

seeds that have been found at St. Etienne and in other parts of France, and the probable connection of a considerable portion of them with these fern-like genera.*

About the last work done by Adolphe Brongniart was the elaboration of the collections of these silicified seeds, the results of which were published posthumously in a large monograph.† In the light of recent discoveries this work assumes special importance. From such an examination as I was able to make in 1900, in company with M. Potonié and under the guidance of M. Grand'Eury, of the beds of St. Etienne, from which most of these seeds were obtained, I conclude that it is doubtful whether any will be found there attached to stems or fronds, but some may be so found, and, as we have seen, they are being so found in other places.

These and other considerations which need not be introduced here have led me to the conclusion that the plants in question should not be classed either as Pteridophyta or as Spermatophyta, but should be regarded as constituting a distinct phylum intermediate between the two, for which I proposed the name Pteridospermaphyta. The three great types to which the Paleozoic seed plants, exclusive of recognized Gymnosperms, either have proved or are likely to prove to be allied are the Ferns, the Calamites and the Lepidophytes. It therefore seems probable that there will need to be recognized three corresponding classes, which should be called, respectively, the Pteridospermæ, the Calamospermæ and the Lepidospermæ. The first of these names has already been appropriately used, unless, as Potonié's classification of *Lyginodendron* in the Lepidodendraceæ would imply, that plant has its closest affinities with the Lepidophytes. In that case it would belong to the class Lepidospermæ. Those having affinities with the Calamarians or Equisetineæ, such as the Stephanosperma, believed to have been borne by *Calamodendron* or *Arthropitys*, would belong to the class Calamospermæ, while those

seeds borne by plants having the foliage of ferns, such as *Neuropteris heterophylla*, would belong to the class Pteridospermæ.

If it be said that the existence of seeds necessarily places a plant in the Spermatophyta, the answer is that at the stage in plant development to which those forms belonged it will not probably prove possible to maintain any such sharp line of demarkation. The distinction between microspores and pollen has already practically broken down, and Kidston now regards the spores of *Neuropteris heterophylla* as the male inflorescence. In like manner the distinction between macrospores and seeds is likely to break down, and the attempt to retain plants of such low organization in the Spermatophyta will present grave difficulties. By establishing an intermediate phylum to which all forms may be referred as fast as the appropriate parts are discovered, all these difficulties will be removed. We should then have the following classification of vascular plants:

PHYLA.	CLASSES.
Pteridophyta.....	{ Filicineæ. Equisetineæ. Lycopodineæ.
Pteridospermaphyta.....	{ Pteridospermæ. Calamospermæ. Lepidospermæ.
Spermatophyta.....	{ Gymnospermæ. Angiospermæ.

LESTER F. WARD.

THE SOUFRIÈRE OF ST. VINCENT IN JULY, 1904.

TO THE EDITOR OF SCIENCE: When the report was circulated in the daily papers of this country that Mont Pelé was in full eruption again, May 8, 1904, the second anniversary of the destruction of St. Pierre, the author wrote to correspondents in Martinique and St. Vincent for particular information as to the condition of the volcanoes which roused so much attention throughout the world two years ago. The data regarding Mont Pelé were published in SCIENCE for July 1, 1904.*

From St. Vincent comes the statement that everything has been quiet at the Soufrière since the great eruptions in the latter part of

* Hovey, 'Mont Pelé from October 20, 1903, to May 20, 1904,' SCIENCE, N. S., Vol. XX., pp. 23-24.

* *Comptes Rendus*, Vol. CXXXIX., pp. 23-27.

† 'Recherches sur les Graines Fossiles Silicifiées,' par Adolphe Brongniart, Paris, 1881, fol. with 21 plates, many colored.

March, 1903. The present condition of the volcano is shown by the following extract from a letter to the author written July 13, 1904, by Rev. Thomas Huckerby of Château Belair, St. Vincent:

The general condition of things is far different from what it was twelve months ago. At the present time there is very little emission of steam from the fissures which formed themselves in the ejecta left inside the crater after the last eruption. The surface of the lake is gradually widening, which result is brought about by the falling down of the ashy sides of the immense bowl. Large quantities of material from the top of the perpendicular windward side are falling in, which cause will ultimately bring back the gradual declivity of former years. I should say that the crater, from east to west, is considerably over a mile in diameter. There is still a very strong smell of sulphuretted hydrogen, which at times is perceptible at Château Belair. It is surprising to find that much of the vegetation especially near the base of the mountain has survived through all the adverse circumstances of the past two years; even the maroon tree is throwing out shoots from its battered and charred roots. The mongoose has found his way back to a point above the Half-Way Tree. I think that we may with safety conclude that the god Vulcan has quietened down to another period of rest as far as St. Vincent is concerned.

Mr. Huckerby also forwards a photograph of the interior of the crater which indicates not only a widening of the lake due to the falling in of the walls, but also a rise due to the accumulation of water. It is evident that the mountain is rapidly resuming its former condition and appearance under the influence of the agencies which tend towards the rapid decomposition of rock material in the tropics.

EDMUND OTIS HOVEY.

AMERICAN MUSEUM OF NATURAL HISTORY,
August 4, 1904.

SPECIAL ARTICLES.

THE INHERITANCE OF SONG IN PASSERINE BIRDS.

Further Observation on the Development of Song and Nest-building in Hand-reared Rose-breasted Grosbeaks, Zamelodia Ludoviciana (Linnaeus).

IN a paper published in SCIENCE, June 24, 1904,* I have recorded some observations in

* SCIENCE, N. S., Vol. XIX., No. 495, pp. 957-959, June 24, 1904.

regard to the growth, plumage and song of hand-reared rose-breasted grosbeaks. It is the purpose of the present paper to carry these observations a step further and to describe what occurred to the birds after they were mated, as recorded in the foregoing paper.

About the third week in May, 1904, the song of the two male birds, each of which now had a mate, became crystallized and assumed a definite character, which was almost alike in both, but was absolutely and entirely different from the song of the rose-breasted grosbeak as it is heard when wild out of doors. I have had for some years in a cage one of the green bulbuls of India, known as Hardwick's bulbul, *Chloropsis hardwickii*, Jardine & Selby. This bird is singularly persistent in singing for about nine months in the year. It is a male. My two pairs of rose-breasted grosbeaks were in a cage adjacent to that of the bulbul, and by the middle of May of the present year the songs of the two male grosbeaks were so closely an imitation of the insistent song of the bulbul that it was difficult, when not looking at the birds, to tell which species was singing. I may say that the song of the green bulbul is emphatic, clear, high-pitched, rather melodious and delivered so that the whole does not occupy more time than does the song of the song sparrow, which, in a certain way, this song resembles. The song of the rose-breasted grosbeak as heard in wild birds I should describe as being like that of the robin, but more melodious and richer, and uttered with much greater deliberation. It will be perceived that the contrast between this kind of song and that of the bulbul is great. This song was constant and of daily occurrence throughout the last ten days of May and the whole of June, but ceased and was given up entirely by July 4.

During the whole of May (the pairs having mated and being in different cages), the process of mating, and later the matters of nest-building and laying were carried on as I shall now set forth. After much preliminary courting on the part of the males, which was accompanied by some severe quarrels between the mating birds, they finally became paired. These quarrels were at times so severe that it was essential to separate the birds for periods