well-founded belief in the rationality of natural processes asserts the possibility of this, while admitting that the intimate details of atomic constitution are beyond our scrutiny and provide plenty of room for processes that transcend finite dynamical correlation.

Joseph Larmor.

INLAND BIOLOGICAL LABORATORIES.

The following informal notes have been received concerning the season's work in various summer laboratories and experiment stations:

Of the research work carried out on the Great Lakes under the auspices of the United States Fish Commission, Professor Reighard says: The work has been purely research work and it was understood from the start that it should be of a fundamental scientific character rather than directed toward the immediate solution of questions of supposed practical importance.

The funds available have not permitted of carrying on the work for more than two months of each summer. During the summers of 1898 and 1899 it was carried on chiefly at Put in Bay, Ohio, (an island in the western end of Lake Erie, at which there is a hatchery of the Commission). By removing the internal fittings of the hatchery it was temporarily converted into a laboratory for each summer's use. This laboratory has been in every way amply equipped. There is gas and water, a small steamer and a supply of other boats. It is intended that work should begin on the first of July, but owing to delay in appropriation bills and to other causes it may happen, as it did this year, that no authorization for the commencement of the work can be issued until the end of June or even the early part of July. Supplies must then be ordered, arrangements made with workers and the hatchery converted into a laboratory. The difficulty involved in undertaking to do this after the first of July for work which is to continue only two months, led this year to the trial of a different plan. Instead of opening the Put in Bay laboratory an effort is being made to carry on the work by means of individual investigators or small parties working independently. It is hoped that work carried on in this way can be continued over a longer period, even during a part of the college year.

The investigations carried on at the laboratory (and elsewhere during the present summer) are as follows:

BOTANICAL WORK.

1. *The Algæ of Lake Erie.*—Dr. Julia W. Snow has been engaged during each of the three seasons and is now engaged in the determination of the algæ of the Lake and in working out their life histories by means of cultures. As many of them assume different forms under different conditions, it is necessary to cultivate them and no final identifications are possible until the life history of each is known. This is of course a labor of years and involves a consideration of the relation of the various algæ groups to the nutritive substances contained in the water, that is, it leads into bio-chemistry. It is expected that results already obtained will be made ready for publication during the coming year.

2. *The larger Aquatic Plants.*—During the first season Mr. A. J. Pieters of the Department of Agriculture at Washington undertook a study of the larger aquatic plants with the purpose of determining whether they are wholly dependent on the water for nutrition or partly on the soil. Mr. Pieters' results are now in press. He did not get much further than a determination of the various soils present on the Lake bottom and the relation of the plants to them. During the second season and during the present season Mr. R. H. Pond, an assistant in Botany at the University, has car-

ried on the work by experimental methods, Mr. Pieters' duties at Washington not permitting him to continue it. Mr. Pond expects to conclude his work by the end of the next academic year.

ZOOLOGICAL WORK.

1. *Collections.*—During the first two seasons extensive collections were made of the invertebrate fauna of the Lake, also collections of the contents of fish stomachs and of the parasites of the aquatic vertebrates. During the past summer a camping party was sent about the shore of the Lake for the purpose of making these collections. Some of the material has been distributed to specialists, but no reports have as yet been received. Pending this, collecting has been discontinued.

2. *Plankton Work.*—This has been carried on by myself with the cooperation of Dr. H. B. Ward of the University of Nebraska. Apparatus has been devised for measuring the actual flow of water through the plankton net. This apparatus is now being rated at the hydraulic laboratory of the University of Ohio, at Columbus. When this work is finished the apparatus will be used in the Lake. It is hoped by this apparatus to settle the question of the actual availability of plankton nets for quantitative work, to find the actual volume of water strained by them and to what extent they become clogged with use.

The Illinois State Laboratory of Natural History has a biological station under the direction of Professor S. A. Forbes, which is not a summer laboratory merely, but is established for continuous investigation of the aquatic life of the State, and is in active operation throughout the year. It is an institution for research and not for instruction, the work being done by a Superintendent and a paid staff.

At present two lines of work are in progress. (1) Systematic study of the ichthyology of the Station field and of other parts of the State reached by excursions, together with the painting of a series of illustrations of the fishes of the State made in the field from the living specimens. (2) An analysis and statement of the results of five years of plankton work done on the Illinois river, at Havana and Meredosia. The work on ichthyology will result in the publication of a State report covering the whole subject for the State of Illinois, a large part of the manuscript for which has already been prepared; and that on the plankton will be ready for publication January 1st, in the form of an independent Bulletin article.

In the absence of Professor C. H. Eigenmann, the Indiana University Biological Station was this summer under the direction of Dr. Robert E. Lyons. The research work being done was as follows: Ed. Showers, 'The Vertical and Horizontal (qualitative and quantitative) Distribution of Bacteria in the Lake'; Mr. Hunt, 'The distribution of Bacteria in the Air'; Mr. Rush, 'The Rôle of the Horseflies and Mosquitoes in carrying Infectious Diseases'; Dr. Baldwin, 'On an Intro-utero cure for Hog Cholera'; Dr. Howe, 'On the Plankton of the Lake.' Mr. Clark and Mr. Ek are completing their floral survey of the Lake; Mr. Ramsey is continuing the faunal survey; Mr. Moenkhaus is conducting the survey work of the Lake.

The entomologic field station of the New York State Museum is a station for the study of the biology of aquatic insects. Professor James G. Needham, of Lake Forest University, is in charge. Investigation is its sole object at present: no courses of study are offered. The work is mainly done by Professor Needham and Mr. Cornelius Betten, assistant in biology in Lake Forest University, with the occasional assistance of visiting specialists, to whom the

facilities of the Station are offered. The location is admirably suited to the purposes in view. Near at hand there is a very great variety of aquatic situations and a rich and varied aquatic fauna. The aquatic insects most abundantly represented are caddice flies, dragon flies, may flies and aquatic Diptera: much work has already been done here on the life histories, habits and ecology of these.

The Station for the present season finds quarters in the Adirondack Fish Hatchery building at Saranac Inn, where an abundance of running water renders possible the rearing of the insects which live in the limpid streams outside. The initial equipment of the station was excellent, and the work has been prosecuted under favorable circumstances. While no instruction is offered here, an effort will be made to report the result of the work in such form as to be available for the use of teachers of natural science generally.

The houseboat 'Megalops' of the Zoological Survey of Minnesota has just been closed and put into winter quarters near the southern boundary of the State. This houseboat was built at Mankato a year ago last spring, for the purpose of investigating the fauna of the Mississippi and Minnesota rivers from Mankato to the southern boundary of the State. Special attention was given to the fishes. The reptiles, amphibia and mollusks also received considerable attention. The smaller forms are to be studied more carefully at stations to be established where the experience of the past two seasons has found the conditions to be most favorable. It is the intention of the Director of the Survey, Professor Nachtrieb, to use the houseboat as headquarters for these investigations near the head of Lake Pepin. Thus far the houseboat has proved to be a most satisfactory and economical institution for such work. The results of the investigations will be published in the Zoological Series of the Reports of the Geological and Natural History Survey of Minnesota.

Some very excellent and satisfactory work has also been done on the birds of Minnesota during the past season. This work is under the immediate direction of Dr. Thomas S. Roberts. The work on the fishes is under the immediate direction of Professor U. O. Cox, of Mankato.

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*THE COLORADO POTATO BEETLE.**

The Colorado potato beetle *Leptinotarca decem-lineata* Say, is one of several closely allied forms that have spread over North America until one or more is found in almost every part of the continent east of the Rocky Mountains, and south of 50 degrees north.

The parent form *L. undecem-lineata*, seems to have originated in the northern part of South America. When the great northward migration came following the retreat of the continental glacier, it is probable that this form also went north, and in its journey encountered the diversified Mexican region, where it split into several racial varieties, each characteristic of a certain climatic area. As the advancing hordes spread northward, three well marked climatic belts were encountered, the Pacific Coast belt of Mexico, and the Mexican table land, and the low Gulf Coast area.

From the Pacific coast strip not much evidence is obtainable as to the presence of these beetles, or the changes produced upon them. On the table-land, however, the form was diminished in size and the pigmented areas are broken up into smaller spots. This form which is called *L. multilineata* grades into *L. undecem-lineata* on the south, and to the northern part of the Mexican plateau passes imperceptibly into *L.*

* Abstract of a paper presented before the Section of Zoology of the American Association.