SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

FRIDAY, NOVEMBER 15, 1907

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FACTS LIMITING THE THEORY OF HEREDITY[1]

MY first duty is to acknowledge the honor done me by the suggestion that I should deliver the address in this section. I need not say that I very highly appreciate the distinction thus conferred.

The fact that a heredity section has been constituted is surely a matter for congratulation. It is a sign that the study of zoology is passing into a maturer stage. For the past half century zoologists have been chiefly occupied with the accumulation of morphological facts of structure and development. The perfection of microscopical methods had revealed regions in which knowledge could be readily advanced by simple means. We became, therefore, students of Cœlenterata, insects, Vertebrata, or whatever it might be, according as fancy or opportunity had specially attracted us to one or other of these groups.

Such work was interim work. It was making up arrears. This task is now practically accomplished. Almost all that can be seen by these simple means has been seen. One more phase is over. The division of our subject matter according to the groups of the animal kingdom is no longer adequate.

We are trying for fresh points of attack. Our forces are disposing themselves in new formations, with fresh centers and a new front. In the organization of the present congress the change has been recognized,

[1] Address delivered at the International Zoological Congress, before the Section of Cytology and Heredity, August 23, 1907.

detic Institute. Leipzig and Berlin, B. G. Teubner. 1907. Second edition. Pp. xviii + 578.

In preparing the well-known first edition of this work Professor Helmert had in view the needs of the physicist, the astronomer and the geodesist rather than those of the mathematician; and, though the treatment of the subject was of necessity mathematical, the emphasis was not placed upon the more intricate parts of the mathematical theory. As a result the book gave a clear presentation of the *method* of least squares and supplemented it by a mathematical discussion which was ample for all ordinary purposes and which in some particulars went beyond the range of the ordinary texts on the subject. Numerous well-chosen problems furnished illustrations of the details of the use of the method in the chief cases.

The plan of the earlier part of the new edition is substantially that of the former one, though minor changes have been made. Nor does this adherence to the plan of a book thirty-five years old necessarily imply a defect in the new work. For the method of least squares is one of the few advanced branches of mathematical science in which such a proceeding is not inappropriate.

Certain features common to both editions deserve notice, and of these one is the treatment of the law of error. No conclusive argument in favor of this law has been given and the author has chosen to base it upon its accord with the results of observation. This is commendable, for it tends to clear a state of affairs which some one has characterized by saying of the law of error that both mathematicians and physicists accept it, the former because they believe the latter have obtained sufficient experimental evidence and the latter because they believe that it has been mathematically demonstrated. It is true that in the second edition one of the numerous mathematical arguments in favor of the law is included, but it is given a secondary place. Moreover, the author expressly considers several possible laws of error.

Clear explanations of the most important ideas of the subject are given early in the work and accompanying them are illustrations of their practical use. Then follows the development of the subject along standard lines from the discussion of direct observations of equal weight to that of indirect determinations of the values of quantities which are not independent.

Of the improvements made in preparing the new edition, one notes an increase in the amount of space devoted to pure theory, particularly in regard to the relations to each other of various kinds of errors of observation and in regard to the application of the method to interpolation. The size of the volume has been increased from 348 to 578 pages, and a large part of this increase is made up of the last three chapters, which deal with technical problems of physical, astronomical and geodetic work.

Pleasing are the frequent references to original sources and the excellence of the examples by means of which the theory is illustrated. A detailed table of contents and an index make all of the matter in the book accessible to the reader, and the publishers have made the book attractive in appearance. An occasional sacrifice of mathematical rigor for the sake of brevity will not prevent even an exacting reader from regarding the text as an excellent treatise on the subject.

George H. Ling.

Columbia University

Scientific Journals and Articles

The opening (October) number of volume 14 of the *Bulletin of the American Mathematical Society* contains the following articles: "Application of a Definite Integral involving Bessel's Functions to the Self-Inductance of Solenoids," by A. G. Webster; "On the Apsidal Angle in Central Orbits," by F. L. Griffin; "The Maximum Value of a Determinant," by E. W. Davis; "The Invariant Substitutions under a Substitution Group," by G. A. Miller; Shorter Notices (Tannery's Leçons d'Algèbre et d'Analyse à l'Usage des Elèves des Classes de Mathématiques spéciales, Tome Premier, by F. Cajori; Tannery's Leçons d'Algèbre et d'Analyse, Tome Second, by G. W. Myers; Pionchon's Mathématiques.

Principes et Formules de Trigonométrie Rectiligne et Sphérique, by G. W. Myers; Schubert's Beispiel-Sammlung zur Arithmetik und Algebra, by G. W. Myers; Russell's Elementary Treatise on Pure Geometry, by O. Veblen; Bruns's Wahrscheinlichkeitsrechnung and Kollektivmasslehre, by H. L. Rietz; Engel's Hermann Grassmanns gesammelte mathematische und physikalische Werke, Band 2, by E. B. Wilson; Jaumann's Grundlagen der Bewegungslehre, von einem modernen Standpunkte aus, by G. W. Myers; Slocum's Text-Book on the Strength of Materials, by G. W. Myers); Notes; New Publications.

The November number (volume 14, number 2) of the *Bulletin* contains: Report of the Fourteenth Summer Meeting of the American Mathematical Society, by F. N. Cole; "On a Special Algebraic Curve having a Net of Minimum Adjoint Curves," by Virgil Snyder; "Note on Certain Inverse Problems in the Simplex Theory of Numbers," by R. D. Carmichael; "Third Report on Recent Progress in the Theory of Groups of Finite Order," by G. A. Miller; Notes; New Publications.

SOCIETIES AND ACADEMIES

THE TORREY BOTANICAL CLUB

THE first fall meeting for the year 1907 was held on October 8, 1907, at the American Museum of Natural History. The meeting was called to order at 8:30 by the secretary, and Dr. E. B. Southwick was elected chairman. Eleven persons were present.

The announced program consisted of informal reports upon the summer's work and observations. In response to calls by the chairman the following members made remarks:

Remarks on the Absence of Undergrowth in a Hemlock Forest: C. STUART GAGER.

Hemlock seeds germinate freely under the parent trees, but seldom attain a height of more than three or four inches. It was suggested that there may be present in the soil a substance or substances secreted by the hemlock roots, and deleterious to the germination and growth of hemlock seedlings. This, as well as poor insolation, must be considered in attempting to explain why the seedlings fail to develop.

Botanical Observations made in Pownal, Vt.: M. A. HOWE.

Dr. Howe reported his attendance at the annual summer field meeting of the Vermont Botanical Club, which was held in Pownal, the extreme southwestern township of Vermont. In this town are the only known Vermont stations for *Liriodendron tulipifera, Morus rubra, Aster sagittifolius* and several other species of interest.

Plant Studies on the Northern Coast of the Gulf of St. Lawrence: C. B. ROBINSON.

Dr. Robinson had spent the first two or three weeks of August at Seven Islands, on the northern coast of the Gulf of St. Lawrence, about 325 miles below the city of Quebec. The coast to the east of the bay of Seven Islands is a nearly level sandy plain, but the western side, and the islands across the mouth, are formed of steep crystalline rock, a kind of feldspar. A range of hills attaining 1,700 feet in height runs parallel with the coast about ten miles inland. With the exception of a few plants like *Sibbaldiopsis tridentata, Empetrum nigrum* and *Achillea millefolium* the rocks and the sand bore strikingly different floras. There was a tendency in some cases for the species of the woods to invade the sand, bringing there species like *Linnæa americana, Moneses uniflora* and *Peramium ophioides.* Three species of *Botrychium* grew in still more open places on the sand. The flora, at best a scanty one, is particularly poor in trees. The shores are lined by black spruce, and the white spruce is less common. Beginning a short distance from the shore, the sand plain becomes a pine barren, with *Pinus Banksiana* as practically the only tree. Two species of paper birch, the fir, larch, aspen and mountain maple are the only other real trees. It had been hoped that the higher latitude would sufficiently compensate for altitudes lower than those of the hills of Gaspé, and thus give a flora comparable with that of the latter. A few such species were found, among them *Diapensia lapponica, Vaccinium ovalifolium, V. uliginosum, Comandra livida, Euphrasia Ran-*