

and distant from each other r , have charges Q_1 and Q_2 , the spheres having a common potential V . Their attraction for each other will be

$$A = K \frac{m_1 m_2}{r^2} - \frac{Q_1 Q_2}{r^2} \\ = K \frac{16}{9} \frac{\pi^2 R_1^3 R_2^3 \rho^2}{r^2} - \frac{R_1 R_2}{r^2} V^2$$

Here K is the value of Newton's constant of gravitation, as it would be determined by the method of Cavendish or Boys, if V were zero absolute.

If V is not zero, and the second term is omitted, the last equation might be written

$$A = K \left(1 - \frac{x}{100} \right) \frac{16}{9} \frac{\pi^2 R_1^3 R_2^3 \rho^2}{r^2}$$

In this equation $K[1 - (x/100)]$ is the gravitation constant that would be determined under such conditions. Both K and x would remain unknown quantities.

Equating these two values of A

$$V = \frac{4}{3} \pi R_1 R_2 \rho \frac{\sqrt{Kx}}{10}$$

If V is measured in volts

$$V = 40\pi R_1 R_2 \rho \sqrt{Kx}$$

If $R_1 = 10$, $R_2 = 1$, $\rho = 11.35$ and $K = 6.6576 \times 10^{-8}$

$$V = 3.68 \sqrt{x}$$

This result shows that if these two spheres have a common potential which differs from absolute zero by 3.68 volts, the value of K as determined by the Cavendish method will be in error by one per cent. of the above value which is that of Boys. If V were ± 8.23 volts, an error of five per cent. would result. If V were 36.8 volts the two spheres would cease to attract each other. The absolute zero in V would be the common potential of the two bodies, when their attraction for each other is a maximum.

Storm clouds and the electrified atmosphere are continually acting inductively upon the earth's surface. The potential difference at the ends of a flash of lightning may amount to thousands of millions of volts. Aside from such disturbances, we are wholly in the dark concerning the average potential of the earth.

It is evident that the smaller the masses used in such determinations, the greater will be the possibility of error in the result, when the potential term is ignored.

It seems very probable that we do not know the real value of the gravitation constant.

FRANCIS E. NIPHER

SOCIETIES AND ACADEMIES

THE AMERICAN MATHEMATICAL SOCIETY

THE one hundred and eighty-second regular meeting of the society was held at Columbia University on Saturday, February 26, extending through the usual morning and afternoon sessions. The attendance included forty-three members.

The president of the society, Professor E. W. Brown, of Yale University, occupied the chair, being relieved by Professors H. B. Fine, T. S. Fiske and H. S. White. The following persons were elected to membership: Mr. L. E. Armstrong, Stevens Institute of Technology; Professor Grace M. Bareis, Ohio State University; Professor G. A. Chaney, Iowa State College; Mr. J. E. Davis, Pennsylvania State College; G. H. Hardy, M.A., Trinity College, Cambridge, England; Mr. Harry Langman, Metropolitan Life Insurance Company, New York City; Mr. E. D. Meacham, University of Oklahoma; Dr. A. L. Nelson, University of Michigan; Mr. Elmer Schuyler, Bay Ridge High School, Brooklyn, N. Y. Six applications for membership were received.

The society has recently taken over the stock of the Chicago Papers and Boston Colloquium Lectures, heretofore in the hands of The Macmillan Company. All publications of the society, so far as in stock, are now obtainable directly from the main office. The New Haven Colloquium was published by the Yale University Press, and is sold by them.

The List of Members of the society for 1916 has just been issued. Copies may be obtained from the secretary.

The following papers were read at this meeting:

T. H. Gronwall: "A functional equation in the kinetic theory of gases (second paper)."

T. H. Gronwall: "On the zeros of the functions $P(z)$ and $Q(z)$ associated with the gamma function."

T. H. Gronwall: "On the distortion in conformal representation."

C. A. Fischer: "Equations involving the derivatives of a function of a surface."

E. W. Brown: "Note on the problem of three bodies."

H. Bateman: "A certain system of linear partial differential equations."

H. Bateman: "On multiple electromagnetic fields."

A. R. Schweitzer: "On a new representation of a finite group."

A. R. Schweitzer: "Definition of new categories of functional equations."

E. B. Wilson: "Critical speeds for flat disks in a normal wind theory."

E. B. Wilson: "A mathematical table that contains chiefly zeros."

E. B. Wilson: "Changing surface to volume integrals."

T. H. Gronwall: "Elastic stresses in an infinite solid with a spherical cavity."

T. H. Gronwall: "On the influence of keyways on a stress distribution in cylindrical shafts."

O. E. Glenn: "The formal modular invariant theory of binary quantics."

O. E. Glenn: "The concomitant system of a conic and a bilinear connex."

P. R. Rider: "Trigonometric functions for extremal triangles."

H. S. Vandiver: "Symmetric functions of systems of elements in a finite algebra and their connection with Fermat's quotient and Bernoulli's numbers (second paper)."

S. A. Joffe: "Calculation of eulerian numbers from central differences of zero."

The next meeting of the society will be held at Columbia University on April 29. The Chicago Section will meet at the University of Chicago on April 21-22. The summer meeting of the society will be held this year at Harvard University early in September. At the eighth colloquium of the society, held in connection with the summer meeting, courses of lectures will be given by Professors G. C. Evans, of Rice Institute, on "Topics from the theory and applications of functionals, including integral equations," and by Professor Oswald Veblen, of Princeton University, on "Analysis situs."

F. N. COLE,

Secretary

THE BIOLOGICAL SOCIETY OF WASHINGTON

THE 551st regular meeting of the society was held in the Assembly Hall of the Cosmos Club, Saturday, February 26, 1916, called to order at 8 P.M. by President Hay. Fifty persons were present.

The first paper on the program was by D. E. Lantz, "An Early Seventeenth Century Mammalogist." This was a review of Edward Topsell's "History of Foure-footed Beastes," published in London in 1607. Topsell was born about 1538 and at the completion of this, the first general work on mammals published in the English language, was chaplain of the church of St. Botolph, Aldergate, under Richard Neile, Dean of Westminster, to whom the book is dedicated. The work, including illustrations, is largely translated from Conrad Gesner's "Historia Animalium," published in 1551; but the author quotes also from over 250 other writers, Hebrew, Greek, Latin, German, Italian and French authorities, and including 76 medical treatises. The speaker gave many curious extracts from Topsell illustrating them with lantern pictures of the animals under discussion, taken from the old wood cuts in the book. The pictures included the antelope, an ape monster, the American sloth, the beaver, various kinds of hyenas, the unicorn, the riverhorse and the Su, an untamable and ferocious animal that has been identified with the American opossum.

The second and last paper on the program was by J. W. Gidley, "A Talk on the Extinct Animal Life of North America." Mr. Gidley defined the terms fossil, petrification, explained how fossils were formed under various conditions and how they are discovered by the collector. He discussed the evolution of certain animals as shown by their fossil remains as particularly exemplified by horses, elephants and dinosaurs. He emphasized in especial the unfortunate tendency on the part of paleontologists to try to see in fossil remains ancestral forms of later fossils or of existing animals. The speaker thought that many fossils represented highly specialized types of their kind, some extinct animals being more highly specialized than their present-day representatives, in fact in many cases their extreme specialization has led to their extinction. In a general way fossil forms represent the evolution of certain groups but the immediate connecting forms are for the most part lacking. Mr. Gidley's communication was profusely illustrated with lantern views of fossil-bearing localities, of fossils, and of certain artists' restorations of fossils. Mr. Gidley's communication was discussed by Dr. L. O. Howard.

M. W. LYON, JR.,
Recording Secretary