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A VIEW OF THE PROGRESS OF DISCOVERY

IN NATURAL PHILOSOPHY, CHEMISTRY, MINERALOGY, GEOLOGY, BOTANY, ZOOLOGY, COMPARATIVE ANATOMY, PRACTICAL MECHANICS, GEOGRAPHY, NAVIGATION, STATISTICS, ANTIQUITIES, AND THE FINE AND USEFUL ARTS.

CONDUCTED BY

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M.DCCC.XXVI.

Larvæ, which are produced under the surface have been very numerous, and the onion and cauliflower tribes have suffered much. An insect, which I have not been able to detect, has almost totally destroyed my crop of apples and pears, by eating out the cores of the fruit when just set. Plums are all destroyed. I do not recollect a richer display of blossom than that which we had in spring, and our disappointment has been proportional to the hope excited. The *Curculio vastator*, which, by committing its depredations in the night, too often escapes the vigilance of the gardener, has not been so numerous as usual; nor have I seen so many moths and butterflies as usually occur. For some years past wasps have been scarce, but this season they are plentiful. I have observed that they are fond of the flower of the *Daucus hispidus*, which seems to stupify them, as they fall to the ground when the flower is shaken, or they may be picked off by means of pincers. Perhaps the flower of the common carrot may have the same effect. At any rate, I hope that the *Daucus hispidus* will be found a useful means of destroying this arch enemy of ripe fruit, by being planted in different parts of a garden,—a boy or girl being employed to go round and pick off the wasps that settle on the flowers. Ever yours truly,

G. S. Mackenzie.

Coul, 3d *August* 1824.

Art. VII.—*On the Crystalline Forms and Properties of the Manganese Ores.* By William Haidinger, Esq. F. R. S. E. Communicated by the Author. With a Plate.

I. *Prismatoidal Manganese Ore.*

Fundamental form. Scalene four-sided pyramid. P = 130° 49′, 120° 54′, 80° 22′. Plate II. Fig. 1.

$$a : b : c := 1 : \surd 3.37 : \surd 2.4.$$

Character of combinations, hemi-prismatic, with inclined faces.

Simple forms contained in the combinations which were observed among the crystals of the variety analyzed.

9.	$(\frac{4}{3}\bar{P}-2)^5$ (*g*)	=	172° 36′,	114° 37′,	66° 25′.
4.	$(\frac{5}{4}\breve{P}r-1)^3$ (*c*)	=	115° 17′,	142° 2′,	76° 56′.
5.	$(\breve{P}r)^3$ (*n*)	=	95° 4′,	132° 50′,	108° 24′.
2.	$P+1$ (*m*)	=	112° 35′,	97° 35′,	118° 45.′
3.	$P+\infty$ (*M*)	=	99° 40′.		
6.	$(\breve{P}r+\infty)^3$ (*l*)	=	51° 18′.		
8.	$(\bar{P}r+\infty)^3$ (*r*)	=	134° 14′.		
11.	$\bar{P}r$ (*d*)	=	114° 19′.		
7.	$(\bar{P}r-1)^5$ (*h*)	=	154° 18′,	116° 10′,	70° 2′.
12.	$\breve{P}r$ (*e*)	=	122° 50′.		
10.	$(\breve{P}r+\infty)^5$ (*s*)	=	76° 36′.		
1.	P (*P*)	=	130° 49′,	120° 54′,	80° 22′.

Combinations. 1. $(\frac{4}{3}\bar{P}-2)^5$, $\frac{(\frac{5}{4}\breve{P}r-1)^3}{2}$. $(\breve{P}r)^3$. $P+1$. $P+\infty$. $(\breve{P}r+\infty)^3$. $(\bar{P}r+\infty)^3$. Fig 2.

The 3d figure represents the projection upon $P-\infty$, the 4th figure the elevation upon a plane parallel to the short diagonal of the prism $P+\infty$. The hemi-prismatic character of the species appears only in the disposition of the faces marked *c*. They form horizontal edges of combination with $(\breve{P}r)^3$. The edges between $(\frac{4}{3}\bar{P}-2)^5$ and $P+1$ are parallel to those between $P+1$ and $(\breve{P}r+\infty)^3$. These crystals are from two to three lines in thickness, and some of them nearly an inch long.

2. $\bar{P}r$. $(\breve{P}r-1)^3$. $\breve{P}r$. P. $P+1$. $P+\infty$. $(\breve{P}r+\infty)^3$. $(\breve{P}r+\infty)^3$. $(\bar{P}r+\infty)^5$. Fig. 5.

Small, but very well pronounced crystals of this variety were disengaged from the same specimen which contains the variety 1. They were found in small drusy cavities, which were discovered when the whole was broken up for analysis. The faces of $\breve{P}r$, marked *e* in the figure, have not been described; they are rarely observed in the crystals of this species.

Cleavage, $\breve{P}r+\infty$ highly perfect and easily obtained; $P+\infty$ also perfect, but less easily obtained; traces of $\bar{P}r+\infty$, and of

$P-\infty$. Fracture uneven, surface of the vertical prisms streaked parallel to their common edges of intersection; $\bar{P}r$ streaked parallel to the edges of combination with P; $P-\infty$ parallel to those with $\bar{P}r$. In general, the faces are smooth, and possess pretty high degrees of lustre.

Lustre, imperfect metallic. Colour, dark brownish-black, inclining to iron-black. Streak, reddish-brown. Opaque, in larger masses. When broken or cleaved in the direction of $\breve{P}r+\infty$, and exposed to the light of the sun, minute splinters are often observed, which, by transmitted light, appear of a bright brown colour, so that the mineral cannot be said to be absolutely opaque.

Brittle. Hardness = 4.0...4.25. Sp. gr. = 4.328, of a number of fragments of crystals; = 4.312, in another experiment of a single crystal of considerable size.

Compound Varieties. Twin-crystals, formed in two different manners. In the first of them the axes of the two individuals are parallel, dependant on the hemi-prismatic character of the combinations of the species; in the second, they are inclined. 1. Face of composition, parallel to $\breve{P}r+\infty$, axis of revolution perpendicular to it. Fig. 6. If we did not give attention to the compound state of this variety, shown in the present instance by the groove along the place of junction, which is not always visible, we might be induced to believe that it possesses a hemi-prismatic character, referred to an axis inclined upon the base of the fundamental pyramid, which is not the case. One can generally trace the peculiar disposition of the crystalline faces upon each of the individuals. A repetition of this law produces thick prisms, terminated perpendicularly upon their axis by a rough face, which consists of the apices of numerous individuals, or rather of numerous particles of two individuals, alternating with each other. Such faces are not uncommon in the prismatoidal manganese ore. 2. Axis of revolution perpendicular, face of composition parallel to a plane of $\breve{P}r$. Fig. 7. The disposition of the faces marked *c*, upon which the hemi-prismatic character of the species depends, is such, that a mere revolution of 180° is not sufficient to bring the two individuals in the position required for joining in a regular twin; though the general disposition takes place also in the present instance, the portions of the two crystals, similarly situated, being 180° distant from each other, compared to the plane of composition.

Irregular composition is very common in this species; it is either granular, or columnar. The latter occurs much more frequently.

Observations.

Few species in mineralogy have been so incorrectly described as the ores of manganese, and, in particular, the most common one among them, the prismatoidal manganese-ore. It is not alone that the slight difference in the angles of two of the prisms, and the situation of the perfect cleavage, was not exactly referred to constant positions, but also colour, streak, hardness, specific gravity, and other important properties, were either incorrectly stated, or confounded with those of other species. The insufficiency of Haüy's descriptions was felt by many mineralogists, and several of them have endeavoured to substitute better ones in their place. The result, obtained by M. Von Leonhard,* is by no means more satisfactory than that of Haüy; Mr Phillips,† with his usual skill in crystallographic observations, has succeeded much better. The description of the forms given by Mohs ‡ agrees very nearly with the latter, at least much more so than any two other descriptions. There are some differences, however, in regard to the absolute measurement of the angles, and in the statement that, according to Mohs, the cleavage parallel to the short diagonal of the prism $P+\infty = 99°40'$ is more distinct, and more easily obtained than any other cleavage of the species; whereas, according to Phillips, the crystals "cleave readily, and with brilliant surfaces parallel to the lateral planes of a rhombic prism of 100° and 80°, and both its diagonals." Though, in many varieties, the cleavage parallel to the long diagonal of that prism may in fact be obtained, it is always less distinct than that parallel to the short diagonal, and often not at all observable. It

* *Handbuch der Oryctognosie*, p. 371.
† *Elem. Introd. to Mineralogy*, p. 243.
‡ *Treatise on Mineralogy*, vol. ii. p. 419.

is important to attend to this difference in the perfection of cleavage; the more so, because the cleavage parallel to the short diagonal of $P+\infty = 99° 40'$, is at the same time parallel to the long diagonal of another prism, $(\breve{P}r+\infty)^5 = 76° 36'$ (the supplement of which is 103° 24′), which occurs very frequently in the same mineral, and might be, or has actually been, mistaken for it, in a more superficial examination of the crystalline forms of the species.

Descriptions of single varieties are particularly desirable, when the characters of the whole species are yet so imperfectly ascertained as in the present case. The variety to which the preceding description refers, was brought by Dr Turner from Ilefeld in the Hartz, and to him I have been indebted for the crystals described above. The most remarkable peculiarity in the series of crystallization of this species, is its hemi-prismatic character, the faces of those forms which assume it being inclined to each other. Those marked *c*, if sufficiently enlarged, would give rise to a form resembling a tetrahedron, like Fig. 8, the planes of which are equal and similar scalene triangles. Among the remaining species, whose forms belong to the prismatic system, only the sulphates of zinc, of magnesia, and of nickel, are known to possess an analogous formation. This was first placed beyond a doubt by Professor Mitscherlich, who observed the fact, that the faces *s* and *t*, Fig. 9, appear only contiguous to the alternating faces of *l*; although the alternating enlargement of these same faces, represented in Fig. 10, had been previously noticed in the sulphate of magnesia, by mineralogists, so far back as Romé de L'Isle and Linnæus. Large crystals of this salt generally show the hemi-prismatic character much more distinctly than small ones.

In the description given above, the streak of the crystals is stated to be reddish-brown, contrary to most indications in works on mineralogy. It is very often the case, however, that we meet with crystals, and still more frequently with compound varieties, consisting of the columnar individuals, which actually afford a black streak. The hardness of these varieties is much inferior to the hardness of the crystals that present a brown streak, being generally between 2.5 and 3.0, (a little below calcareous spar;) and sometimes, in fibrous varieties, it is so inconsiderable as to soil the fingers, and write upon paper. On the contrary, their specific gravity is higher, and often approaches to 4.7. It is important to observe, that the exterior strata of large crystals sometimes afford a black streak, and show low degrees of hardness, while the interior parts still offer the characters indicated in the preceding description. It should seem, therefore, that the difference in several of these properties is owing to a change or decomposition of the substance itself, which does not affect the regular form.

II.—*Pyramidal Manganese Ore.*

Fundamental form. Isosceles four-sided pyramid. P = 105° 25′, 117° 54′. Fig. 11.

$$a = \sqrt{2.76}.$$

Simple forms. $\frac{4}{3}$ P—4 (*a*) = 139° 56′, 59° 46′; P—1 = 114° 51′, 99° 11′; P (P).

Char. of comb. pyramidal.

Combinations. 1. $\frac{4}{3}$ P—4. P. Fig. 12.

2. $\frac{4}{3}$ P—4. P—1. P.

Cleavage, P—∞ rather perfect; P—1 and P less distinct, and interrupted. Fracture uneven. Surface, $\frac{4}{3}$P—4, very smooth and shining, P horizontally streaked and often dull.

Lustre imperfect metallic. Colour brownish-black. Streak dark-reddish, or chestnut-brown. Opaque.

Hardness = 5.0...5.5. Sp. gr. = 4.722, of a crystallized variety.

Compound Varieties.—Twin-crystals: axis of revolution perpendicular, face of composition parallel to a face of P—1, Fig. 13. The composition is often repeated parallel to all the faces of the pyramid, Fig. 14. Generally small particles only of the surrounding individuals are joined to the central one. Massive: composition granular, firmly connected.

Observations.

The preceding description is given by Professor Mohs.*

* *Treatise on Mineralogy, Transl,* vol. ii. p. 416.

It would be superfluous to enlarge here on the propriety of considering this as a species of its own, since, besides Mr Mohs, it has likewise been established as such by Messrs Brooke and Phillips,* and by the Abbé Haüy.† Even in the works of the Wernerian school, the pyramidal forms had been long ago described, in reference to the identical specimen from which the above description was derived. Its locality is Ilmenau in Thuringia. Count Bournon‡ mentions an ore of manganese crystallized in regular octahedrons, having their solid angles replaced by low four-sided pyramids; a form which might be explained upon the supposition, that the variety, Fig. 12, appears in the regular composition represented Fig. 14.; at least it would be interesting to have these varieties compared again with each other.

III.—*Uncleavable Manganese Ore.*

Regular forms and cleavage unknown. Fracture not observable.

Lustre imperfect metallic. Colour bluish-black and greyish-black, passing into dark steel-grey. Streak brownish-black, shining. Opaque.

Brittle. Hardness = 5.0 . . . 6.0. Sp. gr. = 4.145, a botryoidal variety.

Compound Varieties. Reniform, botryoidal, fruticose: composition columnar, impalpable; fracture flat, conchoidal, even; in a second composition it is curved lamellar, the faces of composition being smooth, rough or granulated. Massive: composition granular, impalpable, strongly connected; fracture flat, conchoidal, even.

Observations.

The specimen analyzed is from the neighbourhood of Schneeberg in Saxony, and agrees perfectly with the preceding description, extracted from the treatise of Mohs. It consists of alternating layers, having more or less lustre, dis-

* *Phillips*, 3d Edit. p. 381.
† *Traité*, 2d Edit. t. iv. p. 264.
‡ *Catalogue*, p. 395.

posed in reniform coats. The specific gravity of those parts, which possess a rather stronger lustre, and a conchoidal fracture, is = 4.004, while the specific gravity of those without lustre, and an uneven fracture, was found to be = 4.079.

IV.—*Brachytypous Manganese Ore.*

Fundamental form. Isosceles four-sided pyramid. P = 109° 53′ 108° 39′. Fig. 15.

$$a = \sqrt{1.94}.$$

Simple forms. P—∞ (*o*); P(*P*), Wunsiedel, Bayreuth; P+2 (*s*) = 96° 33′, 140° 30′, Fig. 16., Elgersburg, Thuringia; $(P+1)^3$ (*z*) = 144° 4′, 128° 17′, 154° 25′.

Char. of comb. pyramidal.

Combinations. 1. P—∞. P. Fig. 17., Wunsiedel.

2. P. P+2. Fig. 18., Elgersburg.

3. P. $(P+1)^3$. Fig. 19., St Marcel, Piedmont.

4. P—∞. P. P+2. Fig. 20., Wunsiedel.

Cleavage, very distinct in the direction of the faces of P; entire forms of cleavage may be obtained from larger individuals. Fracture uneven. Surface, P—∞, possessing less lustre than P, but even, and sometimes faintly streaked parallel to the edges of combination with P; P often a little rounded; P+∞ uneven, rough and horizontally streaked; $(P+1)^3$ smooth and even.

Lustre imperfect metallic. Colour dark brownish-black. Streak of the same colour.

Brittle. Hardness = 6.0 . . . 6.5. Sp. Gr. = 4.818, large cleavable individuals from Elgersburg.

Compound Varieties. Massive: composition granular, individuals strongly coherent.

Observations.

The first variety of the species of brachytypous Manganese-ore which I had the good fortune to examine, was brought by Dr Turner from Germany, the ticket bearing the locality of Elgersburg. Being struck with the facility with which this mineral yields to cleavage in the direction of the faces of a four-sided pyramid, and supposing it to belong to the species of the pyramidal manganese-ore of Mohs, I requested Dr Turner's permission to extract the form of cleavage from it, but was much surprised when I could not discover the single cleavage perpendicular to the axis, which is so very distinct in that mineral, and has been likewise indicated by Messrs Brooke and Phillips. Though the mineral cleaves very readily, yet its great hardness, being superior to that of feldspar, and a strong connection among the particles, render it extremely difficult to obtain the faces smooth and plain enough to reflect a good image even of a single very luminous point. I was, therefore, led to suppose, by several approximate measurements, that the regular octahedron should be considered as the fundamental form of the species. In some of the cavities of the same specimen there were, however, crystals in the form of acute four-sided pyramids, similar to Fig. 16, which did not agree with the symmetry of tessular forms. They were rough, and possessed of little lustre, so that they afforded only indistinct measurements of about 140° for the base of the pyramid. Certain varieties from Wunsiedel in Bayreuth, in the cabinet of Mr Allan, engaged in heavy-spar, and associated with prismatoidal manganese-ore in very delicate columnar composition, possess the form of Figs. 15, 17, and 20. The two first of these I also observed in a specimen in the collection of Mr Ferguson of Raith, having the following ticket by Mr Heuland: "Hydrous-oxide of manganese, in the form of an octahedron, with a square basis. Thuringia—is extinct." As Haüy's works contain the pyramidal manganese-ore of Mohs, under the denomination of *Manganese oxide hydraté*,* this specimen is probably intended for a variety of that species, which, however, is very inaccurately described by Haüy, who united under one head the physical properties of one species with the physical and the chemical properties of two or three others to form a general description, to which no object in nature corresponds. I had long ago observed crystals of the form Fig. 19, engaged in a specimen of the *epidote manganèsifere* of Haüy, in the cabinet of Mr Allan, but which I believed likewise to be a variety

* *Traité*, 2de Ed. t. iv. p. 264.

of the pyramidal manganese-ore. Upon measurement, however, for which the small but beautifully formed and bright crystals of this variety are better suited than any of the rest, these also turned out to belong to a species different from the pyramidal one formerly described. The angles which these crystals afforded are given above as the dimensions of the species. The results obtained from the remaining varieties are not sufficiently consistent to be considered different from these, and as, moreover, the colour of their streak and their hardness coincide, we may safely consider them as belonging to the same species. Some of the octahedral crystals, quoted by Count Bournon,* for which he proposes the denomination of *fer oxydulé manganésien*, must also very likely be referred to the brachytypous manganese-ore. He supposes their form to be derived from the regular octahedron, but does not quote any decisive proofs in favour of this opinion, which is rendered necessary when a species nearly resembling it is found to have, for its fundamental form, a four-sided pyramid so little different from the regular octahedron. Those varieties which have their solid angles replaced by four faces, may perhaps belong to the pyramidal manganese-ore, as is mentioned in the observations annexed to that species, which was likewise not distinguished as a species of its own at the period of publication of Count Bournon's catalogue.†

ART VIII.—*Account of the Eruption of the Volcano of Jorullo in Mexico.* ‡ By BARON ALEXANDER DE HUMBOLDT. With a Section of the Mountain.

To the east of the Pic de Tancitaro, the *Volcan de Jorullo* (Xorullo, or Juruyo) was formed in the night of the 29th September 1759. M. Bonpland and myself reached its cra-

* *Catalogue*, p. 395.

† Dr Turner is occupied with the Analysis of the Species described in this Paper, and will give the results in a subsequent Number.—ED.

‡ We have given the above abridged account of this remarkable volcano, in reference to a new theory of its formation by Mr Scrope, which forms the subject of the next Article. See Humboldt's *Essai Politique sur la Nouvelle Espagne*, his *Essai Geognostique*, p. 351, and his *Relation Historique*.—ED.