whole matter. 1, That *S. diplodictya* is not distinct from *S. crassijulis;* 2, that *S. crassijulis* is synonymous with *S. arctica* Pall. (which is the main point); and finally, 3, the familiar assertion that the *S. arctica* of Pallas *is not* the *S. arctica* of Robert Brown—a statement which can not be made too emphatic, in view of the placid acquiescence, for years past, in the dictum of Andersson to the contrary.

It is to regretted that a name grown so familiar as that of *S. arctica* R. Br. must needs be disturbed; on the other hand, *the open fact of the priority of S. arctica Pall. can not be ignored*, and as what Sir William J. Hooker was wont to call "Mr. Brown's S. arctica" was only sustained by the constant mention of the name of the distinguished author, let us hope that the substitution of this name for the one preoccupied may in a large measure preserve unbroken the old associations.

Rockford, Ill.

The Diatom marshes and Diatom beds of the Yellowstone National Park.

WALTER H. WEED.

It is well known that the minute algæ, to which the name of diatoms has been given, possess, in a remarkable degree, the power of separating silica from solution in the waters in which they live. This action is the more remarkable because the silica is often present in such exceedingly small amounts that an almost inconceivable activity on the part of the plant is required to obtain an adequate supply to form their frustules, while the separation of the silica must itself be referred to some vital force exerted by the plant during its growth. It is this action which gives to this low form of life its importance as a geological agent.

As the Diatomaceæ exist under very diverse and extreme conditions of environment, occurring in the icy waters of polar seas, the heated currents of the tropics, and even in the almost boiling waters of hot springs, they are in consequence the most widely distributed form of life known, and their common occurrence in ponds and ditches is well known to every microscopist. Nevertheless, contemporaneous deposits formed of their remains are usually small in comparison with

the immense beds of Tertiary age, which occur in many parts of the orld.

In the prosecution of geological work in the Yellowstone National Park, the writer has found that diatom beds of recent origin cover many square miles in the vicinity of the geyser and hot spring basins. These deposits, which are among the largest fresh water diatom beds of contemporary age known, are still forming by the growth of diatoms in the warm water marshes supplied by the hot spring waters.

These diatom marshes are sure to be remembered by all who may attempt to cross them, for the treacherous surface and apparently bottomless depths of the ooze offer an effectual barrier to any progress in that direction.

Near the Emerald springs at the Upper Geyser Basin of the Firehole river, the most noted geyser region of the park, there is a typical marsh of this character. The waters have in times past encroached upon the neighboring patch of timber, killing the pines (Pinus Murrayana), whose bare, gray trunks stand upright in the ooze or lie scattered about half immersed beneath the waters of the marsh. A subsequent partial recession of the water has left a bare, white strip between bog and wood, on which vegetation has as yet a feeble hold, and the gaunt poles of the dead pines stand in a white powdery soil that is evidently a dried portion of the marsh mud. A large part of this bog is covered with a sparse growth of brackish water plants, nd the drier parts are grass grown and form a fairly firm meadow bottom. The greater portion consists, however, of a semi-liquid, greenish gray, dirty looking ooze. Under the microscope this was found to consist of beautiful siliceous tests of various species of diatoms. Samples of this material, which Mr. Francis Wolle has kindly examined for me, were found to contain the following species:

Denticula valida	Epithemia hyndmannii
" elegans	Cocconema cymbiforma
Navicula major	Achnanthes gibberula
" viridis	Mastigloia smithii
Epithemia argus	Fragillaria—
" " var amphicephala	

The first species named, Denticula valida, was the most abundant, forming the bulk of the specimen. It may be of interest to note here that this species has been found in the gatherings from the geyser basins of Iceland.

The white pulverulent material at the margin of the bog

proved, upon microscopic examination, to consist of the dried remains of these same diatoms, and it is quite evident that this diatom ooze is forming a bed of diatomaceous earth. Subsequent investigation proves that a diatom ooze, consisting of the same species, forms the chief constituent of similar marshes all over the park.

It has also been found that the meadows of the geyser and hot spring basins were once marshes of this character, and are underlaid by beds of soft straw-colored or gray material which consists of the partially dried remains of diatoms. This material when dried is white, loosely coherent, soils the fingers, and consists either entirely or very largely of diatom tests. A number o specimens of this material collected from the Norris, Lower and Upper Geyser Basins, and the hot spring areas of Pelican Creek, were examined by Dr. Wolle, and found to consist of the species already named, forming a diatomaceous earth that is sometimes very pure, and sometimes mixed with more or less glassy silica formed by the drying of the siliceous jelly with which these organisms so often surround themselves.

These diatom beds cover many square miles in the vicinity of active or extinct hot spring vents of the park, and are often three feet, four feet and sometimes five to six feet thick. The wagon road leading to the geyser basins crosses several meadows of this character, notably immediately south of the Norris basin, Geyser meadows, and the meadows of the Upper and Lower basins of the Firehole. At these places the beds are exposed in the cuttings made for drainage, and square blocks of the dried diatom earth lie scattered about at the sides of the road.

In most of the cases observed, these diatom marshes cover ancient deposits of siliceous sinter, diatoms growing in the cooler waters of the decaying springs or their overflow, and covering the sinter beds until even the tops of the cones are submerged beneath the ooze and the vegetation it supports. This is actually the case at several places in the Lower Firehole Geyser Basin, and at the Lewis Lake and Pelican Creek hot spring areas. Such marshes also occur, however, where the cooler alkaline waters of the geysers and boiling springs overflow the natural surface of the ground.

The diatom ooze thus far observed is from cool or tepid waters, but in the collection of algæ from the hot springs of the park, and placed in the hand of Prof. W. G. Farlow for study and description, specimens of Denticula thermalis (Kg.)

have been found, and Mr. W. P. Blake found diatoms in the hot waters of the so-called "geysers" of California and Nevada hot springs.

U. S. Geological Survey, Washington, D. C.

Flowers and Insects. I.

CHARLES ROBERTSON.[1]

Delphinium tricorne Michx.—The flower agrees in most respects with D. elatum, as described by Müller.[2]

It is blue, but the exposed parts of the two upper petals which arch over the entrance to the spur are white, forming a sure guide to the nectar. In D. Ajacis, according to Sprengel (702),[3] the upper petals also form the pathfinders by a variation in color. In D. elatum yellow hairs on the lateral petals form the guides, while in D. Consolida pathfinders are wanting (Müller).

The lower petal has disappeared, since its attractive function has been usurped by the sepals. It is unnecessary as a protection to the stamens and pistils, and its presence in the median line would only prevent proper contact with the anthers and stigmas.

The parts whose function has been most imperfectly explained are the two lateral petals. These close over the numerous stamens, completely hiding them, but an entrance to the spur is left between them and the upper petals. When a bee visits the flower, the lateral petals are forced aside, and the under side of the bee's head comes in contact with the

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[1] The following series of papers is intended to give the results of observations begun in 1886, near Carlinville, Ill. It has been necessary at first to pay particular attention to collecting and determining the insects. Accordingly, in case of many flowers I am able at present to give only a list of visitors.

Mr. Cresson has compared my bees with his own type specimens in the collection of the American Entomological Society, except species of Halictus and Andrena. Professor S. W. Williston has kindly identified the Diptera. Mr. C A. Hart and Mr. Samuel Henshaw have aided me in identifying the Coleoptera. Prof. G H. French and Mr. Hart have named a number of Lepidoptera for me. I am also under obligations to Prof. S. A. Forbes for access to the collections and literature of the Illinois State Laboratory of Natural History, and to Prof. William Trelease for access to his valuable index of the bibliography and to much of the special literature of fertilization. Prof. Trelease has also placed at my disposal his unpublished notes on the subject and a collection of insects which he has taken on flowers.

[2] Unless otherwise specified, all references to Müller are to Herman Müller: Fertilization of Flowers. See also on this species Delpino: Ulteriori Osservazioni, and Lubbock: British Wild Flowers.

[3] The numbers in parenthesis after an author's name refer to Thompson's bibliography of the literature of fertilization, which is printed with Müller's Fertilization of Flowers. As this book is the most important source of information on the literature, references are practically thrown away on all who do not have access to it.