VI. Description of certain gangues of spinelle brought from the Island of Ceylon by M. Leschenault de Latour

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fore shall merely give a figure of what I conceive to be the true theory of this instrument.

a, the letter *T* pasted on the window, sends an image to the

convex object-glass, which is too much rarefied to pass to the eye, but two inverted images are formed at *b* and *c*, which uniting at the eye-glass *CD*, form one inverted image *d*. This again is magnified and sent to the eye at *E*, whence it travels to the retina and sensorium. In both telescopes the image at the eye-glass stands in place of an object.

As this paper is intended as a mere outline, I have not given the exact foci of the glasses, choosing those of high powers. The experimenter is to distinguish between the converging rays and those which form the image. Let him make the following experiment:—Place the glass globe filled with water in the sunbeams, and holding a convex lens over it, he perceives an image of the lens with the sun painted on the convex surface, and he also perceives the gross refracted rays form an image of the sun which can be thrown to some distance, having nothing whatsoever to do with vision. This I proved by the following experiment: I desired a friend to look at a lighted candle, and holding a convex lens opposite his pupil, I perceived the lens with a magnified image of the candle to be painted on his pupil, while by holding the lens a little obliquely, I threw the refracted rays on the side of his nose or on his forehead.

I remain your obedient servant,

Cork, April 22, 1823.

JOSEPH READE, M.D.

VI. *Description of certain Gangues of Spinnelle brought from the Island of Ceylon by M. LESCHENAULT DE LATOUR. By M. le Comte de BOURNON, Chev. de St. Louis, F.R.S. &c.**

IN a memoir on Corundum which I presented to the Royal Society of London, and which has been printed in the Philosophical Transactions for 1802, after having fulfilled the

* Extracted from *Observations sur quelques-uns des Minéraux, soit de l'Ile de Ceylon, soit de la Côte de Coromandel, rapportés par M. LESCHENAULT DE LATOUR. Par M. LE COMTE DE BOURNON. PARIS. 1823.*

end

end which I had proposed to myself, which was to make this substance more perfectly known than it then was, by determining at the same time its intimate connexion with all the stones to which jewellers apply the term *oriental*, such as the oriental ruby, topaz, amethyst, sapphire, &c., I took advantage of this circumstance to insert some details relating to other substances, and more particularly to spinelle. Mr. White, an officer in the English army, whom, on his departure for Ceylon, I strongly recommended to procure some stones from that island, sent us, in a collection otherwise of little value, two fragments of rocks, in which I observed, for the first time, the spinelle of Ceylon in its gangue, and not from the sand of the rivers of that island.

It is twenty years since this observation was made; and since that period we have received no addition to our first knowledge upon this subject respecting the corundum of nearly the whole of India, and that, more interesting on account of its transparency and purity, of the island of Ceylon. Notwithstanding that the English, masters of nearly the whole of India, and at present of the whole of Ceylon, carry on a regular correspondence between every part of India and the metropolis of their country, they are still, I think, liable to reproach in this respect; which opinion arises from the interest which I take in science, and in its progress in a country where it has procured me so many gratifications*.

M. Leschenault de Latour, sent into India by the French Government, with a particular commission to procure for our colonies the vegetables which appear to be useful to their agriculture, as well as to the extension of their commerce, is the inquirer to whom we are indebted for the most extended knowledge of the mineralogy and geology of some of the most interesting districts of India; on account of the information which he has collected concerning these two sciences, though he

* This reproach, perhaps, may seem severe, the Geological Society of London, of which I had the honour to be one of the founders, having printed in 1821, in the second part of the fifth volume of its Transactions, a letter addressed from Ceylon by Dr. John Davy to Sir James MacGregor, and which was read to the Society on the 4th of December 1818. But the details contained in that letter, relating as much to the mineralogy as to the geology of Ceylon, can only be considered, it appears to me, as those of a slight glance thrown over the island. The indications and descriptions which accompany the substances therein named, are so short and incomplete, that they seem but to convey a promise, speedily to be fulfilled, of a work of more importance, containing more instructive details, and so arranged as to arrest the attention of the mineralogist and geologist. I cannot help expressing my regret, that Dr. Davy, so well qualified for this undertaking, has not carried this work to perfection. Perhaps, however, my regret is premature.

was at the time almost a stranger to them. M. Leschenault, remarkable for his extensive knowledge in different branches of natural history, and especially for his zeal and activity, which are equalled only by his great modesty, during a stay of six years in India, scarcely seven months of which were devoted to the researches which he made in the island of Ceylon*, has enriched the French colonies, and principally the Jardin Royal of the Isle of Bourbon, with a great number of plants, useful to the agriculture of the island, as well as to the amelioration, in this respect, of its commercial relations. After having enriched the Jardin du Roi at Paris with many plants, birds, quadrupeds, insects, fishes, and crustacea, which furnish several new species, he has returned to his own country, bringing with him an extremely interesting collection of minerals and rocks, which he collected in the different parts of India through which he travelled. After having first submitted this collection to the choice of the professors of the Jardin du Roi, M. Leschenault presented to the private mineralogical collection of the King, the specimens which were subjected to a second choice made by me. Though I had to regret the loss of a great number of minerals, of which he had no duplicates, this second choice has nevertheless been very useful to the collection, by the facts which their study has put me in possession of. These facts enable me to add some new details to those which I formerly gave relating to corundum and to spinelle; they likewise enable me to make known some others, which the different mineral substances, brought home by this traveller, have introduced to our notice.

I shall commence these details with the description of the various gangues of the spinelle of the island of Ceylon, which are among the minerals presented to the private collection of the King by M. Leschenault.

The first gangue is a carbonate of lime and magnesia, or, more simply, a dolomite. It is colourless, and composed of distinct parts crossing each other in different directions. It contains, thinly disseminated, some small crystals of phosphate of lime of a deep beryl blue, sometimes placed between the particles of dolomite, but more frequently contained in its substance, and which are only discovered by the fractures made to determine the characters of the mineral. These crystals are

* M. Leschenault arrived at Ceylon at the end of July 1820, and quitted it in February 1821, after having been obliged to return to Columbo by a dysentery; and in the short time of his residence in the interior, the science of botany, the special object of his mission and researches, was in consequence that to which his chief attention was directed.

generally

generally of a rounded and indeterminate form; nevertheless, on one of the specimens in the King's collection I observed among them a complete hexahedral prism, and another with many small facets on the edges of its terminal planes. These crystals are but few in this gangue, which likewise contains, in still smaller quantity, some small crystals of spinelle of a pale-red or flesh-colour. They are even contained in the substance of the dolomite; their form is either a regular octahedron, a cuneiform octahedron, or an octahedron the edges of which are replaced by a plane. The dolomite of this gangue dissolves in nitric acid, without any sensible effervescence, and with extreme slowness: a small fragment requires forty-eight hours for its complete solution. It was found by M. Leschenault very near Candy. It is likewise found, as well as the two following gangues, in the isolated rocks at the feet of the elevated mountains which separate Candy from Columbo, and upon the road which joins those two towns.

The second gangue is likewise dolomite, in a lamellary state, and formed, in the same manner as the preceding, of particular masses, but smaller and crossing each other in different directions. When first placed in nitric acid, it produces a very lively effervescence, which becomes weaker by degrees, and at last very feeble. In a short time after it has been placed in the acid, it becomes disintegrated into an infinity of small particles, the greater number of which continue to dissolve very quickly. The analysis which has been made of it gives more carbonate of lime than is necessary to the composition of dolomite. I strongly suspect this rock to contain some particles of carbonate of lime interposed in its substance; from which would arise the lively effect of the acid upon coming into contact with it, its quick solution, as well as the disintegration which it undergoes. This second gangue contains, in rather greater proportion than the preceding, some flesh-coloured crystals of spinelle. It also contains some very small crystals of mica of a very deep yellow colour. Here and there likewise may be observed some small crystals of pyrites, of the icosahedral variety; but I have not observed any trace of phosphate of lime. This gangue was found by M. Leschenault seven leagues east from Candy.

Although the third gangue of spinelle is from the same district as the former, it is essentially different, and of a very particular nature. It consists of very coarse grains, the texture of each of which is lamellated. Of these grains a very great number are white, and their fracture has a very brilliant

lustre; they belong to the dolomite. The others have a gray tint, and their fracture is less bright; they belong to carbonate of lime; but they are mingled with interposed particles of dolomite.

In this gangue are disseminated some small icosahedrons of pyrites, some crystals of mica, of an orange yellow; some amorphous particles, and also some regular crystals of apatite, resembling in their green colour the variety called spargelstein of Spain. It likewise contains a still greater quantity of this substance in small flattened hexahedral prisms, very difficult to recognise on account of a thin white layer which entirely covers them; but when this is removed, the green colour of the apatite appears. I am ignorant whether this white layer arises from an alteration of the apatite, or whether it belongs to another substance which would be completely insoluble in acids; for it was in dissolving this rock in nitric acid that I obtained these crystals. This gangue contains, besides, many minute particles of magnetic pyrites, and likewise a considerable quantity of small crystals of spinelle, of a fine rose colour. I observed among the latter some complete octahedrons, some with the edges replaced, and some, each of the solid angles of which was replaced by four planes, placed upon the faces, as frequently seen in the pleonaste spinelle of Mount Somma, and which I have also observed in the red spinelles found in the sand of the Ceylon rivers. Some of the yellow crystals of mica have a brilliant lustre, on which account they might be very easily taken for some of the hard stones called gems.

The memoir on Corundum, which I presented to the Royal Society of London, having been printed in the *Journal des Mines* for 1803, by referring to pages 97 and 98 of the Number for May of that Journal, it will be seen that this gangue is absolutely of the same nature as those sent to London, from the island of Ceylon, in 1801 or 1802, for the first and the last time*.

The fourth gangue of spinelle is extremely interesting: it is composed for the most part of spinelle and of mica. The spinelle is in octahedral crystals of a brown colour approaching to violet, and they are much larger than those contained in the gangues above described. The colour of some of them is so deep, that they appear to be black; they form one of the varieties of the pleonaste spinelle of Ceylon. These crystals, which are extremely abundant in this gangue, are very close to each other, and often form considerable masses, in which

* See also Phil. Trans. for 1802, p. 308-311.—EDIT.

some of them are in contact with others, and even penetrate them.

The mica is of a brown yellow colour, slightly orange by refracted light; it forms, in this gangue, considerable masses, to which we may give the name of "*mica en masse lamellaire*." The detached parts of these masses are perfectly transparent, and have a very brilliant lustre. By means of nitric acid I have extricated one of them, of the dimensions of two inches by one inch and three lines, from the carbonate of lime, which constitutes a part of the gangue; this mass is perfectly pure, with the exception of some insoluble particles which it contains; among which are particles of magnetic pyrites. I have never yet seen mica in such considerable masses presenting so beautiful and brilliant an aspect. The mica, which in this specimen is very pure, has sufficient solidity to resist pressure, and is consequently very suitable for the illustration of what I asserted for the first time in 1813, in the summary catalogue of my collection, now become that of the King, that the integrant particles of mica are of themselves of very great hardness, and that this substance is so easily broken on account of the weakness of the cohesive force which unites these particles to each other; but that, when small fragments or crystals of mica have sufficient thickness to resist pressure, they cut glass with facility, and will even scratch quartz, or at least deprive it of its polish, a fact which is further confirmed by the nature of its refraction, as well as by that of its reflective power*. The King's private collection possesses a suite of specimens of mica for study, which presents this extremely interesting substance under a great variety of aspects very little known. This suite, which in my opinion is unique, should be consulted in order to obtain a complete knowledge of this substance.

The fifth gangue is very particular: it is a girasol, mixed with particles of a slightly grayish white, with some of a yellowish green, and with others in the state of girasol jasper, on account of the hydrate of iron which is interposed in them. The specimen placed in the Royal collection has adhering to it a small piece in an earthy state, mixed with much brown

* All these characters induce me to believe that this fourth gangue of Ceylon spinelle is the same as that, which, according to Dr. Davy, forms hills in the vicinity of Candy, and in which he likewise observed crystals of ceylanite, which he seems to consider as a different substance from spinelle. I am ignorant of his reasons for making this distinction: ceylanite, it is true, contains a large proportion of iron, but the quantity of that metal varies in the different analyses which have been made of spinelle; I think, therefore, that it is merely interposed in the ceylanite.

36 Mr. S. Seaward's *Description of an improved Gauge*

mica, of which there are some small plates interposed, even in the substance of the girasol. This gangue contains, in the interior of its substance, a considerable quantity of pale-blue crystallized spinelle, among which, however, there are some crystals of so deep a blue that they appear black. M. Leschenault only found this rock on the bank of a river seven miles to the north-east of Candy, on the route to the province of Fassagram, where he met with it in isolated masses.

The sixth gangue of Ceylon spinelle, which is still more particular, is a rock of a granitic aspect, in which the mica is replaced by molybdena in small thin laminæ. This rock is principally composed of transparent granular felspar, and of these laminæ of molybdena. One may observe, besides, some little plates of brown mica, which are thinly disseminated, and a great number of very pale-red crystals of spinelle. This rock was found by M. Leschenault, seven miles to the north-east of Candy, in the same district as the preceding, and likewise in isolated masses upon the bank of the same river.

I may add to the description of these gangues of spinelle, that of a seventh, which is the second of those I have described in the paper on Corundum, printed in the Philosophical Transactions for 1802. This gangue consists principally of transparent felspar or adularia, pure in one part, and mixed in the other with magnetic pyrites and a little carbonate of lime. Some small crystals of spinelle are disseminated in it, but more thinly than in the other gangue mentioned in the same memoir.

VII. *Description of an improved Gauge for ascertaining with Precision the Pressure of highly compressed Steam, Gases, and Fluid Bodies.* By Mr. SAMUEL SEAWARD.

To the Editors of the Philosophical Magazine and Journal.

Gentlemen,

PERMIT me to offer you the accompanying description of a gauge for measuring the pressure of highly compressed fluids or gases, which I shall feel gratified by your introducing into your valuable Magazine, if you consider it deserving of that distinction.

I am, gentlemen, yours, &c.

3 Charles Street, City Road,
Jan. 14, 1824.

SAMUEL SEAWARD.

Descrip-