Several *terraces* exist on the border of Lake Michigan, near Michigan City, the highest of which—the fifth—is elevated 225 feet above the lake. The fourth is 95 feet above the same level, and contains much coarse gravel.

8. *Fossil Plants of the Coal-measures of Terrera, in the Atacama district, Chili.* (Bull. Soc. Geol. de France, III, iii, 572, 1876.)—The plants are Jurassic, of the Lower Lias or Rhætic beds, and included *Jeanpaulia Münsteriana* Presl., *Angiopteridium Münsteri* Gœpp., a *Pecopteris* (*P. Fuchsi*), near *P. Gœppertiana.*

III. Botany and Zoology.

1. *Sensitive Stigmas as an aid to cross fertilization of Flowers;* by Prof. W. J. Beal, (Proc. Amer. Assoc., Buffalo.)—The flowers of *Martynia proboscidia*, a plant sometimes raised in our gardens for pickles, has flowers drooping at an angle of about forty-five degrees. At the opening on the upper side are two flat stigmas, curved back away from each other, exposing the surface which is sensitive to pollen. Farther on are the four anthers, side by side, with their cells placed end to end. The opening is just large enough to take in the humble bee, or the common hive bee will do as well.

I have been carefully watching the Martynia plants for several weeks, since they have been in flower, every day and at nearly all hours and sometimes several times a day. I have the plants in four places, two of which are beds about four feet by ten. They are among other beds of flowering plants which are freely visited by various kinds of insects. I felt quite sure that the humble bee transferred pollen on his back, because I found the stigmas covered with pollen and closed before night each day. I could not contrive how else the pollen could be transferred. I began to fear I should have to give it up. But, one morning about nine o'clock, I saw a single humble bee pass from flower to flower on nearly every specimen on one patch of plants. The visit lasted only a few moments. All parts are quite sticky with glutinous hairs which seem to annoy the bees very much. I have never seen but one bee on the flowers of Martynia; she alighted on the spotted, showy part of the corolla, and crawled, first hitting the stigmas.

One of the most interesting points is now to be explained. The stigmas are sensitive to the touch, and close up in five to ten seconds; often before the insect is ready to back out of the flower. If they are not quite closed at that time, the bee shuts them by pushing her back against the back of one of the stigmas. The lower lobe of the flat stigma next to the bee's back is the larger. No pollen can be left as the insect retreats. A cross of pollen is usually certain. If not very freely dusted with pollen the stigmas open again in about fifteen minutes; if well dusted I have known them to remain closed afterward.

The single flat stigma of the iris, one on each of three sides of the flower, has often been shown to be sure of cross-fertilization, if

fertilized at all. Some years ago I examined hundreds of specimens as they were fertilized by bees. The stigma closes up after it is covered with pollen. It is sensitive to the touch; perhaps only slowly, but I think it moves back in a few seconds. I have examined no specimens lately with special reference to this point. The stigmas of *Mimulus ringens* are curved out like those of the Martynia, and project beyond the anthers. I have seen small native Hymenoptera visit this plant, always crawling in with the back down, although Mühler says in personate flowers the bees always get their backs up as they pass in. The stigmas of this *Mimulus* are slowly sensitive, closing in a few moments after they are touched or well supplied with pollen. The stigmas of the *Mimulus luteus* and *Mimulus moschatus*, and likely other species, close very quickly after being touched. *Tecoma radicans* and *Tecoma grandiflora* and probably other species, are very much like Martynia in the peculiarities mentioned. I have not lately had the opportunity of examining the flowers of the Bigonia or Catalpa but I shall expect to find them cross-fertilized in the same way as Tecomia aided by sensitive stigmas. *Utricularia vulgaris*, one of our larger common bladderworts, has a yellow irregular flower which considerably resembles that of the snap-dragon. The stigmas act much as in Martynia. The lower lip of the stigma is much the larger and when touched bends up close against the upper lip of the corolla just under an arch-like projection. The other nice adaptions for securing cross-fertilization are rather complicated and need not be given at this time.

Pinguicula is quite similar in structure to the Utricularia and is likely sensitive in its stigmas, and fertilized in the same way. All the stigmas which I have seen that are sensitive, stand with one side toward the space visited by insects, and if there are two together, the larger stigma comes next to the body of the insect. —*Buffalo Courier*, Aug. 25, 1876.

2. *On the theory of Evolution;* by Prof. COPE. (Proc. Acad. Nat. Sci. Philad., Feb., 1876.)—Prof. Cope gave a history of the progress of the doctrine of evolution of animal and vegetable types. While Darwin has been its prominent advocate within the last few years, it was first presented to the scientific world, in a rational form, by Lamarck of Paris, at the commencement of the present century. Owing to the adverse influence of Cuvier, the doctrine remained dormant for half a century, and Darwin resuscitated it, making important additions at the same time. Thus Lamarck found the variations of species to be the primary evidence of evolution by descent. Darwin enunciated the law of "natural selection" as a result of the struggle for existence, in accordance with which "the fittest" only survive. This law, now generally accepted, is Darwin's principal contribution to the doctrine. It, however, has a secondary position in relation to the *origin* of variation, which Lamarck saw, but did not account for, and which Darwin has to assume in order to have materials from which a "natural selection" can be made.