

SCIENCE

VOL. 90

FRIDAY, OCTOBER 6, 1939

No. 2336

Science and Social Pioneering: DR. ISAIAH BOWMAN 309

Obituary:

Arthur Edwin Kennelly: PROFESSOR CHESTER L. DAWES 319

Scientific Events:

Public Health in Germany in 1938; The Hall of Man at the World's Fair; Mead Johnson and Company "B-Complex" Award; Recent Appointments at Columbia University; Changes and New Appointments at Harvard University; Semi-centennial Celebration of the Founding of the Medical School of the University of Minnesota 321

Scientific Notes and News 324

Discussion:

Atmospheric Contamination: PROFESSOR A. H. PFUND. *Oxidation-Reduction Potentials and the Mode of Action of Sulfanilamide*: DR. RICHARD O. ROBLIN, JR., and PAUL H. BELL. *Structure and Synthesis of a Plant Wound Hormone*: DR. JAMES ENGLISH, JR., DR. JAMES BONNER and A. J. HAAGEN-SMIT. *The Plasmodium of Hemitrichia vesparium (Batsch) Macbr*: LLOYD G. CARR. *Literature Service for Chemists*: DR. NEIL E. GORDON 326

Scientific Books:

Recent Botanical Books: DR. R. F. DAWSON, PROFESSOR G. W. KEITT, PROFESSOR C. L. WILSON. *Annual Review of Physiology*: DR. CARL J. WIGGERS 330

Reports:

Scientists and the Press 333

Special Articles:

The Structure of the Red Oxidation Products of Tocopherols and Related Substances: PROFESSOR LEE IRVIN SMITH, WILLA B. IRWIN and HERBERT E. UNGNADE. *Appearance of Fermentable Polysaccharide in the Blood and a Simple Method for Its Detection*: PROFESSOR THEODORE E. FRIEDMANN and DR. WHEELAN D. SUTLIFF. *Listerella from a Premature Bovine Fetus*: DR. ROBERT GRAHAM, H. R. HESTER and NORMAN D. LEVINE. *Solute Transport in Plants*: DR. A. S. CRAFTS 334

Science News 10

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.

SCIENCE AND SOCIAL PIONEERING¹

By DR. ISAIAH BOWMAN

PRESIDENT OF THE JOHNS HOPKINS UNIVERSITY

THE classic tale has man witless until he receives the Promethean gift of fire. Light and fire are the age-old symbols of the mystery of the creative force in man or of what some would call the divine beginnings of man's discovery of a forward way. We talk less of mystery to-day for, if the source of the light of understanding is still unknown, man himself has successfully trimmed the wick. Reflected, dispersed and recombined from thousands of mental and spiritual facets, the light reveals ever-new possibilities of adventure, experiment and stimulating insight for the self-conscious creature, half angel, half brute, who talks endlessly about his elusive destiny. Whatever their own genius may be, all thoughtful persons borrow or reflect enlightening fact wherever they find it, and observe with alternating

hope and anxiety the endless search by other men for that object of faith and labor called progress.

Reflecting in this fashion, it seemed to me presumptuous to express only my limited individual opinion in this opening address in an annual exchange between the British and the American Associations for the Advancement of Science. It seemed better to inquire of others what they would choose to say. Because scientists are apt to praise the children of their brains, the views of non-scientists were sought on the contribution of science to social welfare and to that uniquely human process of consciously planned advance across the threshold of experience which we may call social pioneering.

To that end I invited one hundred men who are not engaged in either physical or biological research or teaching to express their opinions. For special rea-

¹ The first British and American Association Lecture, Dundee meeting, 1939.

or structure of plant cells but upon the properties of water.

In the dissection experiments made by the author, both intact and cut stems of plants growing in soil tubes were studied under the dissecting binocular. When a stem with tensile sap columns is cut, air immediately enters all the severed vessels, and the liquid columns recede from the cut end. However, if the deficit is not excessive, menisci in the smaller vessels soon reverse their movement, and these tubes are re-filled. Meanwhile liquid in the large vessels continues to recede, supplying water for the refilling ones as well as that lost by transpiration. As expected from laws of capillarity, competition for water by various-sized tubes results in readjustment, the larger vessels losing and the smaller gaining. As the larger ones become depleted, successively smaller elements lose their contents until finally all conductors are sucked dry. During the various stages of readjustment, and particularly immediately following cutting, columns of sap, water vapor and air may be seen moving in opposite directions in the xylem—a fact that seems clear in terms of capillary action, yet one that has confused many students of translocation.

As might further be predicted, when tensile sap columns in intact xylem vessels are jarred or deformed by flattening the elements with a rounded instrument, they break and the vapor columns expand until they reach the limits of the elements in which they are formed, or until the pressure rises somewhat above the zero point. This proves the tensile state of the water columns, for the vapor phase would not continue to expand if the pressure was above that of saturated water vapor at the temperature of the experiment. As in the cut stem, if vapor is formed in several vessels and the stem is not further disturbed readjustment follows with the vapor columns in the smaller elements contracting and those in the larger continuing to expand. That the columns are water vapor and not air is proved by their rapid collapse under increased pressure. The forcing of air into solution by the surface forces of the bubble would require much more time, as is proved by similar tests with the Askenasy apparatus.

Though the above experiments provide satisfactory evidence of the existence and characteristics of tensile sap columns in plants, the old experiment on subaqueous transpiration performed by Dixon in 1897 has never been explained on a purely physical basis. As recently reported,⁵ Smith, Dustman and Shull⁶ failed to account for this phenomenon, for Dixon was able to obtain a rise of eosin after saturating his test shoots by immersion for twenty-four hours.

⁵ H. H. Dixon, *Bot. School of Trinity Coll., Dublin, Notes*, 4: 319, 1938.

⁶ F. Smith, R. B. Dustman and C. A. Shull, *Bot. Gaz.*, 91: 395, 1931.

The fact, recently confirmed by the writer, that subaqueous transpiration occurs only in the light suggested the following explanation: The pressure flow mechanism of solute transport in the phloem requires the osmotic absorption of water from the xylem in regions of active synthesis. Assimilates in solution move to regions of utilization where water is lost to the xylem or to expanding tissues.

Though a recirculation of water in the xylem will not explain the rise of eosin in subaqueous water movements, there are other places that the water might go. All growing cells of the cambium or expanding leaves of the shoot tips require water. Some liquid might also be lost to the intercellular spaces of leaves which often show a partial flooding. Uptake of water from the xylem would in all cases be a function of phloem activity rather than a secretory process of mesophyll cells as originally suggested by Dixon.

To substantiate these deductions, the writer has recently shown that when experiments on subaqueous water movement are set up using forked branches of *Syringa vulgaris*, ringing one of the branches will favor eosin movement up the unringed branch, especially if there is an appreciable portion of bare stem below the fork to provide an adequate differential of living tissue to consume the moving assimilates. These results indicate that the rise of sap in the non-living conduits of the xylem can be accounted for on purely physical grounds, and they explain the single exception made by Dixon to this assumption. On the other hand, they reemphasize the complexity of the over-all processes of translocation and point out the essential part played by living cells and tissues.

A. S. CRAFTS

UNIVERSITY OF CALIFORNIA, DAVIS

BOOKS RECEIVED

- ADRIANCE, GUY W. and FRED R. BRISON. *Propagation of Horticultural Plants*. Pp. ix + 314. 182 figures. McGraw-Hill. \$3.00.
- ENGELDER, CARL J. *Calculations of Quantitative Analysis*. Pp. viii + 174. Wiley. \$2.00.
- HALL, WILBUR, Editor. *Partner of Nature*. By LUTHER BURBANK. Pp. xi + 315. Illustrated. Appleton-Century. \$3.00.
- KAGAN, SOLOMON R. *Life and Letters of Fielding H. Garrison*. Pp. xvi + 287. Illustrated. Medico-Historical Press, Boston.
- LEVY, HYMAN. *Modern Science; A Study of Physical Science in the World To-day*. Pp. x + 736. 160 figures. Knopf. \$5.00.
- METCALF, C. L. and W. P. FLINT. *Destructive and Useful Insects; Their Habits and Control*. Second edition. Pp. xvi + 981. 584 figures. McGraw-Hill. \$7.50.
- PELTIER, GEORGE L., CARL E. GEORGI and LAWRENCE F. LINDGREN. *Laboratory Manual for General Bacteriology*. Second edition. Pp. viii + 275. Illustrated. Wiley.
- TUCKER, S. MARION. *Public Speaking for Technical Men*. Pp. xv + 397. McGraw-Hill. \$3.00.
- WHITMAN, W. G. *Household Physics*. Third edition. Pp. vii + 436. 412 figures. Wiley. \$3.00.

New and Important MOSBY Texts

PSYCHOBIOLOGY and PSYCHIATRY

By WENDELL MUNCIE, Associate Professor of Psychiatry, Johns Hopkins University; With an Introduction by ADOLF MEYER, Henry Phipps Professor of Psychiatry and Director of the Department of Psychiatry, Johns Hopkins University. 750 pages, 100 illustrations. Price, about \$7.50.

The Phipps Clinic for almost thirty years has exerted a continuous influence on the molding of American psychiatric thought and the development of psychiatric teaching and treatment methods. The inspiration for this effort and its continuity are due to the labors of one man, Adolf Meyer, whose insistence that psychology and psychiatry be accorded a rightful place in general biology has been the basis of modern genetic dynamic psychiatry. This book, written at his invitation, is an attempt to portray the main lines of his teaching. The strong clinical trend in the book needs no apology or defense. It is the basis of all medicine, and whatever laboratory and other special helps are given in extenso are to be considered exclusively in the nature of methods of graphic illustration of what the clinical sense already knows, or aims at. The book is divided into four parts: I.—Psychobiology. II.—Psychopathology. III.—Treatment. IV.—Historical Appendix.

Textbook of NERVOUS DISEASES

By DR. ROBERT BING, Department of Neurology, University of Basel, Switzerland. Translated and Amplified by WEBB HAYMAKER, Assistant Clinical Professor of Neurology and Lecturer in Neuro-Anatomy, University of California. New 5th Edition. 850 pages, 207 illustrations, 9 color plates. Price, \$10.00.

The English edition of Professor Bing's "Lehrbuch der Nervenkrankheiten" differs from the original in that the material has been considerably rearranged, augmented and adapted to American usage. The subject of neurology, as presented in this translation, attains almost the exactness of mathematics. As a diagnostician Bing reveals exactness and extreme meticulousness. In this textbook, Bing has elaborated on the latest advances in neurology in Europe, has unfolded his own immense experience based on the most minute and painstaking observations, and has brought to the practitioner and student as has no other textbook writer, detailed, precise therapeutics in an applicable form.

EXPERIMENTAL PHARMACOLOGY and MATERIA MEDICA

By DENNIS E. JACKSON, Professor of Pharmacology, University of Cincinnati, College of Medicine. 1000 pages, 900 illustrations, 60 color plates. Price, \$10.00.

Experimental pharmacology covers a wide range, and there is at present perhaps no phase of the whole field of medicine which promises more for the future alleviation of human suffering than does this division of medical science. The unit of procedure adopted in this text is the experiment. Each experiment is, as a rule, complete within itself, although in many instances an orderly sequence proceeding from the simple to the more complex, from the known to the unknown, has been introduced. The experiments listed herein are, as a rule, arranged with reference to individual drugs.

The general anesthetics are taken up first. Following this is a group of drugs chiefly characterized by their action on the central nervous system. After these comes a series of substances possessing specific actions on some one or more parts of the involuntary nervous system. These are followed by drugs which act mainly on the circulatory system, then follow the antipyretics, a few miscellaneous drugs, and finally a few experiments on acids, alkalies, and some of the heavy metals. The section on materia medica follows the work on pharmacodynamics.

The C. V. MOSBY COMPANY
3525 PINE BLVD. ST. LOUIS, MISSOURI

The Century Earth Science Series

KIRTLEY F. MATHER, Ph.D.
General Editor

MANUAL OF SEDIMENTARY PETROGRAPHY

By

WILLIAM C. KRUMBEIN

*Instructor in Geology
University of Chicago*

AND

F. J. PETTIJOHN

*Assistant Professor of Geology
University of Chicago*

THIS is the only complete treatment of sedimentary petrography written from the analytical point of view. It is more comprehensive than other books dealing with the same subject. Not only are the usual topics of size and mineral analysis treated in complete detail, but such subjects as shape and surface-texture analysis, as well as orientation analysis, are included. Likewise considerable attention is paid to sampling techniques, generally given only brief consideration in works of this type. Finally, it contains the necessary statistical theory and methods, as well as optical theory and methods, needed in the detailed study of sediments.

This is an up-to-date, authoritative, and practical book that in addition to supplying the textbook needs of advanced courses in sedimentary petrography, will be of use as a reference book for research workers in sediments and for oil field laboratory workers, and will be helpful to soil scientists and ceramists.

Royal 8vo 549 pages Illustrated

Price, \$6.50

D. APPLETON-CENTURY COMPANY

35 West 32nd St.
New York

2126 Prairie Ave.
Chicago

CARNEGIE INSTITUTION OF WASHINGTON

Is a research organization working in many fields. Its monographic publications are placed in the principal libraries of the world. Copies can be purchased at nominal cost.

These publications comprise studies in the following fields:

ARCHÆOLOGY	HISTORY
ANTHROPOLOGY	LITERATURE
ASTRONOMY	MATHEMATICS
BIOLOGY	NUTRITION
BOTANY	PALÆONTOLOGY
CHEMISTRY	PALÆOGRAPHY
ECOLOGY	PHILOLOGY
ECONOMICS	PHYSICS
EMBRYOLOGY	TERRESTRIAL
GENETICS	MAGNETISM
GEOLOGY	ZOOLOGY

*Descriptive lists with prices may be obtained
by addressing*

CARNEGIE INSTITUTION of WASHINGTON
WASHINGTON, D. C., U.S.A.

—WE DO TRANSLATIONS—

Technical and Scientific Translations
from and into all languages

Chemistry, Physics, Biology, Medicine; Metallurgy, Engineering, Aeronautics, Radio, etc. We translate manuscripts, books, patents, articles from foreign journals, catalogues and descriptive literature.

TRANSLATION & RESEARCH BUREAU
55 West 42nd St., New York, N. Y.

*Bargains in New and
Used Glasses! All makes,*



Size & powers of nature, sport & hunting glasses, \$6. upward. Telescopes, spotting & riflescopes. Microscopes, magnifiers & compasses \$1. upward. Repair work & goods guaranteed.

J. ALDEN LORING, OWEGO, N.Y.

*Catalog free,
Box B.*

THE SCIENCE PRESS PRINTING COMPANY

PRINTERS OF

SCIENTIFIC AND EDUCATIONAL
JOURNALS, MONOGRAPHS
AND BOOKS

Correspondence Invited

LANCASTER, PENNSYLVANIA

Inorganic Analysis *with Organic Reagents*

SPEED, convenience, accuracy, and selectivity characterize the analytical methods in which organic reagents are employed for the determination of metals. A choice of procedures—gravimetric, colorimetric, or volumetric—is available for most of the common metals.

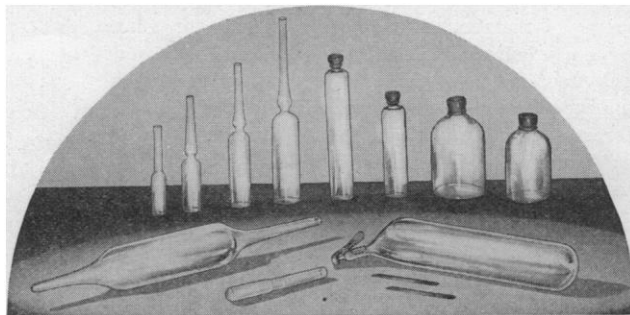
If inorganic analyses are an important part of your routine, write for the list of free abstracts describing the use of Eastman Organic Chemicals. . . Eastman Kodak Company, *Chemical Sales Division*, Rochester, N. Y.

EASTMAN ORGANIC CHEMICALS

PerfeKtum R AMPOULES

(Made in Hungary of Hungarian glass tubing)

**THOROUGHLY ANNEALED
ALKALI-RESISTANT
SHOCK-PROOF**



The distinguishing characteristics of PerfeKtum R Ampoules are as follows: Glass thoroughly annealed to obviate strains and stresses, during fusing or sterilizing, which weaken the ampoules and cause premature breakage. The Hydrogen Ion Concentration of the glass is recorded as pH-6.7, which is equal to that of the best resistant glass known on the market. Easy to seal due to

comparatively low melting point. High thermic quality. Special composition of glass enables it to withstand a temperature of 260°C. without cracking. PerfeKtum R Ampoules fully comply with all official specifications in regards to chemical reactions. Complete stock of all items available for immediate shipment.

Quotations supplied upon request

Inquiries solicited for special requirements

Send for **FREE**
Sample Case
of Ampoules

PERFEKTUM PRODUCTS COMPANY

300 FOURTH AVENUE

NEW YORK, N. Y.