A chapter of especial interest to Americans discusses "The Causes of Genetic Variation," for the work reviewed is to a considerable extent that of American biologists, who have attempted to produce and claim to have succeeded in producing heritable variations under controlled experimental conditions. The work of Woltereck in Germany has shown, according to Bateson, that the character of the food supplied to a parthenogenetic *Daphnia* affects the structure of her immediate offspring, but the effect does not persist further into subsequent generations. Hence there is no permanent racial influence. Tower, however, in potato-beetles, and MacDougal in *Raimannia* claim to have brought about permanent racial changes, the one by altering the temperature and humidity at which the parent beetles are kept, the other by injecting certain salt solutions into the ovaries of the parent plants. Bateson points out that neither of these important results has been independently confirmed by experiment, though this has been attempted by Compton with negative results in the case of *Raimannia*. After reviewing Tower's two principal papers and pointing out a number of inconsistencies, Bateson adds

"The hesitation which I had come to feel respecting these two publications of Tower's has been, I confess, increased by the appearance of a destructive criticism by Gortner who has examined the parts of Chapter III of Tower's book in which he discusses at some length the chemistry of the pigments in *Leptinotarsa* and other animals. As Gortner has shown, this discussion, though offered with every show of confidence, exhibits such elementary ignorance, both of the special subject and of chemistry in general, that it can not be taken into serious consideration."

Regarding MacDougal's work he says, emphasizing the need of repeating the experiment with *Raimannia:*

"He [MacDougal] adds that he is making similar experiments with some twenty genera; but what is more urgently needed is repeated confirmation of the original observation. When it has been shown that this mutation can be produced with any regularity from a plant which does not otherwise produce it on normal self-fertilization, the enquiry may be profitably extended to other plants."

The net result of Bateson's discussion of the causes of genetic variation is negative. No means of controlling genetic variation has, he believes, yet been found.

A chapter dealing with The Sterility of Hybrids presents many interesting questions without answering any of them satisfactorily. Interspecific sterility is shown to be important in keeping species distinct, and it is suggested that in some cases at least it is connected with unit character inheritance, but beyond this point all is uncertainty.

In his concluding remarks, Bateson emphasizes the present partial and incomplete state of our knowledge of genetic problems and in particular of what a species really is. He expresses the conviction that it is not a mere arbitrary group of organisms, though to the systematists it can hardly be anything else. "Their business," says Bateson, "is purely that of the cataloguer, and beyond that they can not go. They will serve science best by giving names freely and by describing everything to which their successors may possibly want to refer, and generally by subdividing their material into as many species as they can induce any responsible society or journal to publish.

"As yet the genetic behavior of animals and plants has only been sampled. When the work has been done on a scale so large as to provide generalizations, we may be in a position to declare whether specific difference is or is not a physiological reality."

W. E. CASTLE

Vorträge über Deszendenztheorie. Von AUGUST WEISMANN. Dritte umgearbeitete Auflage. Jena, G. Fischer. 1913. Pp. xiv + 354, 3 pls., 137 figs. in text.

Mendel's Principles of Heredity. By W. BATESON. Cambridge, Eng., Univ. Press, and New York, G. P. Putnam's Sons. 1913. 3d Impression. Pp. xiv + 413, illustr.

These two books deal with the two most im-

portant advances which have been made in the study of evolution since the time of Darwin, namely the theories of Weismann and Mendel.

For whether one accepts or rejects these theories, no one will question their great value in stimulating research concerning evolutionary problems, the productiveness of which has been enormous in the last thirty years.

It was in the early eighties that Weismann in his essays on heredity challenged the general belief in the inheritance of acquired characters and pointed out the logical distinction between soma and germ-plasm, which despite numberless attacks still stands. Ten years later "The Germ-plasm" theory was published in its fully developed form, and after another decade of debate and study "The Evolution Theory" was published, in which Weismann attempted to make a comprehensive survey of the entire field of evolution as seen in the light of his germ-plasm theory. In the first sentence of his preface, as translated by Thomson, he says: "When a life of pleasant labor is drawing to a close, the wish naturally asserts itself to gather together the main results, and to combine them in a well-defined and harmonious picture which may be left as a legacy to succeeding generations." Succeeding generations have reason to be grateful to Weismann that he undertook thus to present his mature views. Few books on evolution since the publication of Darwin's "Origin of Species" can be read with greater pleasure or profit than this, or are likely longer to survive. To English readers it is accessible in a faithful translation made by Professor and Mrs. J. A. Thomson in their usual clear and graceful style.

The popularity of the original is shown by the fact that a second edition was called for within two years, the third and doubtless final edition being the one before us. In the second edition few changes were made, beyond the addition of a few notes, but by the time the third edition was issued (1913) Mendelism had so far developed as to call for extended review. Weismann welcomes Mendelism as a confirmation of the basic idea of his germ-plasm theory, the doctrine of determiners. Mutation he rejects as inconsistent with the view that adaptations arise gradually through the action of natural selection.

Bateson's book, first published in 1909, may be regarded as the authoritative interpretation of Mendelism. It contains a biography and three portraits of Mendel with a translation of his original papers, and also a comprehensive account of Mendelian principles as developed by the Bateson-Punnett group of workers at Cambridge University. The first edition of the book was exhausted within a few months of its publication and it was then reprinted without change. The present "third impression" was taken advantage of to add "a series of brief appendices to acquaint the reader with the nature of the principal advances made, while awaiting an opportunity of rewriting the book." The "appendices" mentioned consist of brief notices of subsequent publications, which, however, fail to give an adequate notion of their content, or of the direction which the further development of Mendelism has taken since 1909. The book is rightly and honestly called a "third impression," not a new edition. It is essentially a portrait of the Mendelism of 1909, and seeks to combine the fundamental idea in the germ-plasm theory (that of determiners) with the fundamental idea in mutation (that of the sudden origin of characters).

W. E. Castle

Special Articles

A New Method for the Determination of Soil Acidity [1]

Soil acidity problems are at the present time, perhaps, the most important of all soil problems confronting the farmers of Wisconsin and many other states. In studying these problems one of the most serious drawbacks has been the lack of suitable qualitative and quantitative methods for the determination of this acidity. The litmus-paper test when properly made is a fairly satisfactory qualitative test and has been our most reliable test.

[1] Publication authorized by the Director of the Wis. Expt. Station.