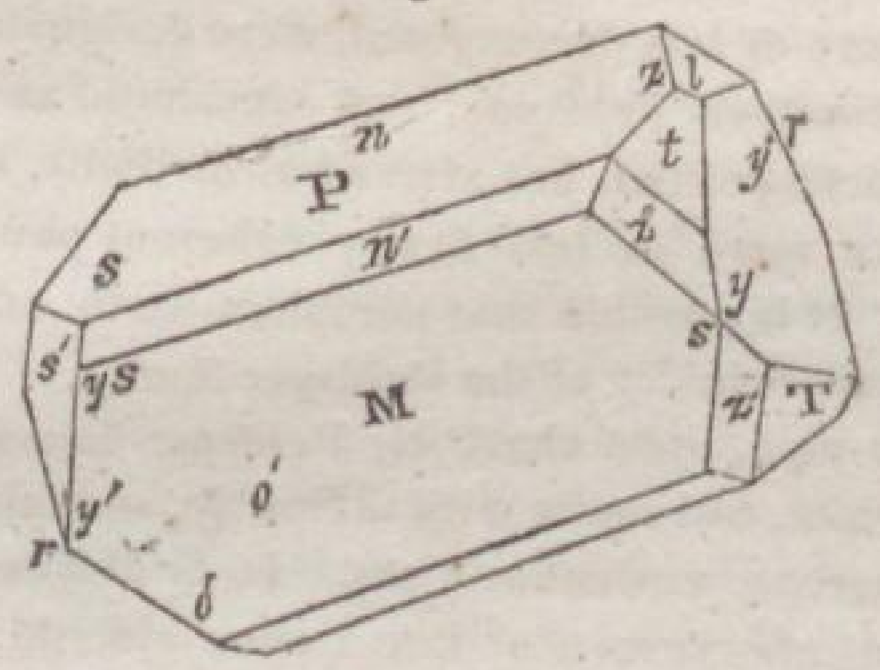


Both are found near Elbogen in Bohemia.

3. Axes of revolution perpendicular, face of composition parallel to P, angle of revolution $=180°$.

Feldspar.

Fig. 194.



La Clayette and Loire in France.

Sometimes there occurs a composition according to several of these laws at once. Massive: composition granular, of various sizes of individuals, sometimes lamellar.

1. Several distinct species were formerly included under the name of Feldspar, and variously subdivided into subspecies and varieties. First, those gray varieties which possess bright iridescent colors, were established into a particular subspecies, under the name of *Labrador Feldspar*. These are now known to comprehend varieties of Feldspar and of Labradorite. The most transparent and pure varieties, generally in implanted crystals, lining the walls of narrow veins in ancient rocks, were likewise considered as a particular subspecies, and called *Adularia*. It is made up of Feldspar and Albite. The less transparent varieties were divided into *common* and *compact Feldspar*; the first of which contained, though not exclusively, easily cleavable crystals; the second, imbedded crystals, having no distinct cleavage, and compound masses of small, or impalpable and strongly connected individuals. *Common Feldspar* contains varieties of all the species enumerated above. From it, *Clinkstone*, which is commonly a mixed mineral, and forms the mass of porphyry-slate, was distinguished as a particular species; so also was *Variolite*, consisting of small globular masses, imbedded in a mixed rock. It has not been exactly ascertained to what species Clinkstone and Variolite belong. Imbedded crystals of considerable degrees of transparency, in porphyry slate, occurring also in various other trachytic and volcanic rocks, were called *glassy Feldspar*. *Ice-spar* occurs in white transparent crystals, greatly resembling Adularia and glassy Feldspar, but implanted in the drusy cavities of rocks ejected by Mount Vesuvius. In regard to

the particular state, in which the varieties of common Feldspar occur, those which are more or less decomposed, were designated by the denomination of *earthy common Feldspar*, and considered as a particular subspecies. If the decomposition has arrived at its limits, so that the whole is converted into a more or less firmly coherent powder, *Porcelain-Earth* is formed. It is possible that porcelain-earth arises from the decomposition of several species of the Feldspar family.

Before the blow-pipe, upon charcoal, Feldspar becomes glassy, semitransparent and white, but melts with difficulty, and only upon its edges, into a semi-transparent, vesicular glass. It is dissolved by borax, but slowly and without effervescence, into a clear globule. It is not acted upon by acids.

Analysis.

	By Vauquelin.	By Klaproth.
	Adularia.	Common Feldspar fr. Carlsbad.
Silica	64·00	64·50
Alumina	20·00	19·75
Potash	14·00	11·50
Lime	2·00	a trace.
Oxide of iron	0·00	1 75
Water	0·00	0·75

Feldspar frequently enters into the composition of rocks, and constitutes, with Quartz and Mica, the different kinds of granite and gneiss; with Hornblende, it forms syenite and greenstone; and with Augite, the Augite-rock. To several of these rocks, large crystals of Feldspar impart a porphyritic appearance; and it is a characteristic mark of the different kinds of porphyry more properly so called, to have isolated crystals of this species distributed throughout their compact mass. Basalt, and some other allied rocks, must be considered as most intimate mixtures of Feldspar with Hornblende or Pyroxene, or with both these species, the individuals being so small as to be no longer recognizable. In several of these rocks which contain Feldspar as one of their ingredients, larger masses of it frequently form concretions separated from the rest, and assume the shape of more or less extended beds. If these be decomposed by the action of the atmosphere, and their situations be favorable, Porcelain earth is formed, among the most remarkable of which we notice those in gneiss, at Aue near Schneeberg in Saxony, and at Hafnerzell in the district of Passau. At Carclaise and Cligga in Cornwall, the porcelain earth originates in the decomposition of granitic rocks. It occurs frequently in beds along with ores of iron and titanium, with several species of the Hornblende and Garnet families; but it may be considered as a rarity in veins, except in those which are composed of the same species of which the rocks consist which they traverse. In these, its varieties are accompanied by Axinite, Quartz, several ores of titanium, Calcarious Spar and other species; and have their surface sometimes covered with scaly particles of Talc. Sometimes the crystals have their surfaces, particularly the planes M, covered with crystals of Albite, disposed in parallel position.

The finest crystals of Adularia are found in the highest districts of St. Gothard, and the Alps of Savoy; several varieties occur also in Salzburg, the Tyrol, Bavaria, Dauphiny, the isle of Arran, in Cornwall and Wales. Very large crystals of Feldspar are found in Siberia, which are generally penetrated by Quartz, sometimes of considerable transparency. Amazon stone, a verdigris-green variety, associated with small white crystals of Albite, occurs near Fort Troitzk in the Uralian mountains. Compact Feldspar, forming the body of clinkstone-porphyry, is found in the Bohemian Mittelgebirge, in the western isles of Scotland, at Sahla in Sweden, in the Hartz, &c. Variolite has been noticed from Piedmont and Corsica. The finest varieties of porcelain earth are those from China, where it is called Kaolin, from Saxony, from Passau, and from Limoges in France.

The United States have thus far afforded few handsomely crystallized specimens of the present species, although they have been quoted from a number of localities. The most interesting of these are Rossie and Governeur in St. Lawrence co. (N.Y.) Greenfield near Saratoga in the same state, and Haddam, (Conn.) At the first mentioned place it is associated with crystallized, white Hornblende and Scapolite in limestone, and at the two last with Chrysoberyl, Garnet and Tourmaline in a granitic vein. A few crystals have been afforded, apparently belonging to this species, at Franconia, (N.H.) in a vein made up chiefly of large crystals of Epidote and Quartz. Crystallized Feldspar in small quantity, frequently accompanies Beryl in N. England; and is met with also in loose masses, lining small cavities in a rock made up of Hornblende, Augite, and massive Feldspar. The crystals are often deeply imbedded in Calcareous Spar. Under these circumstances, it has been found at Middlefield and Becket, (Mass.) Feldspar exists in very large imperfect crystals, disseminated through gneiss, and imparting to it a porphyritic appearance, throughout the primitive region of New England. It is found of a verdigris green color, crystallized and massive, at Beverly, (Mass.) The flesh-colored varieties appear to abound more in the granite which accompanies the Atlantic coast from Connecticut to Maine, though often met with in the interior. Adularia, or opalescent varieties, though not the most strongly marked, occur in Worcester co. (Mass.) and in the granite bordering upon Lake George, near Ticonderoga, (N.Y.) as well as at Haddam, (Conn.) and Paris in Maine. Feldspar in very large, perfectly cleavable individuals, and suited to all the purposes of porcelain manufacture, abound in Charles co. (Penn.,) Delaware, in the Highlands of New York, and at several places in N. England, too numerous to be mentioned. Decomposed Feldspar is met with occasionally in granite beds, as at Andover, (Mass.); in Cheshire, (Conn.) a deposit was discovered in digging the Farmington Canal, which appears to have owed its origin to the red sandstone formation.

Several varieties of this species are used in the arts and manufactures. The purest opalescent varieties of Adularia are cut round and polished, and worn as ring stones, &c. The finest of them are from Ceylon, and are called *moon-stones*. The *sun-stone* is also used in jewellery: it exhibits, reddish and variegated patches of light, in the shape of oblique-angled parallelograms on the cleavage face T. This variety is found at Lyme, (Connecticut.) *Graphic granite* is cut for snuff-boxes, &c.: it consists of a simple variety of the present species, regularly mixed with long parallel crystals of Quartz, whose transverse angular sections bear some resemblance to certain letters. The pure varieties of Feldspar are used in the composition of the paste of porcelain, also for the enamel with which it is covered; and the decomposed variety, or porcelain earth itself, is the most important material in that department of manufactures.

Appendix to Feldspar.

i. *Mikroclinous Felsite.* Breithaupt.

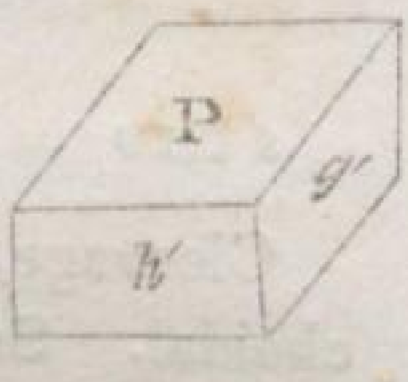
P on M = 112° 15′. P on T = 90° 21′. M on T = 118° 35′.
Cleavages very perfect.
Hardness = 7·75 . . . 8·0. (scale of Breithaupt.)
Sp. gr. = 2·562, reddish to liver-brown, from Arendal.
2·565, reddish white, from Arendal.
2·567, grey, with blue opalescence, from Friedrichsvairn.
2·568, do. in small pure cleavage forms.

The composition of Mikroclinous Felsite is, according to KLAPROTH,

Silica - - - -	65·00
Alumina - - - -	20·00
Potash - - - -	12·25
Oxide of iron - - - -	1·25
Magnesia - - - -	a trace.
Water - - - -	0·50
	99·00

ii. *Murchisonite.* LEVY.

Fig. 195.



P on g' - - - - 90° 00'

g on h' - - - - 90 00

The two cleavages which are at right angles, are like Feldspar; the third has a nacreous lustre, and is as easily obtained as the others. The plane P of this figure is not afforded by cleavage in common Feldspar.

Color white, with a tinge of red. Opake.

It occurs at Heavitree near Exeter, forming a compact rock, associated with Quartz, Mica and black Tourmaline; and is connected with the red marl.

iii. *Ryakolite.* ROSE?

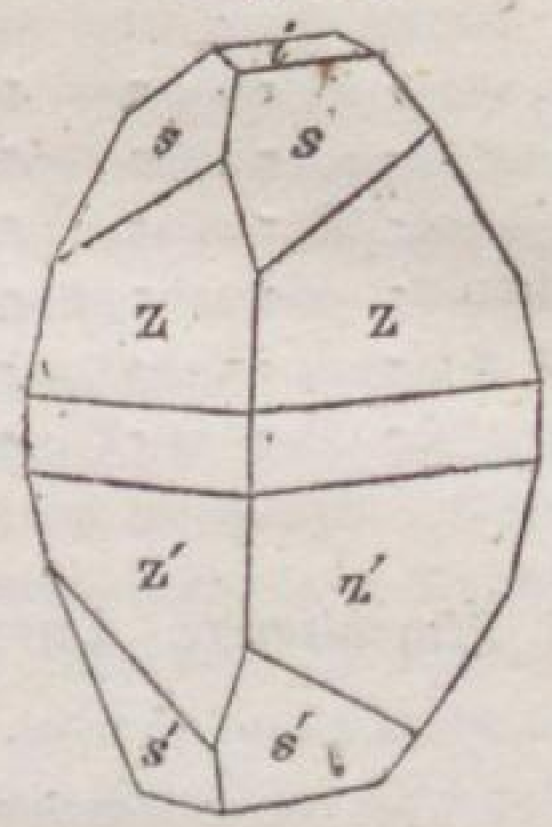
The experiments of G. ROSE upon the glassy Feldspar, are said to have rendered it apparent that its angles are different from those of Feldspar, and from the above enumerated varieties, proposed as species. Its sp. gr. = 2·576. It occurs in the lava of Vesuvius, and in that of the Lacher Lake.

FERGUSONITE.

Primary form. Right square prism.

Fergusonite.

Secondary form. Fig. 196.



s on *s*	-	100° 30′	*z* on *z′*	-	159°

Cleavage, traces parallel to *s*. Fracture perfectly conchoidal. Surface rather uneven.

Lustre imperfectly metallic, inclining to resinous. Color dark brownish black; in thin splinters, pale. Streak very pale brown, like Rutile. Opake; in thin splinters, translucent.

Brittle. Hardness = 5·5 . . . 6·0. Sp. gr. = 5·838.

1. Before the blow-pipe, it loses its color and becomes pale greenish-yellow, but alone, is infusible. It is entirely dissolved in salt of phosphorus, but some particles remain a long time unaltered. The pale greenish globule becomes opake by flaming, or on cooling, when very much saturated. Before the whole portion has been dissolved, it assumes a pale rose color in the reducing flame.

2. *Analysis.*

By Hartwall.

Columbic acid	- - -	47·75
Yttria	- - -	41·91
Oxide of Cerium	- - -	4·68
Zirconia	- - -	3·02
Oxide of tin	- - -	1·00
Oxide of uranium	- - -	0·95
Oxide of iron	- - -	0·34

3. It is found imbedded in Quartz at Kikertaursak, near Cape Farewell in Greenland.

Ferruginous Platina.

In crystals and grains. The form of the crystals described as cubical.

Color dark platina-grey. Surface tarnished, like meteoric iron. Hardness = 8·0 . . . 8·5. (Scale of Breithaupt.)

Malleable. Sp. gr. = 14·6 . . . 15·7. It is magnetic; and in some cases not only attracts, but repels the needle.

1. It gives, by chemical trials, evidence of a considerable portion of iron.

2. It is found in the platina sand from Nijnotaguilsk in the government of Perme in Siberia.

3. Whether it be specifically distinct from Native Platina, still admits of a doubt.

Fettbole.

Massive; composition impalpable. Fracture conchoidal. Color liver-brown. Lustre resinous. Opake. Hardness = 1·50 . . . 2·0. Sp. gr. = 2·249. It falls to pieces in water, attended with a crackling noise. According to Kersten, it consists of a tri-silicate of iron, with 9 proportionals of water. It is, without doubt, an accidental mixture of these principles, resulting from the decomposition of some one or more mineral species.

Fettstein. (See *Nepheline.*)

Fibrolite. (See *Kyanite.*)

FIGURE-STONE. Glyptic Atelene-Picrosmine.

Massive: composition impalpable. Fracture coarse splintery, imperfectly slaty.

Color white, grey, green, yellow, red and brown; none of them bright. Acquires some lustre in the streak. Translucent, in most cases, only on the edges.

Hardness = 2·0 . . . 2·5. Sp. gr. = 2.815 . . . 2·9.

1. Before the blow-pipe, it is infusible, but becomes white. It is partly soluble in sulphuric acid, leaving a siliceous residue.

2. *Analysis.*

	By Klaproth.	By Thomson.
Silica	54·50	49·816
Alumina	34·00	20·596
Potash	6·25	6·800
Lime	0·00	6·000
Oxide of iron	0·75	1·500
Water	4·00	5·000

3. It is brought from China. Less characteristic varieties have been found also in Transylvania and in Saxony.

4. It is cut by the Chinese into various ornaments and grotesque shapes.

Fiorite. (See *Opal.*)

Flint. (See *Quartz.*)

FLUCERINE. Rhombohedral Tungstic-Baryte.

Primary form. Rhomboid, of unknown dimensions.

Six-sided prisms, plates and amorphous masses.

Cleavage most distinct perpendicular to the axis, or parallel with the base of the hexagonal prism.

Fracture uneven and splintery.

Cólor reddish white to yellow. Streak white to yellow. Opake or translucent on the edges.

Hardness =5·50 . . . 5·75. Sp. gr. =4·7.

1. Heated in the matrass, or the glass-tube, it corrodes the glass. Alone, it does not fuse, but its color changes to brown; with borax and salt of phosphorus, it gives a red or orange colored globule, which becomes pale on cooling.

2. *Analysis.*

	By Berzelius.
Fluoric acid	16·24
Peroxide of cerium	82·64
Yttria	1·12

3. It occurs at Finbo and Brodbo, near Fahlun, imbedded in Albite and Quartz.

Appendix to Flucerine.

i. *Fluate with excess of base.*

Traces of crystalline structure. Color yellow.

It resembles porcelain jasper. Before the blow-pipe, it scarcely differs from the foregoing description. If heated alone on charcoal, it turns black, at an incipient redness; but assumes on cooling, successively, dark brown, red and orange tints. It is composed, according to Berzelius, of

Fluoric acid - - -	10·85
Peroxide of cerium - - -	84·20
Water - - -	4·95

It is found at Finbo.

ii. *Fluate of Yttria and Cerium.*

Earthy; found in masses seldom exceeding the size of a pea. Color pale red, sometimes deep red, yellow or white. Easily scratched by the nail.

According to Berzelius, it is a mechanical mixture of fluate of yttria with fluate of cerium and silica. It gives nearly the same reactions as the neutral fluate, first described.

FLUELLITE. ——— Fluor Haloide?

Octahedron with a rhombic base. P on P′ =144°. P on P″ over the summit =109°.

Color white. Transparent.

1. It occurs in minute crystals of the form above mentioned, having its most acute solid angles replaced, along with the Wavellite from Cornwall. It has been found to contain alumina and fluoric acid.

2. Its hardness and specific gravity require to be known, before its place in the natural system can be correctly determined.

FLUOR. Octahedral Fluor-Haloide. Mohs.

Primary form. Regular octahedron.

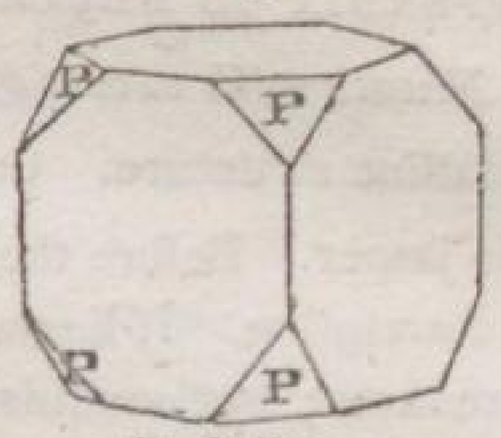
Fluor.

Secondary forms.

1. Fig. 197.

St. Gallen, Stiria.

2. Fig. 198.

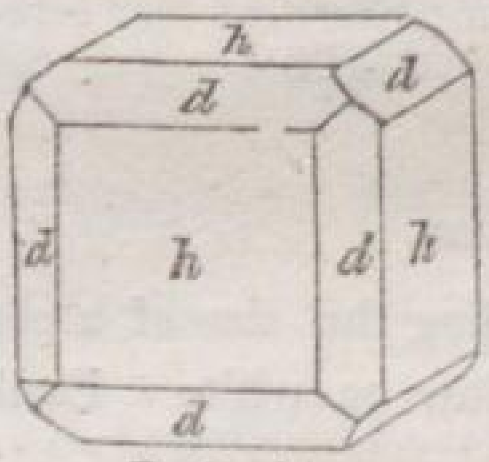


St. Gallen.

3. Cube.

The most common form.

4. Fig. 199.

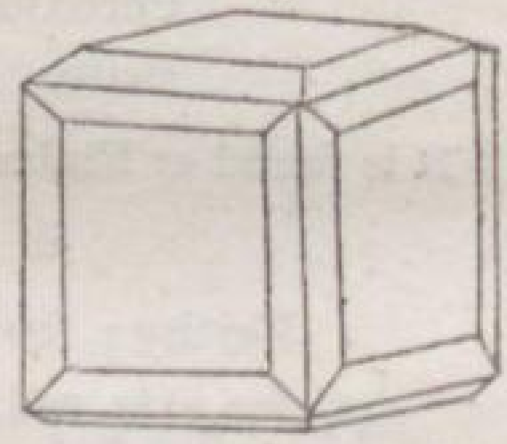


Derbyshire.
Trumbull, (Conn.)

5. Rhombic dodecahedron.

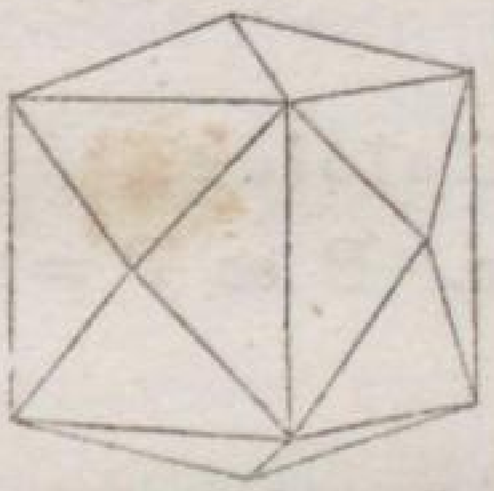
Ehrenfriedersdorf, Sax.

6. Fig. 200.



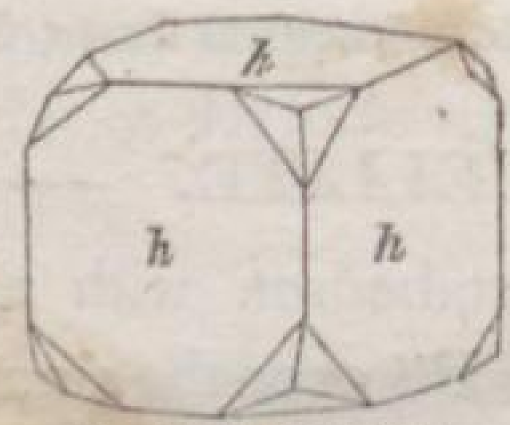
Derbyshire.
Trumbull, (Conn.)

7. Fig. 201.



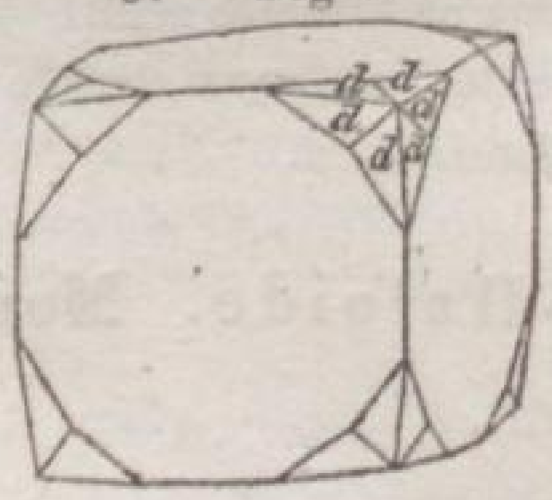
St. Agnes, Cornwall.

8. Fig. 202.

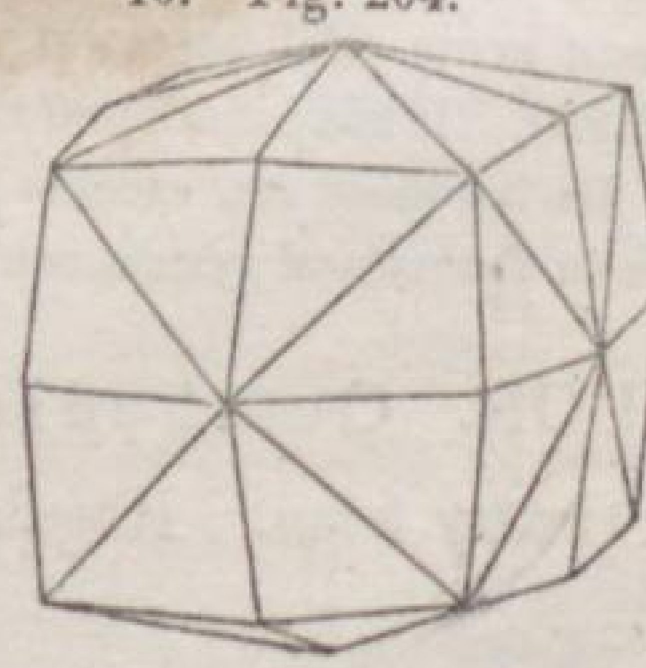


Zinnwald, Saxony.

9. Fig. 203.



10. Fig. 204.



In addition to the foregoing, are found crystals in the form of a cube, with its edges replaced by three planes, and also having the additional planes of Fig. 202. PHILLIPS describes a crystal in his possession, whose general form is that of a cube, but whose edges are replaced by seven planes, and whose solid angles are replaced by more than four times this number, and resulting in a form bounded by 322 planes.

Cleavage, parallel with the faces of the regular octahedron perfect: rarely also, parallel with the faces of the rhombic dodecahedron and cube. Fracture conchoidal, more or less perfect.

Surface. The cube generally smooth. Octahedron often rough and drusy. Dodecahedron various, being sometimes smooth, at other times rough and drusy. Sometimes the faces of the cube and the tetraconta-octahedrons are curved.

Lustre vitreous.

Color white, though not very common, and seldom pure. Generally wine-yellow or violet-blue. Among its brightest colors are emerald and pistachio-green, sky-blue, rose-red, and crimson-red. The dark blue colors bordering upon black, are probably due to bituminous impregnations. Frequently different shades of colors are disposed in coats parallel to the faces of the cube, or symmetrically distributed along the edges or solid angles of crystals.

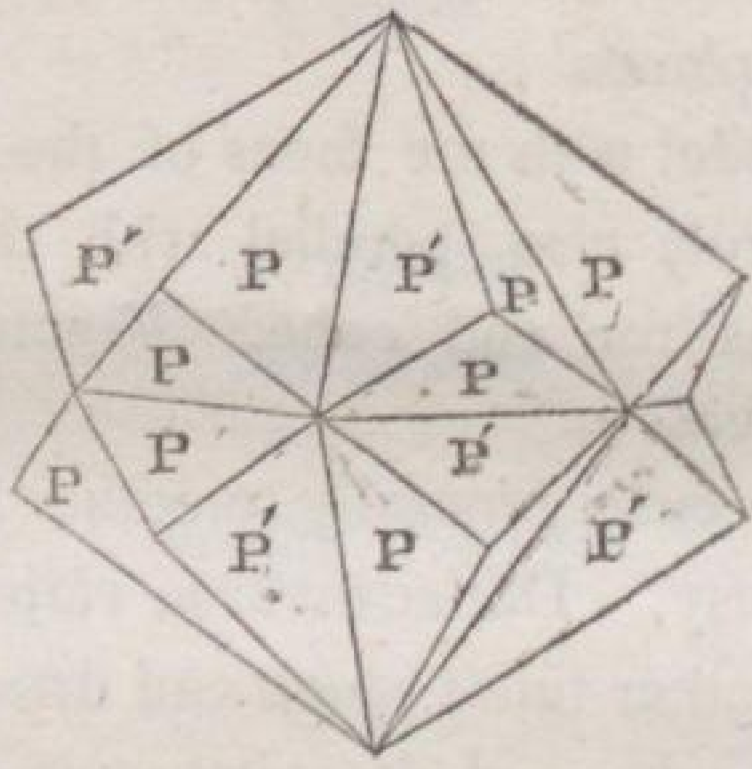
Streak white. It is sometimes slightly tinged, if the colors be very deep.

Translucent . . . transparent. Sometimes different colors appear by reflected and by transmitted light.

Brittle. Hardness =4·0. Sp. gr. =3·140.

Compound Varieties. Twin-crystals. Face of composition parallel to one of the faces of the octahedron; the individuals having one of their axes parallel, are continued beyond the face of composition, and particles of the one are observed formed upon the faces of the other. See annexed figure.

Fig. 205.



Implanted globular shapes, rare: surface drusy, composition columnar. Massive: composition granular, the individuals being of various sizes; if the composition be impalpable, its fracture becomes flat conchoidal and splintery, the surface of fracture being scarcely glimmering. Massive varieties are also sometimes composed of columnar particles, generally of considerable size, seldom thin or diverging, but very often forming a second curved lamellar composition. The faces of composition are sometimes irregularly streaked, more generally uneven and rough.

1. Before the blow-pipe, it decrepitates, and becomes phosphorescent, but loses its color and melts at last into a rather opake globule. It phosphoresces likewise, if thrown upon ignited charcoal or heated iron. Several varieties which exhibit this property in particularly bright green colors, have been called *Chlorophane* or *Pyro-smaragdus.* If exposed to a high degree of temperature, they lose the property of again

showing this phenomenon. Sulphuric acid decomposes the powder of the mineral, attended with the evolution of fluoric acid, which is recognized by its property of corroding glass. Several varieties, particularly the sky-blue ones, lose their color on being exposed to the light.

2. *Analysis.*

By KLAPROTH.

Lime	67·75
Fluoric acid	32·25

3. Fluor does not enter as a regular constituent into the composition of rocks. It is not very frequently found in beds. More generally it occurs in veins, with other minerals, in primitive or transition rocks. Very seldom it is associated with petrifactions, as the blue varieties of Derbyshire, with entrochites.

4. The most beautiful crystals of Fluor are found at Beeralston in Derbyshire, at St. Agnes and other places in Cornwall, and at Zinnwald in Bohemia. Large crystals, generally twins, of the cube, of handsome blue and green colors, occur at Alston in Cumberland, which frequently contain water. Beautiful, dark blue, perfect crystals, having their edges and angles highly replaced, have been found along with Quartz in porphyritic greenstone, near Gourock in Renfrewshire. Well defined crystals of the primary form, of an apple green color, occur at Moldavia in the Bannat of Temeswar. Rose red octahedrons, occasionally of great magnitude, are met with near Chamouni in Savoy. The Saxon varieties are generally of a cubical form, and of violet blue, or wine yellow, colors. The compound uncleavable varieties (*compact fluor*) are chiefly from Strassberg and Stollberg in the Hartz, from Cornwall and Sweden. The friable ones, (*earthy fluor,*) are found in Saxony, England and Norway. The chlorophane occurs at the Pednandrae mine in Cornwall, and at Ecatherineburg in Russia. Specimens from the latter place have been observed to phosphoresce simply from the warmth of the hand.

The United States have not proved very productive in handsome varieties of Fluor. The most remarkable region in this country for the present species, is situated in the State of Illinois, along the country south-west from Cave rock on the Ohio for thirty miles, in Gallatin co. It exists in nodular masses, disseminated through the soil, or occurs imbedded in a compact limestone. Its crystals are often large, and present a diversity of colors; the prevailing one, however, is a dark purple, almost black, but appearing extremely rich by transmitted light. The darker colored varieties emit a bituminous odor when cleaved. Green octahedrons, sometimes an inch in diameter, have been found imbedded in a crystalline Quartz in the notch of the White Mountains in New Hampshire. Fluor (variety *Clorophane*) of several colors accompanies the Topaz and Magnetic Iron-Pyrites, at Trumbull, (Conn.) where it also forms entire veins in gneiss. An emerald green, massive variety occurs in narrow seams in mica slate, at Putney in Vermont. Other American localities are the following: Smith co. (Tennessee) in white and purple cubes; in Virginia, near Woodstock, Shenandoah co., in small loose masses, in the fissures of a limestone rock containing shells; also at Shepherdstown on the Potomac, in veins of white limestone, of red and purple colors; in New Jersey, near Franklin furnace; in New York, at Amity, in thin seams in white limestone, along with yellow Tourmaline, Hornblende and Spinel; and at Lockport and its vicinity, in white cubes, in black limestone, associated with crystallized Calcareous Spar and Celestine; in Massachusetts, at the Southampton lead-mine.

Forsterite.

Primary form. Right rhombic prism? M on M = 128° 54′.

Secondary form. The primary, having its terminal, and its acute lateral, edges replaced by single planes: the inclination of the faces on the terminal edges to the base = 126° 6′.

Cleavage, parallel with P.

Color white. Translucent.

1. It is inferred from the experiments of Children, to be a silicate of magnesia.

2. It is found with Spinel and Pyroxene on Mount Vesuvius.

FRANKLINITE. Dodecahedral Iron-Ore. Mohs.

Primary form. Regular octahedron.

Secondary form. Regular octahedron, with its edges truncated. Irregular forms, grains.

Cleavage parallel with the primary form, but not perfect. Fracture conchoidal. Surface of all the faces smooth.

Lustre metallic. Color iron-black. Streak dark brown. Opake.

Brittle. Acts upon the magnetic needle, but does not exhibit magnetic poles. Hardness =6·0 ... 6·5. Sp. gr. =5·091.

Compound Varieties. Massive: composition granular, strongly connected.

1. Before the blow-pipe, alone on charcoal, it presents the appearances of Magnetic Iron-Ore; but with soda in a good reduction fire, it emits the white smoke of Zinc, and becomes green when heated with the same reagent upon platina-foil in the oxidation-heat of the instrument.

2. *Analysis.*

	By Berthier.	By Thomson.
Peroxide of iron	66·00	66·10
Red oxide of manganese	16·00	0·00
Oxide of zinc	17·00	17·425
Deutoxide of manganese	0·00	14·96
Silica	0·00	0·204
Water	0·00	0·560

3. Franklinite is found at Franklin furnace in Hamburg, (N. Jersey,) accompanied by Red Zinc-Ore, Calcareous Spar and Garnet. The most perfect crystals at this locality are imbedded in the Red Zinc-Ore; those engaged in the Calcareous Spar, and associated with Garnet, exhibit rounded faces, resulting from the truncation of the solid angles of the primary form. A more remarkable deposit of the present species occurs at Stirling in the same region, where it exists in a powerful vein, in which, cavities occasionally appear containing crystals of a very large size, from one to three inches in diameter, and which are associated with Troostite.

Gabbronite. (See *Scapolite.*)

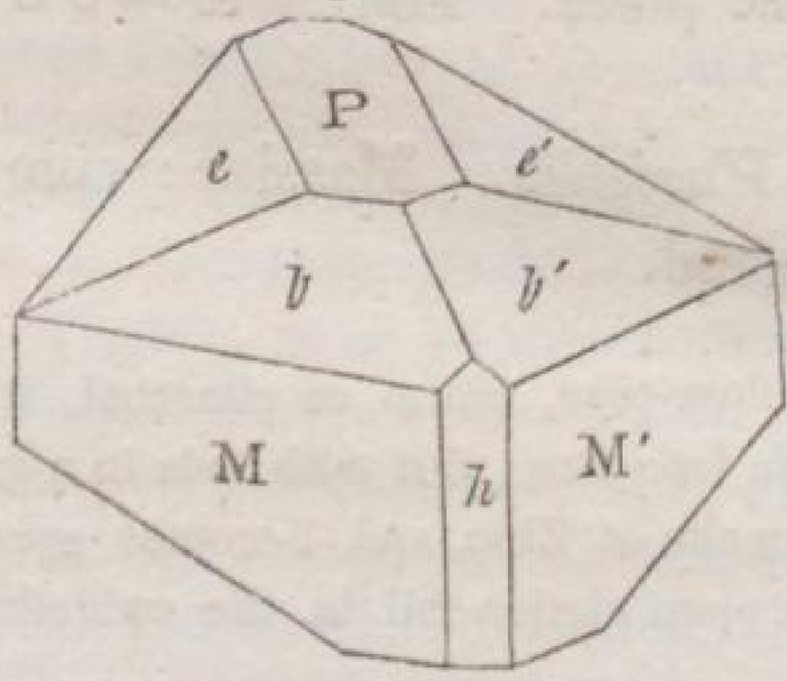
GADOLINITE. Hemi-prismatic Melane-Ore. Partsch.

Primary form. Oblique rhombic prism. M on M = 115°.

Gadolinite.

Secondary form.*

Fig. 207.



M on M′	-	115° c. g.	b on b'	-	120°
P on h	-	98	e on e'	-	120
M on e	-	100	b' on e'	-	130
M on b	-	153			

Cleavage, so imperfect, that its direction has not been ascertained. Fracture conchoidal.

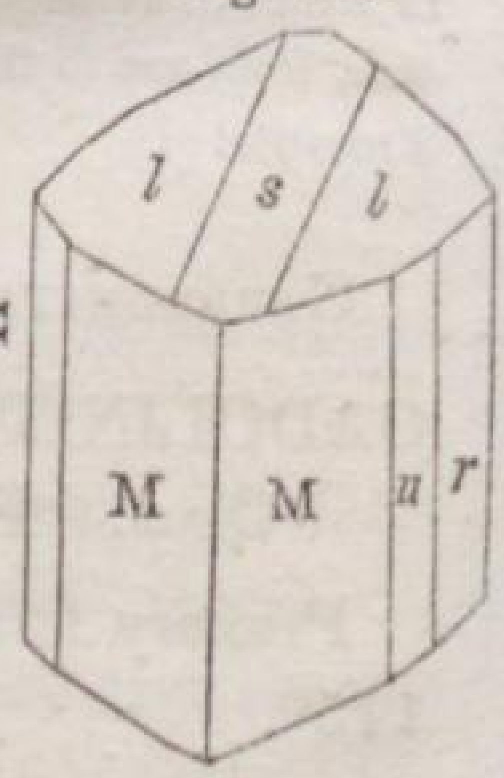
Lustre vitreous, inclining to resinous. Color greenish-black, very dark. Streak greenish-grey. Translucent on the edges, almost opake.

Hardness =6·5 . . . 7·0. Sp. gr. =4·0 . . . 4·3.

* The Abbé Hauy gives the following figure and measurements for this substance, which, however, are only claimed to be approximations.

M on l	- - - - - -	143° 12′	Hauy.
M on r	- - - - - -	125 16	
M on u	- - - - - -	160 32	
l on l	- - - - - -	142 8	
l on r	- - - - - -	108 50	
l on s	- - - - - -	161 11	
r on s	- - - - - -	90 00	
r on u	- - - - - -	144 44	

Fig. 206.



Compound Varieties. Massive: composition impalpable. Fracture conchoidal.

1. As soon as the heat of the blow-pipe is communicated to thin fragments, they exhibit an instantaneous glow. In the strongest heat the mass swells up, turns greyish green, and is traversed by numerous fissures. In very thin fragments, it melts with difficulty, into a greyish glass. Some varieties, according to BERZELIUS, become white, and swell into cauliflower-like masses, without suffering fusion; while others, according to PHILLIPS, fuse readily, after some decrepitation, into a black glass.

2. *Analysis.*

By BERZELIUS.

	fr. Finbo.		fr. Brodbo.		fr. Korarfvet.
Yttria - -	45·00	-	45·95	-	47·62
Protoxide of iron	11·43	-	12·63	-	8·30
Protoxide of cerium	17·92	-	18·20	-	3·40
Silica - -	25·80	-	24·16	-	29·20
Lime - -	0·00	-	0·00	-	3·47
Oxide of manganese	0·00	-	0·00	-	1·42
Glucina - -	0·00	-	0·00	-	1·70
Water - -	0·00	-	0·00	-	5·20

3. Gadolinite occurs in gneiss and granite, and is chiefly accompanied by Feldspar, Albite and Quartz. Its localities are Ytterby near Stockholm, and Finbo and Brodbo near Fahlun in Sweden. It is also found in Greenland.

GAHNITE. (See *Automalite.*)

GALACTITE.

A name which has been given to a mineral found in the trap of Kilpatrick, near Glasgow; but which is probably a variety of Analcime.

GALAPEKTITE. (See *Halloysite.*)

GALENA. Hexahedral Polypoione-Glance.

Primary form. Cube.

Secondary forms.

1. Cube, with the angles truncated.

2. Regular octahedron. Bleiberg in Carinthia. Southampton, (Mass.)

3. Octahedron, with its angles truncated. Cumberland, England.

4. Octahedron, with its angles replaced by four planes resting on the octahedral planes.

5. The same, with the truncation of the summits of the four-sided pyramids situated upon the angles of the octahedron.

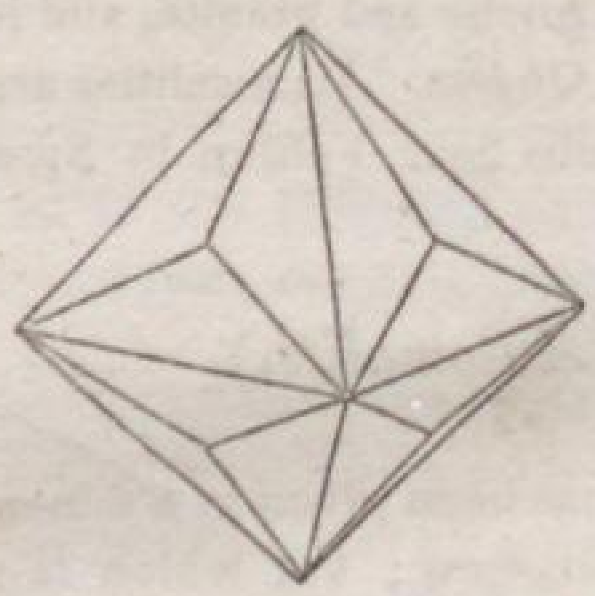
6. The octahedron, with the edges truncated.

7. The octahedron, with the edges bevelled, and the angles truncated,—the truncating planes being the primary faces of the species.

8. The same, excepting that the edges are replaced by three planes, (*pentacontaèdre*, HAUY,) from Feistriz in Stiria.

9. The trigonal icositetrahedron.

Fig. 208.



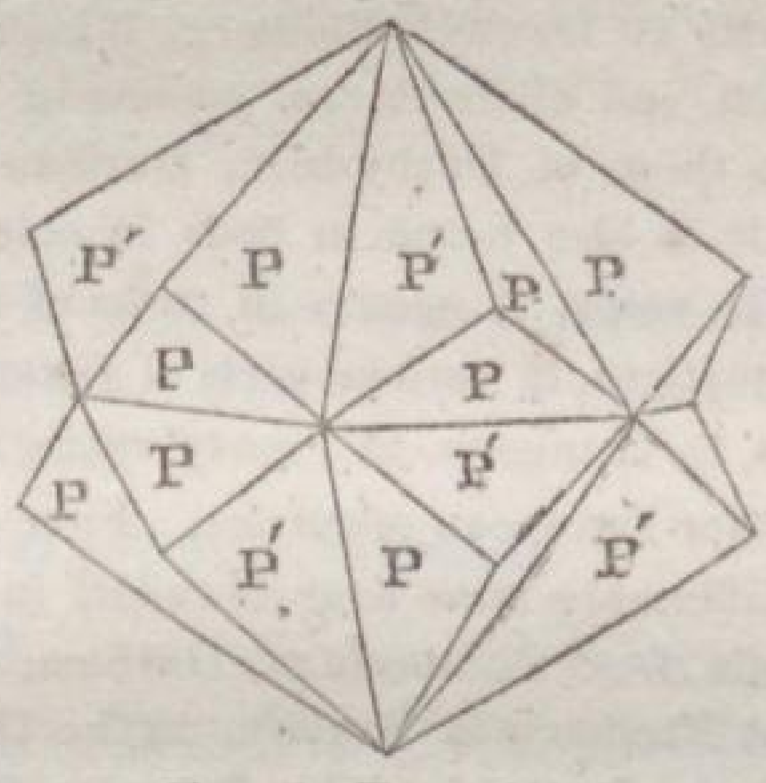
Cleavage, parallel with the cube, highly perfect, and easily obtained. Fracture rarely discoverable. Surface, the cube and the trigonal-icositetrahedron streaked parallel to the edges of combination with the octahedron. Sometimes subject to tarnish.

Lustre metallic. Color pure lead-grey. Streak unchanged.

Rather sectile. Hardness $=2{\cdot}5$. Sp. gr. $=7{\cdot}568$, of a cleavable variety.

Compound Varieties. Twin-crystals; face of composition parallel, axis of revolution perpendicular to a face of the octahedron.

Fig. 209.



Kapnik, Transylvania.

Reticulated, tabular, and some other imitative shapes, the individuals of which are often still observable. Massive: composition granular, of various sizes of individuals, sometimes impalpable. In this case the color becomes pale, or whitish lead-grey, the fracture even, or flat conchoidal, and the streak shining. The granular particles of composition sometimes become elongated, or compressed in one direction, and then approach to lamellar or columnar ones. Pseudomorphoses of Pyromorphite. Plates, &c.

1. Before the blow-pipe, it melts, if heated with precaution, and yields after the sulphur has been driven off, globules of metallic lead. It is partly soluble in nitric acid, and leaves a white residue.

2. *Analysis.*

By Thomson.

Lead	85·13
Sulphur	13·02
Iron	0·50

Galena.

3. Galena is frequently found in veins, but also in great quantity in beds, particularly in limestone rocks. In beds, it is accompanied by various other ores of lead, by Blende, Copper and Iron-Pyrites; in veins, it occurs along with ores of silver, copper and antimony, sometimes with Native Gold. In both cases it is attended by Fluor, Calcareous Spar and Quartz.

4. The remarkable beds of Galena in Carinthia, which occur in limestone, and are worked at Deutsch-Bleiberg, Windisch-Bleiberg, Windisch Kappel, Ebriach, and other places, possess in several respects a striking similarity to those of Derbyshire, Durham and Northumberland, in England. It is also found in beds in older rocks, as in Stiria, Carinthia, &c. In veins, it occurs in rocks of different ages, from gneiss to the coal formations, in various parts of Saxony and Bohemia, in the Hartz, in Anhalt, in Hungary, in Transylvania, in France, in Scotland, and in many other European countries. Fine crystals have been obtained from the Pfaffenberg mine near Neudorf in Anhalt, from Saxony, from Transylvania, from Cumberland, Durham, &c. Compact Galena chiefly occurs at Freiberg in Saxony, in the Hartz, in Carinthia, and at the Lead Hills in Scotland. The *Specular Galena*, or *Slickensides*, which consists of an extremely thin coating of this species on Quartz, or on some other mineral, is found principally in some of the mines of Derbyshire.*

American localities of Galena are exceedingly numerous, although we have but few valuable mining deposits of this species. The most important are those situated in Missouri, in the counties of Washington, St. Genevieve, Jefferson and Madison; and at Galena in the north-west part of the State of Illinois. In these regions the Galena is found in an alluvial deposit of clay and marl, through which are disseminated masses of Quartz,—the whole resting upon a secondary limestone. Numerous localities might also be quoted in Kentucky, Ohio, Tennessee, Virginia and Maryland. In Pennsylvania, it occurs on Perkiomen creek, 23 miles from Philadelphia, accompanied by several of the salts of lead; and in New York at Ancram, and in Livingston's manor in Columbia co. In Connecticut, besides thin veins at Middletown, Huntington, and South-

* The Quartz or mineral on which it is formed, constitutes the vein stone, adhering to both walls of the vein; when these vein stones meet, each being thinly coated by Galena, they are readily separated by the pick, and indeed sometimes fly off spontaneously, with a loud explosion.

ington, a deposit has lately been discovered at Brookfield, whose extent is not yet fully developed. In Massachusetts, numerous veins have been discovered in Hampshire county, the most important of which exist at Southampton and Northampton. In addition to the foregoing, it may be added that Galena has been found in Vermont and Maine.

Galena is the source of the principal part of the lead of commerce. On account of its generally containing a small quantity of silver, it is also employed to a considerable extent for the extraction of this metal. Potters use either the Galena reduced to powder, or the litharge produced from it, for glazing coarse pottery.

GANOMATITE.

Massive: in crusts, and kidney-shaped. Fracture conchoidal. Lustre vitreous. Color yellow, to brown and green. Sp. gr. = 2·926.

Other properties and locality, unknown.

GARNET. Dodecahedral Garnet. MOHS.

Primary form. Rhombic dodecahedron.

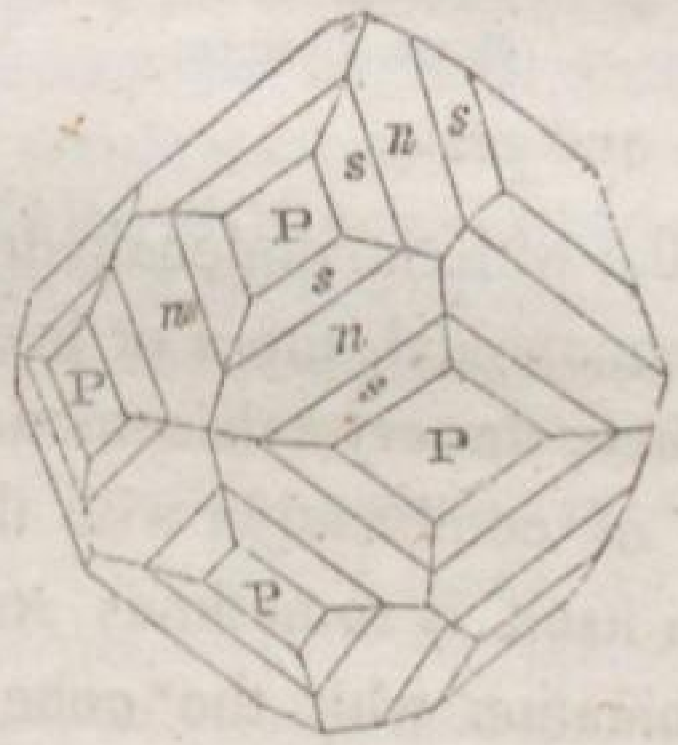
Secondary forms.

1. Dodecahedron, with the edges truncated. Hamburg, (N. J.)

2. Trapezohedron. Washington, (Conn.) Common.

3. Dodecahedron, with the edges replaced by three planes, (*trié marginé*. HAUY.)

Fig. 210.

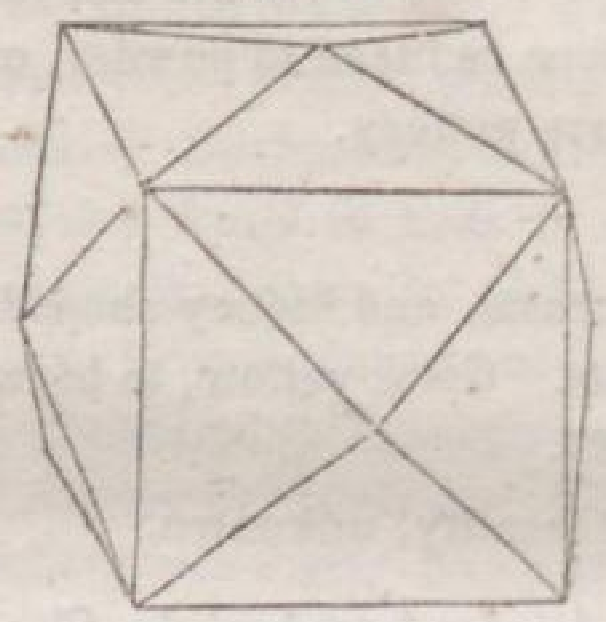


Franconia, (N. H.)

4. The same as 1. with the addition of the truncation of the acute solid angles of the dodecahedron by four planes resting upon the edges of the dodecahedron, (*uniternaire.* Hauy.) Bannat of Temeswar.

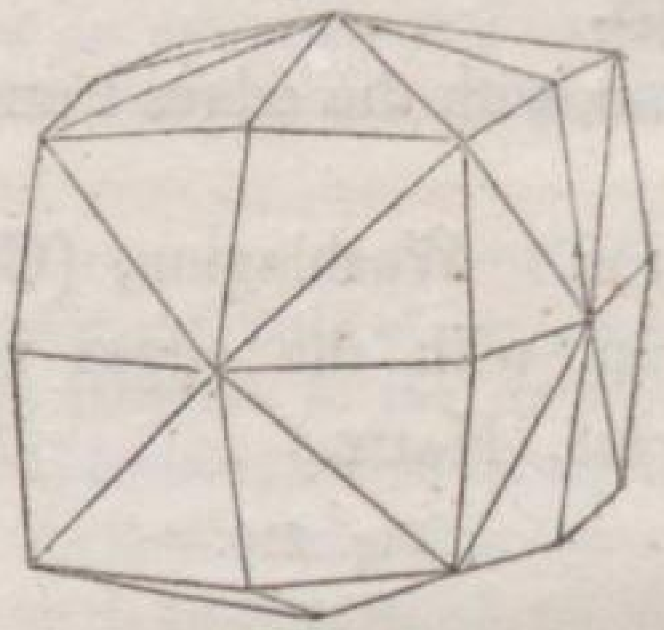
5. Icositetrahedron.

Fig. 211.



6. Tetraconta-octahedron.

Fig. 212.



Mussa, Piedmont.

Irregular forms and grains.

Cleavage, parallel with the dodecahedron, but very indistinct. Fracture conchoidal, more or less perfect, generally uneven. Surface, the crystals sometimes streaked parallel to the edges of combination with the dodecahedron: the dodecahedron itself is sometimes streaked parallel to its edges of combination with the cube. The surface of the grains is uneven, rarely granulated.

Lustre vitreous, inclining to resinous in some varieties, more nearly the latter. Color red, brown, yellow, white, green, black; except some red colors, none of them are bright. Streak white. Transparent . . . translucent.

Hardness = 6·5 . . . 7·5. Sp. gr. = 3·615, Grossular; 3·701, Melanite; 3·769, brown, common Garnet; 3.788, Pyrope; 4·098, crystals of precious Garnet, Tyrol; 4·125, grains of precious Garnet, Ohlapian; 4·179, crystals of Almandine; 4·208, crystals of precious Garnet, Haddam.

Compound Varieties. Massive: composition granular, of various sizes of individuals, and often, even impalpable, easily separated, or strongly coherent; faces of composition irregularly streaked, uneven or rough. If the composition be impalpable, the fracture becomes uneven and splintery. The composition is sometimes thick lamellar, and bent, the face of composition being pretty smooth.

1. From the diversity in hardness and specific gravity, which exists among the numerous varieties of Garnet, it is highly probable that the present limits of the species are too wide, and that they include individuals which will hereafter be discovered to constitute independent species. It is not at all likely, however, that discoveries will take place in coincidence with the arbitrary and empirical separation of the species into varieties, as found in the older treatises of mineralogy; for these are founded almost entirely upon accidental circumstances. These subdivisions from their present currency in books, require to be noticed. *Grossular* occurs only in imbedded crystals of the forms of icositetrahedron, and combinations of it with the dodecahedron. Its colors are confined to asparagus green and mountain green. *Pyreneite* also occurs only in small blackish, imbedded crystals in limestone. *Melanite* possesses the form of modification 1, is generally imbedded, and of a velvet-black color. *Pyrope* occurs only in grains, and is remarkably distinct, from its pure translucency and blood red color, which is not found in any other variety. Among the varieties known under the simple denomination of Garnet, are found every simple form and combination noticed

above, among the crystalline varieties, also grains and massive specimens: it contains likewise every shade of the series of colors, and it is therefore only in the particular union of several of these properties, that we must look for the distinction of the above mentioned varieties. The color of *Precious Garnet* is always red; its crystals are found imbedded. It is the only variety that occurs in grains, and if compound, it presents lamellar composition. *Common Garnet* seldom occurs in red colors, and these are of dull shades; its crystals are generally implanted, and the composition is granular, but not impalpable. *Colophonite* is a compound variety of yellowish-brown and reddish-brown, or oil green and honey-yellow colors, consisting of roundish particles of composition, which are easily separable. If the composition be impalpable, Allochroite is formed. The two varieties *Aplome* and *Essonite*, appear less connected with the rest of the species, than any of those which have been enumerated. The first of these occurs in dodecahedrons, having the acute, solid angle replaced by tangent planes, parallel with which cleavage takes place, thus indicating the cube as the system of crystallization to which they belong. The latter, according to HAUY, presents traces of cleavage parallel to a prism of 101° 40′. It is generally found in grains; but the optical examinations of Dr. BREWSTER and M. BIOT, render it extremely probable that it is only a variety of Garnet.

2. Before the blow-pipe, Garnet melts without effervescence, pretty uniformly, into a black globule, presenting a vitreous lustre. Some varieties present a slight effervescence, but finally yield the same result. The bead obtained by melting is frequently attracted by the magnet.

3. *Analysis.*

	KLAPROTH.			SIMON.	VAUQUELIN.		KL.	LAUGIER.	KL.
	Grossular.	Melanite.	pr. Garnet.	Colophonite.	Allochroite.	Pyreneite.	Pyrope.	Aplome.	Essonite.
Silica - -	44·00	35·50	35·75	37·00	35·00	43·00	40·00	40·0	38·80
Alumina - -	8·50	6·00	27·25	13·50	8·00	16·00	28·50	20·0	21·20
Lime - -	33·50	32·50	0·00	29·00	30·00	20·00	3·50	15·5	31·25
Ox. of iron - -	12·00	24·25	36·00	7·50	17·00	16·00	16·50	2·0	6·50
Ox. of manganese	a trace.	0·40	0·25	4·75	3·50	0·00	0·25	2·0	0·00

Besides these, Colophonite contains 6·5 p. c. of magnesia, 0·5 p. c. of oxide of titanium, and 1·0 of water; Allochroite, 6·0 of carbonate of lime; Pyreneite, 4·0 of water; and Pyrope, 10 of magnesia, and 2·0 of chromic acid.

4. Garnet occurs in many rocks with a degree of constancy, and in a quantity almost sufficient to be regarded as an essential ingredient in

their composition. It is particularly plentiful in mica-slate, gneiss, granite, and also exists, though in smaller quantity, in limestone, chlorite-slate, serpentine and lava. Precious Garnet occurs in slaty primitive rocks; Grossular and Pyrope are found in serpentine, the latter also in other rocks, through the decomposition of which it is brought into the soil. Melanite is imbedded in lava, and occurs implanted in geodes ejected by Vesuvius, also in primitive limestone. Pyreneite is found in a blackish limestone. Common Garnet is found in beds, consisting either wholly, or for the greater part of its varieties, accompanied by Magnetic Iron-Ore, Hornblende and Epidote. Allochroite is found under similar circumstances. Colophonite forms veins in primitive rocks.

5. Grossular is found with Idocrase in a kind of serpentine, in Kamtschatka; Melanite, at Frescati and Albano near Rome; Pyrope, near Bilin in Bohemia, and in the serpentine of Zöblitz, and the forest of Zell in Saxony; Pyreneite, near Barèges in France. Precious Garnet, sometimes in large, but not very transparent crystals, and often covered with a coat of chlorite, occurs at Fahlun in Sweden, and in many localities of the Tyrol, Carinthia, Stiria, Switzerland, Hungary, &c. The varieties possessing lamellar compositions, are found in Greenland; Common Garnet, in large quantities, at Arendal in Norway, Fahlun, Langbanshytta in Sweden, Orawitza in the Bannat in Hungary, Stiria, Siberia and many other places. Colophonite is known from Arendal; Allochroite from Drammen in Norway, and the valley of Zem in Salzburg. The transparent crystals of precious Garnet, called *Almandine*, are chiefly brought from Ceylon and Pegu, where they occur in the sand of the rivers. The Aplome comes from Lena in Siberia, Schwarzenberg in Saxony, and from Bohemia and England; the Cinnamon stone from Ceylon.

Several very beautiful varieties of Garnet have been found in the U. States. Small, but exceedingly perfect, dodecahedrons, of a handsome red-brown color, and transparent, occur at Hanover, (New Hampshire,) disseminated through hornblende-gneiss. Dark blood-red, and highly splendent crystals, (modification 3,) present themselves in geodes, in massive Garnet, Calcareous Spar, and Magnetic Iron-Ore, at Franconia, (N. H.) Splendid geodes, of a transparent, cinnamon-brown colored variety, (of modification 1,) are found, accompanied by Scapolite, in white limestone, at Carlisle, (Mass.): less remarkable specimens, also, of the same variety, occur at Boxborough in the same region. Geodes of Melanite, of great beauty, in which the crystals sometimes are above an inch in diameter, occur at Franklin furnace, in New Jersey, in limestone, associated with Quartz and greenish Feldspar. A rich, red colored Garnet, in irregular trapezohedrons, sometimes of considerable size, is found at Haddam, (Conn.) associated with Chrysoberyl, Automalite, and Columbite. Very perfect trapezohedrons, of a reddish brown Garnet, abound in mica slate, in Munroe, Washington, and several neighboring towns in Connecticut. Large dodecahedral crystals, of a dull red color, and not possessed of smooth faces, are found in chlorite slate, at Marlborough and New Fane, in Vermont: also in mica slate, in Chesterfield, (Mass.) A blackish brown variety, in large crystals, (of modification 1,) is found in limestone, at Lyme, (Conn.) Colophonite in large grains, possessing rich colors, constitutes a powerful vein, in gneiss, at Willsborough, (N.Y.) on Lake Champlain. At Roger's Rock, also, upon Lake George, is found a much finer grained variety, of yellow and red colors. Yellow and reddish, brown Garnet, is found, along with Franklinite, in limestone, at Franklin Furnace, in New York.

GAY LUSSITE. Peritomous Natron-Salt.

Primary form. Oblique rhombic prism. M on M=68° 50′. P on M = 96° 30′.

Cleavage, parallel with the faces of the primary form, perfect; most so, parallel with M. Fracture conchoidal.

Lustre vitreous. Color white. Transparent. Very brittle. Hardness =2·5. Sp. gr. =1·9.

1. When heated, it decrepitates. Before the blow-pipe, it melts rapidly. In nitric acid, it dissolves with a brisk effervescence, giving rise to crystals of nitrate of soda.

2. *Analysis.*

By Boussingault and Cordier.

Carbonate of soda - - - -	33·96
Lime - - - -	31·39
Water - - - -	32·20
Carbonic acid - - - -	1·45
Alumina - - - -	1·00

3. It is found in great abundance, disseminated in detached crystals through clay, near Lagunilla in Colombia.

GEHLENITE. Pyramidal Dystome-Spar.

Primary form. A right square prism.

Cleavage, in traces, parallel with the base.

Lustre resinous, inclining to vitreous. Color, different shades of grey, mostly yellowish; none of them bright.

Opake. Sometimes faintly translucent on the edges.

Brittle. Hardness =5·5 . . . 6·0. Sp. gr. =3·029.

1. Before the blow-pipe, it fuses only in thin splinters. In borax, it is very slowly dissolved. It gelatinizes in heated muriatic acid.

2. *Analysis.*

	By Fuchs.	By Kobell.
Alumina	24·80	21·4
Silica	29·64	31·0
Lime	35·30	37·4
Oxide of iron	6·56	4·4
Magnesia	0·00	3·4
Water	3·30	2·0

3. It has been found on Mount Monzoni, in the valley of Fassa in the Tyrol, along with Calcareous Spar.

GIBBSITE. Staphyline Wavelline-Spar.

Irregular stalactites; tuberose masses.

Structure fibrous, the fibres radiating from the centre.

Lustre faint. Color greenish or greyish white. Translucent.

Hardness =3·0 . . . 3·5, but easily reduced to powder. Sp. gr. =2·4.

1. Before the blow-pipe, it whitens, but is infusible.

2. *Analysis.*

	By Torrey.
Alumina	64·8
Water	34·7

3. It is found in very small quantity only, disseminated through a bed of Limonite, at Richmond, (Mass.)

Gieseckite.

Crystallized in six-sided prisms.

Cleavage not visible. Fracture uneven, splintery.

Lustre resinous, faint. Color olive-green, grey, brown.

Streak uncolored. Feebly translucent on the edges . . . opake.

Hardness = 2·5 . . . 3·0. Sp. gr. = 2·832.

1. *Analysis.*

By Stromeyer.

Silica	46·07
Alumina	33·82
Magnesia	1·20
Black oxide of iron	3·35
Oxide of manganese	1·15
Potash	6·20
Water	4·88

2. It occurs in Greenland, with Feldspar.

3. The above description probably applies to a variety of Mica, similar to Pinite.

Gilbertite.

Massive; foliated.

Lustre pearly. Color white, with a shade of yellow. Translucent.

Sectile. Hardness = 4·00? Sp. gr. = 2·648.

1. *Analysis.*

By Thomson.

Silica	45·155
Alumina	40·110
Lime	4·170
Magnesia	1·900
Protoxide of iron	2·430
Water	4·250

2. It occurs at St. Austle in Cornwall, and contains through its mass particles of Fluor, and what appears to be Apatite.

3. It is quite probable, that the above mineral, which is well known as Cornish Talc, is an aggregate of Talc, Mica and several other mineral species.

Giobertite. (See *Magnesite.*)

GISMONDIN. Abrazitic Kouphone-Spar.

Primary form. Right square prism.

Secondary form. Primary form surmounted by four-sided pyramids, whose faces correspond to the prismatic faces. The adjoining faces of either pyramid incline under 122° 58′: and a face of the upper pyramid to a corresponding one of the lower, under 85° 40′.

Cleavage imperfect, parallel to the pyramidal faces. Surface, prismatic faces frequently rounded; the pyramidal ones smooth, and though generally very small, yet possessing high degrees of lustre. Fracture conchoidal.

Lustre adamantine. Color pale smalt-blue, milk-white, pearl-grey and rose-red. Translucent, in small crystals, nearly transparent.

Hardness =6·0...6·5. Sp. gr. =2·16...2·2.

1. Before the blow-pipe, it phosphoresces, and becomes friable, but is infusible. It gelatinizes with acids without effervescence.

2. *Analysis.*

By Carpi.

Silica	41·4
Lime	48·6
Alumina	2·5
Magnesia	1·5
Oxide of iron	2·5

3. Gismondin occurs along with white octahedrons of Fluor, Feldspar and other minerals, in the drusy cavities of a volcanic rock, at Capo di Bove, near Rome.

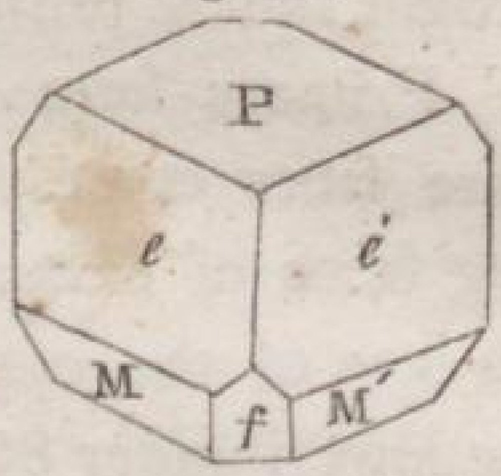
It approaches in several of its properties, especially that of form, the species Zircon.

GLAUBERITE. Prismatic Brithyne-Salt. Mohs.

Primary form. Oblique rhombic prism. M on M′=83° 20′. M on P =104° 15′.

Secondary form.

Fig. 213.



P on e or e'	137°	9′	PHILLIPS.	M on e	147°	40′
e on e'	116	20		P on f	112	20
M or M′ on f	131	35		e or e' on f	132	37

The planes M and f are often wholly wanting.

Cleavage, parallel with M and M′ perfect; traces of P but interrupted by conchoidal fracture. Fracture conchoidal. Surface, planes e streaked parallel to their common edges of combination, partly uneven, but smooth and shining.

Lustre vitreous. Color yellowish or greyish-white. Streak white. Semi-transparent . . . translucent.

Brittle. Hardness = 2·5 . . . 3·0. Sp. gr. = 2·807.

Taste feebly saline and astringent.

1. Before the blow-pipe, it decrepitates, and melts into a white enamel. Immersed in water, it loses its transparency, and is partly dissolved. The same appears in a moist atmosphere.

2. *Analysis.*

By Brongniart.

Sulphate of lime	49·0
Sulphate of soda	51·0

3. It occurs in imbedded crystals in Common Salt, at Villarubia, near Ocana in New Castile. Another locality is Aussee in Upper Austria.

GLAUBER SALT. Prismatic Glauber-Salt. Mohs.

Efflorescent, and in mealy crusts.

Glauber Salt.

Lustre vitreous. Color white. Streak white. Transparent to opake.

Sectile. Hardness = 1·5 ... 2·0. Sp. gr. = 1·481. Taste cool, then feebly saline and bitter.

1. It is easily soluble in water, but readily falls into powder on being exposed to the air.

2. *Analysis.*

By Reuss.

Sulphate	of soda	67·024
Carbonate	of soda	16·333
Muriate	of soda	11·000
Muriate of lime		5·643

3. Glauber Salt is found accompanying Common Salt and Epsom Salt, or as an efflorescence, upon the soil, and on several rocks; also on the shores of salt lakes, and in some mineral springs.

4. It occurs in the neighborhood of Ausser, Ischel, and Hallstadt in Austria, at Hallein in Salzburg, in Hungary, in Switzerland; also in Italy and Spain, and the Sandwich Islands.

Glaucolite.

Massive. Cleavage parallel with a rhombic prism of 143° 30′, nearly. Fracture splintery, or uneven.

Lustre vitreous. Color lavender-blue, to green. Translucent. Hardness = 5·5. Sp. gr. = 2·7 ... 2·9.

1. Fusible with difficulty before the blow-pipe, into a blebby white glass; but is soluble in borax and salt of phosphorus.

2. *Analysis.*

By Bergmann.

Silica	54·58
Alumina	29·77
Lime	11·08
Potash	4·57

3. It is found in compact Feldspar and granular limestone, with Talc, in the granitic mountains, upon the borders of the Sliudianka, which empties into lake Baikal.

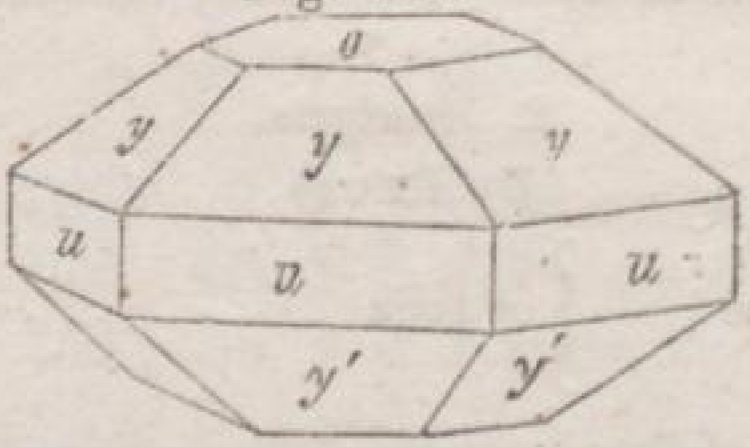
4. With the exception of the cleavage, the foregoing description would apply to some of the varieties of Scapolite.

GMELINITE. Sarcoline Kouphone-Spar.

Primary form. Rhomboid: dimensions unknown.

Secondary form. Regular hexagonal prism, with the terminal edges replaced by single planes.

Fig. 214.



y on y' - - - - 83° 36′

Cleavage parallel to the rhomboid, visible, though not easily obtained. Fracture uneven. Surface streaked, the prism horizontally, the pyramidal planes parallel to the edges of combination with the rhomboid.

Lustre vitreous. Color white, passing into flesh-red. Streak white. Translucent.

Hardness =4·5. Sp. gr. =2·05.

1. Before the blow-pipe, it swells up, and assumes the appearance of an enamel. When held in the flame of a candle, it exfoliates into numerous scales.

2. *Analysis.*

	By Vauquelin, fr. Montecchio-Maggiore.	By Vauquelin, fr. Castel.	By Thomson, fr. Antrim, Ireland.
Silica	50·00	50·00	39·896
Alumina	20·00	20·00	12·968
Lime	4·50	4·25	0·000
Soda	4·50	4·25	0·000
Water	21·00	20·00	29·866
Protoxide of iron	0·00	0·00	7·443
Potash	0.00	0·00	9·827

3. It is found in the cavities of amygdaloidal rocks, at Montecchio-Maggiore, and at Castel in the Vicentine, and in the county of Antrim in Ireland.

4. It would appear that the newly proposed *Ledererite*, from Cape Blomidon, Nova Scotia, is a variety of Gmelinite. It is described by Mr. JACKSON as occurring in regular six-sided prisms, whose terminal edges are truncated, the truncating planes inclining to the prismatic faces under angles of 180°, i. e. y on y' (of the above figure) = 80°; a difference not very considerable, when it is considered that the common goniometer was employed. The crystals, besides, are mentioned as having the longitudinal striæ upon the prismatic faces. Sp. gr. = 2·169. Hardness nearly the same as Feldspar, though from the circumstance that Mr. BROOKE considered the mineral as Apatite, it seems probable that it must be somewhat lower. The crystals are transparent, or only translucent; white, or tinged with flesh-red. Lustre vitreous. According to Mr. HAYES, it consists of, Silica 49·470, Alumina 21·480, Lime 11·480, Soda 3·940, Phosphoric acid 3·480, Oxide of iron 0·140, Foreign matter 0·030, Water 8·580, Loss 1·400. This mineral occurs in trap, with Analcime and Stilbite.

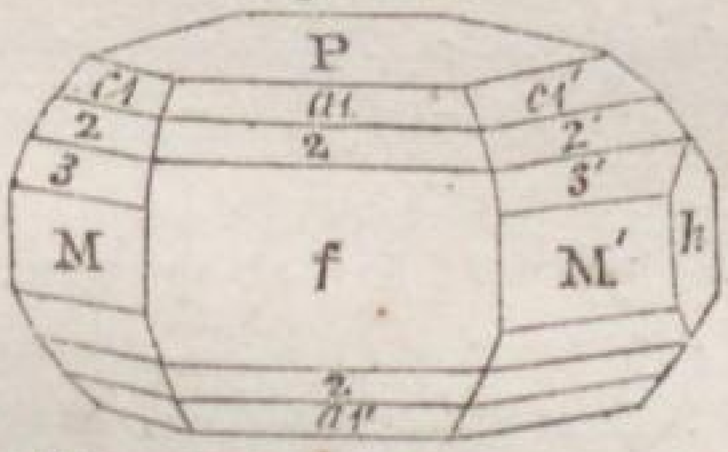
GŒTHITE. (See *Limonite.*)

GRAPHIC GOLD. Prismatic Antimony-Glance. MOHS.

Primary form. Right rhombic prism. M on M = 107° 44′.

Secondary form.

Fig. 215.



			PHILLIPS.			
P on $a1$	-	141° 30′		P on $c3$ or $c3'$		132° 45′
P on $a2$	-	129 12		M on h	-	126 08
P on $c1$ or $c1'$		151 40		f on h	-	90 00
P on $c2$ or $c2'$		136 42				

Cleavage parallel with M highly perfect; with T perfect, though not so easily obtained. Fracture uneven.

Secondary surfaces of the prism vertically streaked; M fused-like; the remaining faces smooth.

Lustre metallic. Color pure steel-grey. Streak unchanged.

Very sectile. Hardness $=1{\cdot}5\ldots2{\cdot}0$. Sp. gr. $=5{\cdot}723$.

Compound Varieties. Regular composition of acicular crystals, nearly at angles of 60° and 120°, in one plane, frequently repeated, and imparting to the whole the appearance of certain characters for writing. Massive: composition imperfectly columnar or granular, small, but not impalpable.

1. The present species presents a great many varieties of crystalline forms, which being generally very much engaged among each other, and moreover modified by regular composition, have not yet been satisfactorily developed.

Before the blow-pipe, it melts easily into a dark grey metallic globule, and covers the charcoal with a white oxide, which changes into a green, or bluish green, when the reduction flame is directed upon it. After having continued the blast for some time, a ductile metallic metal, of a light yellow color, remains.

2. *Analysis.*

By Klaproth.

Tellurium - - - -	60·00
Gold - - - -	30·00
Silver - - - -	10·00

It yet remains to be explained how an amalgam of the above composition should possess a sp. gr. of only 5·723, when the artificial preparation would mount as high as 10.

3. Graphic Gold occurs at Offenbanya in Transylvania, in very narrow, but quite regular veins, which traverse porphyry, several of them at a short distance from each other, and parallel. It is accompanied by Native Gold and Quartz; and is occasionally met with along with Black Tellurium, at Nagyag in Transylvania.

4. It is a valuable ore, on account of its richness in gold and silver.

Graphite. (See *Plumbago*.)

GREEN EARTH. (See *Talc.*)

GREEN IRON-ORE.

Massive: reniform and fibrous.

Lustre vitreous, silky. Feebly translucent upon the edges. Color dark lake-green; the decomposed fibres, yellowish or brownish.

1. It yields water on being heated, and melts very easily into a black porous slag, which is not magnetic. It is soluble in muriatic acid.

2. *Analysis.*

By KARSTEN.

Phosphoric acid - - - -	28·50
Oxide of iron - - - -	62·52
Water - - - - -	8 98

3. It occurs in the Hollester mines near Siegen, in Prussia.

GREEN LEAD-ORE. (See *Pyromorphite.*)

GREEN MALACHITE. Habroneme Copper-Baryte.

Primary form. Oblique rhombic prism. M on M′= 103° 42′. P on the obtuse edge of the prism =118° 11′.

Secondary form. The primary, having the obtuse edge of the prism truncated.

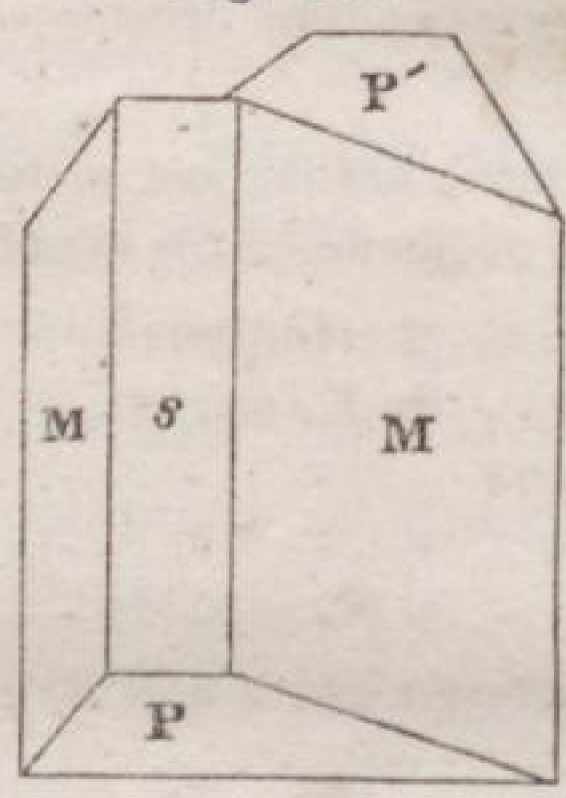
Cleavage, highly perfect in the direction of P; that parallel with the obtuse edge of the prism, or longer diagonal, less distinct. Fracture conchoidal, uneven, scarcely observable in crystallized varieties. The secondary plane upon the obtuse edge sometimes streaked, the other faces smooth.

Lustre adamantine, inclining to vitreous. Color grass-green, emerald-green, verdigris-green. Streak green, rather paler than the color. Translucent, sometimes only on the edges.

Brittle. Hardness =3·5 . . . 4·0. Sp. gr. = 4·008.

Compound Varieties. Twin-crystals: axis of revolution perpendicular, face of composition parallel with the longer diagonal of the prism; angle of revolution =180°.

Fig. 216.



This composition occurs in almost every variety, and even in those masses which consist of columnar particles of composition. It then seems as if both the faces of a prism were present, forming a dihedral termination of each individual of 123° 37, while in fact there exists only one of them. Fascicular aggregations of delicate crystals. Tuberose, globular, reniform, botryoidal and stalactitic shapes: surface drusy, rough, sometimes smooth; composition columnar, generally very thin, often impalpable. Very thin columnar composition, produces a satiny lustre; impalpable composition, is the cause of conchoidal fracture. Massive: composition as above. The composition often repeated; granularly compound masses consist of columnar ones radiating from a centre; curved lamellar ones are likewise composed of thin columnar indiviuals. The surface of the second composition is often rough, and particularly in curved lamellar compositions, covered with a white coating.

1. Before the blow-pipe, it decrepitates, becomes black, and is partly infusible, partly converted into a black scoria. It is easily soluble in bo-

rax, imparting to it a deep green color, and yielding a globule of metallic copper. It is soluble, without residue, in nitric acid.

2. *Analysis.*

	By KLAPROTH.	By VAUQUELIN.
Copper - -	58·00 - -	56·10
Oxygen - -	12·50 - -	14·00
Carbonic acid - -	18·00 - -	21·25
Water - -	11·50 - -	8·75

3. It occurs in the same repositories as Blue Malachite, with which it is frequently associated. Beautiful varieties of Green Malachite are found at Chessy in France, in Siberia, and at Moldavia in the Bannat of Temeswar. The compact Malachite is chiefly found at Schwatz in Tyrol. Green Malachite occurs in Cornwall, Cumberland and Wales, England.

It is found in the United States, at several places, though no where in very handsome specimens. The most interesting localities are in Maryland, in the Blue Ridge in Pennsylvania near Nicholson's Gap, and at the Perkiomen Lead Mine, and in New Jersey at Schuyler's mines, where it is accompanied by Red Copper-Ore.

4. Those varieties which are sufficiently compact, are cut into vases, snuff boxes, ring-stones and other ornaments. Others are used as pigments. If it occurs in sufficient quantity, it is a valuable ore for the extraction of copper.

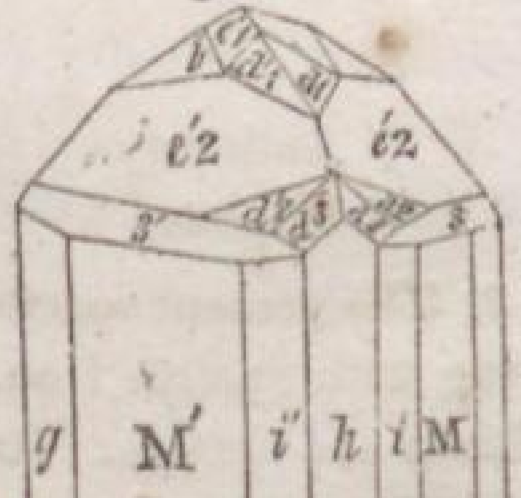
GREY ANTIMONY. Prismatoidal Antimony-Glance. MOHS.

Primary form. Right rhombic prism. M on M = 91° 10′. (90° 45′. MOHS.)

Secondary form.

M′ on M -	88°	40′	PHILLIPS.
M′ on *e*′2, or M on *e*2	145	30	
M′ or M on *h*	134	20	
M′ on *i*′ or M on *i*	171	40	
M′ on *g* -	173	00	
e′2 on *e*2 -	108	30	
h on *e*′2 or *e*2	125	30	
h on *i*′ or *i* -	161	30	

Fig. 217.



Cleavage, highly perfect in the direction of *h*, or the shorter diagonal of the prism; much less distinct parallel with M. Fracture small conchoidal, rather imperfect. Surface, the vertical planes deeply striated parallel to their own intersections, and rough. The remaining faces generally smooth. Subject to tarnish.

Lustre metallic. Color lead-grey, inclining to steel-grey. Streak unchanged.

Sectile. Thin laminæ are a little flexible. Crystals sometimes bent. Hardness =2·0. Sp. gr. =4·62.

Compound Varieties. Massive; composition columnar, of various sizes of individuals, sometimes very thin, but not impalpable. They are long and straight, either parallel or divergent from several common centres, and aggregated in a second angulo-granular composition. The faces of composition are irregularly streaked in a longitudinal direction. Sometimes the composition is granular, and then the individuals often become impalpable, but are generally very strongly connected; the fracture becomes even or uneven. Capillary crystals often form a tissue resembling wool, or felt.

1. Grey Antimony is very fusible before the blow-pipe, and is absorbed by the charcoal. By a continued blast, it may be valatilized, without leaving any considerable residue.

2. *Analysis.*

	By Proust.	By Thomson.
Antimony	75·00	73·77
Sulphur	25·00	26·23

3. The present species occurs in veins and beds: in the latter case along with Spathic Iron. It is frequently associated with Heavy-Spar, Blende and Quartz. Its decomposition produces the *Antimony-Ochre*, a friable, compact yellow substance, with which it is often associated or covered.

4. Veins, consisting almost entirely of the present species, have been discovered at Pösing near Pressburg in Hungary, and at Wolfsthal in the county of Stollberg in the Hartz; also such as contain considerable quantities of it associated with other minerals, at Felsobanya in Upper Hungary, at Cremnitz, Schemnitz, and other places in Lower Hungary, and in France. Other localities are Bräunsdorf near Freiberg in Saxony, Neudorf in Anhalt, Cornwall and Scotland. The fibrous variety occurs at Loben in the valley of the Levant in Carinthia, and the compact at Magurka in Hungary.

5. It is used for extracting the crude antimony, or the metal itsef, which is employed in the manufacture of several metallic alloys, and in medicine.

Appendix to Grey Antimony.

i. *Haidingerite.* Berthier.

Massive; sometimes exhibiting appearances of prismatic crystals, but generally in confusedly aggregated masses, whose structure is foliated.

Lustre feeble, metallic. Color iron-grey, with tarnished hues.

1. Before the blow-pipe, it melts readily. It is quickly acted upon by cold muriatic acid, giving out pure sulphuretted hydrogen; and is totally dissolved except some Pyrites and Quartz.

2. *Analysis.*

By Berthier.

Sulphur	30·8
Antimony	52·0
Iron	16·0
Zinc	0·3

3. It occurs along with Quartz, Calcareous Spar and Iron-Pyrites, at Chazelles in France.

4. It has until lately been rejected as an ore of antimony, on account of the impurity of the metal obtained.

5. It is probable that this mineral is nothing more than an impure variety of Grey Antimony.

Grey Manganese. (See *Pyrolusite*, *Manganite* and *Psilomelan.*)

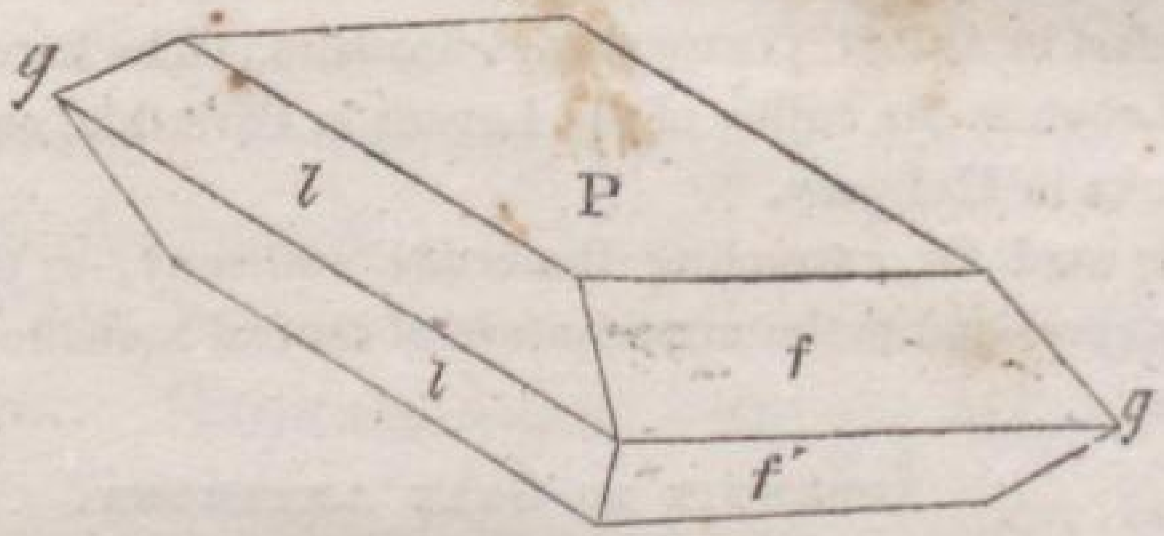
Gurhofian. (See *Dolomite.*)

GYPSUM. Prismatoidal Gypsum-Mica.

Primary form. Right oblique angled prism. M on T =113° 8′.

Secondary forms.

Fig. 218.



Oxford, England—Ohio.

Fig. 219.

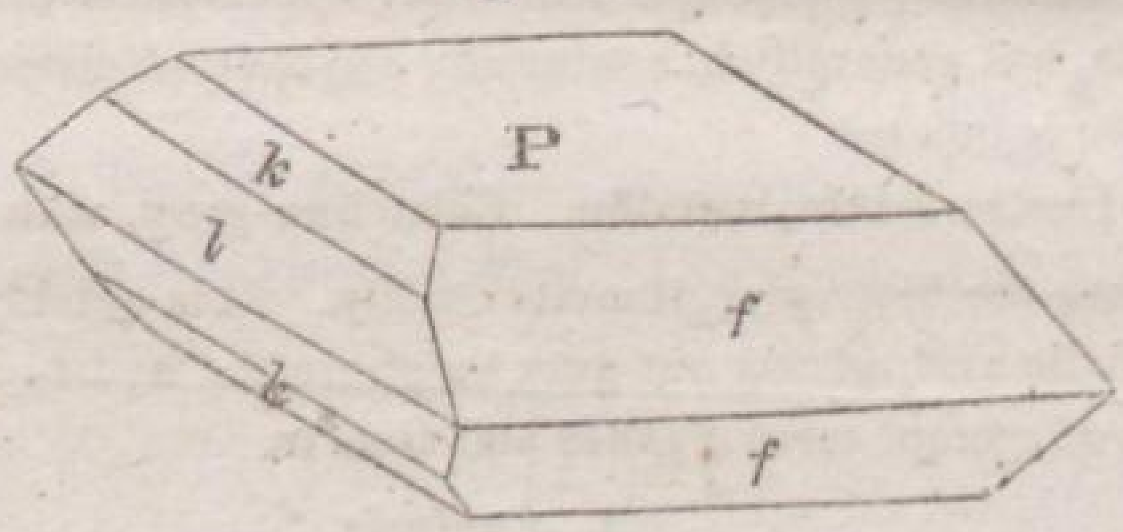


Fig. 220.

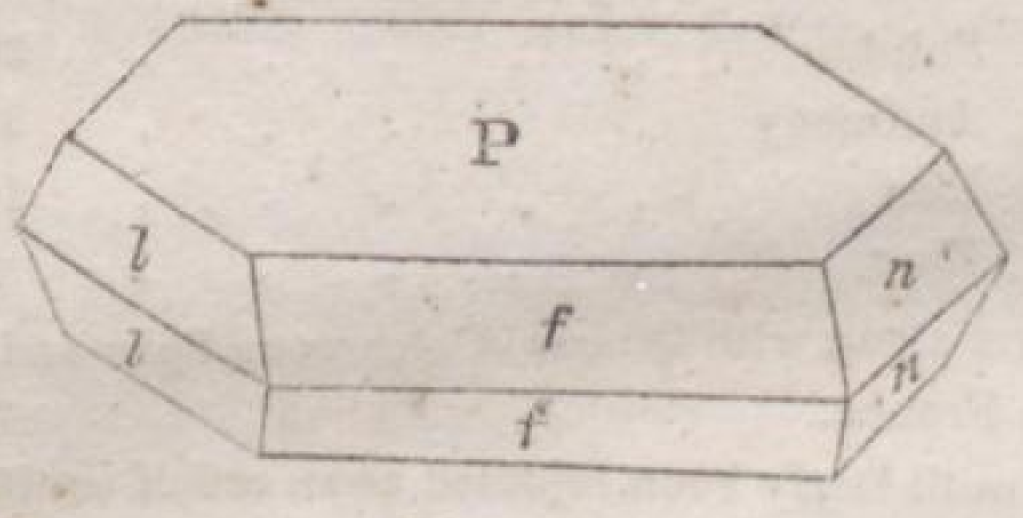


Fig. 221.

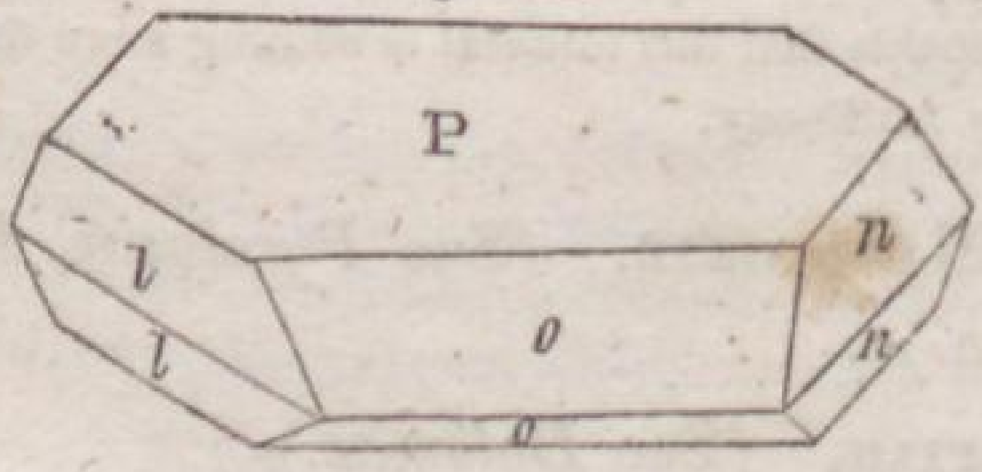
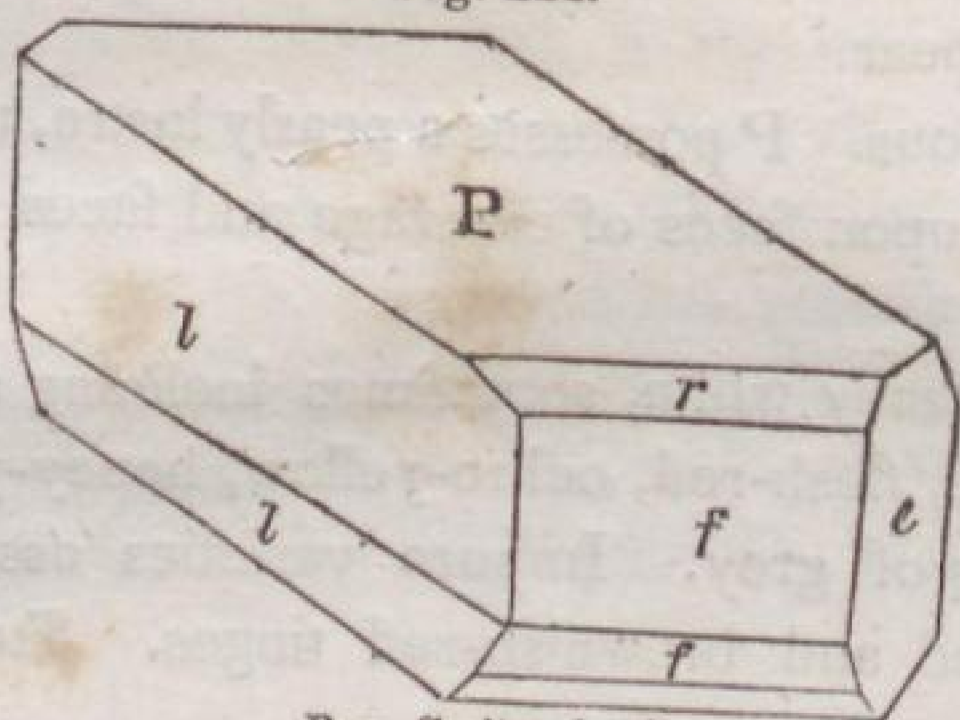


Fig. 222.



Bex, Switzerland.

Fig. 218. Primary form, having the longer and shorter terminal edges replaced. P on l =108° 3′ 19″. P on f= 124° 41′ 43″. f on f=110° 36′ 34″. l on l=143° 53′ 22″. (*trapezienne.* Hauy.)—Fig. 219. The same, altered only through the additional planes k. P on k = 134° 21′ 40″. k on l = 153° 41′ 39″. (*progressive.* Hauy.)—Fig. 220. The same as Fig. 218, with the addition of planes n through the replacement of the acute terminal angles. (*équivalente.* Hauy.)—Fig. 221. The same with Fig. 220. excepting the substitution of planes o for f. o on o =71° 40′ 32″. (*quaterno bisunitaire.* Hauy.)—Fig. 222. Like Fig. 218. with the addition of planes r, and the truncation of the acute, lateral edges. (*disjointé.* Hauy.)

Cleavage, parallel with P highly perfect, and easily obtained; with M and T imperfect, the former of these being of a conchoidal appearance, while the former is obtained with difficulty, on account of the flexibility of the mineral in that direction, and often presents a fibrous aspect. Fracture scarcely perceptible.

Surface. P and l streaked, parallel to their common intersections. The faces e and f often rounded, which gives rise to the well known lenticular shapes, if the faces P and l disappear.

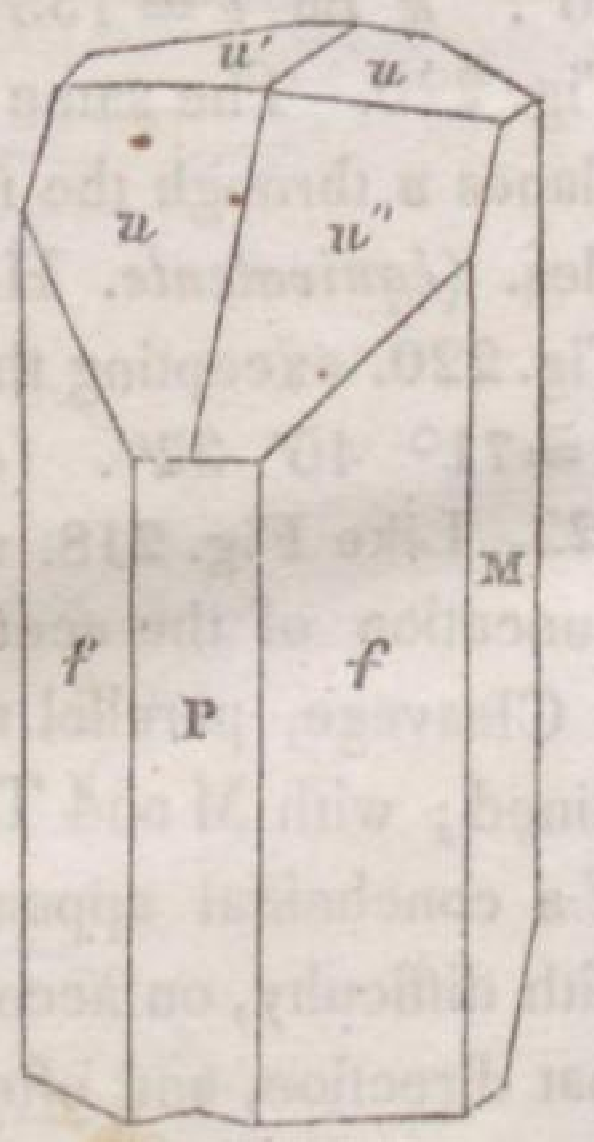
Lustre vitreous. P possesses a pearly lustre, more or less distinct, both upon faces of cleavage and faces of crystallization.

Color, generally white, sometimes inclining and passing into smalt-blue, flesh-red, ochre-yellow, honey-yellow, and several shades of grey. Impure varieties assume dark-grey, brick-red and brownish-red tinges. Streak white. Transparent . . . translucent.

Sectile. Thin laminæ are flexible in the direction of those edges which arise from the intersection of P with r.

Hardness $=1{\cdot}5 \ldots 2{\cdot}0$. The lowest degrees upon P, its highest degrees in the direction in which the crystals are rounded. Sp. gr. $=2{\cdot}310$.

Fig. 223.



Compound Varieties. Twin-crystals. 1. Axis of revolution perpendicular, face of composition parallel to M. Angle of revolution $=180°$, (as in the annexed figure,) which is understood, if we suppose fig. 220. to possess, instead of the edge from the meeting of $f\ f$, a portion of M, and the bisection to take place through P.

2. Axis of revolution perpendicular to M; face of composition parallel to P: angle of revolution $=180°$.

Gypsum.

3. Axis of revolution perpendicular; face of composition parallel to T. According to this law are formed the arrow-shaped twins, consisting of lenticular crystals. Globular masses, generally formed of discernible individuals. Dentiform. Massive: composition granular, passing into impalpable, sometimes scaly; also columnar, often as thin as hair, long, generally straight and parallel. Sometimes without cohesion of the single particles, in the state of powder.

1. Before the blow-pipe, it exfoliates and melts, though with difficulty, into a white enamel, which after a short time falls into powder. In a lower degree of heat, it loses its water and becomes friable, so as to be easily reduced to an impalpable powder. If mixed with water, this powder becomes warm, and soon hardens into a solid mass.

2. *Analysis.*

By Bucholz.

Lime	33·0
Sulphuric acid	44·8
Water	21·0

3. Compound varieties of Gypsum form beds in secondary mountains, more sparingly in the older classes of rocks; and they are generally possessed of a considerable thickness. Its principal repositories are sandstones and clay, in which it is associated with limestone and Common Salt. Brine springs very often issue from the rocks in its vicinity. Simple varieties are chiefly found in clay, in salt works; also in abandoned mines and old heaps, where they are often products of recent origin.

4. Gypsum is found in almost all countries, both crystallized and massive; for example, in Mansfeld, Thuringia, Bavaria, Franconia, Swabia, Switzerland, in the Tyrol, Stiria and Austria; also Poland, Hungary and Transylvania; in England, France, Spain. Beautiful crystals are found near Oxford, at Bex in Switzerland, Hall in the Tyrol, and at Ischel; large lenticular crystals, generally twins, occur at Montmartre, near Paris. Gypsum occurs in great quantities in Nova Scotia, both the earthy varieties and the scaly. In the United States, this species is abundant in Arkansaw, Illinois, Tennessee, Virginia, Ohio and N. York. At Poland, in Trumbull co. (Ohio,) exceedingly perfect and transparent

crystals, several inches long, of the form of Fig. 218, are found. Near Niagara falls, and at Lockport, (N.Y.) very handsome varieties of snowy white, granular, and foliated Gypsum, occur imbedded in black limestone.

5. Gypsum is variously employed in manufacturing artificial marble, stucco work, mortar, &c.; also for making casts of statues, medals, &c. It is added to the mass of certain kinds of porcelain and glass. In sculpture, it is used under the name of alabaster. It is also employed in agriculture, for improving the soil, both calcined, and in its natural state; it forms the paste of colored drawing pencils, and is employed in polishing.

GUMMITE. (See *Halloysite.*)

HAIDINGERITE. Diatomous Gypsum-Mica.

Primary form. Right rhombic prism. M on M =99° 52′.

Secondary forms. The primary, having the lateral and terminal angles replaced by single planes, together with the truncation of the obtuse lateral edges, and the bevelment of the lateral edges. The obtuse edges of the prism are sometimes replaced by three planes.

Cleavage, highly perfect, and easily obtained in the direction of P.

Lustre vitreous. Color white. Streak white. Transparent, in small crystals translucent. Double refraction observable through M, and the opposite face replacing the obtuse edge, making an angle of 40°.

Sectile. Thin laminæ, slightly flexible.

Hardness =2·0 . . . 2·5. The face P may be scratched by Common Salt. Sp. gr. = 2·848.

1. *Analysis.*

By TURNER.

Arseniate of lime - - -	85·681
Water - - -	14·319

2. It has been observed only upon a single specimen, whose locality is unknown, in the cabinet of Mr. FERGUSON, of Raith. The mineral

forms crystalline coats, of a somewhat botryoidal appearance, over a ferruginous Quartz, which covers a rose red variety of Diallogite, resembling that found near Freiberg. The same specimen also contained large crystals of Pharmacolite.

HAIDINGERITE of BERTHIER. (See *Grey Antimony.*)

HALLOYSITE.

Reniform and tubercular masses. Massive; composition impalpable. Fracture conchoidal.

Lustre resinous. Color pure white, or tinged with blue. Translucent on the edges. In water becomes transparent.

Sectile, may be indented by the nail, and polished with the finger.

1. *Analysis.*
By BERTHIER.

Silica - - - - - -	44·94
Alumina - - - - - -	39·06
Water - - - - - -	16·00

It is found in masses three or four inches in diameter, among ores of iron, zinc and lead, in cavities of transition limestone, at Angleure, near Liège.

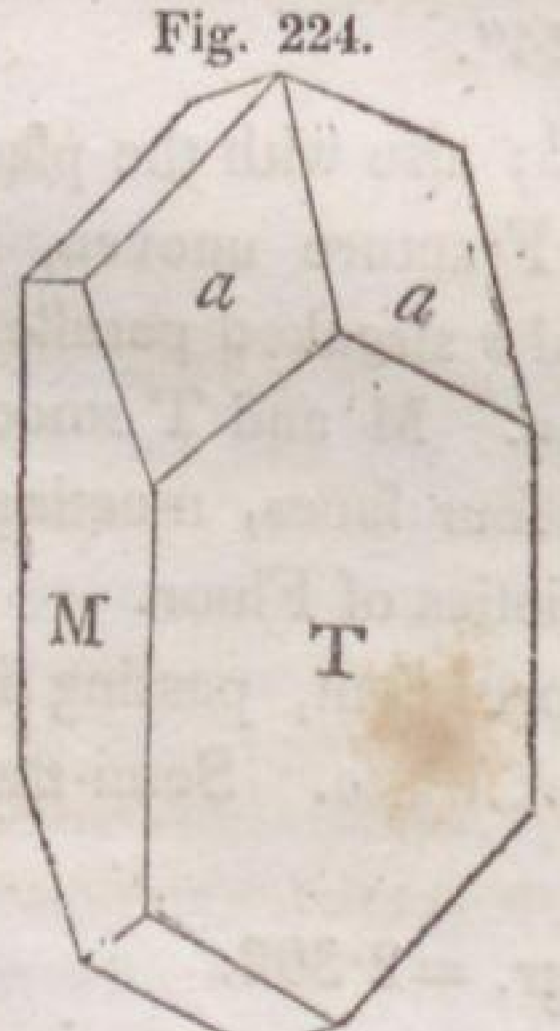
HARD COBALT PYRITES. (See *Cobaltine.*)

HARMOTOME. Paratomous Kouphone-Spar. MOHS.

Primary form. Right rectangular prism.

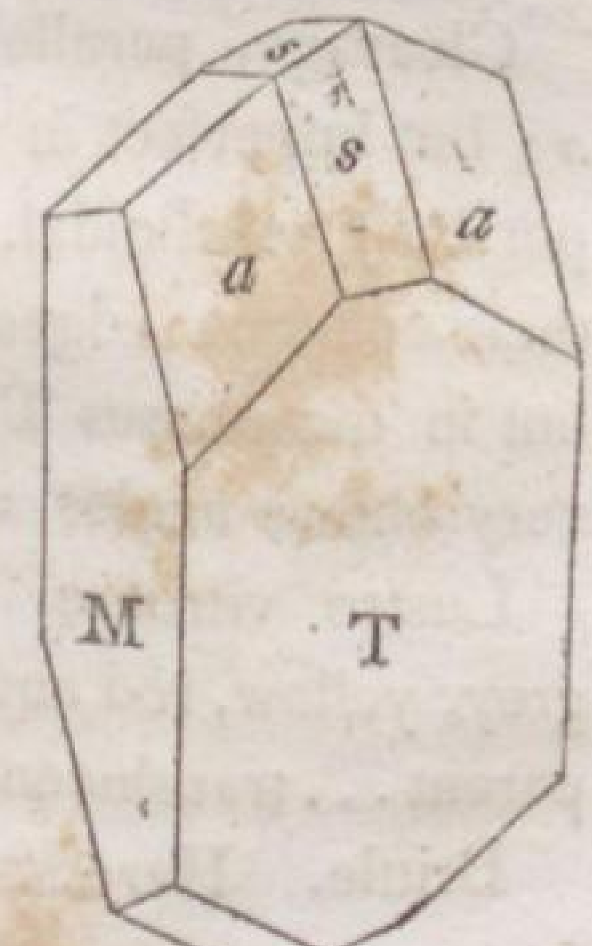
Secondary forms.

Fig. 224.



Oberstein.

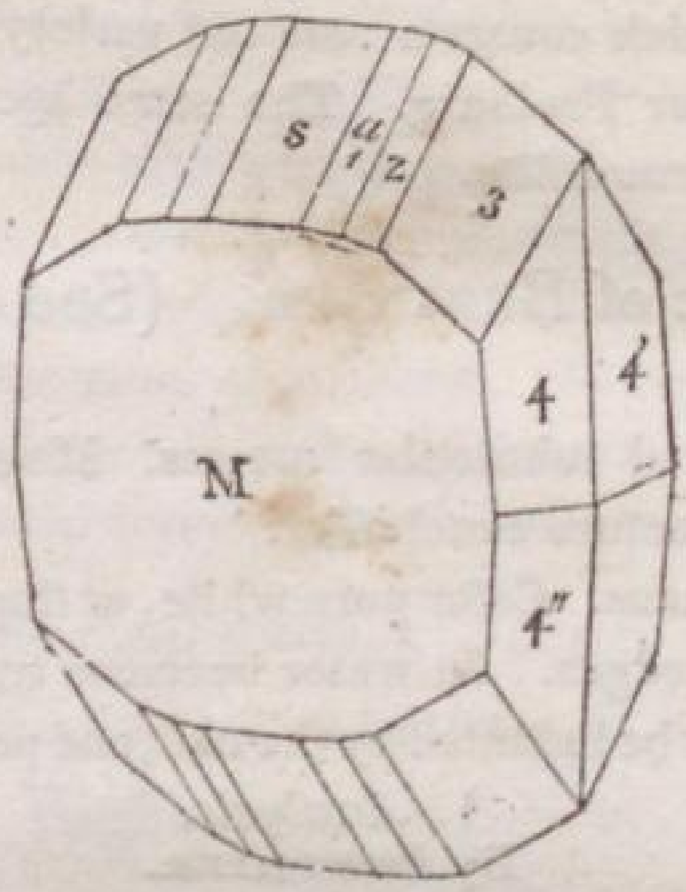
Fig. 225.



Strontian, Scotland.

Harmotome.

Fig. 226.



M on *s* - - -	125°	5′	P.
s on *s* over the summit -	110	26	
s on *a*1 - - -	171	4	
s on *a*2 - - -	151	35	
s on *a*3 - - -	149	32	
*a*4 on *a*4′ - - -	177	28	

Fig. 224. Primary form, with the solid angles truncated. *a* on *a* =121° 57′ 56′. *a* on *a* over the summit, =86° 36′.

Fig. 225. *s* on T = 123° 41′ 24″.

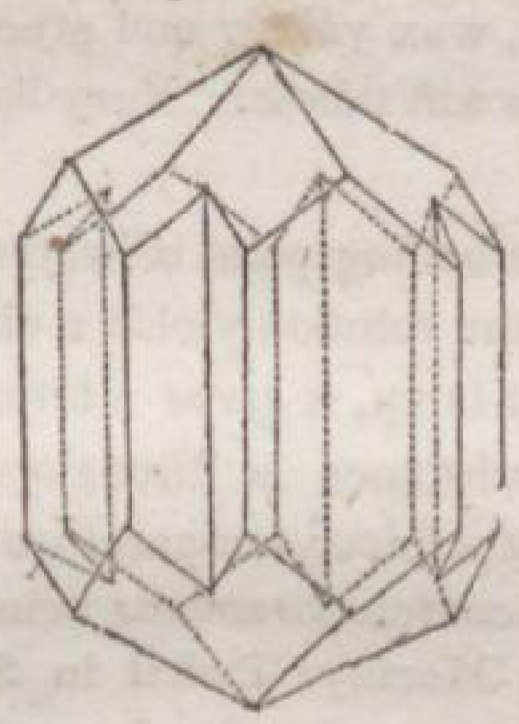
Cleavage, parallel with M and T; also with the planes *a*; but imperfect in all directions. Fracture uneven, imperfectly conchoidal. Surface, *a* and *s* streaked parallel to their common edges of combination. M and T smooth, but in most cases T is divided into four faces, meeting at very obtuse angles, as in certain varieties of Fluor.

Lustre vitreous. Color white prevalent, passing into grey, yellow, red and brown. Streak white. Semi-transparent . . . translucent.

Brittle. Hardness =4·5. Sp. gr. =2·392.

Compound Varieties. Twin-crystals. Face of composition parallel, axis of revolution perpendicular to one of the faces of M and T. The individuals are continued beyond the face of composition, and produce the cruciform crystals. (See annexed figure.)

Fig. 227.



Massive: composition granular, rare.

1. Alone upon charcoal, it melts, without intumescence, into a clear globule. It phosphoresces with a yellow light, and is not easily acted upon by acids.

2. *Analysis.*

	By KLAPROTH.	By WERNEKINK.		By THOMSON.
	fr. Andreasberg.	fr. Schiffenberg.		fr. Strontian.
Silica	49·00	44·79	53·07	48·735
Alumina	16·00	19·28	21·31	15·100
Baryta	18·00	17·59	0·39	14·275
Lime	0·00	1·08	6·67	3·180
Potash	0·00	0·00	0·00	2·550
Ox. iron and mang.	0·00	0·85	0·56	0·000
Water	15·00	15·32	17·09	14·000

3. Harmotome occurs in metalliferous veins, traversing grey-wacke and mica-slate, and in the vesicular cavities of amygdaloidal rocks.

4. The beautiful, cruciform twins occur at Andreasberg in the Hartz; and the simple crystals at Strontian, in Scotland. Other localities are, Kongsberg in Norway, Oberstein in Deuxponts, where it is found in agate balls; Baden, near Engelhaus and Buchan in Bohemia, and in the

vicinity of Mount Vesuvius. It is also said to occur very frequently in amygdaloid, in Scotland.

HATCHETINE.

In the shape of flakes like spermaceti, or of granular masses like bees-wax.

Lustre slightly glistening and pearly, and of considerable degrees of transparency when in flakes, else dull and opake. Color yellowish-white, wax yellow and greenish-yellow.

Hardness, like soft tallow. Very light. Without odor or elasticity.

1. It melts below the boiling point of water. Ether dissolves it readily; being evaporated, the solution yields a viscid, oily inodorous matter. Distilled over the spirit-lamp, it gives a bituminous smell, a greenish-yellow, butryaceous substance is disengaged, and a coaly residue remains in the retort. At a lower temperature a light oil is distilled.

2. It occurs in small contemporaneous veins with Quartz, Calcareous Spar and iron-ores, at Merthyr Tydril in South Wales. It has been described by Mr. BRANDE under the denomination of *Mineral Adipocire.*

3. The description of Hatchetine agrees very nearly with the following one given of *Mountain Tallow.* It has the color and feel of tallow, and is tasteless; its sp. gr. = 0·6078, in its natural state, but is increased by melting it, to 0·983, the air bubbles being driven off. It melts at 118°, and boils at 290°. When melted it is transparent and colorless, but becomes opake and white on cooling. It is insoluble in water, but is dissolved by alcohol, oil of turpentine, olive-oil and naphtha, when hot, but is precipitated when they cool. It does not form soap with alcaline substances, but is combustible. It has been found in a bog, on the borders of Loch Fyne, and has been formerly noticed on the coast of Finland, in one of the Swedish lakes; near Strasburg, and in Scotland.

HAUSMANNITE. (See *Black Manganese.*)

HAUYNE. (See *Sodalite.*)

HAYDENITE. (See *Chabasie.*)

HAYTORITE.

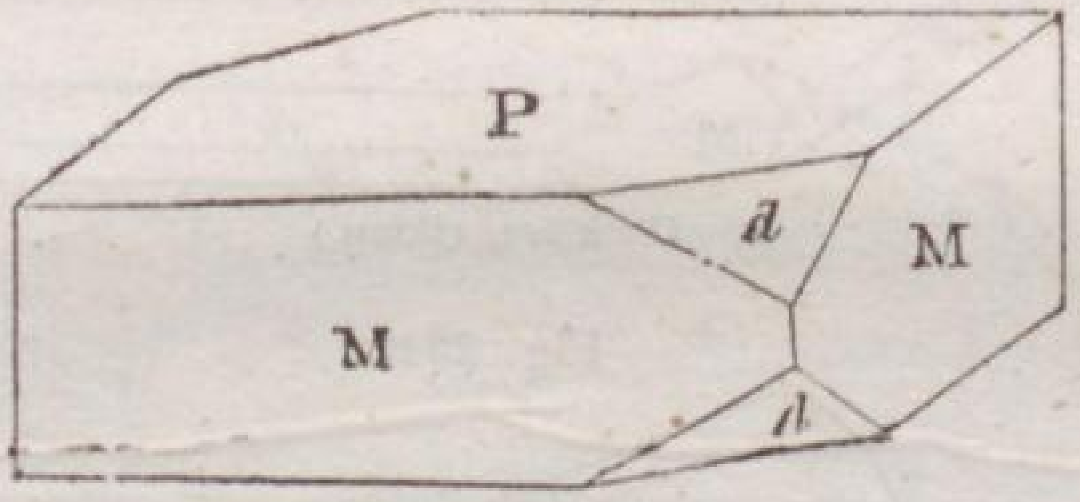
A variety of Quartz, resembling Calcedony, in perfect crystals, single and variously aggregated, and having the form of Datholite, (variety Humboldtite.) It occurs in detached pieces, accompanied by small masses of Calcedony, Garnet, green Hornblende, Talc and Magnetic Iron-Ore—the aggregate being enveloped by a ferruginous clay, and existing in an iron mine adjacent to the Hay Tor granite quarries, in Devonshire. The formation of these crystals is quite inexplicable according to the known laws of pseudomorphism.

HEAVY SPAR. Prismatic Hal-Baryte. MOHS.

Primary form. Right rhombic prism. M on M′=101° 42′.

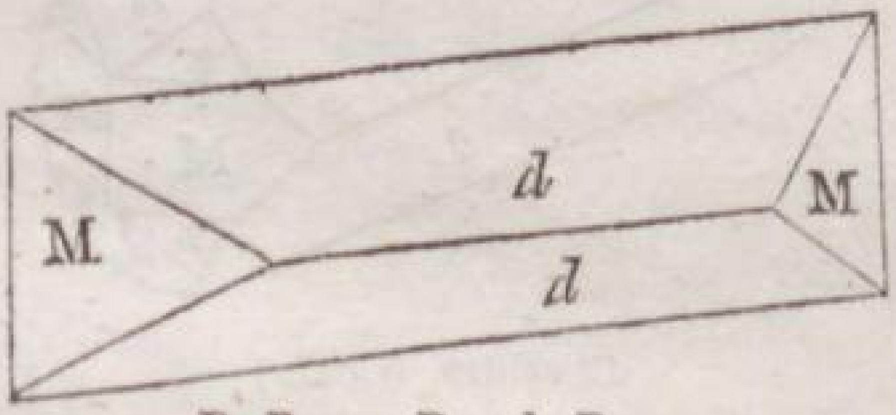
Secondary forms.

Fig. 228.



Cheshire, (Conn.)

Fig. 229.



De Roure, Puy de Dome.

Fig. 230.

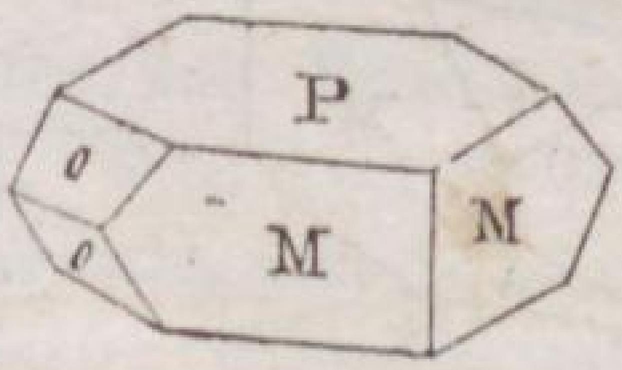


Fig. 231.

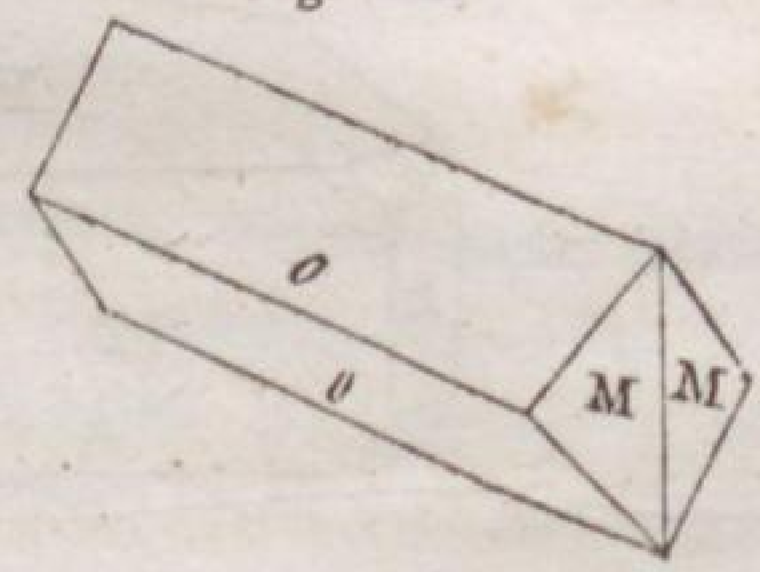
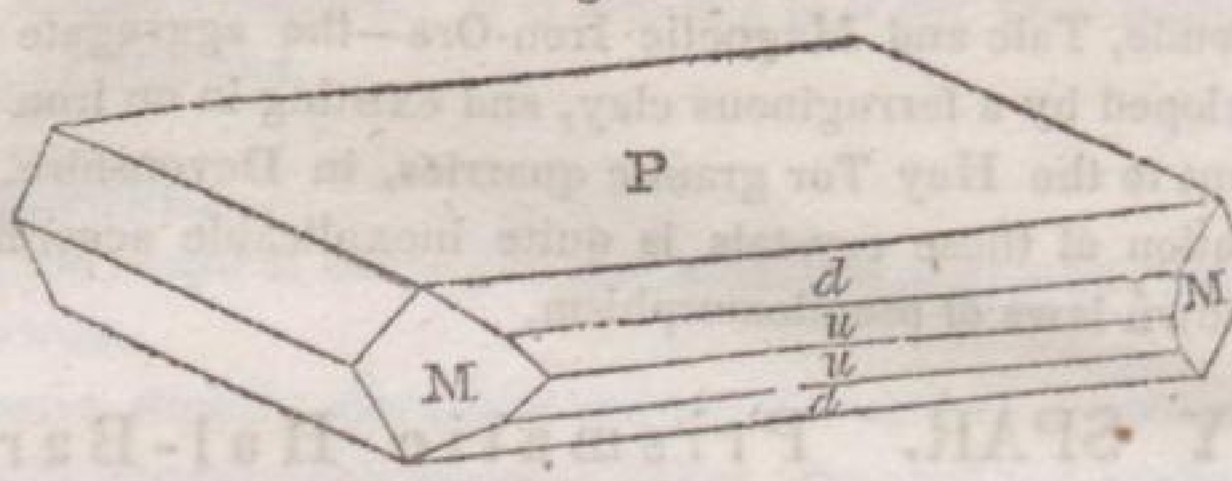
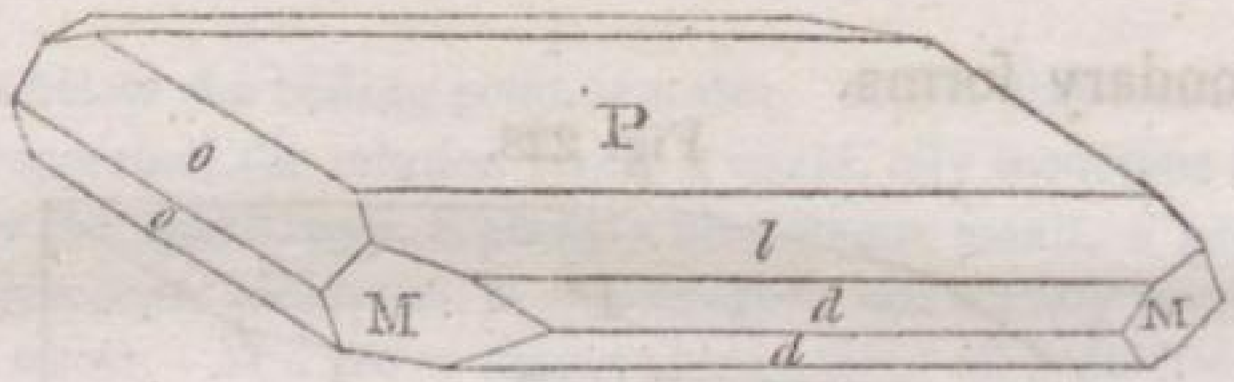


Fig. 232.



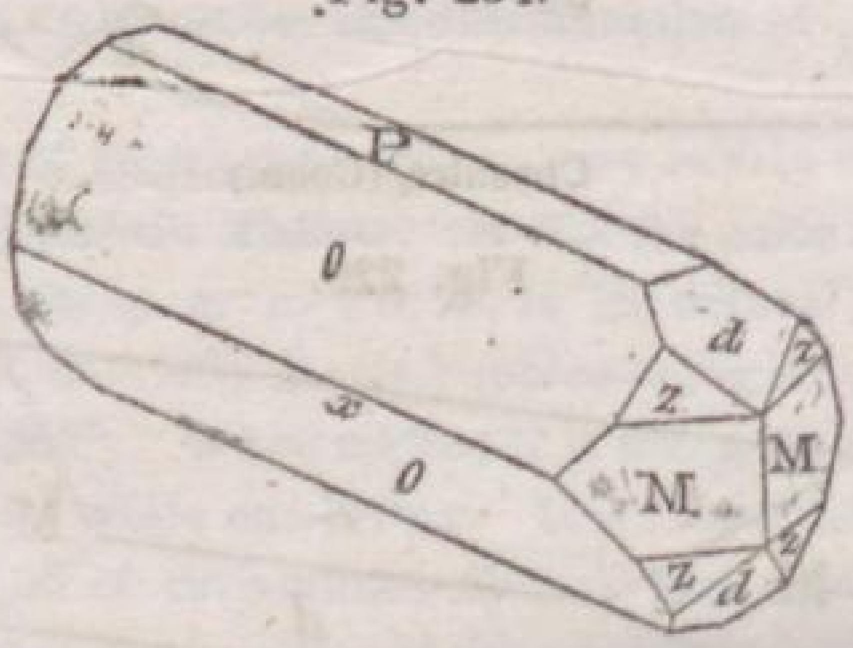
Cheshire, (Conn.)

Fig. 233.



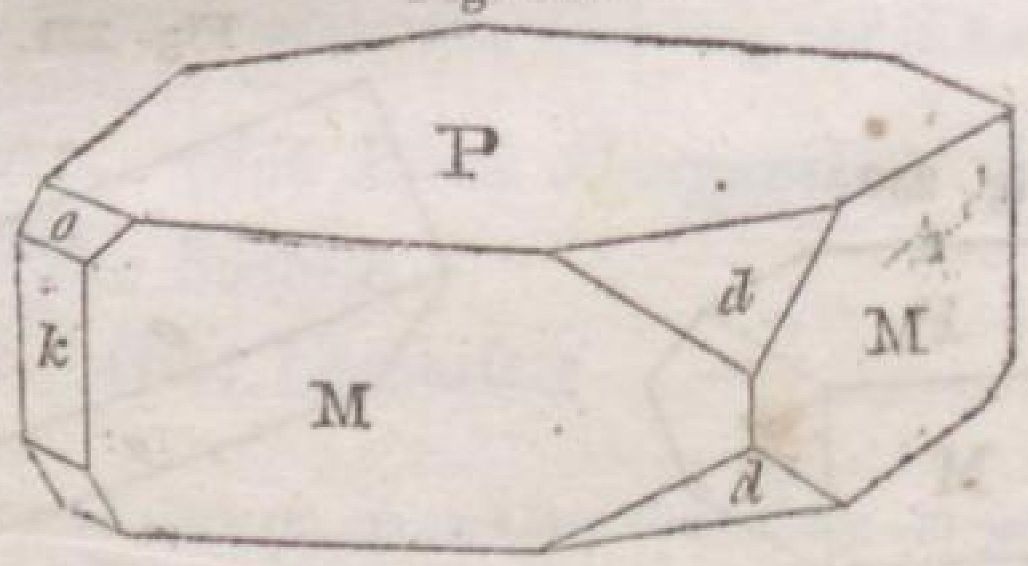
Cheshire, (Conn.)

Fig. 234.



Cheshire, (Conn.)

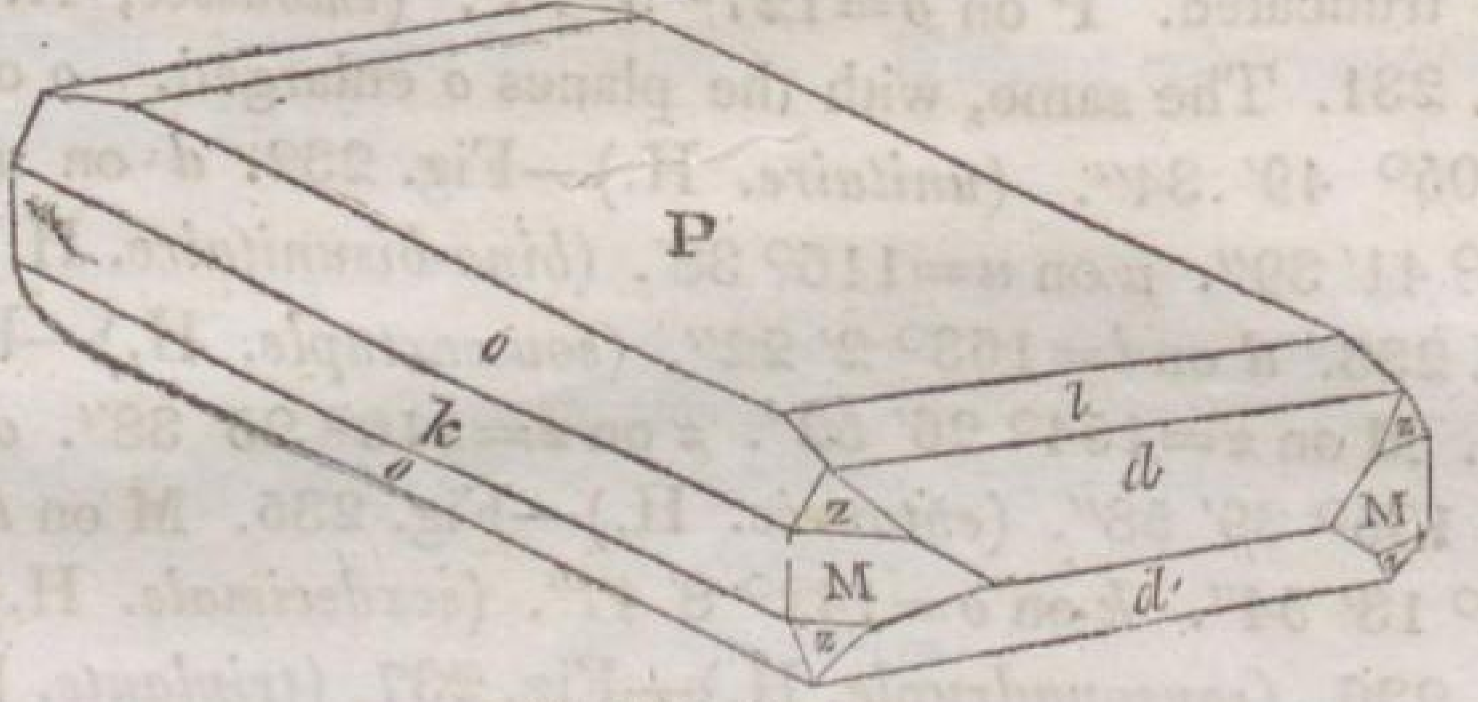
Fig. 235.



Cheshire, (Conn.)

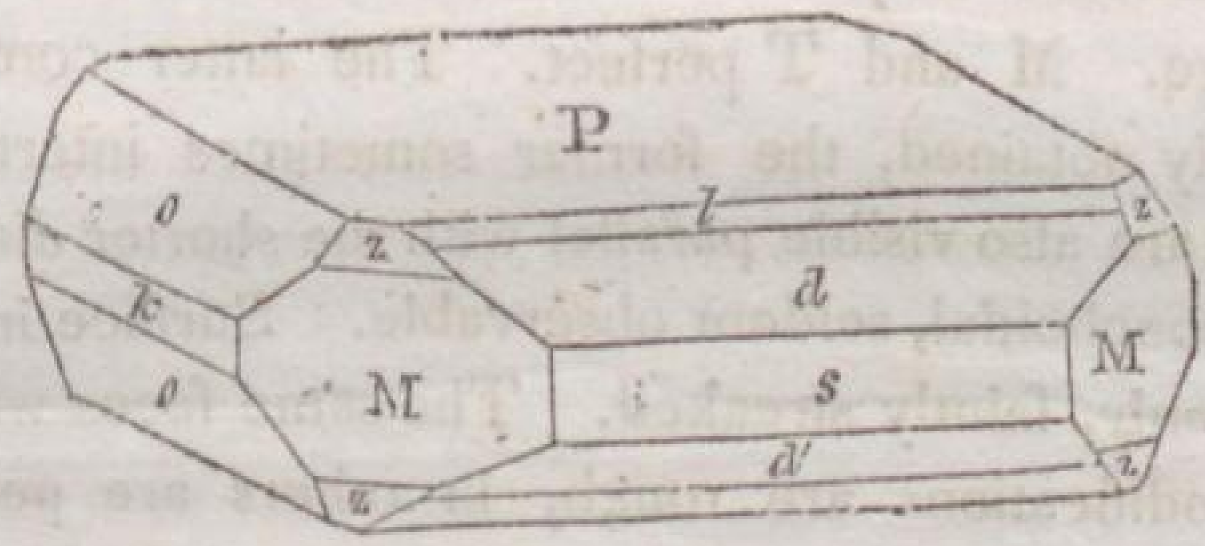
Heavy Spar.

Fig. 236.



Cheshire, (Conn.)

Fig. 237.



Cheshire, (Conn.)

Fig. 238.

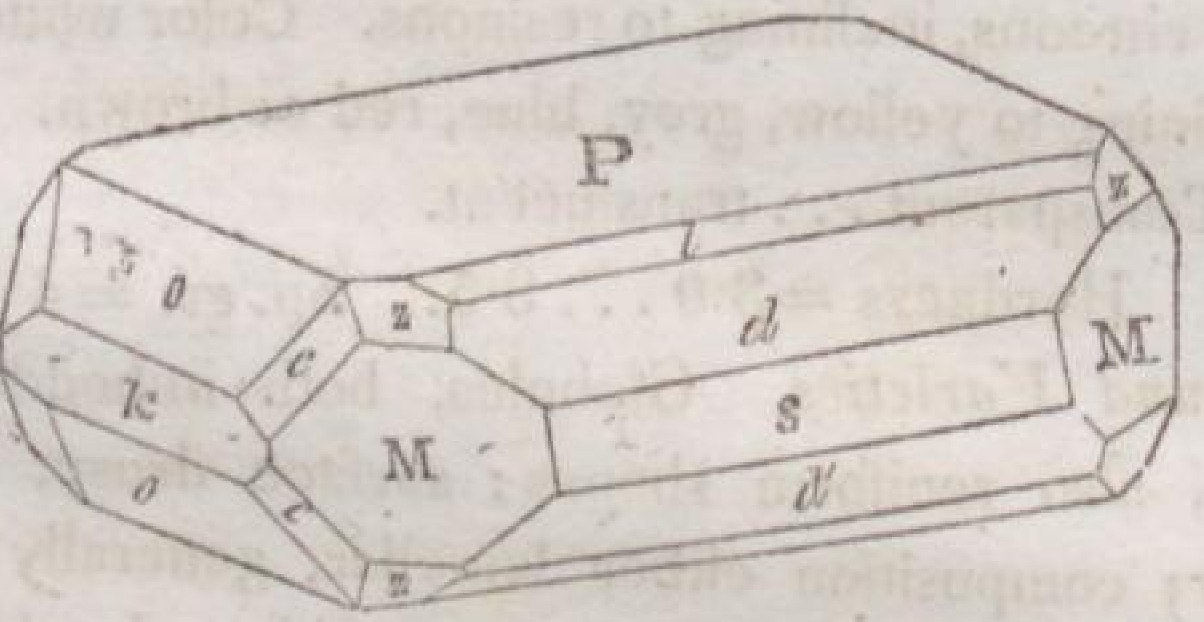


Fig. 228. Primary form, with its obtuse angles truncated. P on $d = 140° 59' 21''$. (*apophane*, H.)—Fig. 229. The same, with the faces d enlarged. d on $d = 78° 1' 58''$. (*binaire*, H.)—Fig. 230. Primary form, with its acute an-

gles truncated. P on o=127° 5′ 13″. (*emoussée*, H.)—Fig. 231. The same, with the planes o enlarged. o on o =105° 49′ 34″. (*unitaire*. H.)—Fig. 232. d on u= 160° 41′ 39″. u on u=116° 38′. (*bino-bisunitaire*. H.)—Fig. 233. d on l=163° 2′ 22″. (*soussextuple*. H.)—Fig. 234. M on z=154° 26′ 52″. z on z=110° 25′ 38″. o on z = 135° 39′ 58″. (*entourée*. H.)—Fig. 235. M on k= 129° 13′ 54″. k on o=142° 8′ 47″. (*sexdecimale*. H.)—Fig. 236. (*sousquadruple*. H.)—Fig. 237. (*triplante*. H.)—Fig. 238. c on o=166° 46′ 49″. M on c=133° 31′ 31″. (*diplonome*. H.)

Cleavage. M and T perfect. The latter commonly more easily obtained, the former sometimes interrupted. Cleavages are also visible parallel with the shorter diagonal. Fracture conchoidal, seldom observable. Surface in a few examples only, faintly streaked. The same faces which in certain modifications are rough, in others are perfectly smooth, while the reverse takes place in other faces; so that they do not constantly present the same appearances.

Lustre vitreous, inclining to resinous. Color white, prevalent, inclining to yellow, grey, blue, red or brown. Streak white. Transparent . . . translucent.

Brittle. Hardness =3·0 . . . 3·5. Sp. gr. =4·446.

Compound Varieties. Globules, both imbedded and implanted, also reniform shapes: surface drusy, uneven and rough; composition either lamellar, generally imperfect or columnar, the latter often very thin. In the reniform shapes, the curved lamellar particles of composition consist of imperfectly straight lamellar, or of columnar ones. Massive: composition as in the imitative shapes, more frequently the distinctly straight lamellar masses are aggregated in a granular composition. The composition is sometimes granular, and even impalpable. Without coherence of the particles, friable.

1. It decrepitates when suddenly heated before the blow-pipe, and fuses with difficulty. Several varieties emit a phosphorescent light, if carefully heated, and retain this property for some time after cooling. In the interior flame, it assumes a burning, hepatic taste.

2. *Analysis.*

By Berthier.

Baryta	- - - - -	66·00
Sulphuric acid	- - - - -	34·00

Several varieties contain substances foreign to this mixture, which must be considered as impurities, as silica, oxide of iron, alumina, &c. Crystals of Heavy Spar have been artificially obtained by dissolving sulpho-cyanuret of barium in sulphuric acid, and allowing this solution to be slowly decomposed by the influence of the atmosphere; they are in the form of the primary; having angles of 101° 42′ and 78° 18′.

3. Many varieties of Heavy Spar, but more particularly the granular and compact ones, occur in beds, accompanying Galena and Blende; others are found in iron ores. It is frequently met with in veins, in rocks of various ages, either with the above mentioned, or with cupriferous, minerals; also with manganese ores, Grey Antimony, and Realgar.

4. Large and beautiful crystals have been found in the mines of Cumberland, Durham and Westmoreland, in England; also at Felsöbanya and Cremnitz in Hungary, at Freiberg, at Marienberg and other places in Saxony, at Pzribram and Mies in Bohemia, at Roya and Roure in Auvergne. A radiated variety, in imbedded globules, is found at Monte Paterno, near Bologna. The *Calcareous Heavy-Spar* of Breithaupt, is a variety of the present species, found near Freiberg. It contains a little sulphate of lime, in consequence of which its sp. gr. is only 4·2.

The deposits of this species are too numerous in the United States to be enumerated; only a few of the more important can be mentioned. The curved lamellar varieties are abundant at the Southampton lead mines in Massachusetts, and in several similar places in the vicinity. In Connecticut, similar varieties are found in connection with the trap and sandstone at Berlin, Farmington, and Southington. But the most interesting locality is at Cheshire, where it occurs in distinct crystals, as well as in foliated masses, associated with crystallized Quartz, Green Malachite and Vitreous Copper, all of which minerals are imbedded in sandstone. An extremely delicate, fibrous, nearly compact variety, is found in great abundance, at Pillar Point, Jefferson co. near Sacket's Harbor, (N.Y.) where it forms large veins. Its colors are reddish-brown, and yellowish and greyish white. At the Perkiomen lead-mine in Pennsylvania, are found the foliated, the compact and the earthy varieties. Heavy Spar is extremely abundant in the Missouri lead-mines, and throughout the southern and western States generally. It occurs at Schoharie, (N. Y.) associated with Stronfianite in the water-limerock.

5. Little use has heretofore been made of Heavy Spar. Pure white varieties are used as a white paint, either alone, or mixed with white lead. The fibrous variety of various colors, from Pillar Point, (N. Y.) has been sawn into moderately sized slabs, and polished; many of which present a very handsome appearance.

HEDENBERGITE. (See *Pyroxene.*)

HEDYPHANE. Hedyphanous Lead-Baryte.

Massive: composition granular and impalpable. Fracture small and imperfectly conchoidal; occasionally exhibiting little fissures.

Lustre adamantine to resinous. Color, greyish white. Translucent.

Hardness =4·5 ... 5·0. (Scale of BREITHAUPT.) Sp. gr. =5·461 ... 5·498.

1. Before the blow-pipe, it melts into a white frit, but less easily than the Mimetene. The lead is not reduced, even in the strongest heat of the reduction flame; nor does the resulting mass assume a polyhedral figure. The arsenical odor is rarely perceptible.

2. *Analysis.*

Oxide of lead	53·00
Muriatic acid	2.00
Lime	14·00
Arsenic acid	22·80
Phosphoric acid	8·20

3. It is found at Langbanshytta in Sweden, where it forms narrow veins in a beautiful red, manganesian Pyroxene, and a granular brown Garnet.

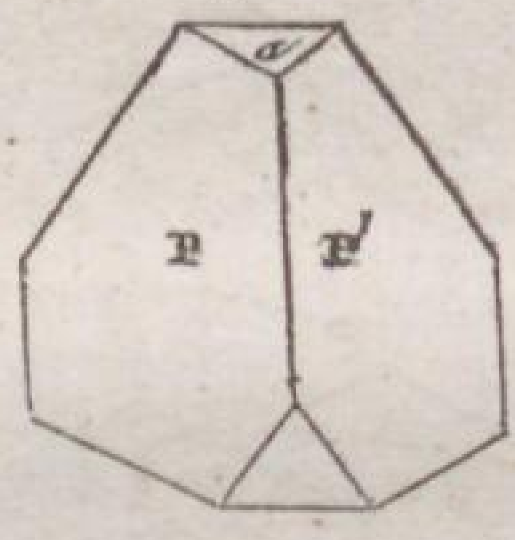
HELIOTROPE. (See *Quartz*.)

HELVIN. Tetrahedral Garnet. MOHS.

Primary form. Tetrahedron.

Secondary form.

Fig. 239.



Cleavage, traces of the octahedron. Fracture uneven. Surface, P smooth, and a little rounded, sometimes streaked parallel to the edges, *a* rough, but even.

Lustre vitreous, inclining to resinous. Color wax-yellow, inclining to honey-yellow, and yellowish brown, or to siskin-green. Streak white. Translucent on the edges.

Hardness =6·0 ... 6·5. Sp. gr. = 3·100.

1. Before the blow-pipe, upon charcoal, it melts in the reducing flame with effervescence into a globule, of almost the same color as the mineral. In the oxidating flame, the color becomes dark, and the fusion more difficult. With borax, it yields a transparent glass, often colored by manganese.

2. *Analysis.*
By VOGEL.

Silica	39·50
Alumina	15·65
Oxide of iron	37·75
Oxide of manganese	3·75
Lime	0·50

3. It has hitherto been found only at Schwarzenberg in Saxony, in beds in gneiss, accompanied by Blende, Quartz, Fluor and Calcareous Spar.

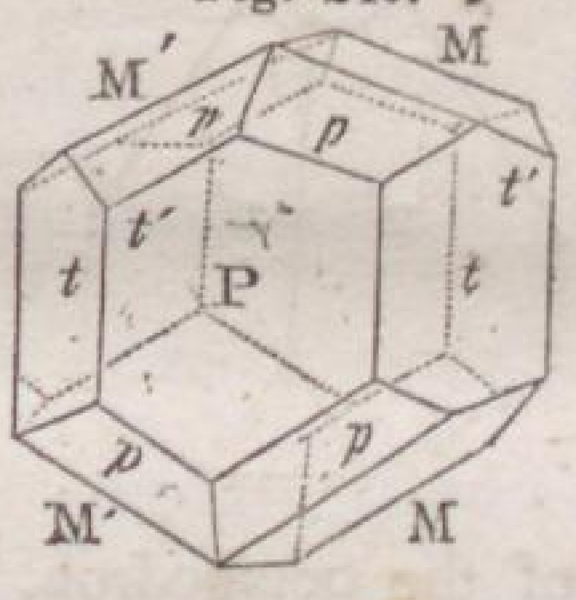
HEMATITE. (See *Limonite* and *Specular Iron.*)

HERDERITE. Prismatic Fluor-Haloide.

Primary form. Right rhombic prism. M on M′ = 115° 53′.

Secondary form.

Fig. 240.



t on *t′*	-	-	-	115° 53′
t on *t*	-	-	-	115 7
p on *p*	-	-	-	141 16

Cleavage distinct parallel to faces M, but interrupted; also perpendicular to the axis,—the latter only in detached portions of very bright and even faces; faint indications parallel to P, *p*. Fracture small conchoidal. Surface, M very smooth, and delicately streaked parallel to its edges of combination with P, and resembling in this respect the faces *p*.

Lustre vitreous, slightly inclining to resinous. Color several shades of yellowish and greenish-white: streak white, strongly translucent.

Very brittle. Hardness =5·0. Sp. gr. =2·985.

1. The present species has been confounded with Apatite, which it exceedingly resembles in several properties; but the different aspect of

the faces p and t, the former being smooth, or but faintly streaked parallel to their intersections with P, while the latter are granulated, proves that the forms do not belong to the hexagonal, but to the prismatic system.

2. The only specimen of Herderite at present known, is in the Wernerian museum at Freiberg. It came from the tin-mines of Ehrenfriedersdorf in Saxony.

HERRERITE. Staphyline Tellurium-Baryte.

Massive: in reniform masses.

Cleavage in three directions, affording rhomboidal fragments, whose angles are incapable of measurement on account of the curvatures of the faces.

Lustre vitreous to pearly, and shining, on fresh surfaces. Color pistachio, emerald, and grass-green. Streak yellowish grey. Translucent.

Brittle. Hardness =4·0 . . . 4·5. Sp. gr. =4·3.

1. Before the blow-pipe, on charcoal, it at first becomes grey, and afterwards gives a white smoke, which adheres to the charcoal. On directing the reduction flame of the blow-pipe upon it, it becomes of a beautiful grass-green. Heated in an open tube, it gives an abundant white smoke, which adheres to the glass, and on examining it with a microscope, it is seen to be composed of innumerable white and transparent globules.

2. *Analysis.*

By Herrera.

Carbonic acid	31·86
Tellurium	55·58
Peroxide of nickel	12·32

3. It is found at Albarradon in Mexico, in transition limestone, in a metallic vein, consisting chiefly of ores of lead, Native Silver, Horn-Silver, and Iodic-Silver.

Appendix to Herrerite.

i. *Fibrous Herrerite.* Del Rio.

Massive: reniform, composition columnar, individuals slender and radiating. Earthy and dull.

Herrerite—Heulandite.

Color apple green.

Very soft; but brittle. Sp. gr. = 3.

1. It occurs with the above, and would appear to be simply a variety which has suffered partial decomposition.

Herschelite.

Primary form. Regular hexagonal prism.

Secondary form. Primary, having its terminal edges replaced, the new planes inclining to the bases under 132°.

Fracture conchoidal. Surface rough. P dull and curved.

Color, white. Translucent... opake.

Hardness = 4·0 ... 5·5? Sp. gr. = 2·11.

1. It is believed to have in general, the composition of Feldspar or Leucite.

2. It is found with Olivin, at Aci Reale in Sicily.

3. It appears to be related to Nephiline; but further researches are required to settle its specific character.

Heterosite. (See *Triplite.*)

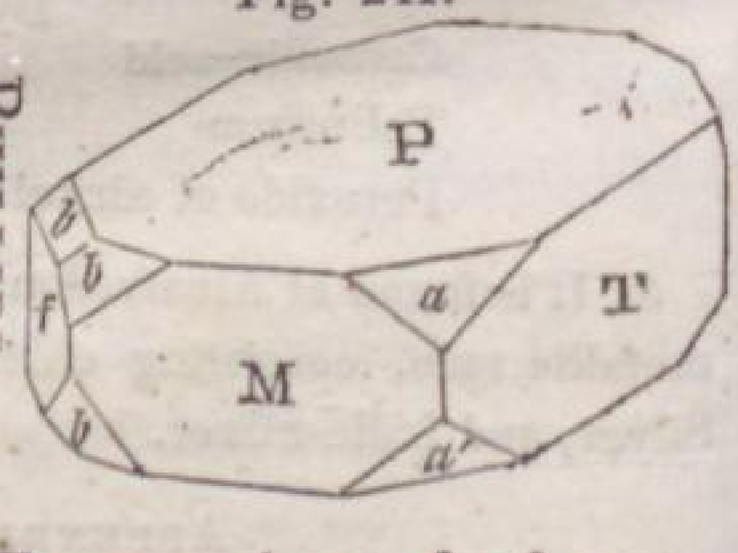
HEULANDITE. Hemi-prismatic Kouphone-Spar. Mohs.

Primary form. Right oblique-angled prism. M on T = 130° 30′.

Secondary form.

M on *a*	-	146°	30′	Phillips.
T on *a*	-	148	00	
P on *a*	-	111	56	
M on *f*	-	114	20	
b on *f*	-	129	40	
P on *b*	-	133	35	
P on b	-	108	15	

Fig. 241.



Cleavage, P highly perfect. Fracture imperfectly conchoidal, uneven. Surface of all the faces more or less uneven; P often concave, M and T convex.

Lustre vitreous. The faces P possess high degrees of pearly lustre, both as faces of cleavage and of crystallization. Color, various shades of white, prevalent, passing into red, grey, and brown. Streak white. Transparent . . . translucent on the edges.

Brittle. Hardness = 3·5 . . . 4·0. Sp. gr. = 2·200. White crystals from Iceland.

Compound Varieties. Massive: composition granular, the individuals being of various sizes, sometimes easily separable, sometimes strongly cohering; faces of composition uneven and rough. Globules formed in vesicular cavities.

1. Before the blow-pipe, it melts with a slight intumescence, during which it emits a phosphoric light.

2. *Analysis.*

	By LAUGIER. fr. the Tyrol.	By WALMSTEDT.
Alumina	10·00	7·99
Silica	45·00	59·90
Carbonate of lime	16·00	0·00
Lime	11·00	16·87
Water	12·00	13·43
Oxide of iron	4·00	0·00
Oxide of manganese	0·50	0·00

3. The varieties of Heulandite are usually found accompanied by Stilbite, in the vesicular cavities of amygdaloidal rocks, and in certain metalliferous veins.

4. Iceland and the Faroe islands afford the most magnificent crystals of Heulandite, of a pearly white color, and often transparent. A similar variety comes from the Vendyah mountains in Hindostan. The brick-red crystals and compound masses occur in the Tyrol and in Scotland.

In North America, the present species is found in great perfection in large white crystals, at Cape Blomidon in Nova Scotia. It has also been met with along with Chabasie upon mica slate, at Chester, (Mass.) and with Stilbite and Chabasie on gneiss, at Hadlyme, (Conn.)

HISINGERITE.

Massive. Cleavage distinct in only one direction. Fracture earthy.

Color black. Streak greenish-grey.
Sectile. Soft. Sp. gr. = 3·045.

1. If gently heated before the blow-pipe, it becomes magnetic; in a stronger heat, it melts into a dull, opake, black globule, and yields a yellowish green glass with borax.

2. *Analysis.*
By Berzelius.

Oxide of iron . . .	51·50
Silica . . .	27·50
Alumina . . .	5·50
Oxide of manganese . . .	0·77
Volatile matter . . .	11·75
Magnesia	a trace.

3. It has been found in the parish of Svarta in Südermanland, intermixed with limestone.

4. It is probable that it belongs to the species Limonite.

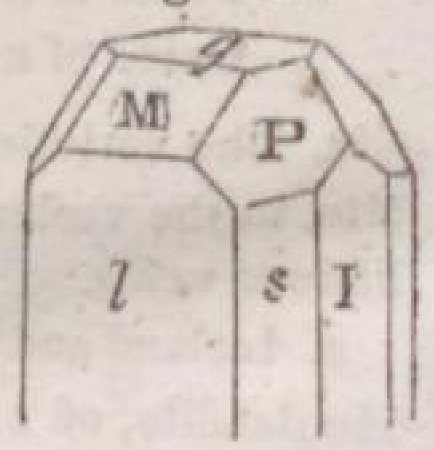
HOPEITE.

Primary form. Right rhombic prism. M on M′ = 101° 24′.

Secondary form.

s on *s* over I - -	81°	34′
M on M over *g* - -	101	24
P on P over M - -	139	41
P on P′ - -	107	2

Fig. 242.



Cleavage parallel with the longer diagonal perfect, that parallel with the base less distinct. Surface, plane I streaked lengthwise; the rest of the faces smooth.

Lustre vitreous, pearly upon *l*. Color greyish white. Streak white. Transparent . . . translucent. Refraction double.

Sectile. Hardness =2·5 ... 3·0. Sp. gr. =2·76.

1. Before the blow-pipe, it gives off its water, and melts into a clear colorless globule, tinging the flame green. It gives no skeleton of silica with salt of phosphorus, with which it melts in all proportions. If much of the mineral is added, the globule turns opake in cooling, but does not deposit any fumes of zinc on the charcoal. The globule obtained from fusing it with borax does not become opake on cooling. With soda, it gives a scoria which is yellow when hot; copious fumes of zinc, and nearest the scoria, some of cadmium also, are deposited. The melted mineral forms a fine blue glass with solution of cobalt. Hopeite seems therefore to be a compound of some of the stronger acids, as phosphoric, or boracic acid, with zinc an earthy base, a little cadmium, and a great deal of water.

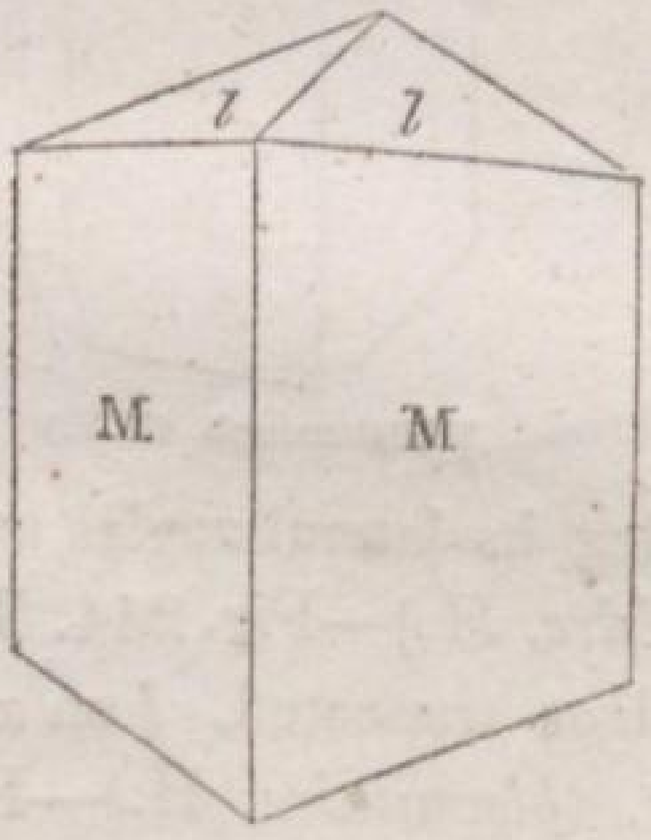
2. It has been hitherto found only in the Calamine mines of Altenberg, near Aix-la-Chapelle, and is very rare.

HORNBLENDE. Hemi-prismatic Augite-Spar. MOHS.

Primary form. Oblique rhombic prism. M on M′= 124° 30′.

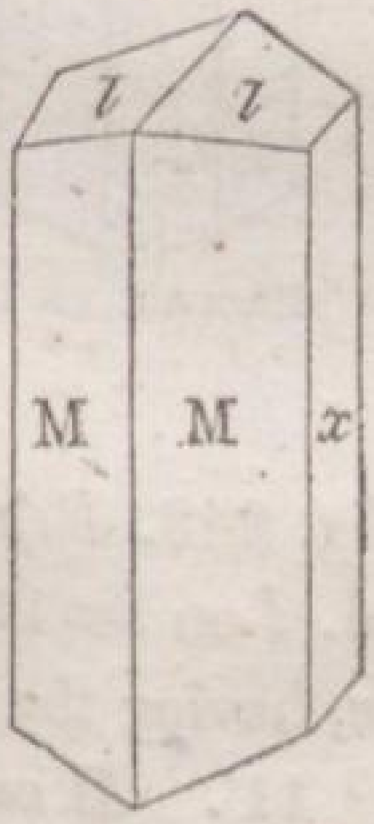
Secondary forms.

Fig. 243.



Edenville, (N.Y.)

Fig. 244.



Edenville and Amity, (N.Y.)

Hornblende.

Fig. 245.

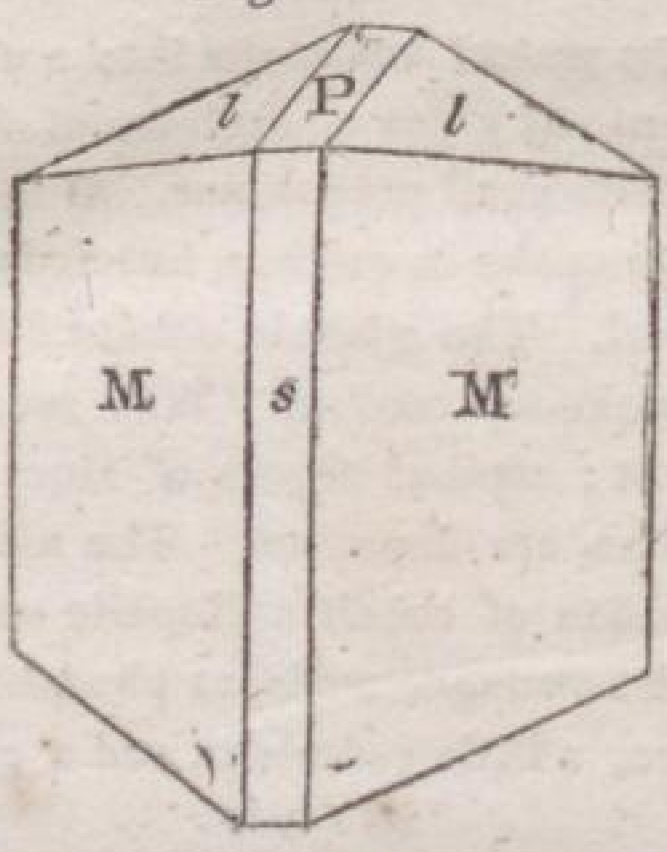
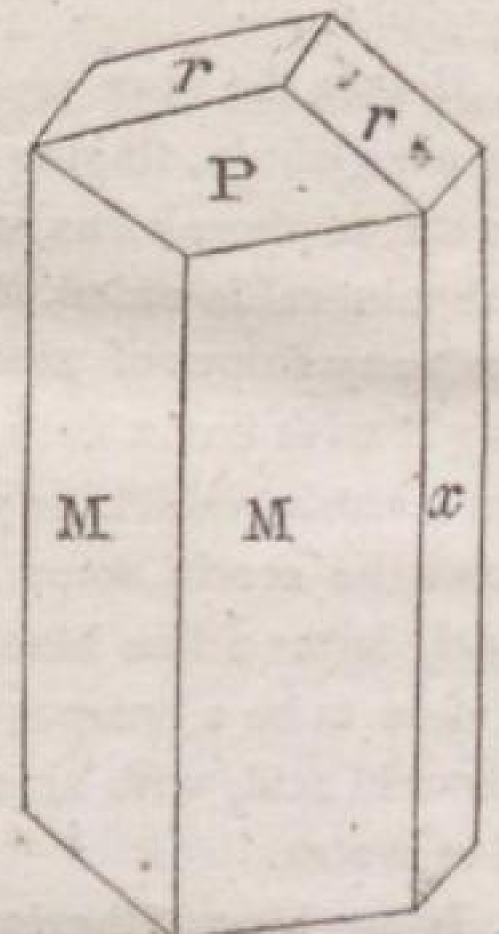
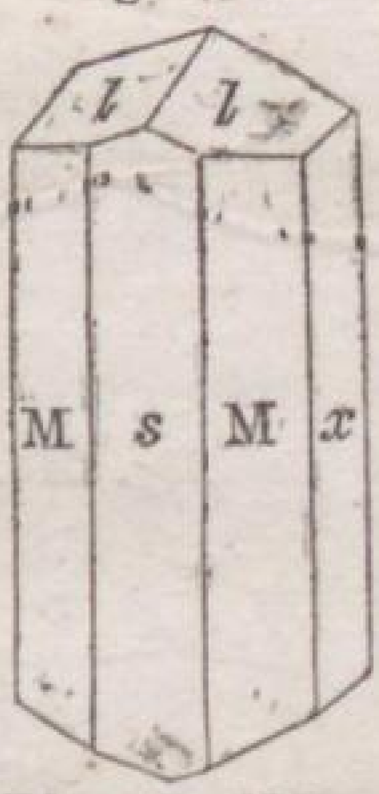


Fig. 246.



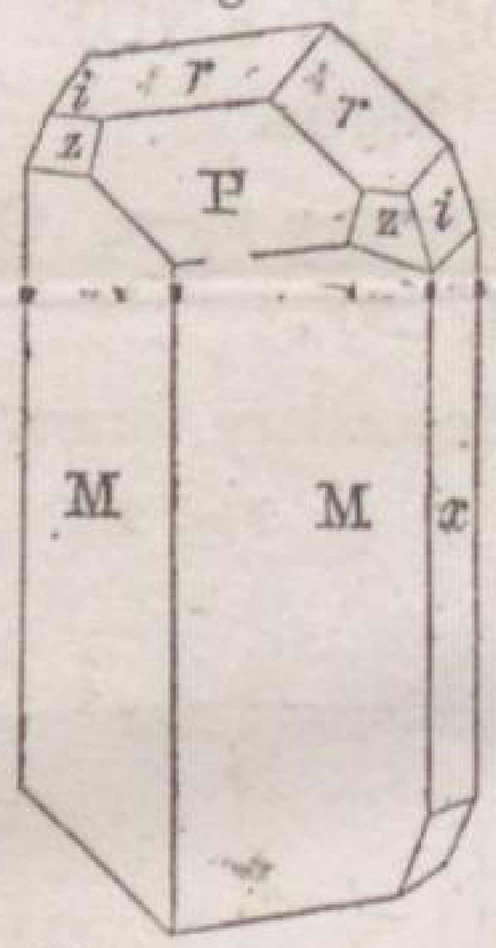
Teplitz, Bohemia.

Fig. 247.



Edenville, (N.Y.)

Fig. 248.



Willsborough, (N.Y.)

Fig. 243. Primary form, having its lateral angles truncated. l on $l = 110° \; 2'$. (*ditétraèdre*. H.)—Fig. 244. The same, having the acute lateral edges truncated. l on $x = 105° \; 11'$. M on $x = 117° \; 43'$. (*bisunitaire*. H.)—Fig. 245. P on $s = 104° \; 57'$. P on $l = 164° \; 49'$. M on $s = 152° \; 17'$. (*dihexaèdre*. H.)—Fig. 246. r on $r = 149°$

38′. r on $x = 105° 11′$. (*dodécaèdre.* H.)—Fig. 247. (*triunitaire.* H.)—Fig. 248. x on $z = 118° 28′$. i on $x = 129° 8′$. (*acceleré.* H.)

Cleavage. M highly perfect; less distinct parallel with P, and to the diagonals of the prism. Fracture imperfectly conchoidal, uneven. Surface, sometimes streaked parallel to the axis; sometimes all the faces are uneven.

Lustre vitreous, inclining to pearly upon faces of cleavage in the varieties possessing pale colors. Color, various shades of green, often inclining to brown; there is an uninterrupted series into perfectly white, and into black varieties. Streak greyish-white ... brown. Nearly transparent ... opake.

Brittle. Hardness =5·0 ... 6·0. Sp. gr. =3·167, basaltic Hornblende from Lower Stiria; 3·127, Carinthin; 3·026, Actynolite from Zillerthal; 3·006, blackish-green common Hornblende; 2·931, white Tremolite.

Compound Varieties. Twin-crystals: face of composition parallel, axis of revolution perpendicular to *s*, of Fig. 245. as in Fig. 250.

Fig. 249.

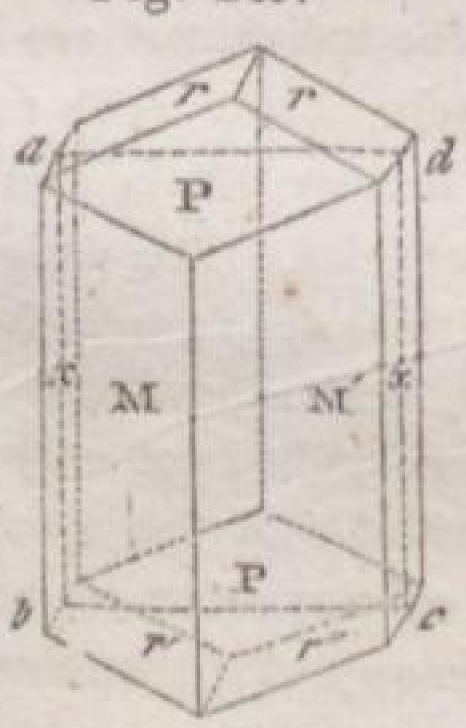
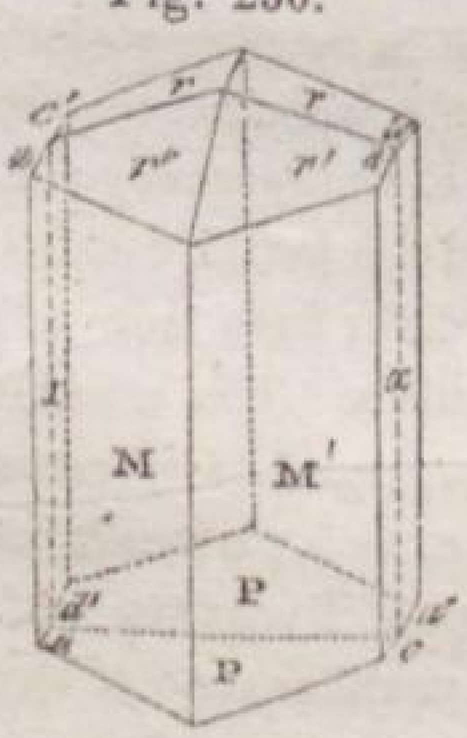


Fig. 250.



This composition is also observable in massive varieties, sometimes in very thin laminæ, having often some foreign substance, particularly laminæ of Pyroxene, interposed between them. Massive: composition granular, individuals of various sizes, generally strongly cohering, and producing in the large, a tendency to slaty fracture; composition columnar, individuals of various sizes, sometimes very delicate, generally long, parallel, or diverging, and aggregated in a second granular composition. Compositions of short and irregularly distributed columnar particles, possess, in the large, a slaty fracture. Very thin columnar composition produces a silky lustre.

1. Of those varieties of the present species which have obtained distinct names, and which in some systems of mineralogy, have even been regarded as forming separate species, the following are the most remarkable, viz. *Hornblende*, *Tremolite*, *Actynolite* and *Asbestus*. The dark blackish and greenish colors constituted Hornblende, which was divided into *basaltic*, *common* and *slaty*; the first of these affording crystals easily cleavable; the second such as are of difficult cleavage, and the massive, granular and columnar varieties, excepting such as are jet-black, shining and easily cleavable, which were distinguished under the name of *Carinthin*, and the third comprehends such massive specimens as exhibit a slaty fracture. Tremolite consists of the pale green, grey, bluish and white varieties, and has been divided into *common*, *asbestiform* and *granular*. The first occurs in crystals, rarely with perfect terminations, and in massive varieties, in which the individuals are large; the second in columnar compositions, or coarsely fibrous, with considerable degrees of transparency; the third refers to very thin or capillary crystals; and the fourth consists of granular particles. The varieties of Actynolite differ from those of Tremolite, by their deep green, (often grass-green) colors. The asbestiform tremolite, and asbestiform actynolite, form a passage into *asbestus*, which term is applied not only to minute columnar, and variously interwoven individuals of this species, but to those also of Pyroxene and some other species,—the name denoting rather a peculiar state of aggregation in these species, than the substance of a distinct mineral.*

* Asbestus in general, has been divided into *amianthus*, which consists of highly delicate fibres, often thinner than a hair, longitudinally

Green Diallage or *Smaragdite*, in some cases consists of laminæ of Hornblende, with faces of composition parallel to *s*; in others, of the same, alternating with laminæ of Pyroxene; both generally of bright green colors.

Among the varieties of this species, and those of Pyroxene, a striking analogy of certain varieties has been observed. Augite and Hornblende, Sahlite and Actynolite, Diopside and Tremolite, stand in these relations; and both series terminate in their respective kinds of asbestus.

2. Before the blow-pipe, Hornblende melts with a little difficulty, attended by a slight degree of intumescence, into a globule, which is not clear, but variously colored by iron or chrome, agreeably to the contents of the specimen. In borax, it also fuses slowly.

3. *Analysis.*

	By BONSDORF.			By VAUQUELIN.
	a white var.	a green var.	a black var.	Smaragdite, fr. Corsica.
Silica	60.31	46·26	45·69	50·00
Magnesia	24·23	19.03	18·79	6·00
Lime	13·66	13·96	13·85	13·00
Alumina	0·26	11·48	12·18	11·00
Protoxide of iron	0·15	3·43	7·32	0·00
Protoxide of manganese	0·00	9·36	0·22	0·00
Fluoric acid	0 94	1·60	1·50	0·00
Oxide of iron	0·00	0·00	0·00	5·50
Oxide of copper	0·00	0 00	0 00	1·50
Oxide of chrome	0·00	0 00	0·00	7·50
Water & foreign substances	0·10	1·04	0·00	0·00

4. Imbedded crystals of basaltic Hornblende often accompany those of Pyroxene in basaltic and amygdaloidal rocks. Crystals of Hornblende and of Tremolite, are found in limestone and dolomite rocks, as well as in porphyry and granite. Common Hornblende, Actynolite, and Tre-

cohering with each other, and easily separated; into *common* asbestus, relating to coarser varieties, more firmly cohering, and yielding splintery fragments; into *Rock-cork*, in which the particles are aggregated in a loose felt-like texture; and into *Rock-wood* or *ligneous asbestus*, in which a texture of the preceding kind, only more firm and close, assumes the appearance of dried wood.

molite, occur in metalliferous veins and beds in ancient rocks, with ores of titanium, iron, zinc and lead. Common Hornblende frequently enters into the composition of rocks, as in sienite, greenstone, &c. Actynolite is chiefly found in talcose slate. Amianthus lines the sides of narrow veins in primitive mountains.

5. Basaltic Hornblende occurs in beautiful crystals, near Teising and Teplitz in Bohemia. Large and very distinct, black crystals are found imbedded in granular limestone, at Pargas, Finland. Crystals of a handsome green color, often becoming small, and possessed of rounded edges, occur at Pargas in Finland, in white limestone; and which have been called *Pargasite.* The crystals in the drusy cavities of Vesuvian minerals, though small, are generally very distinct, and possess a high degree of lustre. Handsome varieties of Tremolite are found in dolomite at St. Gothard: Amianthus in great abundance at Corsica, also in Piedmont, Savoy, Salzburg, and Zöblitz, in Saxony. Rock-wood exists in large masses, in a metalliferous bed at Sterzing in the Tyrol: Rock-cork at Johanngeorgenstadt in Saxony, at Sahlberg in Sweden, in Moravia, and at the Lead-Hills in Scotland. Green Diallage, generally accompanied by Garnet and Saussurite, occurs at Corsica, on Monte Rosa, in the Bacher, and several other places in Southern Europe.

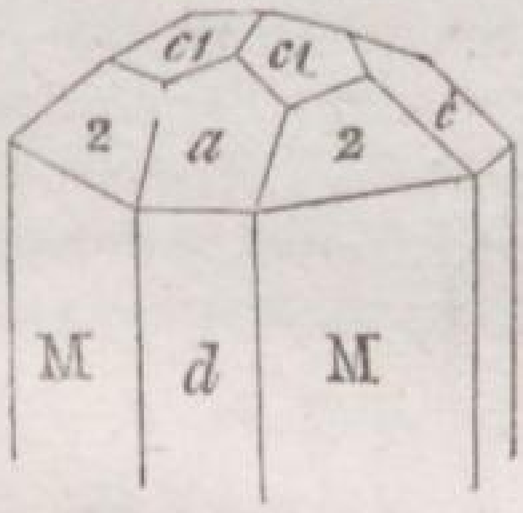
The United States afford the present species in all its varieties. Long black crystals, sometimes flattened through the truncation of the obtuse lateral edges, occur at Chester, (Mass.) and at Franconia, (N. H.); the latter place likewise affords brilliant black prisms, having the acute lateral edges replaced. Large and handsome black crystals (*dodécaèdre.* H.) occur at Newton, (N.J.) Small but very perfect black crystals, are found at Willsborough, (N.Y.) upon the mountain near the well known Garnet and Tabular Spar locality, where they occur imbedded in black Tourmaline. Very distinct reddish brown crystals, one or two inches long, and possessing nearly the same diameter, have been obtained along with black Spinel, at Amity, (N.Y.) Hair-brown and greenish white crystals, of unusual finish and beauty, occur in the limestone of Edenville, (N.Y.): also a light greyish white variety in limestone, from the same vicinity, associated with yellow Tourmaline and Rutile, whose crystals are often coated and penetrated by Kerolite. White crystals, above an inch long, and three quarters of an inch wide, but much flattened, abound throughout the dolomite beds of Litchfield co. (Conn.) particularly at Canaan; they are also found under similar circumstances, farther north into the borders of Massachusetts, at Sheffield and Great Bar rington. Similar, though more slender forms of the same variety, occur at Antwerp, (N.Y.); at which place also is found the variety Pargasite. Handsome varieties of Actynolite are found at most of the steatite quarries in Vermont; particularly at Windham, Readsborough and New-Fane: also at Middlefield, (Mass.) Massive, granular Hornblende, in large easily cleavable individuals, of a shining black color, are found at Plymouth, (Vt.) and at Edenville, (N.Y.) Columnar and radiating varieties, of the same color, abound in Hawley, (Mass.) A green fibrous variety, the fibres several inches long, and parallel, occurs at Cumberland, (R. I.) Massive Tremolite, as well as fibrous, abounds throughout the granular limestone and dolomite of the country. The finest specimens are found in Litchfield county, (Conn.) Hornblende asbestus abounds at Staten Island, (N.Y.) at West-Farms, (Conn.) at Brighton and Dedham, (Mass.); also near Philadelphia, in Hornblende rocks. A delicate variety, in short fibres, (Byssolite,) occurs in the iron-mines of Franconia, (N. H.)

HORN QUICKSILVER. Pyramidal Pearl-Kerate. MOHS.

Primary form. Right square prism.

Secondary form.

Fig. 251.



M or M on $c1$, or $c1$	-	129° 30?
M or M on $c2$, or $c2$	-	158 00
M or M on d	-	135 00
a on d	-	119 30

Cleavage, parallel with M very indistinct. Fracture perfectly conchoidal. Surface smooth.

Lustre adamantine. Color yellowish grey or ash-grey, also yellowish and greyish white. Streak white. Translucent, sometimes only on the edges.

Sectile. Hardness =1·0 . . . 2·0. Sp. gr. =6·482.

Compound Varieties. Crystalline coats, probably formed originally upon globules of fluid mercury : composition not observable. Massive: composition granular.

1. Before the blow-pipe, upon charcoal, it is entirely volatilized, if pure. It is not soluble in water.

2. *Analysis.*

Oxide of mercury	- - - - - -	88·48
Muriatic acid	- - - - - -	11·52

3. This rare mineral occurs in secondary rocks, along with Cinnabar and ochry varieties of Iron-Ore.

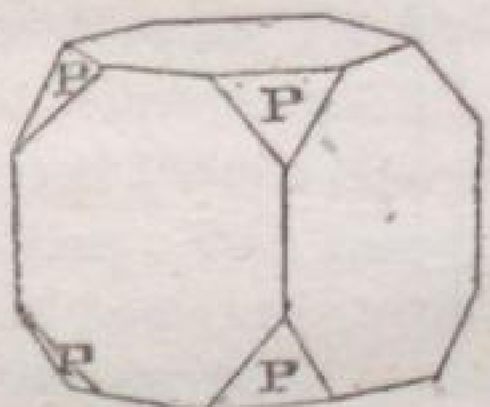
4. Its chief locality is Moschellandsberg in Deuxponts, but it also occurs at Idria in Carniola, and Almaden in Spain. At Horzowitz in Bohemia, it has been found with Cinnabar in veins, traversing a bed of Iron-Ore.

HORN SILVER. Hexahedral Pearl-Kerate. Mohs.

Primary form. Cube.

Secondary forms.

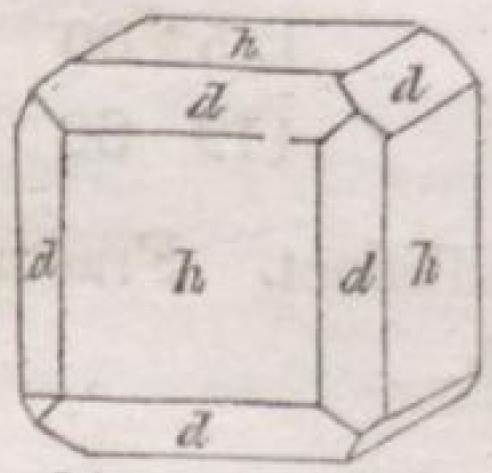
1. Fig. 252.



Cornwall, England.

2. Octahedron. Siberia.

3. Fig. 253.



Johanngeorgenstadt.

4. Rhombic dodecahedron. Siberia.

Cleavage none. Fracture more or less perfectly conchoidal. Surface of the cube sometimes faintly streaked parallel to the edges of combination with the dodecahedron.

Lustre resinous, passing into adamantine. Faces of fracture often more splendent than those of crystallization. Color pearl-grey, passing on the one hand into lavender-blue and violet blue, on the other, into greyish, yellowish and greenish white, into sisken-green, asparagus-green, pistachio-green, and leek-green. The color becomes brown on being exposed to light. Streak shining. Translucent . . . feebly translucent on the edges.

Sectile. Hardness =1·0 . . . 1·5. Sp. gr. = 5·552, a white granular variety from Peru.

Compound Varieties. In crusts: composition scarcely observable, sometimes columnar. Massive: composition granular, strongly coherent, or imperfectly columnar, and often bent; faces of composition rough.

1. It is fusible in the flame of a candle, and emits fumes of muriatic acid. Upon charcoal, it may be almost entirely reduced before the blow-pipe, and is likewise easily reduced, if rubbed wet upon a clean surface of iron or zinc. It is insoluble in nitric acid or in water. It may be obtained in a crystallized state, either from fusion, or from the evaporation of a solution of muriate of silver in ammonia.

2. *Analysis.*

By Klaproth.

	from Saxony.	from Peru.
Silver	67·75	76·0
Oxygen	4·75	7·6
Muriatic acid	14·75	16·4
Oxide of iron	6·00	0·0
Alumina	1·75	0·0
Sulphuric acid	0 25	0·0

3. Horn Silver is most frequently found in the upper parts of veins in clay slate, but occurs also in beds, generally along with other ores of silver; very often also with ochry varieties of Limonite, or with similar varieties of decomposed Iron-Pyrites. It is associated with several species of copper-ores, and with Calcareous and Heavy Spar.

4. Formerly, it occurred in considerable quantities in the Saxon mining districts of Johanngeorgenstadt and Freiberg; also at Joachimsthal in Bohemia. In small quantities, it occurs in France, in Spain, at Kongsberg in Norway, in Cornwall, and Silesia; but in large masses, frequently associated with Native Silver, in Mexico and Peru, where the green varieties of colors particularly occur.

Hornstone. (See *Quartz.*)

Humboldtine.

Mssive : in plates.
Color bright yellow.
Soft, yielding to the nail. Sp. gr. = 1·3.
Acquires resinous electricity by friction.

1. On ignited charcoal it is decomposed, giving out a vegetable odor, and leaves a metallic stain, at first yellow, then black, and at last red. It is insoluble in water and alcohol.

2. *Analysis.*

By Rivero.

Protoxide of iron - - - - - - -	53·56
Oxalic acid - - - - - - -	46·14

3. It occurs imbedded in moor-coal, near Bilin in Bohemia; and is supposed by Rivero to have been produced from the decomposition of succulent plants.

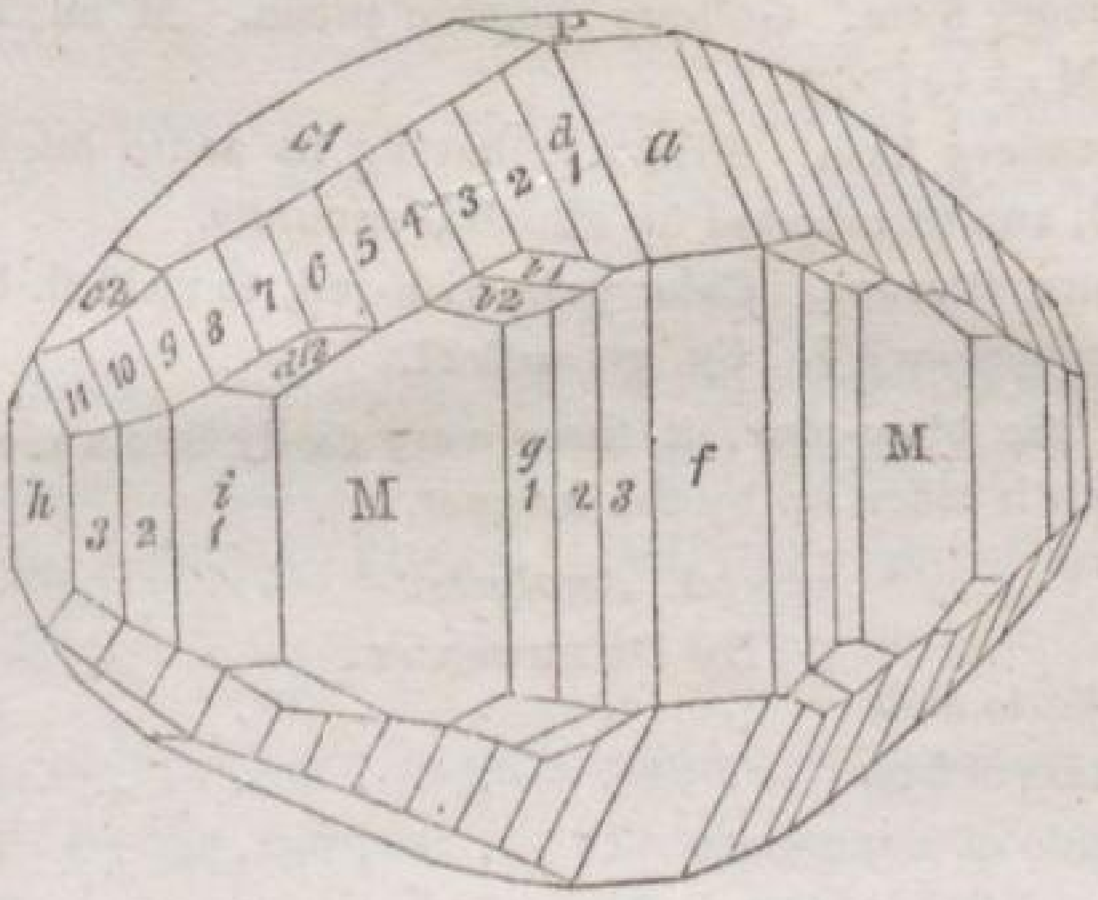
Humboldtite. (See *Datholite.*)

Humite.

Primary form. Right rhombic prism. M on M = 120°.

Humite.

Secondary form. Fig. 254.



P on *f* or *h*	90° 00′	PHILLIPS.	*h* on *d*11	157° 20′
M on *h*	120 00		*h* on *g*3	100 40
M on *d*1	118 12		*h* on *g*2	103 40
M on *f*	150 00		*h* on *g*1	115 15
P on *c*1	144 1		*h* on *i*1	133 36
P on *c*2	153 45		*h* on *i*2	140 56
h on *a*	90 00		*h* on *i*3	143 20
h on *d*1	101 50		*c*1 on *d*1	155 2
h on *d*2	103 42		*c*1 on *d*5	159 10
h on *d*3	112 45		*c*1 on *d*7	159 30
h on *d*4	119 24		*d*1 on *g*3	116 25
h on *d*5	121 45		*d*12 on *d*8	163 22
h on *d*6	125 30		*d*12 on *g* 3	131 15
h on *d*7	129 46		*b*2 on *g*3	143 15
h on *d*8	121 20		*b*1 on M	137 00
h on *d*9	124 2		*f* on *a*	115 10
h on *d*10	136 16			

Cleavage, traces parallel to M and *h*, or to a six-sided prism.

Fracture imperfectly conchoidal.

Lustre vitreous. Color various shades of yellow, sometimes almost white, passing into reddish brown. Transparent . . . translucent.

Brittle. Hardness = 6·5 . . . 7·0.

1. Alone before the blow-pipe, it becomes opake on the outside, but is infusible. It gives a clear glass with borax.

2. It occurs at Monte Somma, with Mica and various other minerals.

3. Several of the properties of Humite would seem to render it probable that it may be identical with Brucite. At present, however, the crystalline forms of the latter substance oppose this union of the two minerals, although it must be confessed that Brucite has never been found in perfectly formed crystals.

Huraulite.

Primary form. Oblique rhombic prism. M on M = 62° 80′. P on M = 101° 13′.

Secondary form. Primary, having its acute lateral edges replaced, and terminated by dihedral summits.

Lustre vitreous. Color yellowish-red, to reddish-brown.

Hardness = 3·5. Sp. gr. = 2·27.

1. Before the blow-pipe, it fuses very easily into a metallic, black globule, which is taken up by the magnet.

2. *Analysis.*

By Dufresnoy.

Phosphoric acid	38·00
Protoxide of iron	11·10
Protoxide of manganese	32·85
Water	18·00

3. It is found in little masses, dispersed through graphic granite, near Limoges in France, and is accompanied by an olive green, fibrous Vivianite. The graphic granite, however, is not found in place. With the Huraulite is found a massive mineral in scales, fibres, and impalpable, which is supposed to be the same substance. The scaly variety is of an intense, reddish-brown color, and a bright pearly lustre.

Hyacinth. (See *Zircon.*)

Hyalite. (See *Opal.*)

Hyalosiderite.

A partially decomposed variety of Peridot.

Hydrate of Magnesia. (See *Native Magnesia.*)

Hydrargillite. (See *Wavellite.*)

Hydro-Carbon.

Primary form unknown. Crystals acicular.

Lustre pearly. Color white, or yellowish-white.

Sp. gr. = 0.65.

Hydro-Carbonate of Lime.

The variety Chalk of Calcareous Spar, altered by having been subjected to the influence of trap dykes. It occurs at the Giant's Causeway in the north of Ireland. According to Da Costa, it consists of four atoms of carbonate of lime, and three atoms of water.

HYDRO-CARBONATE OF LIME AND MAGNESIA.

A variety of Calcareous Spar or Dolomite, found in veins and irregular masses, in an amygdaloid of a loose texture, accompanied by zeolitic minerals and the common Calcareous Spar, at Derry in the north of Ireland.

HYDROGEN. Pure Hydrogen-Gas. MOHS.

Amorphous. Transparent. Expansible.

Sp. gr. = 0·0688. BERZ. 0·0732. BIOT and ARAGO.

Odor peculiar.

1. Hydrogen-Gas, as it is found in nature, is generally in a state of combination. By the assistance of chemical processes, it may be obtained, free from all odor. It burns with a feeble light in atmospheric air, and if mixed with it, detonates when inflamed. It imparts neither taste nor odor to water, with which it is kept in contact.

2. Hydrogen-Gas is developed from several kinds of rocks, limestone, beds of coal, &c.; also from pools and stagnant water in general; and it is met with under these circumstances in different countries throughout the globe.

HYDROLITE. (See *Gmelinite.*)

HYDROPHANE. (See *Opal.*)

HYDROPHYLLITE. (See *Appendix.*)

HYDROSILICITE. (See *Kerolite.*)

HYPERSTHENE. Prismatoidal Schiller-Spar. MOHS.

Primary form. Oblique rhombic prism. M on M = about 93°.

Secondary form. Primary, having the acute lateral edges bevelled. Warwick, (N.Y.)

Cleavage, parallel to the sides and base of the primary prism, more perfectly, parallel to the shorter diagonal of that form, traces parallel to the longer diagonal of the same. Fracture uneven.

Lustre eminently metallic-pearly, upon the most perfect diagonal cleavage; in other directions, more or less distinctly vitreous. Color greyish, brownish or greenish-black; several varieties almost copper-red upon the perfect face of cleavage. Streak greenish-grey. Opake; in some varieties, slightly translucent on the edges.

Brittle. Hardness =6·0. Sp. gr. =3·389.

Compound Varieties. Massive: composition granular, individuals sometimes of considerable size; faces of composition uneven and rough.

1. If heated alone, it is little altered in appearance, but melts upon charcoal into a greenish-grey, opake globule, easily soluble in borax.

2. *Analysis.*

By Klaproth.

Silica - - - -	54·25
Magnesia - - - -	14·00
Alumina - - - -	2·25
Lime - - - -	1·50
Oxide of iron - - - -	24·50
Water - - - -	1.00
Manganese - - - -	a trace.

3. Hypersthene occurs engaged in a mixture of Labradorite and Pyroxene. The rock often contains Magnetic Iron-Ore, and seems to be analogous to sienite or greenstone. It exists also in a slaty rock with Garnet, in serpentine along with Saussurite, and in white limestone along with Spinel and Brucite.

4. It was first brought from the coast of Labrador. It is quoted from Cornwall, England, where it is said to occur in serpentine, and from Greenland, where it exists in primitive slate. The variety, however, from the last mentioned place, with a blue opalescence parallel to the shorter diagonal of the prism, presents two faces of cleavage inclined at an angle of about 124° 30′, and must be referred to the species Hornblende.

Hypersthene has within a few years been met with in Orange county, (N.Y.) at Warwick, in the formation of limestone, with which is associated serpentine, and which is so abundant in Spinel and Brucite. It occurs here in crystals several inches long, by half an inch in diameter; but oftener in very minute prisms. In both cases, the prisms are deficient in regular, terminating planes, though they commonly have their acute lateral edges bevelled. It is associated with Brucite, and is not abundant.

HYPOCHLORITE. (See *Green Iron-Ore.*)

HYPOSKLERITE. (See *Feldspar.*)

HYPOSTILBITE.

Massive: in globules, consisting of delicate fibres, or impalpable.

Lustre feeble. Color white.

Does not scratch glass. Sp. gr. = 2·14.

1. Before the blow-pipe, it melts with difficulty upon the edges; the mass swelling and becoming rough. Soluble in the acids without forming a jelly. The solution furnishing a precipitate by oxalate of ammonia.

2. *Analysis.*

	By BEUDANT.	By DU MENIL.
Silica	54·43	52·25
Alumina	18·32	18·75
Lime	8·10	7·36
Soda	2·41	2·39
Water	18·70	18·75

3. It has been found with Stilbite and Epistilbite, in amygdaloid, from Faroe.

4. The above description is quite inadequate for the distinction of this mineral from Mesotype.

ICE-SPAR. (See FELDSPAR.)

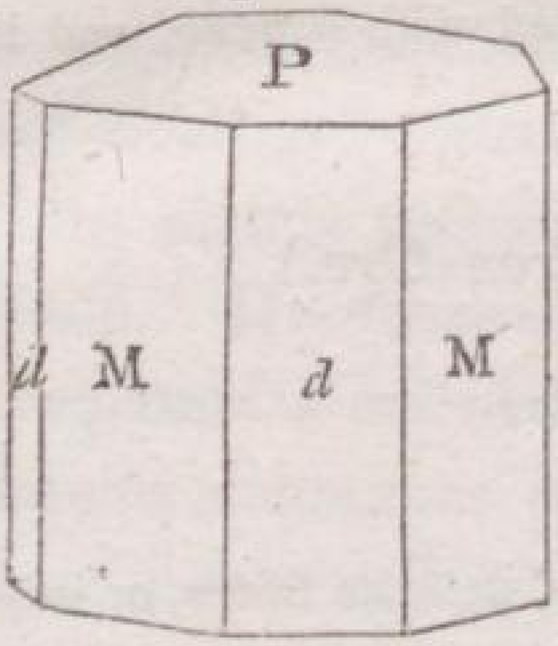
IDOCRASE. Pyramidal Garnet. MOHS.

Primary form. Right square prism.

Idocrase.

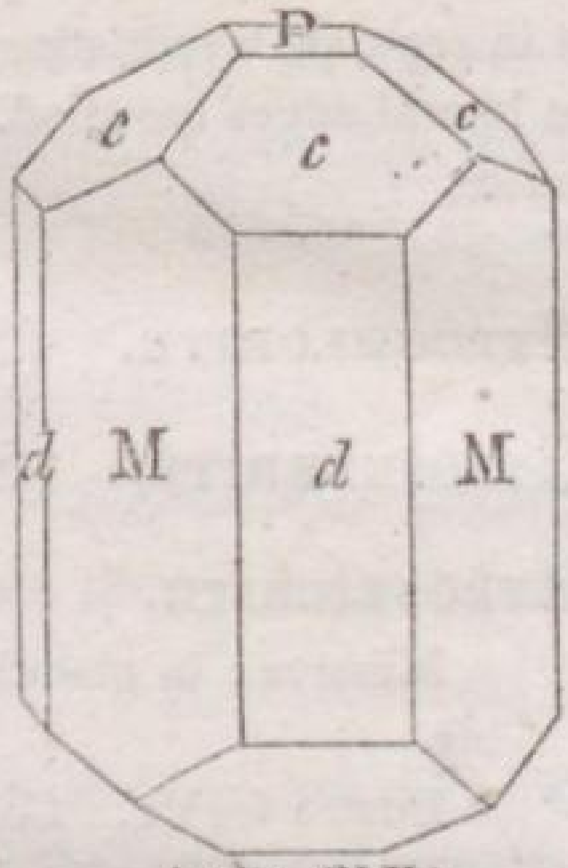
Secondary forms.

Fig. 255.



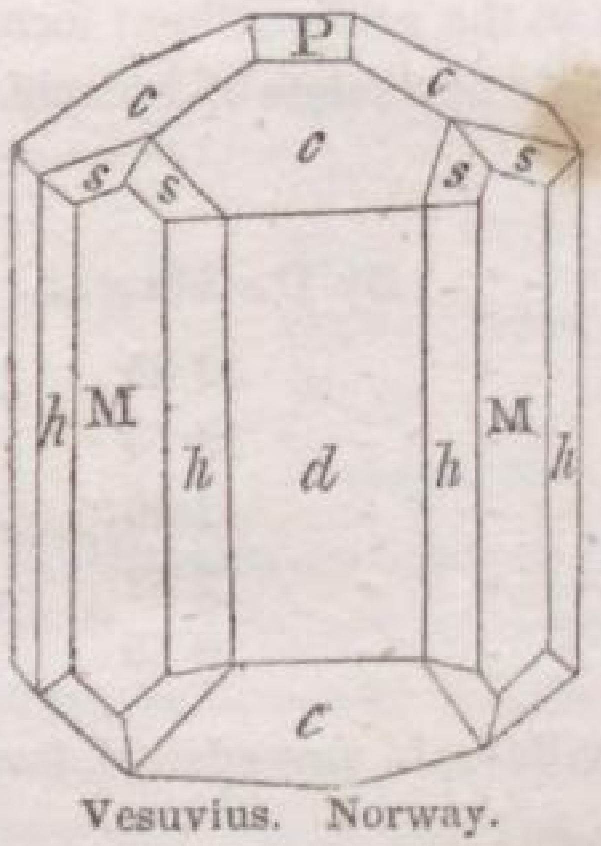
Worcester, (Mass.)

Fig. 256.



Amity, (N.Y.)

Fig. 257.



Vesuvius. Norway.

Fig. 258.

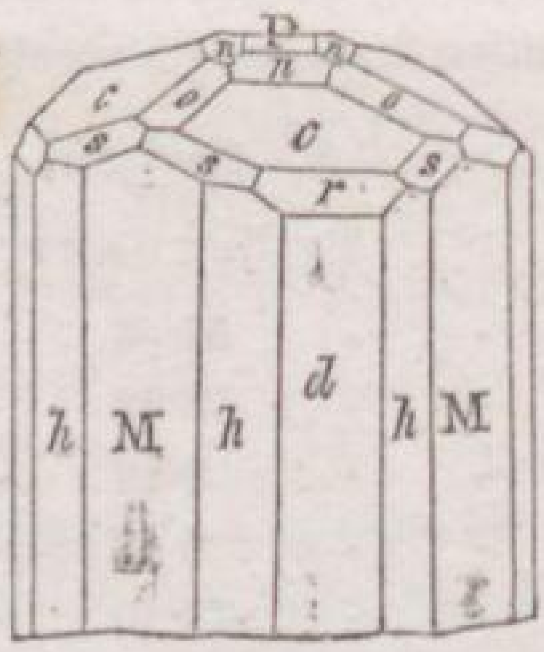
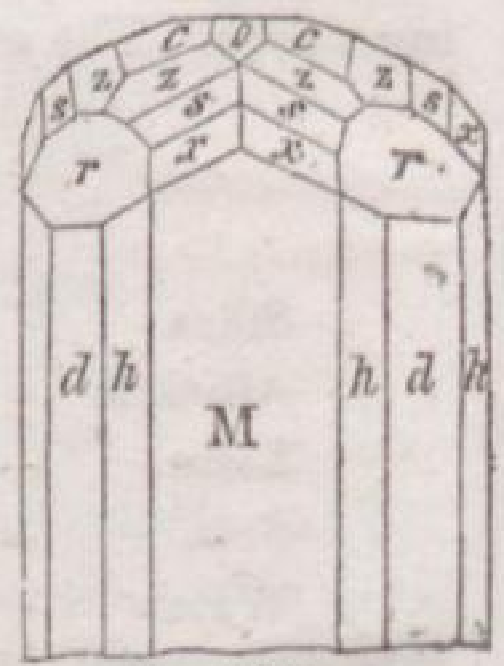


Fig. 259.



Vesuvius.

Fig. 255. Primary form, with the lateral edges truncated. M on $d=135°$. (*périoctaèdre.* H.)—Fig. 256. The same, having the terminal edges truncated. P on $c=142°$ $54'$. (*unibinaire.* H.)—Fig. 257. M on $h=153°$ $27'$. d on $h=161°$ $33'$. s on $s=148°$ $24'$. c on $s=150°$ $31'$. M on $s=144°$ $44'$. (*isoméride.* H.)—Fig. 258. P on $n=$ $165°$ $51'$. c on $r=145°$ $25'$. d on $r=161°$ $42'$. r on $s=$ $152°$ $58'$. P on $o=151°$ $52'$. c on $o=154°$ $45'$. M on o

=118° 8′. (*encadrée.* H.)—Fig. 259. P on r=108° 18′. d on r = 161° 42′. r on z=153° 30′. r on s=152° 58′. r on x=150° 35′. x on x=154° 28′. z on z=139° 52′. (*ennéacontaèdre.* H.)

Cleavage, parallel with M not very distinct, still less so parallel with P. Fracture imperfectly conchoidal, uneven. Surface, P sometimes uneven and curved; the lateral faces striated parallel to their common intersections, the rest of the faces smooth.

Lustre vitreous, inclining to resinous, sometimes the latter very distinctly. Color various shades of brown, passing into leek-green, pistachio-green, olive-green and oil-green. Streak white. Semi-transparent . . . faintly translucent on the edges. If viewed in the direction of the axis, the colors incline more to yellow, perpendicular to it, more to green.

Hardness =6·5. Sp. gr.=3·399.

Compound Varieties. Massive: composition granular, of various sizes, sometimes considerable, and often strongly connected. There occur also columnar compositions, generally of thin individuals, straight and divergent or irregular, faces of composition irregularly streaked.

1. Before the blow-pipe, on charcoal, it melts easily into a pale green glass, rarely attended by effervescence. With borax, it easily melts into a clear glass stained with iron.

2. *Analysis.*

	By Klaproth.		By Borkowsky.
	fr. Vesuvius.	fr. Silesia.	fr. Eger, Bohemia.
Silica	35·50	42·00	41·00
Alumina	33·00	16·25	22·00
Lime	22·25	34·00	22·00
Magnesia	0·00	0·00	3·00
Oxide of iron	7·50	5·50	6·00
Oxide of manganese	0·25	a trace.	2·00
Potash	0·00	0·00	1·00

3. Some of the varieties of Idocrase occur in serpentine, others in veins in gneiss and limestone, and in ejected volcanic masses. It is commonly associated with Garnet, Pyroxene, Mica and Hornblende.

4. The imbedded crystals of the form *unibinaire*, have been found on the banks of the Wilui river, and Lake Baikal in Siberia; the implanted, complicated crystals occur at Monte Somma, among the fragments ejected by Vesuvius, and have been originally formed in those cavities of the rock in which they are found. At Hasta, near Eger in Bohemia, it occurs in long, reddish-brown, deeply striated forms, and in columnar masses; in similar circumstances in Finland. In beds in limestone, it occurs at Orawitza in the Bannat of Temeswar, and at Mount Monzoni near Fassa in Tyrol; also near Christiania in Norway, and in magnificent crystals of a light green color, in the valley of Brozzo, and at other places in Piedmont. A variety from Tellemarken in Norway, of a blue color, and containing copper, has been called *Cyprine*.

The most interesting specimens of Idocrase which the U. S. has hitherto afforded, were discovered at Worcester, (Mass.) in a quartzose rock, in which it formed seams and veins, accompanied by Pyroxene and Garnet. The variety is precisely similar to that from near Eger in Bohemia. Another locality is at Amity, (N.Y.) where it occurs both granular and in crystals, (sometimes an inch in diameter,) disseminated through limestone with Pyroxene and Hornblende. The granular variety was supposed by Dr. Thomson to constitute a new species, to which he gave the name of *Xanthite*. The handsome brown crystals accompanying Corundum at Newton, (N. J.) have been erroneously referred to this species: they belong to Tourmaline.

Igloite. (See *Arragonite*.)

Ilmenite. (See *Crichtonite*.)

Ilvaite. (See *Yenite*.)

Indianite.

Massive; composition granular to impalpable. It yields to cleavage, according to Brooke, in two directions, inclined to each other under angles of 95° 15′ and 84° 45′.

Lustre vitreous. Color greyish-white, with a tinge of rose-red. Translucent.

Hardness = 5·5 . . . 6·0. Sp. gr. = 2·72.

1. It is infusible before the blow-pipe.

2. *Analysis.*

	By Chenevix.	By Laugier.	
		white variety.	rose-red variety.
Silica	42·5	43.0	42·0
Alumina	37·5	34·5	34·0
Lime	15·0	15·6	15·0
Soda	0·0	2·6	3·3
Oxide of iron	3·0	1·0	3·2
Water	0·0	1·0	1·0

3. It occurs in the Carnatic, associated with Feldspar, Hornblende, Garnet, Corundum, Epidote and Magnetic-Iron.

4. It is nearly related to, if not identical with, Labradorite.

Indicolite. (See *Tourmaline.*)

Iodic Mercury.

In spots of a fine lemon-yellow color, in the variegated sandstone of Casas viegas, Mexico. In the air, as well as in ammonia, it changes to black. It resembles the artificial protiodide of mercury.

IODIC SILVER. Monotomous Pearl-Kerate.

Massive: in thin plates.

Color greyish white, or silver-white. Exposed to the air, it changes to lavender-blue. Lustre resinous. Streak semi-metallic. Translucent.

Soft, flexible.

1. Before the blow-pipe, on charcoal, it instantly melts, and produces a smoke which tinges the flame of a beautiful violet color, globules of silver at the same time appearing upon the charcoal.

2. It is found at Albarradon, near Mazapil in Mexico, and occurs in thin veins in steatite.

IOLITE. Prismatic Quartz. MOHS.

Primary form. Regular hexagonal prism.

Secondary forms.

1. Primary, having the terminal edges truncated.

2. The same, having all its edges, both lateral and terminal, truncated; rarely, also, its angles.

Cleavage, parallel with M, but very indistinct. Fracture conchoidal. Surface of some crystals rough and dull.

Lustre vitreous. Color various shades of blue, generally inclining to black. Streak white. Transparent ... translucent; blue if viewed in the direction of the axis, yellowish-grey if perpendicular to it.

Hardness =7·0 ... 7·5. Sp. gr. =2·583 ... 2·718.

Compound Varieties. Massive; composition granular, strongly connected, and recognized with difficulty.

1. Before the blow-pipe, it melts in a good heat, but with difficulty, and only on its edges, into a glass not inferior to the mineral, either in color or transparency.

2. *Analysis.*

	By GMELIN.	By STROMEYER.	By Dr. BRANDES. var. Peliom, fr. Bavaria.	By BONSDORFF. var. Steinheilite, fr. Finland.
Silica	42·60	48·538	54·00	49·95
Alumina	34·40	31·730	28·50	32·28
Magnesia	5·80	11·305	0·50	10·45
Lime	1·70	0·000	0·00	0·00
Oxide of iron	1·50	5·686	16·18 peroxide	5·00
Ox. manganese	1·70	0·702	0·25	0·03

3. Iolite occurs in aggregated crystals with Garnet, Quartz, &c. at Cabo de Gata in Spain, in the bay of San Pedro; and this variety has been called *Iolite*. *Peliom* is found at Bodenmais in Bavaria, sometimes in very distinct crystals, but generally massive, with Magnetic Iron-Pyrites. It occurs with Feldspar and Garnet, in fine crystals, at Ujordlersoak in Greenland, at Arendal in Norway, and at Orijerfvi in Finland;

the variety from the last place has been called *Steinheilite*. Iolite also comes from Siberia and from Lunzenau in the Erzgebirge.

It is found in the U. S. at Haddam in Connecticut, associated with Garnet and Anthophyllite in gneiss.

4. The *Saphire d'eau* of the jewellers is a transparent variety of the present species from Ceylon.

IRIDOSMINE. Iridosmic Sclerone-Metal.

Primary form. Regular hexagonal prism.

Cleavage indistinct, and only in the direction of the bases.

In grains.

Lustre metallic. Color between silver-white and lead-grey.

Malleable with difficulty. Hardness =6·5. Sp. gr. = 17·96 . . . 18·57.

1. It undergoes no perceptible change when heated before the blowpipe. Heated with nitre, it affords the characteristic odor of osmium and a mass soluble in water, to which, when nitric acid is added, a green precipitate makes its appearance.

2. *Analysis.*
By Thomson.

Osmium - - - - -	24·5
Iridium - - - - -	72·9
Iron - - - - -	2·6

3. It is found with Native Platina, at Nijnotaguilsk, in the Urals, and in South America.

IRON PYRITES. Hexahedral Iron-Pyrites. Mohs.

Primary form. Cube.

Secondary forms.

1.
Cube, with angles truncated.

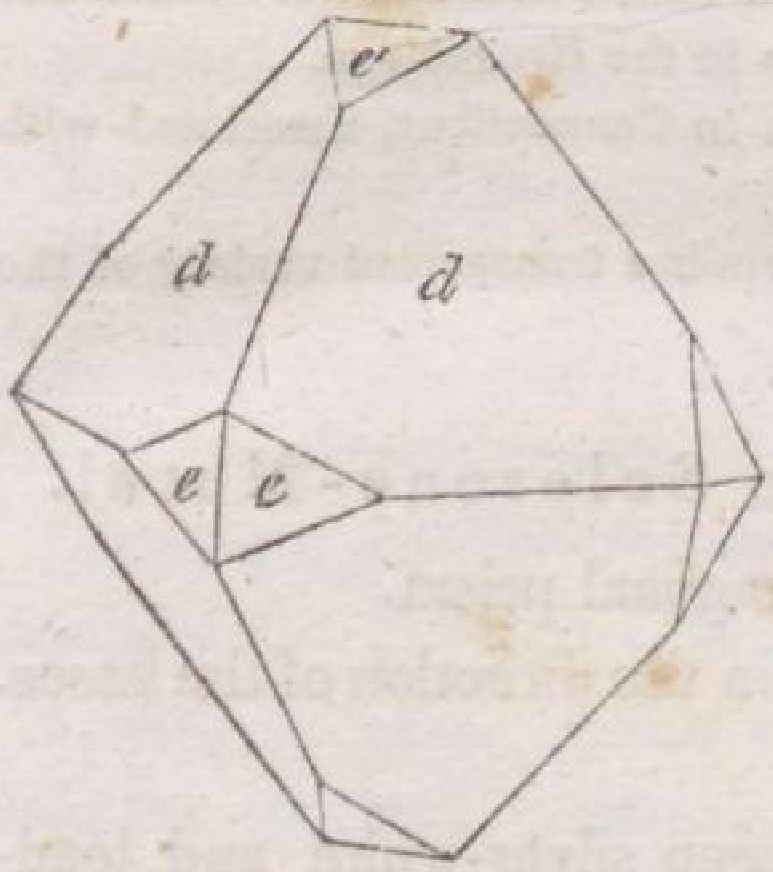
Shoreham, (Vt.) Marietta, (Ohio.)

2.
Regular octahedron.

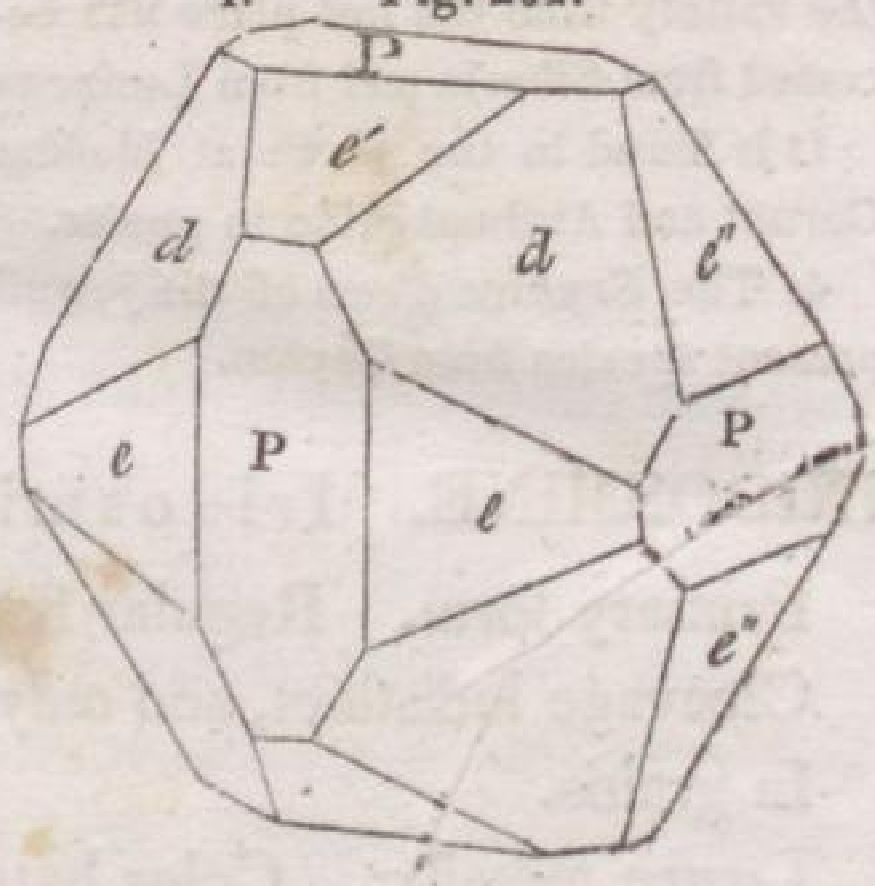
Haddam, (Conn.) Rare.

Iron Pyrites.

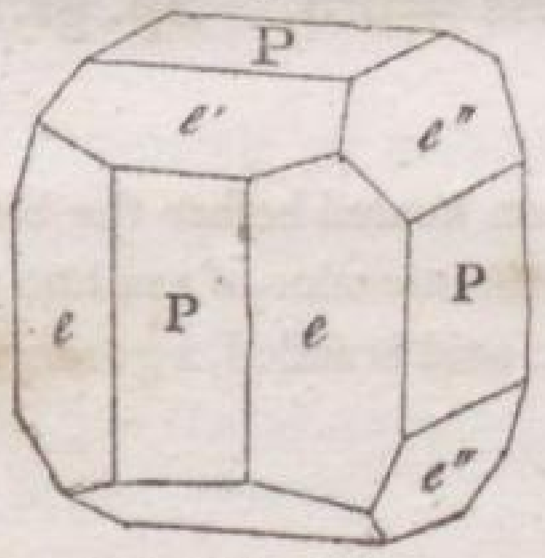
3. Fig. 260.



4. Fig. 261.

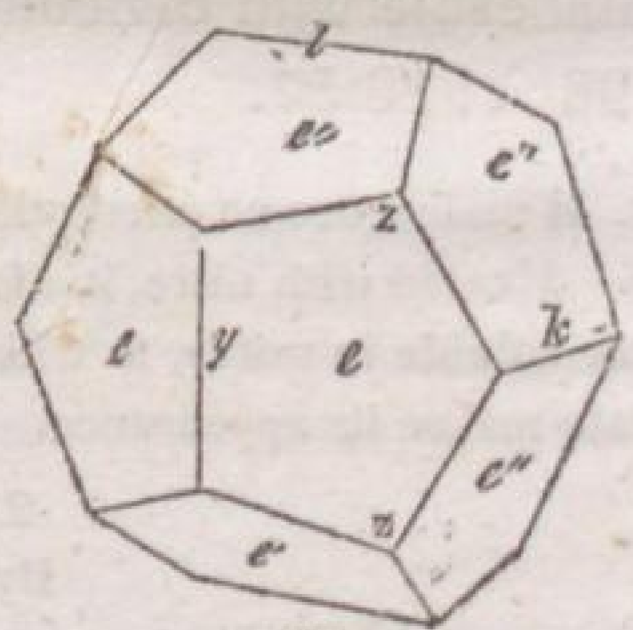


5. Fig. 262.



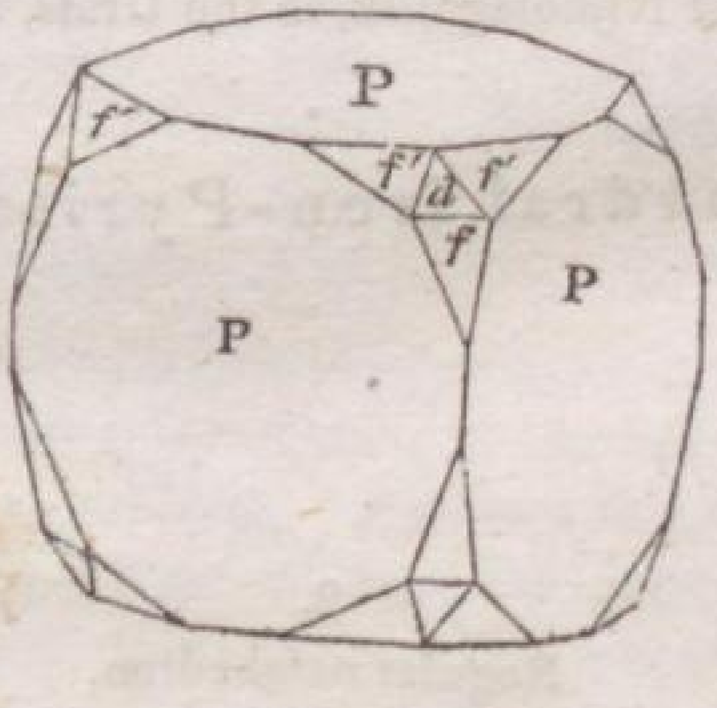
Cornwall—Elba.

6. Fig. 263.

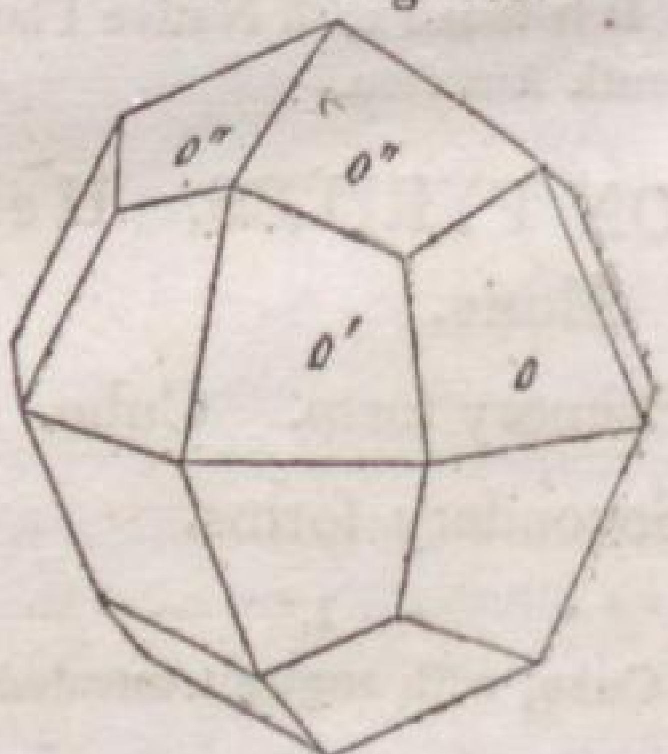


Elba.

7. Fig. 264.



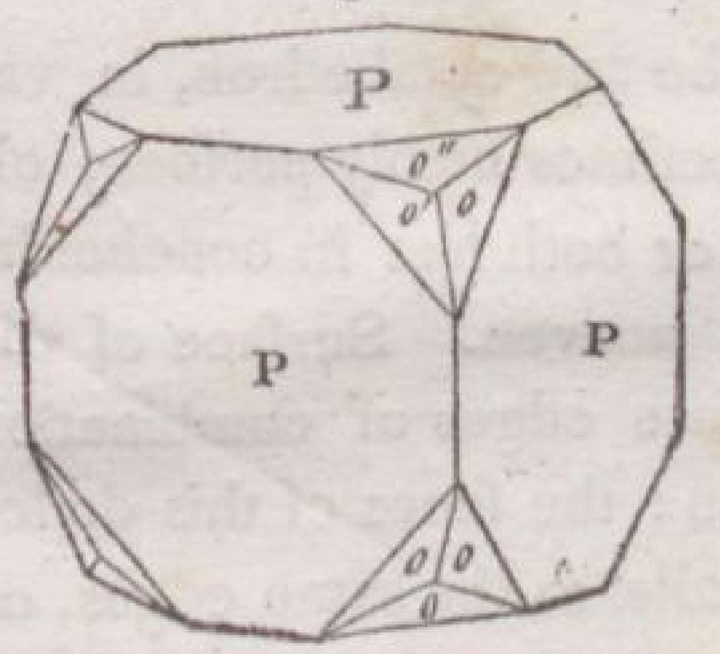
8. Fig. 265.



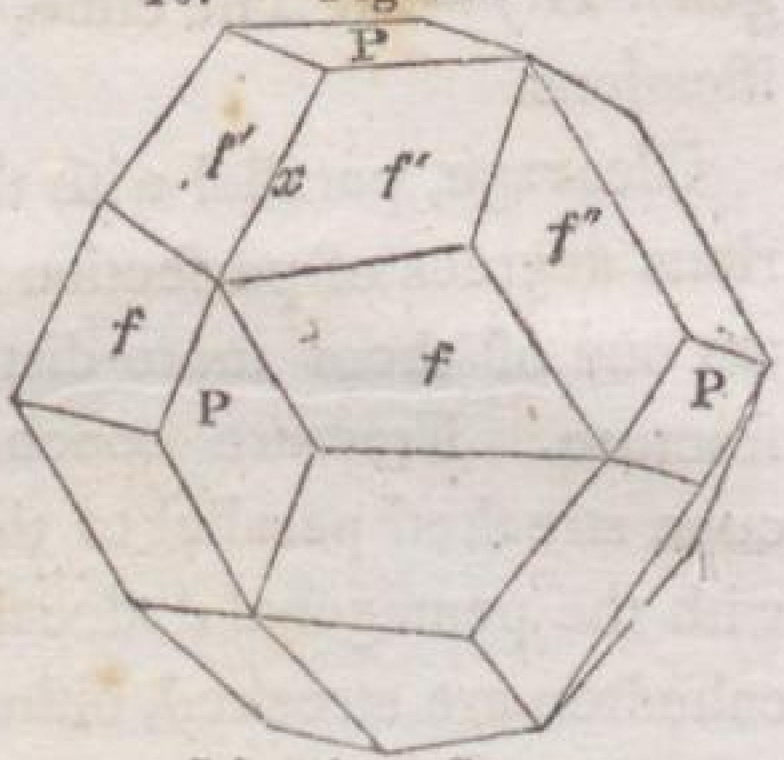
Corsica.

Iron Pyrites.

9. Fig. 266.

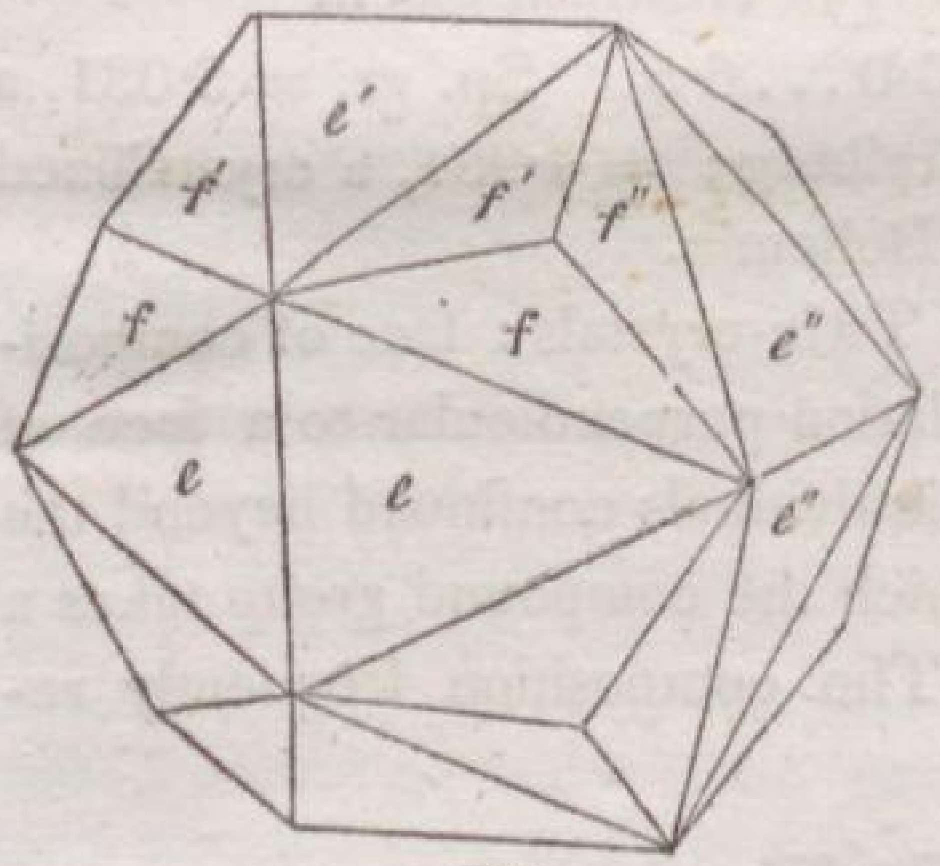


10. Fig. 267.



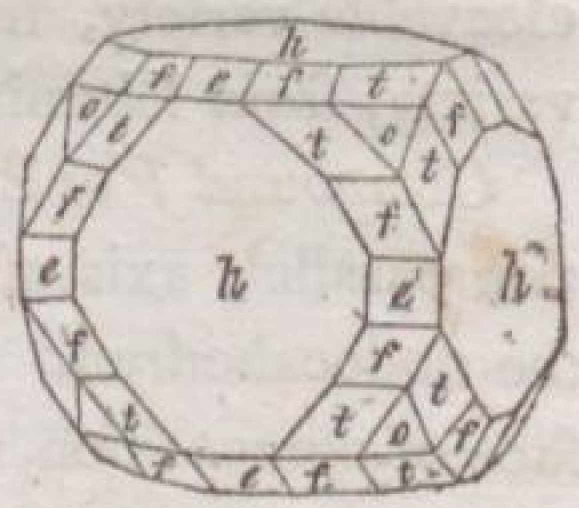
Schneeberg, Saxony.

11. Fig. 268.



Elba.

12. Fig. 269.



Valley of Planen, near Dresden.

1. (*Cubo-octaèdre*. H.)—2. (*octaèdre*. H.)—3. *e* on *e* 126° 52′ 12″. *d* on *e* = 140° 46′ 7″. (*icosaèdre*. H.)—4. P on *e*=153° 26′ 5″. (*cubo-icosaèdre*. H.)—5. (*cubo-dodecaèdre*. H.)—6. (*dodecaèdre*. H.)—7. P on *o*=144° 44′ 8″. *o* on *o*=131° 48′ 36″. (*triépointé*. H.)—8. (*trapezoidal*. H.)—9. *f* on *f*=141° 47′ 12″. *d* on *f*=157° 47′ 33″. P on *d*=152° 15′ 52″. (*quadriépointé*. H.)—10. (*triacontaèdre*. H.)—11. *f* on *e* =162° 58′ 34″. (*panto-*

gène. H.)—12. The cube, embracing all the previous modifications.

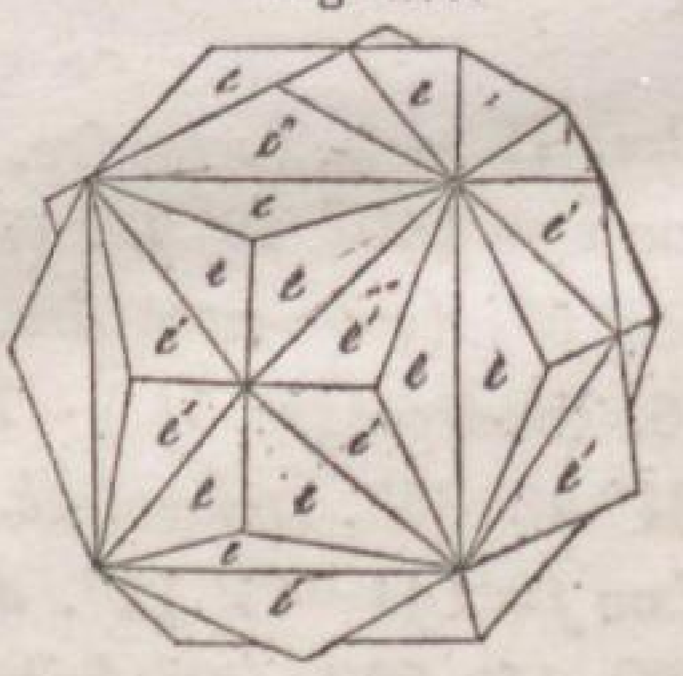
Cleavage, parallel with the cube and octahedron, in various degrees of perfection; sometimes highly perfect; often one of them more distinct, or both lost in conchoidal fracture. Fracture conchoidal, uneven. Surface of the cube streaked parallel to the obtuse edges of combination with the pentagonal dodecahedron: the faces of this dodecahedron are streaked, either parallel to the same edges, or parallel to edges which are perpendicular to the former.

Lustre metallic. Color, very few shades of a characteristic bronze-yellow. Streak brownish-black.

Brittle. Hardness = 6·0 . . . 6·5. Sp. gr. = 5·031, a cleavable variety, from Freiberg; = 4·981, a crystallized variety, from Littmittz in Bohemia.

Compound Varieties. Twin-crystals: face of composition parallel, axis of revolution perpendicular to a face of the dodecahedron. The individuals continued beyond the face of composition, by which the compound group takes a cruciform appearance. The composition frequently repeated.

Fig. 270.



Schoharie, (N.Y.)

Imbedded and implanted globules; surface drusy; composition indistinctly columnar. Massive; composition granular, sometimes even impalpable, strongly coherent; fracture uneven, or on a large scale, flat conchoidal. Cellular.

1. In the oxidating flame of the blow-pipe, Iron Pyrites becomes red upon charcoal, the sulphur is expelled, and oxide of iron remains. At a high temperature, in the interior flame, it melts into a globule, which continues red-hot for a short time when removed from the blast, and possesses, after cooling, a crystalline fracture and metallic appearance. In heated nitric acid, it is partly soluble, and leaves a whitish residue. Some varieties are subject to decomposition when exposed to the action of the atmosphere.

2. *Analysis.*

By Hatchett.

Iron	47·30	47·85
Sulphur	52·70	52·15

3. Iron-Pyrites is one of the most common and widely diffused species among the ores; and occurs in very various repositories. It is engaged in imbedded crystals, and in massive nodules; the former particularly in clay-slate and greywacke-slate, the latter in greenstone, granular limestone, &c. It even forms beds by itself, included in primitive slate; and is often an important ingredient of those beds which contain ores of lead, iron, &c. It frequently occurs mixed with coal seams, and the beds of clay which form a part of the coal measures. The *Auriferous Pyrites* contains a small portion of native gold mechanically mixed with it, which appears to operate by a galvanic effect in producing the decomposition to which this variety is so generally subject. Iron-Pyrites is also found with ores of silver. It is contained in many organic remains, both of vegetable and animal origin, and is one of the species which can be distinctly traced in the composition of some of the meteoric masses.

4. Some of the crystals, along with their localities, have been mentioned above. The island of Elba is the most conspicuous for large and well defined crystals: very fine crystals are found in Piedmont, at Freiberg, Johanngeorgenstadt, &c. in Saxony, in Bohemia, in Hungary, in the Hartz, at Kongsberg in Norway, at Fahlun in Sweden, in Derbyshire and Cornwall.

The United States is not particularly rich in localities of interesting varieties of Iron-Pyrites. Shoreham, (Vt.) and Schoharie, (N. Y.) produce, in the black limestone quarry of the former place, and in the water limerock of the latter, the handsomest crystals we have yet discovered. The secondary limestones in the vicinity of Marietta, (Ohio,) afford interesting crystals.

5. Iron-Pyrites is roasted for extracting sulphur; after which it is exposed to the oxidating influence of the air for the production of sulphate of iron.

Iron Sinter.

Reniform, stalactitic . . . massive. Composition impalpable. Fracture conchoidal.

Lustre vitreous. Color yellowish-, reddish-, blackish-brown. Transparent . . . translucent on the edges.

Not very brittle. Soft. Sp. gr. = 2·40.

1. Before the blow-pipe, it intumesces, and some varieties emit a strong arsenical odor, during which they are partly volatilized.

2. *Analysis.*

	By Klaproth.	By Kersten, fr. Freiberg.	By Stromeyer.
Oxide of iron	67·00	40·45	33.46
Arsenic acid	0·00	30·25	26·06
Sulphuric acid	8·00	0·00	10·75
Protoxide of manganese	0·00	0·00	0·59
Water	25·00	28·50	28·48

3. It is found in several old mines, as Freiberg and Schneeberg in Saxony, and in Upper Silesia.

Iserine.

In small rounded grains.

Cleavage scarcely distinguishable. Fracture conchoidal.

Lustre semi-metallic. Color black. Streak black.

Hardness = 5·5. Sp. gr. = 4·68 . . . 4·78.

1. Before the blow-pipe, alone, on charcoal, it is unalterable. With the fluxes, it acts in general like Magnetic-Iron; but with the salt of phosphorus, it presents in the reduction flame a bluish-red color.

2. *Analysis.*

	By Rose, fr. Norway.	By Rose, fr. Iserweise.	By Klaproth, fr. Cornwall.	By Berthier, fr. Brazil.
Titanic acid	43·73	50·12	45·25	43·5
Peroxide of iron	42·70 }	49·88	51·00	54·0
Protoxide of iron	13·57 }			
Oxide of manganese	0 00	0·00	0·25	0·0
Silica	0 00	0·00	3·50	2·50

3. Its localities are numerous; the principal ones, however, are the banks of the Mersey near Liverpool, England, and Iserweise in the Riesengebirge.

4. Iserine possesses a strong affinity to Crichtonite in its most important properties, with which it is probable that future researches will prove it identical.

Isopyre.

Regular forms not observed. Massive, in very pure masses of considerable size, (nearly two inches in each direction): composition impalpable. Fracture conchoidal.

Lustre vitreous, often considerable. Color greyish black and velvet, occasionally dotted with red. Streak pale greenish grey. Opake, or very faintly translucent on the thinnest edges, with a dark, liver brown tint.

Brittle. Hardness = 5·5 . . . 6·0 Sp. gr. = 2·91.

Slight action on the magnetic needle.

1. From the description of Tachylite, (by Breithaupt,) it would seem that Isopyre is identical with that substance, excepting that the sp. gr. of Tachylite is only 2·5 . . . 2·54.

2. Before the blow-pipe, it fuses without the disengagement of moisture or gas; melted in salt of phosphorus, it gives indications of silica.

2. *Analysis.*
By Turner.

Silica - - - -	47·09
Alumina - - - -	13·91
Peroxide of iron - - - -	20·07
Lime - - - - -	15·43
Peroxide of copper - - -	1·94

4. Isopyre is found in the west of Cornwall.

Ittnerite. (See *Sodalite.*)

Jade. (See *Nephrite.*)

JAMESONITE. Axotomous Antimony-Glance. Mohs.

Primary form. Right rhombic prism. M on M = 101° 20′.

Secondary forms. The primary, with its acute lateral edges truncated.

Cleavage, parallel with T highly perfect; less distinct, though easily observed, when the crystals are not too small, parallel with M and the secondary lateral planes. Fracture not observable.

Lustre metallic. Color steel-grey. Streak unchanged.

Sectile. Hardness =2·0 . . . 2·5. Sp. gr. = 5·564.

Compound Varieties. Massive: composition columnar, individuals generally very delicate; straight and parallel, or divergent.

1. Before the blow-pipe, in an open tube, it yields a dense white smoke of oxide of antimony, and leaves behind chiefly antimoniate of lead. Upon charcoal, after the volatilization of the antimony and lead, there remains behind a slag, which, with the fluxes, exhibits the reaction of oxide of iron, containing traces of oxide of copper.

2. *Analysis.*

By Rose.

Sulphur	22·15	22·53
Lead	40·75	30·71
Copper	0·13	0·19
Iron	2·30	2·65
Antimony	34·40	34·90

3. It occurs in masses of considerable dimensions in Cornwall; also in Hungary.

Jeffersonite. (See *Pyroxene.*)

JOHANNITE. Cyprine Uranium-Salt.

Primary form. Oblique rhombic prism. M on M = 111°?

Cleavage, parallel with M.

Color grass-green, to siskin-green. Lustre vitreous. Streak siskin-green. Semi-transparent.

Hardness =2·0 . . . 2·5. Sp. gr. = 3·1 . . . 3·2. Taste bitter, rather than astringent.

1. It dissolves easily in water; and is a double sulphate of uranium and copper, containing water.

2. It is very rare, and has been met with only in an abandoned mine at Joachimsthal in Bohemia.

JURINITE. (See *Brookite*.)

KAKOCHLOR.

In imitative shapes, and compact. Fracture conchoidal, to uneven.

Lustre resinous. Color bluish black.

Hardness = 2·5 . . . 3·0.

1. Locality not mentioned.

KAKOXENE.

In capillary crystals, and massive, with fine columnar composition, consisting of divergent individuals.

Lustre silky. Color yellowish, to brown. Streak yellowish.

Hardness = 3·00 . . . 4·00. Sp. gr. = 3·38.

1. *Analysis.*

By STEINMANN.

Phosphoric acid	17·86
Alumina	10·01
Silica	8·90
Peroxide of iron	36·82
Lime	0·15
Water and fluoric acid	25·95

2. It is found in the fissures of a variety of Limonite, in the mines of Hrbek, near Zbirow in Bohemia.

3. It is altogether probable that this mineral is only a variety of Wavellite.

KAOLIN.

Decomposed Feldspar and Albite. q. v.

KARPHOLITE. Prismatoidal Wavelline-Spar.

Massive: composition thin columnar, scopiform and stellular, rather incoherent, meeting again in angularly granular compositions.

Lustre silky. Color high straw-yellow, sometimes approaching to wax-yellow. Opake.

Hardness =4·5 ... 5·5. Sp. gr. =2·935.

1. It intumesces before the blow-pipe, becomes white, and melts imperfectly into a coherent mass.

2. *Analysis.*

	By Steinmann.	By Stromeyer.
Silica	37·53	36·154
Alumina	26·48	28·669
Protoxide of manganese	17·09	19·160
Protoxide of iron	5·64	2·290
Lime	0·00	0·271
Fluoric acid	0·00	0·470
Water	11·36	10·780

3. It occurs in granite at Schlackenwald in Bohemia, accompanied by Fluor and Quartz.

Karphosiderite.

Reniform masses; rarely, also, granular. Fracture uneven.

Lustre resinous; shining and glimmering in the streak. Color straw-yellow.

Hardness =4·0 ... 4·5. Feels greasy. Sp. gr. =2·5.

1. Before the blow-pipe, upon charcoal, it becomes black; and melts, in a strong fire, into a globule, which is attractable by the magnet. In glass of borax, it is easily soluble; and with salt of phosphorus, it melts into a black scoria. It contains oxide of iron, phosphoric acid, water, with small quantities of oxide of manganese and zinc.

2. It occurs in Greenland.

Karstenite. (See *Anhydrite.*)

KERASITE. Peritomous Lead-Baryte. Haidinger.

In radiated masses.

Cleavage highly perfect and easily obtained, parallel to a right rhombic prism of 102° 27′, and in the direction of its shorter diagonal. Fracture imperfectly conchoidal, to uneven.

Lustre adamantine, particularly upon the cross-fracture, inclining to pearly upon faces of cleavage. Color yellowish white, straw yellow, rose red, pale. Translucent.

Brittle. Hardness =2·5 . . . 3·0. Sp. gr. =7·077.

1. It decrepitates slightly before the blow-pipe, and is easily melted; the globule is of a deeper color than the mineral. On charcoal, it is reduced, and emits fumes of muriatic acid. Treated with peroxide of copper and salt of phosphorus, the flame assumes an intensely blue color.

2. *Analysis.*

By Berzelius.

Oxide of lead	90·13
Muriatic acid	6·84
Carbonic acid	1·03
Water	0·54

3. It is found near Church-hill, in the Mendip Hills in Somersetshire, engaged in manganese-ores, and accompanied by several other salts of lead, and by Calcareous Spar.

Keratite. (See *Quartz.*)

Keratophyllite. (See *Hornblende.*)

KEROLITE. Brittle Atelene-Picrosmine.

Primary form. Doubly oblique prism. Dimensions unknown.

Cleavage, parallel with M highly perfect, and easily obtained; less distinct parallel with T, least of all parallel with P. Fracture uneven. Surface of M streaked parallel with its combinations with P.

Lustre pearly upon M, inclining to vitreous; upon the rest, glimmering or dull. Color oil-green, siskin-green, leek-green, to blackish green, rarely presenting patches of duck-blue. Streak white. Translucent, in thin laminæ.

Sectile. Laminæ brittle. Hardness=2·5 . . . 3·0. The lowest degrees upon M: the highest upon the solid angles and edges. Sp. gr. =2·4 . . . 2·6.

Kerolite.

Compound Varieties. Massive: composition broad columnar, curved, lamellar and divergent: also botryoidal in cavities, and impalpable. Sp. gr. of the compact =2·2... 2·3. Color white, tinged by grey, green and red.

1. Before the blow-pipe, when heated suddenly, it decrepitates violently; the fragments becoming white and harder. In very small fragments, if the heat is gradually applied, a roundish enamel-like edge is produced; but unattended with any ebullition. In powder, with borax, the lighter colored varieties produce a perfectly colorless glass; the blackish green variety affords a greenish transparent glass. Pseudomorphoses in the shape of Quartz, Hornblende and Spinel.

2. *Analysis.*

	By Pfaff. var. Kerolite.	By Nuttall. var. Marmolite, fr. Hoboken.	By Steel. var. Marmolite, fr. Hoboken.	By Shepard. var. Deweylite. fr. Middlefield.	By Shepard. bl. gr. var. fr. Blanford.
Magnesia	18.01	46·0	41·720	40·00	41·400
Silica	37·95	36·0	41·256	40·00	40·00
Lime	0·00	2·0	0·000	0·00	0·932
Water	31·00	15·0	17·680	20·00	15·670
Protox. iron, with traces of chrome	0·00	0·5	0·000	0·00	2·700
Alumina	12·18	0·0	1·000	0·00	0·000
Peroxide of iron	0·00	0·0	0·400	0·00	0·000

3. The present species is found in veins in serpentine, and disseminated through Schiller-Spar.

4. The Kerolite was first described by Breithaupt, as occurring in reniform masses, in plates and compact, with a hardness = 2·0 ... 2·5, and sp. gr. = 2·33 ... 2·4, having a resinous lustre, and occurring in thin seams in serpentine, at Franckenstein in Silesia. The *Marmolite* of Nuttall must be referred to the same species; it occurs at Hoboken, (N. J.) where it is found forming narrow veins in serpentine; and from whence is derived the specimens possessed of a distinctly crystalline structure. It also occurs at this place possessed of an impalpable texture, but only in small quantities. A leek green and blackish green, variety, in curved and stellular laminæ, occurs at Blandford, (Mass.) engaged in Schiller-Spar. The compact variety of the United States, and which has been called *Deweylite*, by Emmons, is found in seams and irregular veins at Middlefield, (Mass.) at Cooptown, Harford county,

(Md.) and at Amity, (N. Y.) The pseudomorphoses occur at Middlefield, (Mass.) in the shape of Quartz, of considerable dimensions, and of greyish white color; and at Amity, (N. Y.) of a bluish green and dark green color, in the shapes of Hornblende and Spinel.

APPENDIX TO KEROLITE.

i. *Dermatin.* BREITHAUPT.

Reniform, rarely globular, and in thin coatings or crusts. Fracture conchoidal.

Lustre resinous, slightly increased in the streak. Color blackish-green to leek-green, dark olive-green, and dark liver-brown. Translucent on the edges. Streak straw-yellow, or pea-yellow.

Hardness = 2·0. Sp. gr. = 2·136.

1. It has a greasy feel, and when moistened by the breath, emits an earthy smell. Before the blow-pipe, it cracks, changes to a black color, and increases in hardness.

2. It is found upon serpentine, at Waldheim in Saxony.

KILLINITE. (See *Spodumene.*)

KNEBELITE.

Massive. Fracture imperfectly conchoidal.

Lustre glistening, to dull. Color grey, spotted dirty white, red, brown and green. Opake.

Hard. Difficult to break. Sp. gr. = 3·714.

1. Alone, before the blow-pipe, it remains unaltered.

2. *Analysis.*

By DOEBEREINER.

Silica	32·5	30·32
Protoxide of iron	32·0	34·58
Protoxide of manganese	35·0	35·10

Locality unknown.

KONIGITE.

Primary form. Right rhombic prism. M on M′ = 105°.

Crystals clongated, somewhat barrel-shaped, and closely aggregated.

Cleavage parallel with P, perfect.

Color emerald and blackish-green. Translucent.

Hardness = about 2·0.

1. It consists of sulphuric acid and oxide of copper.

2. It accompanies Red Copper-Ore, and comes from Werchetori in Siberia.

3. In chemical composition it resembles Brochantite, but this substance occurs in thin rectangular tables, whose angles are truncated, and edges bevelled, without any traces of cleavage.

KORNITE.

An impalpable variety of Quartz, (q. v.) of a dull green color, a feebly vitreous lustre, and conchoidal, or splintery fracture: with sp. gr. = 2·8 . . . 2·9. It is also called *Splintery Hornstone*.

KOUPHOLITE. (See *Prehnite.*)

KROKALITE. (See *Mesotype.*)

KROKYDOLITE.

Massive: composition columnar, particles of composition thin and parallel; impalpable, when the fracture is uneven or splintery.

Color indigo-blue.

Hardness = about 4·0. Sp. gr. = 3·200 . . . 3·265.

1. Before the blow-pipe, it easily melts into a shining black glass, which is magnetic.

2. *Analysis.*

By STROMEYER.

	Fibrous variety.	Compact variety.
Silica	50·81	51·64
Protoxide of iron	33·88	34·38
Soda	7·03	7·11
Water	5·58	4·01
Magnesia	2·32	2·64
Lime	0·02	0·25

3. Its localities are Orange River, Africa, Greenland, Norway and Golling Salzburg.

KUPAPHRITE. Prismatic Euchlore-Mica. MOHS.

Primary form. Right rhombic prism, dimensions unknown.

Secondary form. Primary, having the acute lateral edges truncated.

Cleavage, parallel with P perfect. Fracture not observable. Surface, M deeply streaked in a horizontal direction. The rest of the faces smooth.

Lustre pearly upon P, both as faces of crystallization, and of cleavage; vitreous upon the other faces. Color pale apple-green and verdigris-green, inclining to sky-blue. Streak of the same color, only paler. Translucent, generally only on the edges.

Very sectile. Thin laminæ, flexible. Hardness = 1·0 ... 1·5. Sp. gr. = 3·098, of a crystallized variety from Schwatz.

Compound Varieties. Reniform and botryoidal shapes: surface drusy, composition columnar, faces of composition a little rough.

1. Alone, before the blow-pipe, it decrepitates very briskly, and throws around powdered fragments, which color the flame green. In the process, it immediately turns black, and melts into a steel-grey pearl, destitute of crystalline facets. On charcoal, it quietly emits moisture, without detonation; but after a longer exposure to the influence of the flame, it swells a little through the extrication of arsenical vapor. With carbonate of soda, an imperfectly fluid mass is obtained, which contains a nucleus of white metallic matter.

2. *Analysis.*

By Kobell.

From Falkenstein in the Tyrol.

Arsenic acid	25·366	25·01
Oxide of copper	43·660	43·88
Water	19·824	17·46
Carbonate of lime	11·150	13·65

3. It occurs in beds and veins, accompanied by other ores of copper, particularly by Blue Malachite.

4. The known localities of Kupaphrite are, the Bannat of Temeswar, Libethen in Hungary, Schwatz in the Tyrol, Saalfeld in Thuringia, and Matlock in Derbyshire.

KUPFERINDIG. (See *Purple Copper-Ore.*)

KUPFERSCHAUM. (See *Kupaphrite.*)

KUPHOLITE.

Massive: the individuals flat, also impalpable.

Lustre pearly. Color, yellowish white, wax-yellow, light yellowish brown. Streak white. Transparent, to translucent.

Hardness = ·5 . . . 1·00. Sp. gr. = 1·922 . . . 1·934.

1. It yields, when calcined, about 25 p. c. of water.

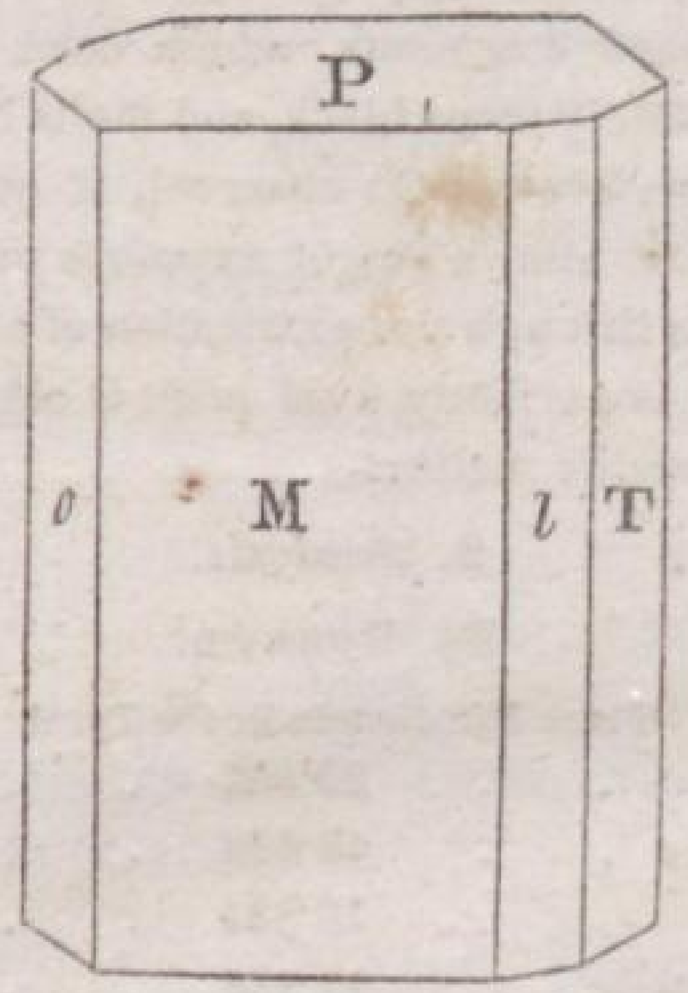
2. It occurs at Schwarzenberg, in the Erzgebirge, accompanied with the Metaxite and Kryptose Carbon-Spar of BREITHAUPT.

KYANITE. Prismatic Disthene-Spar. MOHS.

Primary form. Doubly oblique prism. P on M=93° 15′. P on T=100° 50′. M on T=106° 15′.

Secondary form.

Fig. 271.



P on l - 97° 48′	P on o - 83 38	M on l - 145 16	PHILLIPS.	T on l - 140° 55′	T on o - 122 20

Cleavage, parallel with M highly perfect, and easily obtained; less distinct parallel with T; least of all, parallel with P. Fracture uneven. Surface streaked parallel to the common edges of intersection.

Lustre pearly upon M, particularly if the face is produced by cleavage; inclining to vitreous upon the other faces. Color generally white, often passing into blue, sometimes inclining to green or grey, and rarely to black. Frequently spots of berlin-blue elongated in one direction, upon a paler ground.

Streak white. Transparent . . . translucent.

Brittle. Hardness = 5·0 . . . 7·0; the lowest degrees upon M, the highest on the solid angles and edges. Sp. gr. = 3·675, a blue, transparent variety cut and polished; 3·559, a milk white variety of Rhaetezite.

Compound Varieties. Twin-crystals: faces of composition parallel, axis of revolution perpendicular to M. Massive: composition broad columnar, sometimes straight lamellar, often curved, or divergent; faces of composition in most cases irregularly streaked.

1. Two varieties were formerly distinguished as particular species, *Kyanite* and *Rhætizite*: the former referring simply to such varieties as are blue, the latter to those whose color is white. The *Fibrolite* of Count Bournon must also coalesce with the present species, with which it perfectly agrees in every property.

2. Before the blow-pipe, Kyanite is infusible. With borax, it is soluble with great difficulty. Some crystals exhibit positive, others negative electricity, on being rubbed.

3. *Analysis*.

	By Saussure.	By Laugier.	By Klaproth.	By Chenevix. var. Fibrolite.
Alumina	54·50	55·50	55·50	58·25
Silica	30·62	38·50	43·00	38·00
Lime	2 02	0·50	0·00	0·00
Magnesia	2·30	0·00	0·00	0·00
Oxide of iron	6·00	2·75	0·50	0·75
Water	4·56	0·75	0·00	0·00
Potash	0·00	0·00	a trace	0·00

4. The varieties of Kyanite occur in crystals, or massive, imbedded in rocks of the primitive class, as gneiss and mica slate; and are often attended by Garnet and Staurotide.

5. Crystals, and large cleavable varieties, are found at St. Gothard in Switzerland, the Zillerthal in the Tyrol, the Saualpe in Carinthia, and the Bacher mountain in Stiria. The variety *Rhætizite* is chiefly known from Pfitsch in the Tyrol. The *Fibrolite* has been brought from the Carnatic and from China, where it was found in loose crystals, accompanying Corundum.

Several very interesting localities of Kyanite are known in the United States, the most important of which is that in Massachusetts, at Chesterfield, where it occurs in mica-slate, accompanied by Garnet. Nodular masses of Quartz, one or two feet in thickness, are here occasionally penetrated throughout with crystals, and cleavable masses of the present species, often of a handsome blue color. Large rolled masses, sometimes above a foot in diameter, of a similar variety, occur at Litchfield and West Farms, (Conn.) containing also Corundum and massive Apatite. The variety Fibrolite occurs in very distinct prisms, at Lancaster, (Mass.) and at Bellows Falls, (Vt.); at both places in gneiss. A black variety is found in North Carolina, in the soil, accompanied by crystals of Rutile.

6. Blue varieties of Kyanite are sometimes cut as gems.

Kymatine.

Massive: composition columnar, individuals thin, and arranged so as to produce an undulating structure: also impalpable.

Lustre pearly. Color greenish-grey. Streak white.

Rather brittle. Hardness = 2·0 . . . 3·00. Sp. gr. = 2·923 . . . 2·981.

Locality not mentioned.

LABRADORITE. Polychromatic Feldspar. Partsch.

Primary form. Doubly oblique prism. P on M = 94° 30′. P on T = 119°. M on T = 115°.

Secondary forms. These are analogous to those of Albite, but they present less variety, and on account of their rarity in general, have been but little investigated.

Cleavage parallel with P and M most distinct, that in the direction of the remaining primary face very imperfect.

Lustre, upon the cleavage planes of P pearly, passing into vitreous. Color white, passing into grey, with a tinge of blue. Opalescent and iridescent tints appear in directions not coincident with the cleavages.* Translucent on the edges.

Brittle. Hardness =6·0. Sp. gr. =2·69 . . . 2·76.

1. Before the blow-pipe, Labradorite resembles Feldspar. With oxide of nickel and borax, it affords a blue pearl. It is entirely dissolved by heated muriatic acid.

2. *Analysis.*

By Klaproth.

	from Labrador.	from Saxony.
Silica	55·75	51·00
Alumina	26·50	30·50
Lime	11·00	11·25
Soda	4·00	4·00
Oxide of iron	1·25	1·75
Water	0·50	1·25

3. Labradorite occurs in sienitic rocks; also as a regular constituent in several kinds of gabbro rocks, with serpentine.

4. It was first brought from the coast of Labrador. It occurs also in Ingria, in large, but ill defined crystals, in Greenland, and as a constituent of several rocks in various places of the Hartz, Saxony, near Florence, &c. The variety commonly quoted from Norway, in the zircon-sienite of Friedrichsvärn, belongs to the species of Feldspar, and not to Labradorite.

Labradorite is but little known in the U. S. But one locality of any importance is known to exist in the country, which is situated at the distance of 60 miles west of Mount Moriah, upon Lake Champlain, (N.Y.) in an almost uninhabited country. It here exists in the greatest abun-

* From the researches of Dr. Brewster, it appears that these tints arise from the existence of empty crystallized cavities distributed through the mass.

dance, in granite, and presents the same handsome colors as the variety from Labrador. It is occasionally met with also in rolled masses, in the vicinity of Pompton plains, (N. J.) and at Amity, (N. Y.)

LANARKITE. (See *Dyoxylite.*)

LAPIS-LAZULI. (See *Sodalite.*)

LATROBITE. Eruthrone Feldspar.

Primary form. Doubly oblique prism. P on M=91° 9′. P on T = 98° 30′. M on T = 93° 30′; obtained from cleavage.

Color pale red.

Hardness = 5·75 ... 6·50. Sp. gr. = 2·8, BROOKE. 2·72, GMELIN.

1. It fuses before the blow-pipe, in the platina forceps, into a white enamel. With borax, it yields a globule, pale amethyst red in the oxidating flame, and colorless in the reducing one. With salt of phosphorus, a globule with a silica skeleton, is obtained, yellow in the oxidating flame, and becoming opake on cooling, transparent in the reducing flame.

2. *Analysis.*

	By GMELIN.	
Silica	44·653	41·780
Alumina	36·814	32·827
Lime	8·291	9·787
Oxide of manganese	3·160	5·767
Magnesia with some manganese	0·528	0·000
Potash	6·575	6·575
Water	2·041	2·041

3. It occurs in Amitok island, near the coast of Labrador, with Mica and Calcareous Spar.

END OF THE FIRST VOLUME.

[illegible] in granite, [illegible] the same handsome colors as the variety from Labrador. It is commonly met with also in rolled masses, in the vicinity of [illegible] (N. J.) and [illegible] (N. Y.)

Labradorite. (See [illegible].)

[illegible] (See [illegible].)

LATROBITE. Erythrose Feldspar.

Primary form. Doubly oblique prism. P on M = 91° 9′. P on T = 98° 30′. M on T = 93° 30′; obtained from cleavage.

Color pale red.

Hardness = 5·75 ... 6·50. Sp. gr. = 2·8, Brooke. 2·72, Gmelin.

It is fusible before the blow-pipe, in the platina forceps, into a white enamel. With borax it yields a [illegible] in the oxidating flame and colorless in the reducing flame. [illegible] flame, and becoming [illegible] on cooling, [illegible] in the [illegible] flame.

A. Analysis.

By Gmelin.

Silica	[illegible]	[illegible]
Alumina	[illegible]	[illegible]
Lime	[illegible]	[illegible]
Oxide of manganese	[illegible]	[illegible]
Magnesia with trace of oxide of iron	[illegible]	[illegible]
Potash	[illegible]	[illegible]
Water	[illegible]	[illegible]

It occurs [illegible] with the [illegible] of Labrador, [illegible]

END OF THE FIRST VOLUME.