

# SCIENCE

VOL. LXIX

MAY 10, 1929

No. 1793

## CONTENTS

<i>Michelson's Economic Value</i> : DR. ROBERT A. MILLIKAN .....	481
<i>Meteor Crater Exploration</i> : PROFESSOR HERMAN L. FAIRCHILD .....	485
<i>Scientific Events:</i>	
<i>Agricultural Research Bureaus in Great Britain; U. S. Biological Survey; The National Arboretum; Gifts for Medical Research at New York University; Physical Laboratories of the University of Chicago; The Fiftieth Anniversary of the Incandescent Light and Mr. Edison</i> .....	487
<i>Scientific Notes and News</i> .....	490
<i>University and Educational Notes</i> .....	494
<i>Discussion and Correspondence:</i>	
<i>On the Phylogeny of Horses, Dogs and Cats</i> : PROFESSOR W. D. MATTHEW. <i>The Practical Significance of Increasing the Daily Light Period of Winter for Strawberry Breeding</i> : DR. GEORGE M. DARROW and GEORGE F. WALDO. <i>The Precise Expression of "Dryness"</i> : C. G. BATES. <i>The Stoning of a Minor Prophet</i> : P. B. S. ....	494
<i>Scientific Books:</i>	
<i>Pavlov on Conditioned Reflexes</i> : PROFESSOR A. J. CARLSON. <i>Serviss's The Story of the Moon</i> : CAROLYN GESLER .....	498
<i>Scientific Apparatus and Laboratory Methods:</i>	
<i>The Dissection of the Spiral Valve of Squalus acanthias</i> : CHARLES E. HADLEY .....	500
<i>Special Articles:</i>	
<i>X-rays and Mutations</i> : PROFESSOR JAMES W. MAJOR. <i>The Occurrence of Podsol Soils in Quebec Province</i> : R. R. MCKIBBIN .....	500
<i>The National Academy of Sciences</i> .....	502
<i>Science News</i> .....	x

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

## THE SCIENCE PRESS

New York City: Grand Central Terminal.  
Lancaster, Pa. Garrison, N. Y.  
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.

## MICHELSON'S ECONOMIC VALUE<sup>1</sup>

IN the year 1896 Albert A. Michelson took a new egg into the nest over which he brooded—or the department on which he sat—at the University of Chicago, and after an incubation period of twenty-five years—so long a time did it take to prove that the egg had ever been fertilized at all—he at last had it hatched and sufficiently feathered to justify pushing it out of the nest and bidding it go scratch up its own worms.

To-night, Mr. Chairman, you, representing the public which is obliged to supply the corn-meal required to keep both Michelson and Millikan scratching, have brought us here to exhibit our worms and to let you see whether they are worth the price paid to get them. And as you will presently see that leaves me no choice but to take for the subject of my speech the length of Mr. Michelson's worm, or the economic value of Michelson. For if you ask him to explain, in terms that you can understand, the value of his work I think that you will be told to go to the interior of a star where the temperature is estimated to be 50,000,000° C., or even to a hotter place, if such there be, described by a familiar monosyllable especially beloved by men like Michelson trained for the sea. For Mr. Michelson is wont to say that the sole reason, and the good and sufficient reason, why he spends so much time trying to measure the velocity of light to one part in three hundred thousand is simply that he likes to do it.

But I am going to make bold, now that I have left the nest and am where he can no longer reduce my rations, to contradict him and to tell you, and to tell him, that that is not the sole reason, nor is it the good and sufficient reason. (You see, Mr. Michelson, the young rooster, after the immemorial manner of young roosters, is questioning the old cock's right to do just exactly as he "damn-pleases" in the hen-yard.) To prove my point I have only to call your attention to the fact that if Mr. Michelson had "chosen" to spend his days and his nights sitting on a log pounding it with the butt end of a hatchet he would soon have found himself in a straight-jacket in the nearest institution especially provided by the state for the care of the deranged.

<sup>1</sup> Address delivered at the dinner of the Society of Arts and Sciences held in New York on February 22, 1929, upon the occasion of the presentation of the gold medal of the society to Messrs. Michelson and Millikan.

# BIOLOGICAL SUPPLIES

Zoological

Embryological

Botanical

Materials

Drosophila

Cultures



Groups

Slides

Life  
HistoriesPhilippine  
Land Shells

A Good Book on Seashore Ecology. Verrill's  
Vineyard Sound Report. \$3.00.

Catalogs will be sent on request  
Address all correspondence to

Geo. M. Gray, Curator  
Supply Department

## Marine Biological Laboratory

Woods Hole, Mass., U. S. A.



## Portuguese Man-of-War

Large size, each.....	\$3.50
Medium size, each.....	2.00
Small size, each.....	1.00
Imperfect specimens, each .....	.50

THE SOUTHWESTERN  
BIOLOGICAL  
SUPPLY HOUSE

211 South Polk Street Dallas, Texas

### Ask For

No.	Subject
10	Capacitance, Inductance and Magnetic Measurements
20	Galvanometers
30	Keys and Switches
40	Resistances, etc.
48	Electrolytic Conductivity Measurements
75	H-Ion Equipment
726	White Potentiometer
755	Type K Potentiometer
765	Students Potentiometer

We Publish 45 Catalogs and Bulletins  
Write for Complete List



### Catalogs and Bulletins on Electrical Measuring Instruments

are sent on request  
Correspondence invited on electrometer problems

LEEDS & NORTHRUP CO.  
4901 STENTON AVE.  
PHILADELPHIA, PA.



## The Language of Research

*Statistics has become the language of research. And statistical method cannot be wholly appreciated without some coherent idea of the stages by which it has reached present development.*

Dr. Helen M. Walker has prepared a carefully balanced narrative of these stages in

### STUDIES IN THE HISTORY OF THE STATISTICAL METHOD

wherein the modern applications of statistics are set forth against a background of the work of De Moivre, Galton, and Gauss, Pearson and many others. Original development of the normal curve, moments, percentiles, correlation, etc., are discussed. No similar study has hitherto appeared. The illustrations include reproductions of some rare old portraits. Dr. Walker is Associate Professor of Educational Statistics at Teachers College, Columbia. The price of the new book is \$5.00. *Published in a limited edition of 700 copies.*

### Other New Books

#### MEDICINE: Its Contribution to Civilization

By Edward B. Vedder. A book every educated person should be familiar with. It is written for general rather than professional reading. Corrects a lot of misinformation on which even well informed people rely. \$5.00.

#### SHIPWAYS TO THE SEA

By Ernest S. Clowes. A study of our inland waterways, and a setting forth of their vital importance to our national welfare. \$4.50.

#### THE WILLIAMS & WILKINS COMPANY

Publishers of Scientific Books and Periodicals  
BALTIMORE, U.S.A.

## School of Medicine Western Reserve University

Cleveland, Ohio

NEW LABORATORIES AND  
HOSPITALS  
RESTRICTED CLASSES  
THOROUGH INSTRUCTION  
LARGE CLINICAL FACILITIES  
HIGH STANDARD OF SCHOLAR-  
SHIP

Admission confined to students having aca-  
demic degrees and to Seniors in Absentia.

*For information address:*

THE REGISTRAR  
2109 Adelbert Rd. CLEVELAND

## BOSTON UNIVERSITY SCHOOL OF MEDICINE

ORGANIZED IN 1873

ANNOUNCEMENT

may be obtained by application to

THE REGISTRAR  
80 East Concord Street,  
Boston, Massachusetts

## JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE

The School of Medicine is an Integral Part of the University and is in the Closest Affiliation with the Johns Hopkins Hospital.

### ADMISSION

Candidates for admission must be graduates of approved colleges or scientific schools with two years' instruction, including laboratory work, in chemistry, and one year each in physics and biology, together with evidence of a reading knowledge of French and German.

Each class is limited to a maximum of 75 students, men and women being admitted on the same terms. Applications may be sent any time during the academic year but not later than June 15th.

If vacancies occur, students from other institutions desiring advanced standing may be admitted to the second or third year provided they fulfill the requirements and present exceptional qualifications.

### INSTRUCTION

The academic year begins the Tuesday nearest October 1, and closes the second Tuesday in June. The course of instruction occupies four years and especial emphasis is laid upon practical work in the laboratories, in the wards of the Hospital and in the dispensary.

### TUITION

The charge for tuition for 1929-30 will be \$800 per annum, payable in two installments. There are no extra fees except for certain expensive supplies, and laboratory breakage.

Inquiries should be addressed to the Executive Secretary of the School of Medicine, Johns Hopkins University, Washington and Monument Sts., Baltimore, Md.

Graduates in Medicine who satisfy the requirements of the heads of the departments in which they desire to work are accepted as students for a period not less than three quarters. Tuition charge is \$50 a quarter.

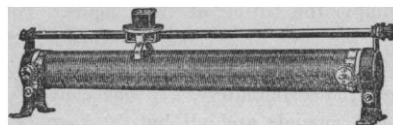
## Advance Yourself in Chemistry this Summer

**GRADUATE** Quantitative Organic Microanalysis  
**COURSES:** Chemical Microscopy  
Theory of Solutions  
**UNDERGRADUATE:** A full year course in Inorganic, Analytical, Organic, or Physical Chemistry

UNIVERSITY OF PITTSBURGH  
SUMMER SESSION

July 1-August 23

*For details, write the Director*



## NEW JAGABI RHEOSTATS—

wound on *porcelain tubes* instead of porcelain-enameled iron tubes, have high insulation and low inductance. They meet an ever increasing demand by Educational, Research and Industrial Laboratories for better and more rugged Jagabi Rheostats.

Write for *New Bulletin 1215-S*, listing 57 Standardized ratings, which are carried in stock.

JAMES G. BIDDLE, 1211-13 ARCH ST., PHILADELPHIA

## New Crowell Books

### General Elementary Botany

By **ELMER CAMPBELL**  
(*Transylvania College*)

400 pages, 250 illustrations, 8vo., \$3.00

A general but fundamental perspective of the plant world.

### Freshman Algebra *for Liberal Arts Courses*

By **JAMES BYRNIE SHAW**  
(*University of Illinois*)

160 pages, 8vo., \$2.00

This text is written from a standpoint that differs considerably from that of most of the books on Algebra of the present day.

### Fundamentals of Physics

By **A. L. FITCH**  
(*University of Maine*)

350 pages, 100 figures, 18 portraits, 8vo., \$2.50

The underlying facts of physics mathematically expressed. Designed for an introductory course lasting a full year.

### Comparative Neurology

By **JAMES W. PAPEZ**  
(*Cornell University*)

544 pages, 300 illustrations, 8vo., \$6.00

The form, structure, and functions of the nervous system of vertebrates; for students in biology, physiology, and psychology.

---

*In Press—Ready in August*

### General College Chemistry

By **JOSEPH A. BABOR**  
(*College of the City of New York*)

600 pages. With 167 figures, color plate, and chart. 8vo., \$3.75

A book which is scientific in spirit and intensive in the study of fundamental principles and their application. Constant use is made of atomic structures throughout the book.

### The Science of Psychology

By **RAYMOND H. WHEELER**  
(*University of Kansas*)

600 pages, 60 illustrations, \$3.75

The first text-book on general psychology to be written from the configurational and organismic standpoints. The organismic standpoint has practically become established in sociology, and is rapidly proving its value in psychology and neurology.

## THOMAS Y. CROWELL COMPANY

393 Fourth Avenue

New York