

said above, the motion is provoked by the least possible breath of air.

I do not remember a mechanism entirely like this elsewhere among either Orchids or other Phanerogams. Many Orchids are provided with long fringes, but these are due to excessive dissection of the sepals (as in *Cirrhopetalum*), or to hairs—often multicellular—which, however, are non-versatile. Mr. Rolfe, of the Kew Herbarium, reminds me of the case of *Bolbophyllum lemniscatum*. I need not here further mention the extraordinary appendages of the sepals: they are figured in the *Botanical Magazine*, Pl. 5967.

The labellum in *P. ornatus* is quite small: in Fig. 1 it is shown at *l*, but in the lateral view (Fig. 2) it is hidden by the two petals (*i.p.*). Like the labellum in so many allied Orchids, it moves readily on its narrowed neck if touched. The oscillations are performed especially in a vertical plane.

The usually accepted view as to the meaning of this vibratility is that hinted at by Morren ("Recherches sur le mouvement et l'anatomie du labellum du *Megaclinium falcatum*," 1841, p. 95) and Darwin ("Fertilization of

well enough how such an arrangement can aid cross-fertilization.<sup>1</sup> I believe this is the chief part played by the vibratile labellum in *Bolbophyllum*, in which genus the elasticity is especially manifest. This in no way excludes the attractive function suggested by Darwin. This latter could only hold for cases where the labellum is easily visible outside the flower, and for such cases as *B. barbigerum*, *B. tremulum*, &c., where it is richly plumed. On the other hand, there is no reason why the "spring-board" function should not operate in every case of vibratile labellum; hence I regard this as its primary significance, whilst the attractive one is secondary only. This is a question which I hope soon to follow up.

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#### CUBIC CRYSTALS OF GRAPHITIC CARBON.

IN the analysis of a meteoric iron found in 1884 in the sub-district of Youndegin, Western Australia, and of which two of the four fragments have been generously presented to the British Museum by the Rev. Charles G. Nicolay, Curator of the Geological Museum, Fremantle, I have obtained some crystals, a description of which may be of interest to the students of carbon.

The crystals were obtained as an insoluble residue on treatment of 8·3200 grammes of the iron with aqua regia: they are bright, opaque, grayish-black, have a metallic lustre, and present forms belonging to the cubic system. As their characters were not recognized as belonging to any known mineral, it seemed unlikely that the nature of the crystals could be completely determined, seeing that the total weight obtained was only 3 milligrammes; further, two fragments of the iron, weighing 2 and 7 grammes respectively, had not yielded a single crystal, and there was thus a possibility of their being so localized in the iron as to render impracticable an increase of the quantity of material available for experiment.

The crystals were about a hundred in number, the average thickness of the larger ones being 1/100 of an inch. Many of them are sharply defined cubes; some have their edges truncated by the faces of the dodecahedron; in others the edges are replaced by rounded faces of a tetrakisshexahedron.

Their hardness is greater than that of rock salt and less than that of calcite: the streak is black and shining. Of four crystals, two sank to the bottom and two remained near the surface of a solution having a specific gravity of 2·12. The crystals are unaffected by acids: heated in a combustion-tube in a current of oxygen, hydrogen, or chlorine, they are unattacked, even when the glass begins to melt. Heated in a platinum capsule with the table-blowpipe, they slowly disappear without flame. Heated with potassium nitrate in a crucible over a Bunsen burner, they are unaltered; but disappear very slowly, without deflagration, when heated with the table-blowpipe.

In density, colour, and streak, and in its chemical behaviour, the residual mineral thus bears a close resemblance to native graphite, but it is considerably harder, and it presents itself in well-defined crystals which belong, like those of the other crystallized form of carbon, the diamond, to the cubic system: terrestrial graphite, when crystallized, is found only as tabular crystals so indistinctly formed that doubt has long existed as to whether they should be referred to the hexagonal or monosymmetric system.

In a paper entitled "Graphite pseudomorphous after Iron Pyrites," Haidinger, in 1846, described some graphitic crystals which were doubtless similar to those furnished by the Youndegin iron: his observation, however,

<sup>1</sup> Regarding the nature of the pollinia, and their mode of removal in *Pleurothallis*, vide Darwin, *loc. cit.* p. 166.

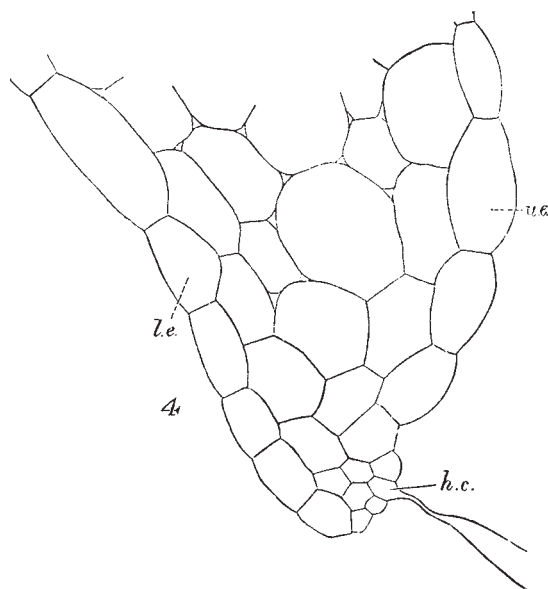


FIG. 4.—Transverse section through the edge of a sepal, showing the insertion of one of the vibratile hairs. *h.c.*, cell bearing the hair (part of which is represented); *l.e.*, epidermis of lower side of sepal; *u.e.*, epidermis of upper side.

Orchids," p. 171); *l.e.* that by the continued motion of the labellum caused by the wind, insects are led from motives of curiosity to visit the flower. This explanation will hardly hold for such a genus as *Pleurothallis*, where the labellum is extremely small, and its motion would be hardly obvious from outside the flower. Here the labellum acts rather as a spring-board. The insect entering the flower will lean upon and displace the labellum, which, from the extreme elasticity of its neck, will oscillate up and down in precisely the same manner as a spring-board would. By this is insured the insect's head being thrust against the stigma or pollen-masses, and the act of pollinization promoted. Sometimes I have found that if the labellum be displaced by gently pressing downwards it will be retained for a few seconds in the displaced position on removing the force. Soon, however, the elastic reaction overcomes the resistance of the sepals (by which it is temporarily jammed), and the labellum flies up again, considerably overstripping its normal position of rest. After one or more small oscillations, it comes to rest. Such a simple experiment as this shows

has been forgotten, and is without record in modern meteoric literature. The crystals—of the size, number, and completeness of which Haidinger makes no mention—were obtained by him from a nodule of graphite which had dropped out of the Arva meteoric iron, and chiefly from a study of their form he inferred that they were pseudomorphous after iron pyrites. Even yet no iron pyrites, crystallized or massive, has been found in a meteorite, the meteoric sulphide of iron being, not the bisulphide, but the protosulphide: further, Gustav Rose, after examination of the crystals, expressed the opinion that the replacement of the edges of the cubes was suggestive rather of holosymmetry than of hemisymmetry, an interpretation which would exclude iron pyrites as a possible antecedent mineral.

The Younegin graphitic crystals support the view entertained by Rose: the existence of the dodecahedron face, of which there is goniometrical proof, is of itself quite sufficient to show that the crystalline form is distinct from that of iron pyrites.

The iron pyrites theory being discarded, and the fact being recognized that no mineral constituent of meteorites has yet been found which crystallizes in forms similar to those of the graphitic crystals, there naturally arises a feeling of doubt as to the correctness of the view according to which they are of pseudomorphic origin, and thus a question as to whether they may not possibly be a third allotropic condition of crystallized carbon presenting the general characters of graphite, but a crystalline form frequent in the diamond.

Bischof denies the possibility of explaining the pseudomorphism of terrestrial minerals by any other process than the slow action of water, of which there is no evidence in meteorites; and though it would be unsafe to argue that only in this way could meteoric pseudomorphs be produced, there is sufficient difficulty in their explanation to demand strong evidence before the pseudomorphism of the graphitic crystals is granted, more especially when we have regard to the fact that no other graphitic pseudomorph has yet been established either in meteoric or in terrestrial minerals.

Examination of the Younegin crystals under the microscope shows that some of them are hollow, and appear to be built up of successive cubical shells: on several of the crystals there are globular growths covering a large part of a cube-face, and occasionally the globule is broken, and is seen to be merely a thin, now empty, shell, of which the bottom is the face of the cube. The crystals are easily frangible, and no cleavages were observed: they appear to be quite homogeneous in their material.

Although some of these characters suggest a pseudomorphic origin of the crystalline form, it cannot be said that they prove it. Both of the recognized crystalline forms of carbon, graphite and diamond, have long been standing difficulties for the crystallographer. As already pointed out, the crystals of graphite are rarely more than mere tables, of which there is a controversy as to the crystalline system; those of the diamond are often so different in their geometrical characters from the crystals of every other known substance, that it cannot be satisfactorily determined whether they are to be referred to a holosymmetric or to a hemisymmetric type.

Hollow and skeleton crystals are often the result of a hurried crystallization, as is so well seen in the artificial crystals of bismuth and of common salt. The diamond, too, when in cubes, has faces more uneven than those of the Younegin crystals, and shows usually the same replacement of its edges by rounded faces of tetrakishehexahedra.

It thus might be argued with some force that the Younegin crystals have been the result of a hurried crystallization of carbon, and that, while striving to reach a dignity which has been assigned to cubes of diamond, they have been overtaken by misfortune and come out in

cubes of the less honoured mineral, graphite. The obtuse, almost flat, square pyramid seen on some of the cube-faces, the hollow globular growths, the occasional parallelism of the grouping of the cubes are distinct, however, from what is met with in the diamond.

And after consideration of all the observed characters of these crystals it will be seen that the explanation of the occurrence of the crystals in the interior of a mass of iron by means of pseudomorphism is untenable. Though the easy frangibility, the absence of evidence of cleavage, the hollowness, and the occasionally crust-like structure, are more or less characteristic of pseudomorphic crystals, they are not incompatible with an independent crystallization: on the other hand, while the superior hardness distinguishes the crystals from those of native terrestrial graphite, the separateness, completeness, and general excellence of the crystals, the delicacy of various acicular projections, and more especially of the obtuse, almost flat, square pyramid seen on some of the cube-faces, are sufficient to prove that the crystalline form never had a previous tenant. The delicacy of the acicular projections is such that the crystals must have been formed *in situ*. In case of pseudomorphism the elements of the original mineral ought to be in the vicinity of the crystals, and there ought to be an excess either of the original mineral or of the replacing amorphous graphitic carbon: both are, however, conspicuous by their absence, and in this fragment of the iron the whole of the graphitic carbon is present as cubic crystals.

On examination of a large graphitic nodule from the Cocke County meteoric iron, now in the British Museum, crystals of graphitic carbon, cubo-octahedral in form, are to be seen in some of the crevices.

There can be absolutely no doubt that the graphitic crystals are the result of crystallization of the meteoric graphite, and that they represent a third allotropic condition of crystallized carbon, the general characters being those of graphite, and the crystalline system that of the diamond.

As this form of graphitic carbon is unknown among terrestrial minerals, and has so important a bearing on the formation of meteoric graphite, it may conveniently receive a special name; I suggest the term "cliftonite," after Prof. R. B. Clifton, F.R.S., who has long been interested in the physical characters of minerals, and has done much to encourage their study.

A full description of the meteoric iron itself and of the graphitic crystals will appear in the forthcoming number of the Journal of the Mineralogical Society.

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#### NOTES.

WE are glad to learn that at the Naval Review (some lessons suggested by which we may refer to in a future number) 120 official invitations were sent out to men of science, while many were hospitably entertained by the Peninsular and Oriental, the Orient, the British India, and the Cable-Laying Companies. Some time next century we may hope that the existence of science, of a Royal Society, and of eminent scientific men employed in the public departments, may dawn upon the then Lord Chamberlain.

THE Jubilee dinner of the Electric Telegraph, which is going on as we go to press, is a brilliant affair, to which we shall refer at length next week.

WE print to-day the text of the Technical Education Bill. It was absolutely necessary that some such measure should be introduced, and we may hope that as it has no relation to party politics it will be passed without much difficulty. One change in the Bill ought certainly to be made. According to the fourth clause, there is to be no payment out of the local rate in respect of a scholar unless or until he has passed the sixth standard. This may be a very proper provision so far as boys are concerned;