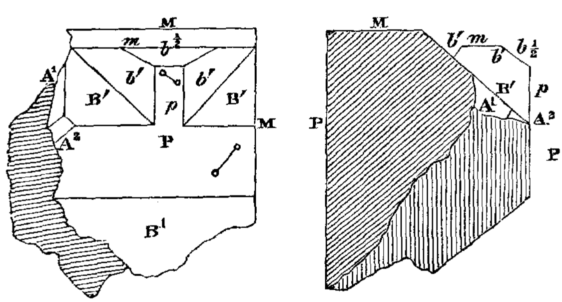
VII. *Note on the Law of Twinning and Hemihedrism of Leucophane.* *By* EMILE BERTRAND, *Paris**.

THE crystallography of leucophane has been treated of by Professor Des Cloizeaux in his *Manuel de Minéralogie*, by Mr. Greg (Phil. Mag. [IV.], vol. ix. p. 510), and by Professor Von Lang (*Mineral. Mittheil. Tschermak*, 1871). I have also published a note on this mineral in the *Annales des Mines*, vol. iii. 1873; but up to the present time two interesting facts concerning it have not been noticed. It is known that leucophane has a very good cleavage parallel to the base, $p = 0\,0\,1$, and that the acute bisectrix of the optic axes is perpendicular to this cleavage. With a sufficiently large plate it is easy to obtain with the polarizing microscope two directions apparently at 90° to one another, in which the hyperbolæ and the lemniscates are perceived.

In certain cases one finds two crystals separated by a single plane of junction which have the planes of their optic axes orientated at about 90° to one another. In other cases one observes a series of very narrow bands corresponding to as many crystals of which the axes are situated in planes making angles of nearly 90° with one another. By an examination of a great number of cleavages of leucophane, I have succeeded in establishing that these twins are very frequent, especially in plates of some magnitude. I shall describe a very good twin crystal of this kind, which, moreover, presents another peculiarity. It consists of two crystals placed at about 90° to one another, the two bases lying in one and the same plane.



Each of these crystals shows two well-developed faces, $b^1 = 1\,1\,2$, truncating two edges parallel to the base; the two

* Read April 12, 1877.

other edges are not truncated in the large crystal; but in the smaller one faces $b^{\frac{1}{2}}=1\,1\,1$ are found truncating these edges.

Is, then, leucophane hemihedral, and indeed doubly so, as is the case with edingtonite? To prove this, the observation of a large number of crystals will be necessary; and unfortunately crystals of leucophane are very rare. I have examined a crystal in the collection of Mr. Adam, which presents the same hemihedrism: two edges parallel to the base are modified by $b^1=1\,1\,2$, and one of the two others by $b^{\frac{1}{2}}=1\,1\,1$. The fourth edge is not present, owing to the crystal being broken at this part.

The British Museum also contains a crystal which I have not examined; but the figure of the crystal published in Tschermak's *Mineral. Mittheil.* (1871) shows that the crystal is modified differently on the four edges of the base. This crystal therefore seems to present the same hemihedrism as that noticed above. Without pronouncing definitely on the hemihedrism, I think that there is sufficient probability to justify me in calling attention to the fact, and to encourage an examination as to whether other crystals present the same hemihedrism.

Instead of considering leucophane to be hemihedral, one might suppose that it belonged to the oblique system rather than to the prismatic. On this supposition the base would become the plane of symmetry $g^1=0\,1\,0$, the bisectrix of the optic axis would be the horizontal diagonal of the base, the faces $b^1=1\,1\,2$ and $b^{\frac{1}{2}}=1\,1\,1$ would become $m=1\,1\,0$ and $e^4=1\,0\,4$ respectively. But this supposition would only be admissible if the hemihedrism to which I have called attention were a hemihedrism with parallel faces; for in the case of a hemihedrism with inclined faces one would not find the four vertical faces necessary for forming the prism. But the twinned specimen of which I have spoken above shows very clearly a hemihedrism with inclined faces. Moreover, if leucophane crystallized in the oblique system one would probably observe a crossed dispersion in the polarizing microscope, whereas the symmetry of the dispersion of the colours is most perfect. This does not constitute a proof, but renders it extremely probable that the system is prismatic.

I have likewise proved that the trace of the plane of the optic axes on the face $p=0\,0\,1$, parallel to the cleavage, coincides with the diagonal of this face; for if a twinned plate be examined with the ordinary microscope between two Nicols, the line of separation of the two crystals is observed to be situated very approximately at 45° to the trace of the plane of the optic axes of each of the two crystals, the plane of the optic axes of one crystal being at 90° to that of the other.

This coincidence, which is necessary in the prismatic system, but not in the oblique, gives a fresh argument in favour of the system being prismatic.

We may therefore conclude that the greater part of the crystals of leucophane are twinned and most probably hemihedral. It will be interesting to obtain evidence whether other crystals besides those mentioned above present the same hemihedrism.

VIII. *Crystallographic Notes. By* W. J. Lewis, *M.A., Felllow of Oriel College, Oxford, and Assistant in the Mineral Department, British Museum**.

[Plate III.]

Barium Nitrate.

LAST autumn my friend Mr. T. Davies, of the British Museum, kindly brought me a fairly large crystal with a very large number of faces on it. It had been found at the bottom of a reagent-bottle which had been put aside for many years. The solution, owing to a faulty stopper, had all evaporated, leaving this single crystal. The label had been lost; so, after a crystallographic investigation, I scraped off a very small portion from a part on which were no crystal-faces. By means of this I was able to determine that the crystal was one of barium nitrate. I have thought that a description of its crystallography would be interesting, both on account of the remarkable development of its faces and its decided tetartohedrism. The facts already known about barium nitrate are that it crystallizes in the cubic system, shows a hemihedrism with parallel faces, and has the forms $\{1\,0\,0\}$, $\{1\,1\,1\}$, $\pi\{2\,1\,0\}$, and $\kappa\pi\{1\,2\,4\}$ (Scacchi, *Pogg.* cix.).

The forms observed on the crystal in question are $a=\{1\,0\,0\}$,

* Read April 12, 1877.

Barium Nitrate.

Fig. 1.

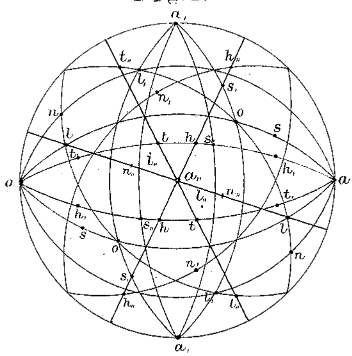


Fig. 2.

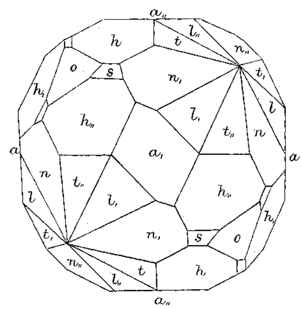
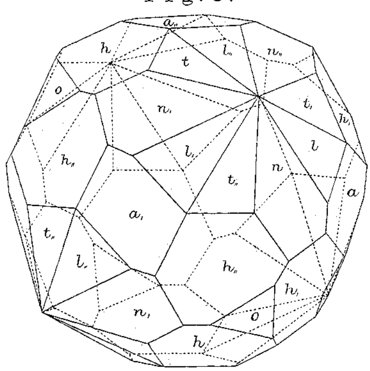


Fig. 3.



Sphene

Fig. 34. *From Hessenberg's Min. Not. VI.*

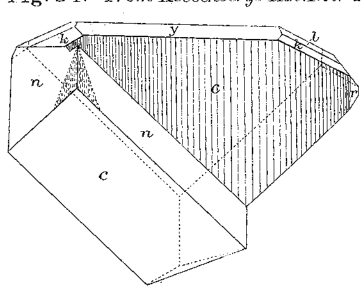
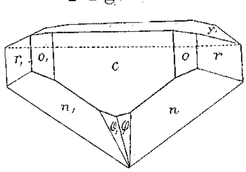


Fig. 4.



Mintern Bros. lith.