in addition graduate courses are offered, for which certificates will be issued, counting toward special degrees to be created.

A new university is to be founded at Perth, Western Australia. Mr. Cecil Andrews, who represents the commission charged with carrying out the project, is at present visiting the universities of this country.

Dr. George H. Denny, president since 1902 and previously professor of Latin at Washington and Lee University, has been elected president of the University of Alabama.

Dr. A. S. Pearse goes to the St. Louis University School of Medicine as associate professor of biology.

At the University of Maine, Mr. Earle O. Whittier has been appointed instructor in chemistry and Mr. Clayton Urey, instructor in physics.

New appointments in the faculty for the University of Montana for 1911–12 are as follows: Honorable John B. Clayberg, honorary dean and professor of Montana practise and mining irrigation law; H. W. Ballantine, acting dean and professor of law; Philip S. Biegler, assistant professor of electrical engineering; George H. Cunningham, instructor in mechanical engineering; G. A. Gross, instructor in engineering shops.

The faculty of Middlebury College, Vermont, has increased from twelve to twenty-five in the last four years. There are eight new instructors this year, all but two of them filling new positions. These include: Avery E. Lambert, Ph.D., assistant professor of zoology, from the State Normal School, Framingham, Mass.; C. Allan Lyford, A.M., assistant professor of geology from Clark College; George H. Cresse, A.M., assistant professor of mathematics; Ray L. Fisher, assistant professor of physical education and director of athletics; Irving W. Davis, instructor in pomology.

Dr. Duncan Graham has been appointed lecturer on bacteriology at the University of Toronto.

Dr. Alex. Findlay, special lecturer at the University of Birmingham, has been appointed professor of chemistry in the University of Wales at Aberystwyth.

DISCUSSION AND CORRESPONDENCE

A CARBONIFEROUS FLORA IN THE SILURIAN?

Under the caption "The Oldest Silurian Flora" Dr. G. F. Matthews[1] has recently set forth geological conclusions and correlations, which, if true, mean nothing less than the condition implied by the above title.

History shows, even in the literature of geology and paleontology, that if error be reiterated with sufficient frequency and vociferation it will, unless disproved or controverted, gradually gain credence and eventually tacit acceptance. Sometimes, therefore, as in the present instance, so persistent is the erroneous utterance, it unfortunately becomes necessary to repeat the protest; and in order that the paleobotanical misinformation contained in Dr. Matthews's last article may not, as in some preceding instances, find unopposed entrance to the text-books, the common dogma of geology, it obviously becomes somebody's unpleasant duty to challenge his conclusions. This I regretfully do, the seemingly inane title of this note being an epitome of the issue.

It concerns mainly the flora and the age of the "fern ledges"—the "Cordaites shale" and the "Dadoxylon sandstones"—at St. John and Lepreau, near the Bay of Fundy, which Sir William Dawson more than forty years ago referred to the Devonian, and which Matthews now declares are, in part at least, Silurian. Soon after the publication of Dawson's papers mild protests were offered by Geinitz and several others at placing beds with such distinctly Carboniferous plants and insects in the Devonian. About thirty years later, when both the Devonian and the Carboniferous floras were far better known and their stratigraphic significance more definitely determined, opposition was again made by Mr. Robert Kidston, the highest British authority on the Paleozoic floras, and myself, each of whom had examined collections from the disputed beds. Each, wholly without knowledge of the other's views, at once referred the flora to the Carboniferous, both regarding the plants as probably belonging

[1] *Bull. Nat. Hist. Soc. New Brunswick*, No. 28, 1910, pp. 241–249.

to the Pottsville group, which covers the "Lower" and "Middle Coal Measures" of the British Isles. As to their Carboniferous age neither of us had any doubt; and I think I speak correctly for Mr. Kidston when I add that the extensive discoveries of the past ten years, though without exception confirmative of our correlations, can have made us but little more certain of our ground. In reply we have heard repeated the arguments of the "sixties," that the flora differs from all other Devonian floras because it is estuarine or marsh, and that the relative metamorphism and the stratigraphy of the beds unmistakably prove their Devonian age.

It is impossible here to give particulars or even the substance of the paleobotanical evidence. Briefly, it is clear that the flora comprises an association of genera characteristic of the Upper Carboniferous; that many of the species are identical with plants in the Pottsville of the Appalachian trough, while other forms differ no more than may naturally be expected in view of the remoteness and isolation of the basin; that all types characteristic of the Devonian, including estuarine and delta beds in other parts of the world, are absent; that the evidence of the associated animal fossils is in agreement with that of the plants; that the metamorphism is not greater than in the Rhode Island Coal Measures; and that, in this region of extensive Pleistocene and sea concealment, and of folding, faulting and metamorphism, the stratigraphic evidence presented is neither clear nor conclusive.

We are now told that the floras ("faunas") of the "fern ledges" are Silurian! They are said to differ from all other pre-Carboniferous floras because they are "delta" floras! To be more explicit, the plant-bearing delta deposits are correlated by him with other beds in different regions shown by their marine remains to be Silurian. The "Dadoxylon sandstones" are accordingly referred to No. 2 of the Mascarene Silurian series, while the "Cordaites shales" are said to belong to No. 3 of the same series. In other words, Dr. Matthews now concludes that the "fern ledges" are of Clinton and Niagara ages. By no process can he possibly be interpreted as permitting the youngest plant beds to be above the Helderberg. Hence, if any paleobotanist has at any time entertained sufficient confidence in the stratigraphic arguments to cause real anxiety lest the "fern ledges" might possibly be Devonian, the new stratigraphic "correlation" must certainly put him completely at ease.

The almost astounding faunal discoveries brought to light by Dr. Walcott in the Canadian Rockies should deeply impress on every paleontologist the virtue of conservatism; but the possible analogies with the "fern ledges" floras are very limited. The wonderfully preserved fauna exhibiting so wide a systematic range and such singular biologic relations in the Cambrian of Canada nevertheless comprises characteristic Cambrian fossils. On the other hand, to assume that under local environmental conditions (which there is no reason for regarding as unique) there were developed at one known spot in the world not only a group of identical genera in characteristic association, but also species in part identical with those later reproduced in the "Upper Carboniferous," the flora being largely composed of fern genera nowhere else known in pre-Carboniferous beds and devoid of all the Devonian and Silurian types supposed to be contemporaneous, is certainly going to the extreme in the doctrine of parallelism in development.

To return to Dr. Matthews's paper: The discussion of the "fern ledges" floras and their ages is supplementary to the announcement of the discovery, in beds correlated by Dr. Matthews with the No. 1 (Medina) division of the Mascarene series, at Beaver Harbor, New Brunswick, of an Arthrostigma flora. Arthrostigma has been regarded as characteristic of the Devonian. We shall therefore look forward with keen interest to the full publication with, let us hope, adequate illustration of this older flora. The new flora which is from a different region is said to have nothing in common with the "fern-ledges" floras, which include such common Carboniferous genera as *Calamites, Annularia. Astero-*

phyllites, Neuropteris, Alethopteris, Megalopteris, Pecopteris, Whittleseya and *Sigillaria.*

David White

PROFESSOR PUNNETT'S ERROR

In Professor Punnett's admirable little book, entitled "Mendelism," there occurs an error of definition that ought not to go unnoticed. This error, which runs through the whole book, begins on page 2, where may be found this statement: "Among animals the female contributes the ovum and the male the spermatozoon; among plants the corresponding cells are the ovules and pollen grains."

The last half of the quoted sentence contains three distinct errors: (1) Half of the plant kingdom possesses no pollen grains nor ovules, yet its members have parts that correspond with the ova and spermatozoa of animals; (2) the ovules and pollen grains are not *cells* but each is a cell complex; (3) it is a gross mistake to regard the pollen grains and ovules of plants as corresponding with the spermatozoa and ova of animals.

The first two mistakes might be passed over; but the third, in a book that is written for the reading public, is unfortunate and should be corrected in the next edition. The pollen grain is multicellular and the ovule is multicellular. The genetic cells of higher plants are produced in these bodies. It is as correct to call the testis of an animal a gamete as to call a pollen grain a gamete. The terminology of the genetic cells in plants need offer no difficulty to the zoologist. If he will consult the literature, or his botanical friends, he will find that, besides using the term *gamete* for the conjugating cells of both plants and animals, he may use *ovum* and *spermatozoon* for plants as well as for animals.

F. C. Newcombe

PHENOMENA OF FORKED LIGHTNING

As pointed out in a recent paper in Science, September 1, the negative end of a lightning discharge is forked. When visible we call it forked lightning. When such a system of drainage channels penetrates a shower of negatively charged drops, great differences in potential between drops not far removed from each other must be created. Before the flash the drops have approximately equal potentials. They then repel each other. Drops having radii of one mm. only need to be charged to a potential of 0.0031 volt in order that their repulsion for each other may balance their gravitational attraction.

As soon as the flash occurs these drops attract each other. They coalesce, and a brief dash of large drops of rain follows.

Francis E. Nipher

SCIENTIFIC BOOKS

A Study of Chiriquian Antiquities. By George Grant MacCurdy. Memoirs of the Connecticut Academy of Arts and Sciences, Vol. III., March, 1911. New Haven, Conn. Pp. 249, 384 text figures, 49 plates.

In a beautiful volume Dr. MacCurdy has given us the fruits of a long and patient investigation of the excellent collection of antiquities from Chiriqui in the Museum of Yale University. Not too much praise can be given to the painstaking examination and clear description of the long series of specimens, to the careful grouping of the material, which makes it possible for the student to master the wealth of new material with comparative ease. The author's description is about the same as that given by Holmes, but with a few modifications in terminology and grouping. Together with Professor Putnam's paper on conventionalism in ancient American art, and Professor Holmes's earlier description of ancient art of the province of Chiriqui, we have here material that needs only the additional researches of the field investigator to give us a clear picture of the archeology of a part of the Isthmian region. It is fortunate that, for a comparison of cultural types, the archeologist has at his disposal the two careful investigations by Dr. Hartman on the eastern and western parts of Costa Rica.

The illustrations in Dr. MacCurdy's volume are of the excellence of all the work of Mr. Rudolf Weber, whose illustrations of the publications of the Heye Expedition and for-