

SCIENCE

VOL. LXXXII

FRIDAY, JANUARY 30, 1931

No. 1883

<i>The American Association for the Advancement of Science:</i>	
<i>Recent Developments in Photoelectricity:</i> PROFESSOR C. E. MENDENHALL	107
<i>Psychology's Family Relations among the Sciences:</i> PROFESSOR MADISON BENTLEY	113
<i>Obituary:</i>	
<i>Memorials; Recent Deaths</i>	117
<i>Scientific Events:</i>	
<i>Calendar Reform; The Marshall Field Archeological Expedition; The Aztec Ruins National Monument; The New York State Forest Research Institute; The International Congress on Illumination</i>	118
<i>Scientific Notes and News</i>	121
<i>Discussion:</i>	
<i>The Vampire Bat:</i> DR. MARCUS WARD LYON, JR. <i>Concerning Early Diagnosis of Whooping Cough:</i> DR. LOUIS W. SAUER. <i>The Finding of Large Centipedes in Wyoming and Western Nebraska:</i> HAROLD J. COOK. <i>The Excelsior Geyser Again:</i> PROFESSOR EDWIN LINTON	124
<i>Special Correspondence:</i>	
<i>The Ella Sachs Plotz Foundation for the Advancement of Scientific Investigation:</i> DR. JOSEPH C. AUB	126
<i>Quotations:</i>	
<i>Ellwood Hendrick</i>	128
<i>Scientific Books:</i>	
<i>Williams on the Migration of Butterflies:</i> DR. L. O. HOWARD. <i>Comrie on Barlow's Tables:</i> PROFESSOR CHARLES H. SMILEY	129
<i>Scientific Apparatus and Laboratory Methods:</i>	
<i>A Convenient Hydrometer:</i> PROFESSOR A. C. TESTER. <i>Repair of Non-Conductive Galvanometer Strings:</i> DR. CHESTER W. DARROW. <i>A Siphon Moist Chamber for Microscopic Mounts:</i> DR. FLORENCE A. MCCORMICK	130
<i>Special Articles:</i>	
<i>Some Peculiarities in the Thermoelectric Properties of Monel Metal:</i> EMERY MESCHTER. <i>Strophanthin:</i> DR. WALTER A. JACOBS and ELMER E. FLECK. <i>The Fauna of the Middle Devonian Beauvais Sandstone of Missouri:</i> DR. CAREY CRONEIS and ARNOLD D. HOFFMAN. <i>Responses of Sheep to "Death Camas":</i> DR. ALVAH R. McLAUGHLIN	132
<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.

RECENT DEVELOPMENTS IN PHOTOELECTRICITY¹

By Professor C. E. MENDENHALL

UNIVERSITY OF WISCONSIN

THE general quantum theory may be said to have been born of a black body and sired by the photoelectric effect. Consequently, since we are all, willy-nilly, quantists, every one has at least a genealogical interest in photoelectricity. For some, this interest is enhanced by a certain fascination of the phenomenon itself, and just at present the relation of experiment to statistical and wave-mechanical theory is attracting particular attention. While it is my purpose to discuss mainly recent aspects of the subject, though with no attempt at completeness, it will be useful for the sake of clarity to restate very briefly certain of the earlier generalizations, in order that the later material may be placed in proper relation to them.

The term photoelectricity covers what are, from the standpoint of technique at least, two distinct fields,

the "external" and "internal" effects, the latter being sometimes more descriptively called "photo-conductivity," and it is with the former only that we shall be concerned. Furthermore, the "external effect" itself involves two sets of phenomena, which are experimentally and theoretically quite distinct, according as the matter from which electrons are being removed is in the one case a vapor or in the other case a solid or liquid.

The case of a vapor is obviously the simplest, but it has been the last to be developed because of experimental difficulties. The Bohr theory led one to expect that if the energy of the light quantum equalled or exceeded the ionization energy of the atom, or molecule, ionization would result, and experiments of Williamson, Lawrence and others have verified this and given values of the ionization potential consistent with other determinations. On account of the difficulty of working with sufficiently short wave-lengths,

¹ Address of the retiring vice-president of Section B—Physics, American Association for the Advancement of Science, Cleveland, December 31, 1930.

New McGraw-Hill Books

Leith—

WORLD MINERALS AND WORLD POLITICS

By **C. K. Leith**, Professor of Geology, University of Wisconsin. *A Whittlesey House Publication.*
213 pages, 5 x 7½. \$2.00

A study of the distribution of the world's mineral resources especially as it influences national and international politics.

Maguire—

AEROLOGY

By **Charles Joseph Maguire**, Lieutenant, United States Navy, Aerologist of the Bureau of Aeronautics, Navy Department. 136 pages, 6 x 9, 31 plates. \$2.50

This book presents a brief but accurate, non-mathematical discussion of the atmosphere.

Jenkins and DuMez—

QUANTITATIVE PHARMACEUTICAL CHEMISTRY

By **Glenn L. Jenkins**, Professor of Pharmaceutical Chemistry, University of Maryland, and **Andrew G. DuMez**, Professor of Pharmacy and Dean of the School of Pharmacy, University of Maryland. *McGraw-Hill Publications in Pharmacy.* 405 pages, 5½ x 8, illustrated. \$3.50

A textbook and laboratory manual presenting the theory and practice of quantitative analysis applied to pharmacy.

Whitbeck—

ECONOMIC GEOGRAPHY OF SOUTH AMERICA

By **R. H. Whitbeck**, Professor of Geography, University of Wisconsin. Second edition. 430 pages, 6 x 9, 197 illustrations. \$3.50

The second edition of this widely-used textbook brings both the text and statistical matter entirely up to date.

Thomas—

THE ELEMENTARY THEORY OF TENSORS

By **Tracy Y. Thomas**, Assistant Professor of Mathematics, Princeton University. 122 pages, 6 x 9, illustrated. \$2.00

An exposition of the more elementary ideas of the theory of tensors and the application of these ideas to geometry and mechanics.

*Send for
copies
on approval*

McGraw-Hill Book Company, Inc.

370 Seventh Avenue
NEW YORK

The Journal of General Physiology

EDITED BY

W. J. CROZIER

JOHN H. NORTHPROP

W. J. V. OSTERHOUT

In response to numerous requests, it has been decided to resume the offer for a complete set of the back volumes at half price to new subscribers. The first thirteen volumes complete may therefore be obtained for \$32.50 by new subscribers, until further notice.

Contents of Volume 14, No. 3, January 20, 1931

RAHN, OTTO. The order of death of organisms larger than bacteria.

HOWLAND, RUTH B., and BERNSTEIN, ALAN. A method for determining the oxygen consumption of a single cell.

LILLIE, RALPH S. The conditions of recovery of transmissivity of newly repassivated iron wires in nitric acid.

BAILEY, I. W., and ZIRKLE, CONWAY. The cambium and its derivative tissues. VI. The effects of hydrogen ion concentration in vital staining.

OSTERHOUT, W. J. V., and HILL, S. E. The death wave in *Nitella*. III. Transmission.

McCUTCHEON, MORTON, LUCKÉ, BALDUIN, and HARTLINE, H. KEFFER. The osmotic properties of living cells (eggs of *Arbacia punctulata*).

LUCKÉ, BALDUIN, HARTLINE, H. KEFFER, and McCUTCHEON, MORTON. Further studies on the kinetics of osmosis in living cells.

SUBSCRIPTION PRICE PER YEAR (ONE VOLUME), \$5.00

PUBLISHED BIMONTHLY BY

The Rockefeller Institute for Medical Research

YORK AVENUE AND 66TH STREET

NEW YORK, N. Y.

BROOKLYN BOTANIC GARDEN MEMOIRS

Volume I: 33 contributions by various authors on genetics, pathology, mycology, physiology, ecology, plant geography, and systematic botany. Price, \$3.50 plus postage.

Volume II: The vegetation of Long Island. Part I. The vegetation of Montauk, etc. By Norman Taylor. Pub. 1923. 108 pp. Price, \$1.00.

Vol. III: The vegetation of Mt. Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor. 151 pp., 27 text-figs., vegetation map in colors. June 10, 1927. Price, \$1.60.

AMERICAN JOURNAL OF BOTANY

Devoted to All Branches of Botanical Science

Established 1914. Monthly, except August and September. Official Publication of the Botanical Society of America. Subscription, \$7 a year for complete volumes (Jan. to Dec.). Parts of volume at the single number rate. Volumes 1-17 complete, as available, \$138. Single numbers, \$1.00 each, post free. Prices of odd volumes on request. Foreign postage: 40 cents.

ECOLOGY

All Forms of Life in Relation to Environment

Established 1920. Quarterly. Official Publication of the Ecological Society of America. Subscription, \$4 a year for complete volumes (Jan. to Dec.). Parts of volumes at the single number rate. Back volumes, as available, \$5 each. Single numbers, \$1.25 post free. Foreign postage: 20 cents.

GENETICS

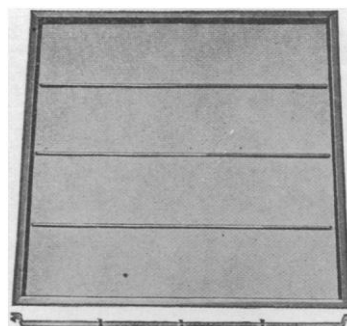
A Periodical Record of Investigations bearing on Heredity and Variation

Established 1916. Bimonthly. Subscription, \$6 a year for complete volumes (Jan. to Dec.). Parts of volumes at the single number rate. Single numbers, \$1.25 post free. Back volumes, as available, \$7.00 each. Foreign postage: 60 cents.

Orders should be placed with

The Secretary, Brooklyn Botanic Garden,
1000 Washington Ave. Brooklyn, N. Y., U. S. A.

The Wistar Institute Slide Tray



Section through two trays, showing nesting features

This tray will carry forty-eight 1-inch slides or thirty-two 1½-inch slides or twenty-four 2-inch slides. Ample space for high mounts, well protected from accident or dust. Trays nest together. Width and breadth the same, so that they may be nested in either direction. All metal—no paint or varnish to affect slides.

Price, \$1.00 each

Orders may be sent to

THE WISTAR INSTITUTE

Thirty-sixth St. and Woodland Ave.

Philadelphia, Pa.

New Publication of THE PHILIPPINE BUREAU OF SCIENCE

FILTERABLE VIRUS AND RICKETTSIA DISEASES. By Earl Baldwin McKinley. 442 pages, 70 plates, and 7 text figures; post-paid, paper cover, \$2.50; bound in full red keratol, \$4.00.

THE PHILIPPINE JOURNAL OF SCIENCE, a monthly, issued in three volumes a year; per year, \$5.00.

A list of the publications of the Philippine Bureau of Science and a sample copy of the Philippine Journal of Science will be sent upon request.

Subscriptions and orders for publications should be sent to

THE BUSINESS MANAGER Philippine Journal of Science

Bureau of Science

Manila, P. I.




Field Equipment for Engineers, Explorers, Hunters, Travelers

Scientific Instruments; Packing Equipment; Skis; Firearms; Clothing; Fiala Pat. Sleeping Bags; Optical Instruments; Astronomic Telescopes; Range Finders; Binoculars. Paulin Altimeters *Write for Catalog "A"*

FIALA OUTFITS

47 Warren St., New York



Use Hoke devices for the control of compressed gases

Ask for folder S-2

Hoke Inc. 22 Albany Street
New York City

THE SCIENCE PRESS PRINTING COMPANY

PRINTERS OF

SCIENTIFIC AND EDUCATIONAL
JOURNALS, MONOGRAPHS AND BOOKS

Correspondence Invited

LANCASTER, PENNSYLVANIA

FOR SALE

- (1) **Berichte der Deutschen Botanischen Gesellschaft.** Complete, Vols. 1-33 (1883-1915). Also Heft 7 & 8 of Vol. 34, except Heft 1 of Vol. 28 and Heft 6 of Vol. 31. Vols. 1-14 bound in leather & board. Vols. 15-22 in half Morocco. Vols. 23-33 unbound, as above for \$198.00.
- (2) **Plant Physiology** (Am. Soc. Plant Physiologists). Vols. 1-5 (1926-1930). Complete, unbound, for \$25.00.
- (3) **Botanical Abstracts.** Vols. 3-15 (1920-1926) with bound Index. Vols. 1-10. Unbound for \$78.00.

Address: Alexander P. Anderson, Laboratory
Red Wing, Minn.

THE MICROSCOPE

By SIMON H. GAGE, of Cornell University

Revised, Dark-field Edition (1927) now Available.

The Old and the New in Microscopy, with a special chapter on Dark-field Methods and their Application.

Postpaid, \$3.50

COMSTOCK PUBLISHING CO., ITHACA, N. Y.



Hi-Speed MIXERS

Clamp to any tank, operate from light circuit, mix all liquids, maintain even temperature baths. Thousands used in sizes for 1 to 50,000 gallon tanks.

Write for Catalogue

ALSO ENGINEERING CO.
39 West 60th St., New York

PHONELESCOPE Teaches Through the Eye

SOUND, ELECTRICITY
CAPITAL APPARATUS WORKS

Box 835

Washington, D. C.

NEW LISTS FINE SHELLS

A Generic List of recent Mollusca covering 34 sheets has just been issued and will be mailed to those interested. Nothing quite like it in existence. Also 5 sheets covering books on Conchology. Will quote prices on any Mollusca desired from any part of the World. Largest scientific stock in existence.

Walter F. Webb

202 Westminster Road

Rochester, N. Y.

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 47 Catalogs and Bulletins
Write for Complete List

Catalogs and Bulletins on

ELECTRICAL MEASURING INSTRUMENTS

are sent on request

Correspondence Invited
on Electrometric
Problems



LEEDS & NORTHRUP COMPANY
4801 STENTON AVENUE PHILADELPHIA, PA.
LEEDS & NORTHRUP