gardeners and agricultural students," and no doubt fills a need for a brief popular presentation. However, the diseases selected are on the whole a little more applicable to English than to American needs, though many of them are among our common troubles.

Milburn is secretary of agriculture and lecturer in agriculture, Lancashire County Council, England, and Bessey is professor of botany in our own Michigan Agricultural College. The latter's connection with the work has been largely confined to a prefatory note and a little of the subject-matter, especially in the introductory chapter dealing with the nature and classification of fungi and with fungicides. Bessey's connection with this book makes it the fifth on plant diseases that has been put forth by American authors in recent years, and we understand that a revision of one of these and a new one are now in preparation, showing the growing importance of vegetable pathology in this country. All of the books presented so far or under consideration are by men who have devoted more of their time to teaching than to the experimental side of plant pathology, especially as regards prevention of disease. The next author of a book on plant diseases should come from the latter class.

G. P. Clinton

PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES

The second number of Volume 2 of the *Proceedings of the National Academy of Sciences* contains the following articles:

1. *Personal Equation and Steadiness of Judgment in the Estimation of the Number of Objects in Moderately Large Samples:* J. Arthur Harris, Station for Experimental Evolution, Cold Spring Harbor, N. Y.

While there is no certain differentiation among the experimenters in personal equation, they differ distinctly in steadiness of judgment. The latter is conspicuous in contrast with the former in that it is unmistakably influenced by previous experience.

2. *Polypeptide-Hydantoins:* Treat B. Johnson, Sheffield Scientific School, Yale University.

The formulas for a large number of polypeptide-hydantoins are set up. Some of these substances have already been synthesized and methods for synthesizing others are being developed.

3. *Recent Explorations in the Cactus Deserts of South America:* J. N. Rose, Division of Plants, U. S. National Museum, Washington.

Large collections of cacti in South America have been made, including many species which have never before been collected and some which, though collected, have been poorly described or wrongly classified.

4. *On the Albedo of the Planets and Their Satellites:* Henry Norris Russell.

A table is given of the values finally derived for the albedo of the various planets and satellites. The values are in agreement with the current views of the constitution of the bodies. The value for the earth is intermediate between those of cloudy and cloudless planets.

5. *Quantum Relations in Photo-Electric Phenomena:* R. A. Millikan, Ryerson Physical Laboratory, University of Chicago.

So far as experiment has thus far gone Einstein's equation seems to be an exact statement of the energies of emission of corpuscles under the influence of light waves. Thus the correctness of the quantum theory and the reality of Planck's h are corroborated.

6. *The Chemical Activity of the Ions of Hydrochloric Acid Determined by Electromotive Force Measurements:* James H. Ellis, Research Laboratory of Physical Chemistry, Massachusetts Institute of Technology.

In this paper are presented accurate measurements of the electromotive force at 18, 25 and 35° of voltaic cells of the type H_2, HCl, $Hg_2Cl_2 + Hg$, with the acid-concentration varying from 0.03–4.5 normal. From the data are calculated the energy effects attending the reaction which takes place in such cells and those attending the transfer of hydrochloric acid in aqueous solution from one concentration to another. From these results are then calculated the chemical activities (or effective

concentrations) of the ions of the acid. These activities are shown to decrease with increasing concentration much more rapidly than do the ion-concentrations derived in the usual way from the electrical conductance ratio.

7. *Effects of Centrifugal Force on the Polarity of the Eggs of Crepidula:* EDWIN G. CONKLIN, Department of Biology, Princeton University.

It is difficult, but not absolutely impossible, to change the polarity of eggs and cleavage cells, and the persistence of polarity and the restoration of dislocated parts to normal condition is connected with a somewhat resistant framework of protoplasmic strands.

8. *The Emission Quanta of Characteristic X-Rays:* DAVID L. WEBSTER, Jefferson Physical Laboratory, Harvard University.

To excite any characteristic radiation it is necessary to use a potential above a critical value. The lines all increase in the same ratio for any given increase of potential. There is reason to believe that the characteristic rays are always a result of excitation of higher frequency oscillators.

9. *The Results of Investigations of the Ecology of the Floridian and Bahaman Shoal-Water Corals:* THOMAS WAYLAND VAUGHAN, U. S. Geological Survey, Washington, D. C.

The ability of corals to remove sediment from their surfaces, their mechanism for catching food, their carnivorous nature, their relation to light and temperature, and so on, have been studied.

10. *Cambrian Trilobites:* CHARLES D. WALCOTT, Smithsonian Institution, Washington, D. C.

Data have been assembled to aid in clearing up some of the problems of formations of the Appalachian region by a careful comparison of portions of their contained faunas with those of other localities.

11. *The Minute Structure of the Solar Atmosphere:* GEORGE E. HALE and FERDINAND ELLERMAN, Mt. Wilson Solar Observatory, Carnegie Institution of Washington.

The minute structure of the quiescent solar atmosphere resembles that of the photosphere. The results apparently support the hypothesis that the solar atmosphere consists of parallel columns of ascending and expanding gases, but such questions as the dimensions of the columns and the direction of motion and velocity are reserved for subsequent discussion.

12. *Monochromatic Photography of Jupiter and Saturn:* R. W. WOOD, Department of Physics, Johns Hopkins University.

The variation of the appearance of Saturn and Jupiter when photographed with light of different wave-lengths suggests a mist or dust in the planet's atmosphere which scatters the shorter wave-lengths.

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SPECIAL ARTICLES

PHOTOGRAPHS SHOWING THE RELATIVE DEFLECTION OF THE POSITIVE AND OF THE NEGATIVE IONS AS COMPARED WITH THAT OF THE ELECTRON

POSITIVELY and negatively charged ions, atomic in size (commonly called "retrograde rays"), *accompany* the stream of electrons issuing from the cathode in a highly exhausted discharge tube. Thomson[1] studied their properties by placing a photographic plate within the tube in such a position as to receive these rays after being deflected simultaneously by an electric and a magnetic field. When the fields are coincident (not crossed) the displacements on the photographic plate are in directions at right angles to each other. The photographic method is now in common use.

To the writer's knowledge no photographs, however, have been published in which all three of the component carriers—the positive ion, the negative ion and the electron—are shown simultaneously on the same plate. Since the mass of the electron is only 1/1700 that of the hydrogen atom, and since the square of the magnetic deflection varies inversely as the mass, it follows that the electron is driven off the plate by a magnetic field that would give the ion only an appreciably small deflection. By weakening the magnetic field the trace due to the electrons may be retained on the plate.

Two full-sized photographs, Figs. 1 and 2,

[1] J. J. Thomson, "Rays of Positive Electricity," pp. 75, 1913.