CONTENTS

The American Association for the Advancement of Science:
A Mathematical Critique of Some Physical Theories: PROFESSOR GEORGE D. BIRKHOF —— 147

The China Foundation for the Promotion of Education and Culture: DR. E. V. COWDRY —— 150

Charles Cleveland Nutting: DR. DAYTON STONER —— 151

Scientific Events:
The Richmond Meeting of the American Chemical Society; A Geological Excursion in Texas; Award of Prizes by the Sesquicentennial Exposition of Philadelphia; Scientific Lectures at Pasadena; Dinner in Honor of Dr. Erwin F. Smith —— 152

Scientific Notes and News —— 154

University and Educational Notes —— 159

Quotations:
Chile and the Chemists —— 159

Discussion and Correspondence:

Scientific Books:
Clayden's Cloud Studies: DR. H. H. CLAYTON. Heinroth's Die Vögel Mitteleuropas: HARRY C. OBERHOLZER —— 164

Special Articles:
The Fibriellar Structure of the Dental Enamel Matrix of the Guinea Pig: PROFESSOR T. D. BECKWITTH and PROFESSOR ADRIENNE WILLIAMS. Alkaloid Seed made Permeable by Heat: ANNA M. LUTE —— 165

Annual Report of the Secretary-Treasurer of the Pacific Division of the American Association —— 166

Science News —— x

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.

New York City: Grand Central Terminal.

Annual Subscription, $6.00. Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

Entered as second-class matter July 18, 1925, at the Post Office at Lancaster, Pa., under the Act of March 3, 1879.

A MATHEMATICAL CRITIQUE OF SOME PHYSICAL THEORIES

The purpose of this paper was to review some of the mathematical-physical theories of the past and of the present, indicating briefly the nature of certain concepts upon which these theories rest as well as attendant logical difficulties, and proposing certain modifications. It goes without saying that geometry is the first and simplest of such theories. Some day, when the field of knowledge has extended so far that simplification becomes necessary, ordinary geometry may be approached somewhat as follows:

1) Geometry treats of elements called points and the relation called distance between pairs of points.

2) The complete tabulation of distances between pairs of points may be arranged as follows:

(a) the points P correspond to real number triples \((x_1, y_1, z_1)\);

(b) the squared distance between \(P_1\) and \(P_2\) is \((x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2\).

All geometry follows very readily from these agreements. Beginning in this way one may successively define line-segments, lines, planes, perpendicularity, rectangular coordinate systems, etc. The whole body of geometrical fact with corresponding analytic framework is easily deducible, and yet one may stop at the fundamental principles without taking up beautiful but less vital geometrical studies. In its origin the geometrical concept of space is always to be associated with that of a corresponding body of reference.

Classical dynamics arises in the attempt to use Euclidean space and absolute time as the means for expressing the laws of nature. There lie certain fundamental difficulties at the very basis of this attempt to make space the container of matter. The simplest illustration of them arises in dealing with a collection of "equal rigid elastic spheres." When only two spheres collide, the assumed laws of contact action determine uniquely their directions and velocities after collision; but when more than two spheres collide, the situation is entirely different.

1 Synopsis of address as retiring president of the American Mathematical Society before a joint meeting of the American Association for the Advancement of Science, the American Mathematical Society and the Mathematical Association of America. The full text will appear in an early number of the Bulletin of the American Mathematical Society.