only from Cape Cod to New Jersey, abounding chiefly in the shore waters of Long Island sound and New York harbor.

This alga attains a length of 50 cm. and a breadth of 10 cm., but this is an unusual size. The ordinary specimen would not exceed 20 cm. in length and 5 cm. in breadth.

This plant attaches itself to the piles of wharves, pieces of decayed wood, and rarely grows on stones and shells. It grows most abundantly 6 to 10 feet below low tide mark. It is a diœcious plant, and also has a non-sexual method of reproduction. The antheridia are small, nearly transparent dots promiscuously distributed in the tissue of the thallus. When liberated, in salt water, the antherozoids are quite active, and while they were not observed fertilizing the female organ, it is safe to affirm that they accomplish a union with the female portion of the plant in the way common to algæ.

The female organ—the cystocarp—is jug-shape, with a prominent orifice. The cystocarps are found equally distributed on the surfaces of the thallus which is one cell thick. The interior of the cystocarp is very complicated. It develops from an apical cell. This further testifies that Dr. Schmitz's theory of the origin of the reproductive organs of the red algæ is true—namely, they are terminal growths, or branches of the frond.

Experiments in germinating spores were quite successful. Carpophores were cultivated for several days in salt water. Cell division was rapid and there were young filaments developed containing 16 to 20 cells. The study of spore germination and the development of the young plant is to be continued.

Botanical field work in western Idaho. By D. T. MacDougal.

As may be seen by reference to the map, a large proportion of the state of Idaho consists of a triangular mountain mass, with its greatest length from north to south, reaching in places an elevation of 14,000 to 15,000 feet, and including on its eastern border the Bitter Root, Coeur d' Alene and Rocky Mountain ranges.

Botanical explorations have been carried on in the valley of Clark's Fork of the Columbia to the eastward in Montana, in the basin of the

Snake River in southeastern and southern Idaho, to the westward in the Columbian plain in Washington, and in the northern part of Idaho, where the Clark's Fork of the Columbia cuts its way westward through the mountains, but this great central labyrinth is as yet an unknown land to the botanist, nor is he behind his brother zoologist in this matter.

With the purpose of beginning a systematic survey that should finally include this whole region, Messrs. J. H. Sandberg, A. A. Heller and myself, acting under the direction of the Botanical Division of the Department of Agriculture, undertook at the beginning of the last season the exploration of a portion of this territory along the western border of the mountain ranges.

In accordance with this plan, we took the field with a camp outfitted at Lewiston, at the head of navigation of Snake river, in the latter part of April, and worked southward till we struck the Craig Mountains, then swinging around northward, followed the line where the foot hills run down to meet the plain, across the basins of the Clearwater and Palouse rivers, Lake Coeur d' Alene, and Clark's Fork of the Columbia river at its expension into Lake Pend d'Oreille.

This route was chosen because it offered easy access to widely differing areas. To the westward lay the basaltic Columbian plains, with an elevation of 700 to 2,500 feet, with its vegetation made up of plants peculiar to the Pacific coast flora; to the eastward, rising in successive tiers, were the secondary ranges, composed of trachyte, limestone, quartz and granite, reaching an elevation of 7,000 feet, with its wide range of plants comprised in the Rocky Mountain flora.

The difference between these two areas is still further heightened by the peculiarities of the climate. The basaltic plain, during the rainy season, which ends in the latter part of May, supports a dense growth of succulent, broad leaved, rapid growing plants, which mature very early. With the close of the rainy season, the soil dries into dust in a very few days, the earlier growth dies, and is replaced by hardy, coarse, narrow-leaved forms which are capable of enduring the extreme heats of the summer. In the mountains, however, the water supply coming from melting snows and springs is more equable, and we have a greater number of plants which endure throughout the season.

The flora of both regions is characterized by extreme localization. The limits within which a large percentage of the species were collected often comprised no more than a few square yards or a few acres. As examples may be given Mimulus cardinalis, Castalia Leibergii, Corydalis aurea, Polygonum Kelloggii.

Although the mountain region is very rich in Algæ Lichens Mosses and Hepatics, the conditions for work and character of our outfit made it necessary to confine our attention almost wholly to the Phanerogams and Pteridophytes, although a few lower forms were collected.

In all, ample material of about 1,000 species was brought in, which is fairly representative of the region explored.

THE APPLICATION OF MATHEMATICS IN BOTANY. By KATHERINE E. GOLDEN.

The tendency in the sciences is toward reducing results and conclusions to exactness, as far as possible, and this is as true for botany as for any of the so-called exact sciences. The tendency being toward precision, naturally the use of mathematics is becoming more general in all the sciences, in the solution of problems and the expression of results.

In physiological botany, especially, the use of mathematics is very applicable, for a great many of the principles of physiological phenomena are reducible to the principles of physics and chemistry, which are represented by mathematical formulæ, and when so represented, the conception of the phenomena is simplified, and is divested of much of the mysteriousness that attaches to it, as fundamental principles are often easier of comprehension when reduced to mathema ical formulas. For instance, in studying the absorption of gases by plants, there are so many factors that enter the solution of the problem that the subject is complex to a great degree, but when it is known that the amount of gas dissolved from a mixture is proportional to the relative volume of it in the mixture multiplied by its coefficient of solubility, the quantities of gases that can be dissolved by the cell-sap are known, and a definite basis is obtained from which to start, and to take into consideration other conditions.

To show the estimate that Francis Galton* places on the laws governing the life of plants, in his work on "Natural Inheritance," in trying to arrive at some measurable characteristic by which to determine the reason for the statistical similarity shown in successive generations, he used sweet peas with which to experiment, separating them into groups ac-

*Francis Galton. Natural Inheritance, 1889, pp. 79-82.