collected on the island of Sachalin by F. Schmidt, but his specimens lack flowers.

P. A. RYDBERG
NEW YORK BOTANICAL GARDEN

SCIENTIFIC BOOKS

An Investigation of Evolution in Chrysomelid Beetles of the Genus Leptinotarsa. By WILLIAM LAWRENCE TOWER. Washington, D. C., Carnegie Institution.

It has been an obvious criticism of many of the recent experimental and statistical investigations of matters connected with evolution that they were entirely too narrow in their scope. Even the famous studies of the evening primroses, by de Vries, suffered from the fact that their author did not really know as much about the species of *Œnothera* as was desirable, and was even ignorant of the original habitat of the species giving rise to so many remarkable mutations. The de Vriesian studies attracted so much attention that it was not long before many skilled botanists were hot on the trail of the missing data, and to-day the whole subject is on a very much better footing.

Professor Tower, in his work on the Colorado potato beetle and its allies, has not depended upon results obtained in the laboratory alone, but has undertaken a comprehensive study of the whole of the genus *Leptinotarsa,* and even of the related genera, in the field. He has compiled all the information extant in the literature of the subject, and has made repeated trips to Mexico and elsewhere to collect and study the beetles in their native habitats. He has found Mexico to contain a large number of species of *Leptinotarsa,* having characteristic habitats and habits, all of which he has described, with photographic illustrations. Southern Mexico, it is concluded, is the center of origin of *Leptinotarsa,* and consequently the Mecca of whoever would seek to unravel the secrets of its evolution.

It is not possible, of course, to give a summary of these ecological investigations in a review, but as an example we may quote from some of the remarks on *Leptinotarsa undecimlineata:*

> An instructive illustration of the manner in which the dispersion of this beetle takes place was afforded by the recent building of a railroad through a perfectly flat, frequently flooded savanna near Tierra Blanca. The food plant grows generally over the savanna, but the beetle is entirely absent excepting at a few points along the road where the work of constructing ditches to keep the roadbed intact has created new localities with favorable conditions for their existence. Over a distance of about 18 kilometers there are now located flourishing colonies at each place where the work of the railroad builders has made existence possible, while on the unmodified savanna I have not been able to locate a single colony, and doubt if there are any. In this instance the advance into a new area has occupied two years and has been rapid. That transportation [by human means] did not bring about the starting of these colonies is certain, as the work of railroad construction was entirely suspended during the rainy season, when the beetles are active and dispersion takes place. It is perfectly clear that in this case the distribution was brought about by some few individuals from a colony happening by chance to discover the newly created habitat, proper for æstivation and for the breeding of the next generation. In each generation many will perish by not being able to reach the proper habitat after once having abandoned the parent colony, but the fact remains that some do discover proper habitats, and when such are found new colonies are established. . . . It is not necessary that the soil should be of a special chemical composition or temperature and rainfall of special amounts, but it is essential that during pupation and æstivation the beetle shall not be subjected to excessive desiccation or moisture, and that the soil shall be porous enough to admit of an abundant supply of air.

This, indeed, is real biology; and how different from some ecological writings we have seen!

When we come to the potato beetle, *L. decemlineata,* the discussion is most comprehensive. The most interesting fact brought out is the retreat of *L. juncta,* of the southern states and Atlantic seaboard, before the invading hordes of *decemlineata.* Now these two species have *different food plants,* and so apparently should not compete! It appears, however, that they freely cross, and

Concerning this crossing in nature and its effect upon *juncta* I shall have more to say in a later paper. The full explanation of the extinction of *juncta* is to be found in the fact that the two species cross freely in nature, and that this natural crossing has resulted in a most interesting and peculiar case of prepotency in one species and of submergence in the other.

Chapter II., on Variation in *Leptinotarsa,* gives us a detailed account of the variation, not merely of the adults, but also of the early stages. Schemes are invented for tabulating the different kinds of variation, and abundant statistics are offered. There is a most interesting section on "Place Variation," a term used to signify "the variation in any given species in the same locality from generation to generation, or from season to season, or year to year." Professor Tower says:

As far as I am able to determine from observations and experiment, place variations result in no permanent modifications, nor do the changes seem to be inherited. . . . This place variation must necessarily be a troublesome factor in the study by biometric methods of evolution, geographical variation or selection. In my own work it has been the rock upon which many cherished schemes have been wrecked, and I suspect it has not yet completed its destructive work. If one would study any of the broader problems of evolution by biometric methods he must first of all determine whether in the material chosen for study this phenomenon exists, and if it is found, too great care or too long a time can not be spent in the elimination of this factor. At present I know of but one method of doing this—that is, by collecting data and material over a sufficiently long period to determine the range of this form of variability. Unhappily this demands time, patience and often funds which the investigator will not or can not afford. The failure to take into consideration this place variation vitiates the validity of a large part of the biometric work that has been done, and there is no reason to think that it will be otherwise in the future.

It appears from the tables given, that there was usually an oscillation, *occupying about four generations,* from one extreme to the other. This oscillation even occurred in a laboratory experiment, as shown in *A,* Plate 26. Any one observing the changes through four generations only might consider that he had a beautiful case of progressive evolution, when, in the fifth, he would be again at the starting point! It is certainly conceivable, and if true of extraordinary interest, that this phenomenon is not *wholly* due to external causes, but is in part the outcome of a rhythmic pulsation of life, as it were, analogous to that which produces the well-known phenomenon of alternation of generations.

Professor Tower sums up his views on place variation under four heads, the fourth deserving to be quoted in italics.

In place variation, whenever there occurs an extreme oscillation of the population there is an accompanying production of an unusually large percentage of extreme variations or mutants.

This he observed in nature, and also under experimental conditions. The general fact has been known or suspected for many years—see, for instance, the variable Virginia colony of *Helix nemoralis,* and other like cases—but Professor Tower has planted what was somewhat of a "castle in the air," firmly upon the ground.

In the laboratory experiments it was found that mere selection of the extremes of normal variation (say light or dark) did not affect the type, the polygons made from the offspring of light or dark beetles being practically coincident. When, however, strong environmental stimuli (say dryness and moisture) were applied, it was found that marked "place variation" occurred, resulting in distinct polygons for the lots so treated, the two not even closely approaching, much less overlapping. By the application of suitable conditions, together with rigid selection, it was easily possible to produce two very distinct races: not, however, much exceeding the extremes of normal variation for the species. Nevertheless, when these things were abated, the beetles soon went back to the normal condition of the species, no trace of the past excentricity remaining.

I have said that no trace of the excentricity remained, but while this was exactly true for the bulk of the material, *while the excentricity*

was at its greatest, several mutations were produced.

Thus there were produced from the light (dry) series examples of *pallida* and *defecto-punctata,* and from the dark (wet), specimens of *melanicum.* The most numerous of these was the *pallida,* a form with the usual markings, but the ground color exceedingly pale. This *pallida* occurred also out of doors in the potato fields, but so rarely that Professor Tower is convinced that it is virtually impossible for it to establish itself. When isolated and inbred, however, it comes perfectly true, and in this way a very numerous colony of pure *pallida* was obtained. Some of these were bred in company with typical *decemlineata,* and it was found that the normal crossings (*i. e.,* of like beetles) were to the abnormal as 7 to 1. On account of this, the *pallida* were not swamped, but continued to increase when both were transferred to natural conditions in the grounds of the University of Chicago. Professor Tower was very anxious to allow the *pallida* to spread widely over the country, and see what would happen; but the injurious character of the insect made this impossible and so the colony was destroyed.

When bred with *decemlineata, pallida* gave the normal Mendelian results, with *decemlineata* dominant.

Melanicum, the dark variety, is in some ways even more interesting.

It appears to be very distinct, and is crossed with difficulty with *decemlineata;* when a successful cross is obtained, the results are Mendelian.

It is, moreover, ill adapted to the habitat of *decemlineata,* into which it must be born, as it is apparently able to live or reproduce only in a high percentage of humidity. My experience with them is that only the above condition can be used for their propagation in experiment, and there is every reason to believe they would require a like condition in nature.

This appears to be very suggestive of a method of origin of a new species. It is shown that the mutation *melanicum* arises from *decemlineata* when the latter is subjected to conditions of moisture, and that it requires excessive moisture. Let *decemlineata* reach a too moist region, and produce a few *melanicum;* will not these proceed still farther into the humid area, and there multiply in comfort and isolation, forming a veritable new species? This will be facilitated by the difficulty of crossing with the parent form.

Chapter IV., on habits and instincts in *Leptinotarsa,* is especially important for the understanding of the evolution of these beetles. It was ascertained that selective mating existed in respect to size, being due to the inability of abnormal individuals to properly perform the sexual act.

We do not ordinarily realize how narrow are the limits within which successful copulation can take place in insects, or how slight a variation is sufficient to prevent the performance of the sexual act with such completeness as to insure the leaving of progeny.

Nevertheless, as was to be expected, there was no trace of psychological selection.

The above account does not in any sense do justice to this remarkable work. There is much in it to which no reference has been made; and I do not attempt a summary of Professor Tower's closing chapter, which should be read in its entirety, and is too long to republish here. There are places where one does not feel quite sure that the facts justify the conclusions reached, and here and there we find inconsistencies. We also regret the absence of information in several places; thus we are told that the conditions at Cabin John Bridge were such as to produce many mutations, but just what those conditions were does not appear. We also have names for some new species and varieties, without any descriptions. These things, as I learn from a letter received from the author, will be remedied in a subsequent publication; the present volume (though of 320 pages) being merely preliminary, and representing a mere fraction of the whole material gathered.

A rumor has reached me that there is some question about the continuance of the grants upon which Professor Tower's work depends. This work is necessarily somewhat expensive; but if, in some way or another, this country

can not find for Professor Tower all the money and leisure it requires, for as many years as he is willing to continue his labors, it will be disgraceful beyond measure. One of the truest tests of the intellectual status of a country is found in its ability to quickly realize the importance of a work of the first class. Since this book came out, I have asked a number of naturalists whether they had read it; and have so far failed to find one who has given it more than superficial attention. Its bulk and the fact that it is ostensibly devoted to a very limited subject—a single genus of beetles—together with its limited circulation, resulting from the mode of publication, have combined to prevent it from receiving due attention, at least in certain quarters where it should have been hailed with delight. If the present notice will serve to show that it is of the first importance to every biologist, whatever his specialty, that will be ample excuse for its length. T. D. A. Cockerell

SOCIETIES AND ACADEMIES

THE AMERICAN SCHOOL HYGIENE ASSOCIATION

The American School Hygiene Association held its meeting for organization in Washington City, May 6 and 7, 1907, at the Hotel Shoreham. The following program was presented:

Monday, May 6, 3:00 P.M.

Report of Committee on Organization, Arthur T. Cabot, M.D., chairman, fellow Harvard University, Boston.

"Physiological Age and its Influence on School Progress," C. Ward Crampton, M.D., assistant director of physical training, New York City Public Schools.

Monday, 8:00 P.M.

"Medical Inspection of Schools in Massachusetts," Hon. George Martin, LL.D., secretary of the Massachusetts State Board of Health.

"Medical Examination in New York City Public Schools," John J. Cronin, M.D., assistant chief medical inspector, Board of Health, New York City.

Discussion opened by Thomas Darlington, M.D., commissioner of health, New York City.

Tuesday, May 7, 3:00 P.M.

"The Requirements of Proper School Furniture," Robert W. Lovett, M.D, Harvard Medical School.

(These papers are to be published by the association.)

Business Meeting.

A constitution and certain resolutions were adopted, of which a few extracts are here given.

EXTRACTS FROM THE CONSTITUTION

Article II. The objects of this Association shall be: (*a*) To stimulate research and to promote discussion of the problems of school hygiene. (*b*) To take an active part in movements wisely aiming to improve the hygienic conditions surrounding children during school life.

Article X. The Council shall be empowered to publish its proceedings in a volume or journal, together with special reports, bibliographies and articles that may aid in the objects of this Association.

Article XIV. Any person may become an active member of this Association upon recommendation of two members, election by the council and the payment of one year's dues.

Article XV. Honorary members shall be nominated by the Council and shall be elected by a two-thirds vote of the members present at the annual meeting.

Article XVI. The Association shall hold an annual meeting and such other meetings as they shall from time to time determine.

Article XIX. Funds shall be raised by annual dues of three dollars from each active member, and in such manner as shall be approved by the Council.

RESOLUTIONS ADOPTED AT THE FIRST MEETING

Whereas, The maintenance and development of the health and vigor of school children is a matter of paramount importance, and

Whereas, Experience in all great cities has shown the importance of health inspection; be it

Resolved, That in every city and town adequate provision should be made both for sanitary inspection of schools and for medical inspection, the latter to include not only inspection for contagious diseases, but also of eyes, ears, teeth, throat and nose and of general physical condition.

Whereas, The improvement in the health and of the hygienic conditions surrounding school children depends largely upon the intelligent cooperation, the competency, the interest and the faithfulness of teachers and principals in matters of hygienic importance; therefore, be it