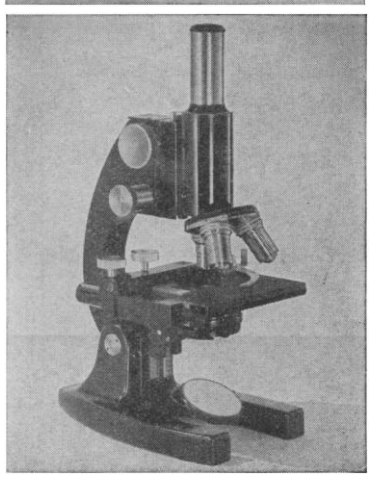
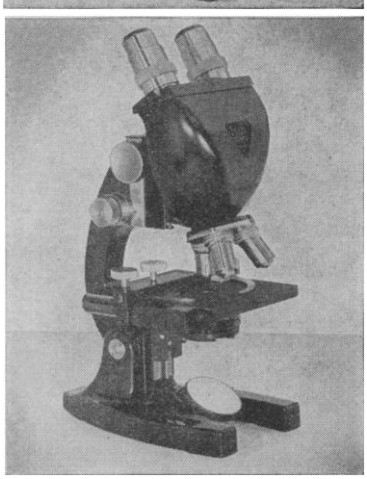
SCIENCE

VOL. 93, No. 2420
NEW SERIES

FRIDAY, MAY 16, 1941

SUBSCRIPTION, $6.00
SINGLE COPIES, .15





BAUSCH & LOMB MICROSCOPES

For all Laboratory Requirements

Whatever your requirements, you have available in the new series of B&L Microscopes a model that will fulfill your specific needs. In optical quality and mechanical precision these models are identical. The only difference is in the equipment required to handle specialized work. Three of the more popular microscopes in this new series are:

1. Model A, recommended for elementary Botany, Zoology, Biology in high school or college. Rugged construction for severe classroom service.
2. Model BA-8, the standard outfit for Histology, Bacteriology, Pathology and similar work. Widely used in college and professional laboratories.
3. Model CTA-8, an outfit designed for all types of routine and research microscopy. Provides advantage of inclined binocular eyepiece for extended observation with quick conversion to monocular for photomicrography and micrometry.

For complete details on the entire new series, ask for Catalog D-185. Bausch & Lomb Optical Co., 642 St. Paul Street, Rochester, N. Y.

BAUSCH & LOMB OPTICAL COMPANY

EST. 1853

FOR YOUR EYES, INSIST ON BAUSCH & LOMB EYEWEAR, MADE FROM BAUSCH & LOMB GLASS TO BAUSCH & LOMB HIGH STANDARDS OF PRECISION

Science: published weekly by The Science Press, Lancaster, Pa.
Entered as second-class matter July 18, 1923, at the Post Office at Lancaster, Pa., under the Act of March 3, 1879.

A New Edition

FOLEY'S

College Physics

3d Edition

This new edition represents a thorough and painstaking revision based largely on the very helpful suggestions and criticisms of a number of teachers who have used the former editions in their classes. A complete new set of problems is provided.

By Arthur L. Foley, Ph.D., Professor Emeritus of Physics, Indiana University. About 500 Illus. About 775 Pages $3.75

Ready in June

A New Textbook

CULVER'S

Musical Acoustics

This book presents an up to date and accurate treatment of the fundamental laws of acoustics as they apply to the production and transmission of musical sounds. It is intended for one semester courses and requires a minimum of mathematics.

By Charles A. Culver, Ph.D., Professor of Physics, Carleton College. Illustrated

Ready in June

THE BLAKISTON COMPANY, Philadelphia

THE PSYCHOLOGY OF THE PHYSICALLY HANDICAPPED

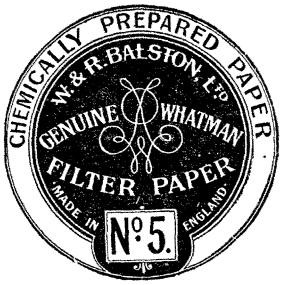
By RUDOLF PINTNER, *Teachers College, Columbia University,* JON EISENSON, *Brooklyn College,* and MILDRED STANTON, *Teachers College, Columbia University*

391 pages, 8vo, $3.00

IRA S. WILE in *The Survey* says, "Good textbooks dealing with the personality development, mental hygiene, mechanisms of behavior and psychological tests for the physically handicapped are all too rare. It is all the more fortunate, therefore, that this volume is presented under the combined authorship of three well-known authoritative teachers. They have thoroughly formulated and discussed the many problems underlying general personality growth and reaction in terms of special handicapped groups such as the deaf, the hard of hearing, the blind, the partially sighted and the crippled. . . . This contribution deserves warm appreciation, not merely by students of psychology but by all working professionally with the physically handicapped whether they be doctors, teachers, counsellors or social workers."

CLIFFORD WOODY, *University of Michigan,* says, "The authors have rendered excellent service in bringing together the results of experimental studies dealing specifically with the various classes of handicapped children. This volume has been much needed and will be widely used."

F. S. CROFTS & CO., NEW YORK



WHATMAN . . .

When you need it.

One advantage of standardizing on WHATMAN Filter Papers is the knowledge that supplies are promptly available from all dealers in laboratory supplies.

Supporting dealers' normal stocks is a large reserve stock, held by us in New York from which your local supply house can draw, upon short notice, to fill unusually large orders promptly.

Should a rush of work necessitate a larger quantity of a particular grade and size than you usually need, you can be sure of adequate supplies promptly if you have standardized on WHATMAN.

This is one reason why leading laboratories in all lines of industry specify WHATMAN for every analysis requiring Filter Papers.

Samples cheerfully supplied

H. REEVE ANGEL & CO., INC.

7-11 Spruce Street, New York, N. Y.

WHATMAN High Grade FILTER PAPERS

Announcing

HOMOCYSTINE
and
HOMOCYSTEINE

BIOLOGICAL INVESTIGATIONS conducted since the discovery of homocystine and homocysteine suggest their importance in the metabolism of methionine and the relation of choline to that process.[1,2]

Homocystine and homocysteine are similar in certain respects, both chemically and biologically, to cystine and cysteine.[3,4] Although never isolated from natural sources, the biological importance of these synthetic substances has been established.

Increasing interest in these two compounds and investigations now in progress may disclose other important functions for these synthetic sulfur containing amino acids.

Homocystine SMACO and Homocysteine SMACO, suitably purified for use in biological research are now being prepared in the Research Laboratories of S.M.A. Corporation.

1. DU VIGNEAUD, V., DYER, H. M., and HARMON, J.: *J. Biol. Chem.*, 101:719:1933.
2. DU VIGNEAUD, V., CHANDLER, J. P., MOYER, A. W., and KEPPEL, D. M.: *J. Biol. Chem.*, 131:57:1939.
3. SINGAL, S. A., and ECKSTEIN, H. C.: *Proc. Soc. Exper. Biol. & Med.*, 41:512:1939.
4. VIRTUE, R. W., and DOSTER-VIRTUE, M. E.: *J. Biol. Chem.*, 128:665:1939.

HOMOCYSTINE SMACO
in 1, 5 and 10-gram bottles.

HOMOCYSTEINE SMACO
in 1, 5 and 10-gram vacuum sealed ampuls.

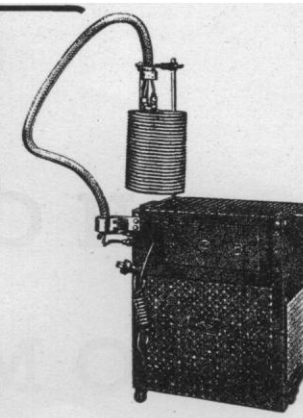
•

PRICES ON REQUEST

RESEARCH LABORATORIES
S. M. A. Corporation
CHAGRIN FALLS, OHIO

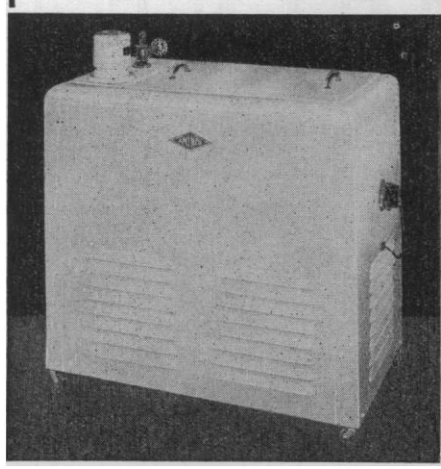
SMACO

PORTABLE CONSTANT TEMPERATURE BATH COOLER



For use in baths or tanks for maintaining bath liquid at or below room temperature with an accuracy of ±0.1°C. or ±0.75°C. Since the coil is intended for immersion in the liquid to be cooled, this unit is put into service in a few minutes. No installation or pipe connections are required. Does away with expensive and bothersome brine or water-cooling systems. Capacities: 625, 1905 and 2520 b.t.u. per hour.

Fully Described in Bulletin A2099



REFRIGERATED CONSTANT TEMPERATURE BATH . . With Built-in Pump for Circulating Liquids Through Other Laboratory Apparatus

Four standard temperature ranges: room to 14°F., room to −20°F., 14° to 160°F., and −20° to 160°F. Constant to ±¼°F. Special baths available for ranges from −40° to 200°F. Bath capacities, 16 and 50 gal.

Fully Described in Bulletin A2099

AMERICAN INSTRUMENT CO.
8010 GEORGIA AVENUE · SILVER SPRING, MARYLAND

SPRAGUE - DAWLEY, INC.

Pioneers in development of the standard laboratory rat

Madison, Wisconsin

The Foundations of Science

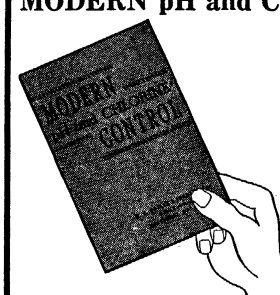
By H. POINCARÉ
Pp. xi + 553.

Containing the authorized English translation by George Bruce Halsted of "Science and Hypothesis," "The Value of Science" and "Science and Method," with a special preface by Poincaré, and an introduction by Josiah Royce. *Price, postpaid,* $5.00.

THE SCIENCE PRESS

Grand Central Terminal **New York, N. Y.**

MODERN pH and CHLORINE CONTROL

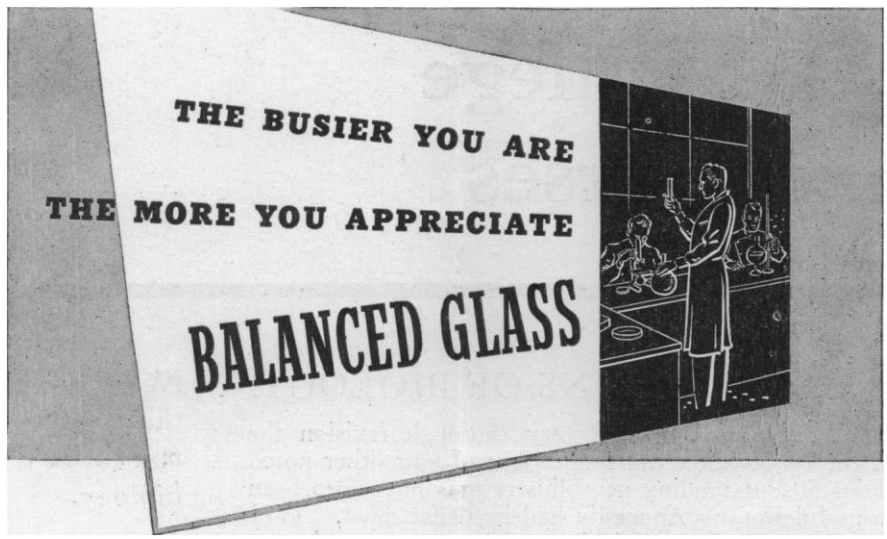


This 80 page book gives all necessary information for the practical application of pH, chlorine and phosphate control and for water analysis.

It contains a simple explanation of the meaning of pH control, its application to various processes and descriptions of Taylor Slide Comparators, with methods of operation, and precautions which must be observed.

Copy sent free on request.

W. A. TAYLOR & CO., INC.
7300 York Road **Baltimore, Md.**



T.M. REG. PYREX U.S. PAT. OFF.

When the demands upon your laboratories are greatest you appreciate Balanced Glass most. For this is the ideal laboratory glass—the all-around glass. You turn to it confidently, sure of its strength, certain of its stability, and positive of its thermal resistance. All of these properties are *balanced* one against the other. Not one has been enhanced at the expense of another. All are present in the desired proportion for virtually any laboratory work. All are *combined* for maximum value—maximum laboratory usefulness.

In these days when time is such a factor, when tests, reports, and findings are more urgent than ever, standardize on Balanced Glassware. Always specify Pyrex brand Laboratory Ware, the only glassware made of Pyrex brand Chemical Glass, the Balanced Glass. Available from your regular laboratory ware dealer.

"PYREX" is a registered trade-mark and indicates manufacture by

CORNING GLASS WORKS • CORNING, N. Y.

CORNING *means* Research in Glass

Pyrex Laboratory Ware BRAND

Important texts for 1941 college science courses

Woodruff's FOUNDATIONS OF BIOLOGY. Sixth Edition. In making this very thorough revision the author has had the cooperation and suggestions of four other noted biologists. About 50 outstanding new illustrations have also been added, and the useful Botany Appendix had been extended. (773 *pages.* $3.75.) Baitsell's *Manual of Biology* to accompany this text will also be revised this spring, to be ready for use in fall classes.

New revisions of 2 of the most popular basic texts for general biology.

Mavor's GENERAL BIOLOGY. Second Edition. Additional material on botany and human biology, and many new illustrations increase the value of a very well-liked text. *Ready May 13th.* (897 *pages.* $4.00 *probable.*) *Laboratory Exercises in General Biology,* closely coordinating with the text, are also being prepared by the author and will be ready in time for use in fall classes.

COMPARATIVE EMBRYOLOGY OF THE VERTEBRATES, by *Dr. Alfred F. Huettner.* A modern approach and interpretation, thorough scientific accuracy, nearly 200 original illustrations, all exceptionally clear, detailed and accurate, make this an outstandingly fine text for students of embryology. *Ready May 20th.* (c.440 *pages.* $4.50, *probable.*)

A new text for embryology, unique in the excellence of its illustrative equipment.

COLLEGE ENTOMOLOGY, by *E. O. Essig* This book covers the history and biology of the 33 orders of insects, emphasizing those species which, because of their historical background, economic importance, or unusual and interesting appearance, should be known to all students of natural history. Full lists of families, keys for separating the various categories of insects, and abundant illustrations, largely original, are included. *To be ready in September.* (c.750 *pages.* $5.00, *probable.*)

A very comprehensive, completely illustrated new foundation text in entomology.

The Macmillan Company, New York

Important texts for 1941 college science courses

Holmes' GENERAL CHEMISTRY. Fourth Edition. New treatment of metals to show their preparation, properties, and uses; a new chapter on strategic raw materials; up-to-the-minute material on petroleum, plastics, synthetic fibers, etc.; and discussion of recent research and theory further strengthen this popular text. *Ready in June.* (c.700 *pages. Illus.* $3.75, *probable.*)

New editions of 2 of the leading texts for general chemistry.

Brinkley's PRINCIPLES OF GENERAL CHEMISTRY. Third Edition. A thoroughly modern, up-to-date presentation for students who have had high-school chemistry, this text is notable for its excellent treatment of all modern chemical theory. *Ready in June.* (c.737 *pages.* $4.00, *probable.*)

Sherman's CHEMISTRY OF FOOD AND NUTRITION. Sixth Edition. Completely rewritten to incorporate full discussions of all the important advances made in food chemistry and nutrition, and their significance to health. *Ready May 20th.* (611 *pages.* $3.25, *probable.*)

A new edition of the standard text for food chemistry and nutrition.

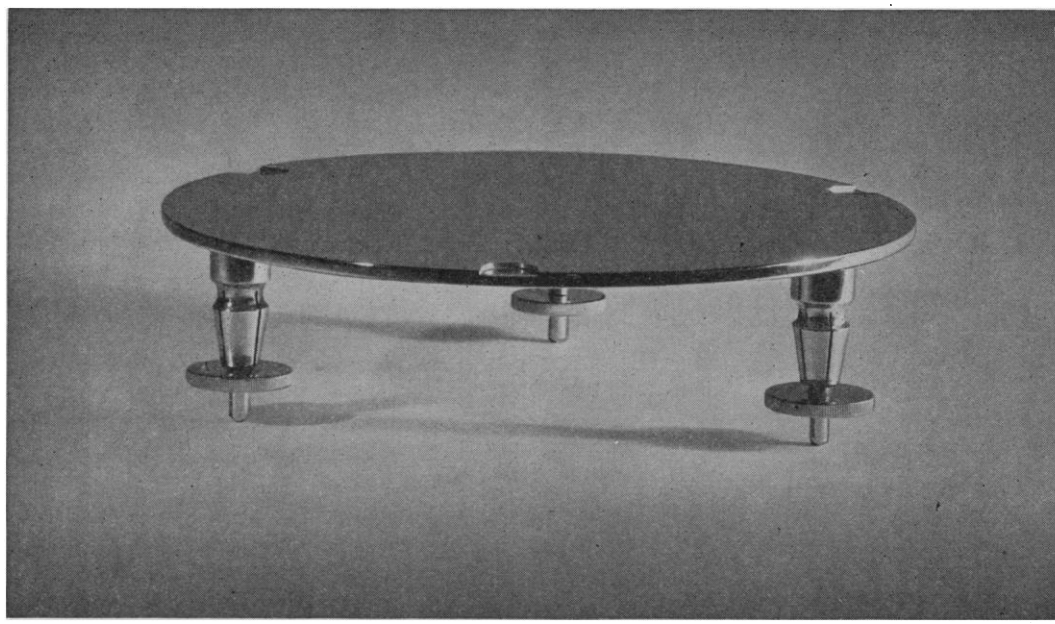
Black's INTRODUCTORY COURSE IN COLLEGE PHYSICS. Second Edition. A thorough revision to bring all material up to date, and to include many new problems, and new illustrations. A "student's text," this book is an exceptionally fine teaching instrument. 734 *pages.* $3.75.

A new edition of an outstandingly successful text for first-year physics.

PHYSICS, by *Frank L. Robeson.* This new text for general college physics is simply and clearly written to be within the understanding of students who have not had previous training in the subject. Written by a man who is both a physicist and an engineer, the text is very thorough, accurate and exact in all statements and definitions, and completely up to date. Sufficient problem material is included for two years' assignments. *Ready in September.* (c.750 *pages.* $3.75, *probable.*)

A new foundation text in physics for both engineering and arts students.

The Macmillan Company, New York



THE *Leveling Table*—16 cm. in diameter—is substantially made of brass, heavily nickled. Each of its three supports is provided with a screw for adjustment.

Write for the *Complete Catalogue* with price-list

Kymographs	**Recording Levers**
Time Recorders	**Manometers**
Electrodes	**Operating Holders**
Keys and Switches	**Stands and Clamps**
Tambours	**Inductorium**
Magnetic Signals	**Respiration Pump**

Parts and Accessories

The HARVARD APPARATUS COMPANY, *Incorporated*

Dover, Massachusetts

SCIENCE

VOL. 93 FRIDAY, MAY 16, 1941 NO. 2420

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.

ANNUAL MEETING OF THE AMERICAN PHILOSOPHICAL SOCIETY

By Professor EDWIN G. CONKLIN

VICE-PRESIDENT AND EXECUTIVE OFFICER; PROFESSOR EMERITUS OF BIOLOGY, PRINCETON UNIVERSITY

THE American Philosophical Society held its annual meeting in its hall on Independence Square, Philadelphia, on Thursday, Friday and Saturday, April 24, 25, 26. The annual meeting of the council was held on the afternoon and evening preceding the session on Thursday. This was an innovation intended to give more time to the important work of the council than was possible heretofore when it met only at dinner on the evening preceding the executive session. President and Mrs. Morris entertained the council at dinner, which was given this time in the society's hall.

The program on Thursday morning and afternoon included thirteen papers in the physical and biological sciences, abstracts of which are printed below. On Thursday evening, Dr. Hugh S. Taylor, professor of chemistry at Princeton University, gave the Franklin Medal Lecture on "Large Molecules through Atomic Spectacles." The lecture was illustrated by models, slides and moving pictures showing novel conceptions of the structure of large molecules. The Benjamin Franklin Medal of the society was presented to Professor Taylor at the close of his lecture.

In the old days congenial members of this society used to adjourn to a Rathskeller or beer garden after an evening lecture, where light refreshment and light or heavy discourse were in order. These aftermath meetings were often most profitable and enjoyable. With the thought of reviving as far as possible this custom, round table parties were held in the hall of the society following Professor Taylor's lecture and

The antimony electrode is extensively used in measuring pH in industrial processes,[3] but it is rarely used in physiological investigations. It does not function satisfactorily in strongly alkaline solutions[4] or in the presence of powerful oxidizing agents[5] as in the blood, but these limitations are not encountered in dealing with gastric contents. The antimony electrode is less sensitive than the glass electrode,[4] but is accurate to a change of 0.1 in pH, which is adequate for measurements on gastric contents. The greatest disadvantage of the antimony electrode has been the

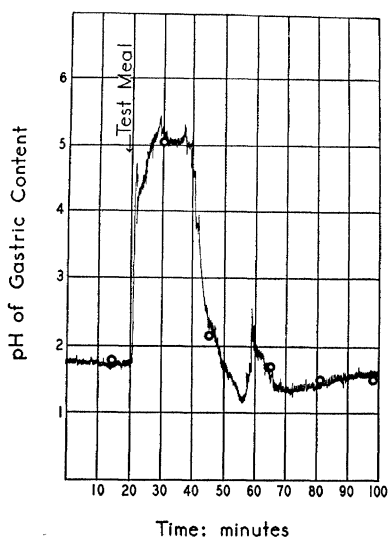


FIG. 1. Continuous record of pH of gastric contents obtained with antimony electrode before and after test meal. Dots represent values obtained with glass electrode on gastric contents withdrawn with Levin tube.

tendency for its current to drift and thus yield erratic and erroneous values.[6, 7] Many attempts have been made to overcome this defect by obtaining a surface coating of stable oxides.[5] We have succeeded in preparing an electrode which is stable in gastric contents by treating the metal with bromine water.

In preparation for use, the electrode is polished with fine emery paper and immersed for 30 minutes in a 1 per cent. solution of bromine in water; it is then washed in water and dried with a soft cloth but is not polished. At intervals of approximately one week during daily use, the electrode is polished with emery paper and treated with bromine water as described. The electrode thus prepared responds to change in pH within the range 1.0 to 7.0 without appreciable lag and without drift.

There is no danger of any toxic action from the antimony when the electrode is swallowed. None of the subjects, in whose stomach the electrode was retained for several hours each day for nearly a month, complained of any disturbance. As further proof, an electrode was carefully weighed and placed in n/10 HCl; after 24 hours of immersion the loss of weight was 0.2 mg; and after 48 hours, 0.3 mg.

The electrode does not function satisfactorily for one to two hours after a full-sized meal, presumably because it may become embedded in large masses of food. This difficulty is not encountered with any of the ordinary test meals used for clinical purposes.

Fig. 1 shows a tracing from a typical record of the pH of the gastric contents before and after a test meal. In this experiment a Levin tube was also passed into the stomach and specimens of the contents withdrawn; the pH of these specimens was determined in the usual manner with the glass electrode; the values obtained are shown as dots in Fig. 1. The agreement between the values found is within pH 0.15. In the record shown here the pH of the gastric contents reached a minimum value 36 minutes after the test meal was given. An abrupt but brief rise in pH then occurred. This momentary rise is characteristic of many records we have obtained.

HOWARD W. HAGGARD
LEON A. GREENBERG

YALE UNIVERSITY

[3] G. A. Perley, *Indus. Eng. Chem.* (Analytical Ed.) 11: 316, 1939.
[4] G. A. Perley, *Indus. Eng. Chem.* (Analytical Ed.) 11: 319, 1939.
[5] T. R. Ball, The Antimony Electrode in pH Measurements. *Trans. Electrochem. Soc.* 72: 139, 1937.
[6] E. J. Roberts and F. Fenwick, *Jour. Am. Chem. Soc.*, 50: 2125, 1928.
[7] H. W. Haggard and L. A. Greenberg, *Am. Jour. Digest Dis.* (in press).

BOOKS RECEIVED

COULSON, C. A. *Waves; a Mathematical Account of the Common Types of Wave Motion.* Pp. xii + 156. 29 figures. Interscience. $1.50.

DURAND, DAVID. *Studies in Consumer Instalment Financing, No. 8: Risk Elements in Consumer Instalment Financing.* Pp. xx + 163. 5 figures. National Bureau of Economic Research, New York.

GALE, ARTHUR S. and CHARLES W. WATKEYS. *Elementary Functions and Applications.* Revised edition. Pp. xxi + 409. 203 figures. Holt. $2.25.

JOKL, ERNST. *The Medical Aspect of Boxing.* Pp. 251. 55 figures. 4 plates. J. L. Van Schaik, Pretoria, South Africa.

MCALLISTER, ETHEL M. *Amos Eaton, Scientist and Educator, 1776–1842.* Pp. xiii + 587. Illustrated. University of Pennsylvania Press. $5.00.

MAYER, JOSEPH. *Social Science Principles in the Light of Scientific Method.* Pp. xxii + 573. Duke University Press. $4.00.

RAMSEY, A. S. *An Introduction to the Theory of Newtonian Attraction.* Pp. ix + 184. Illustrated. Cambridge University Press, Macmillan. $2.50.

VALENTINE, WILLARD L. *Experimental Foundations of General Psychology.* Revised edition. Pp. xvi + 432. 72 figures. Farrar and Rinehart. $2.00.

WARD, HAROLD, Editor. *New Worlds in Science; an Anthology.* Pp. 670. Illustrated. McBride. $3.50.

WOOD, ALEXANDER. *Acoustics.* Pp. xvi + 588. Illustrated. Interscience. $6.00.

A REVISION OF UNUSUAL INTEREST

New Fifth Edition

SHULL'S

PRINCIPLES OF ANIMAL BIOLOGY

By A. FRANKLIN SHULL
Professor of Zoology, University of Michigan

McGraw-Hill Publications in the Zoological Sciences

417 pages, 6 x 9, illustrated. $3.50

LIKE previous editions of this widely-used text, which has been a leader in the field for twenty years, the present revision provides a body of principles which may be brought under such topics as morphology, physiology, ecology, taxonomy, geographical distribution, paleontology, and evolution.

In revising the text the author has placed greater emphasis upon function, in order to cultivate the student's interest in the workings of the living machine. Descriptions of the mechanisms of regulation have been scattered through the physiological parts of the book, and the account of the operation of the autonomic nervous system has been extended. Problems of development are rediscussed in the light of present-day views, but the rest of the embryology chapter has been simplified. Other changes relating to physiology involve the present concept of the nerve impulse, the chemistry of muscle contraction, the composition of the blood, and the chemists' idea of atomic structure.

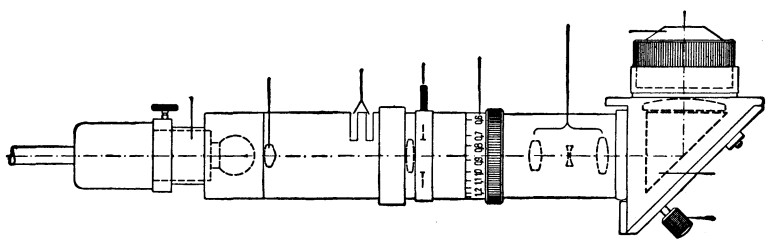
A considerable amount of new material has been included in the treatment of the topics mentioned above, and many new illustrations have been added.

Send for a copy on approval

McGRAW-HILL BOOK COMPANY, INC.

330 West 42nd Street, New York, N. Y. **Aldwych House, London, W.C.2**

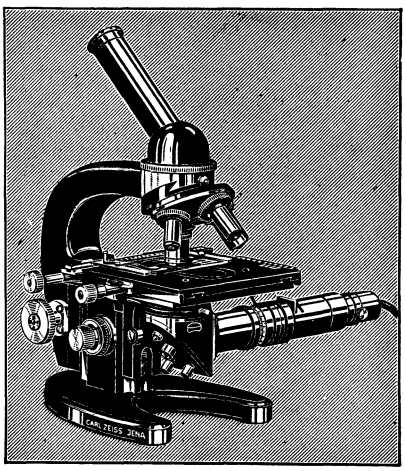
A New Illumination Device for MICROSCOPES



ZEISS

PANCRATIC CONDENSER

The Zeiss Pancratic Condenser is a complete illumination system embodying the Kohler principle of illumination. Source of light and condenser are contained in a single tube attachable to any make of microscope forming an ideal compact unit for microscopic work in transmitted light at different magnifications. With the Pancratic Condenser it is possible for the first time to synchronize instantaneously the numerical aperture of the condenser with the numerical aperture of the respective objective within a range from N.A. 0.16 to N.A. 1.40. In practice this provides a smooth transition from illumination as needed for low power work to the correct illumination for medium and high powers. The Pancratic Condenser may further be used for Dark Field illumination with objectives of numerical apertures up to 1.0. Color as well as polarising filters are also available.



Modern Stand LgOG and Pancratic Condenser—an ideal combination

Literature and Prices on Application

CARL ZEISS, INC.

485 Fifth Avenue NEW YORK

728 So Hill Street LOS ANGELES

CARL ZEISS JENA

NEW WILEY BOOKS

To Be Ready for Fall Use

AN INTRODUCTION TO PHYSICAL STATISTICS

By **ROBERT BRUCE LINDSAY**, *Hazard Professor of Physics, Brown University.*

This book is intended to present in as clear a fashion as possible a brief survey of and introduction to all the fundamental methods of statistical technique now in use in physics. It is suitable for use by graduate students of the first or second year.

Approximately 321 pages; 17 illustrations; 6 by 9; Probable price, $4.00

TEXTBOOK OF QUANTITATIVE ANALYSIS

Third Edition

By **WILLIAM T. HALL**, *Massachusetts Institute of Technology.*

For the usual one-year course in quantitative analysis. Revisions have been made in many sections, such as the one on theory of indicators. Expanded discussions are given in the sections on oxidation-reduction indicators and colloidal solution, flocculation and precipitation, and others. Many new illustrations have been added.

Approximately 369 pages; 52 illustrations; 6 by 9; Probable price, $4.00

A BRIEF COURSE IN ORGANIC CHEMISTRY

By **REYNOLD C. FUSON**, *Professor of Chemistry, University of Illinois;* **RALPH CONNOR**, *Associate Professor of Chemistry, University of Pennsylvania;* and **CHARLES C. PRICE** and **H. R. SNYDER**, *both Associates in Chemistry, University of Illinois.*

An elementary textbook and laboratory manual in organic chemistry, for students of agriculture, home economics, veterinary medicine, pre-dentistry, and pre-medicine. The fundamental concepts and the more important types of organic compounds are discussed as early as possible, and are constantly used throughout the remainder of the book.

Approximately 265 pages; 24 illustrations; 6 by 9; Probable price, $2.50

A TEXTBOOK IN ELECTRICITY AND MAGNETISM

By **HARRY C. KELLY**, *Associate Professor of Physics, Montana State College.*

This book is intended for use by students both in electrical engineering and in science. The level of the book is intermediate between those textbooks that are decidedly elementary and those that are too advanced for a second-year course in physics.

Approximately 418 pages; 247 illustrations; 6 by 9; Probable price, $4.00

THE GLASS ELECTRODE

Methods, Applications, and Theory

By **MALCOLM DOLE**, *Associate Professor of Chemistry, Northwestern University.*

A complete coverage of theory and practice in the use of the glass electrode. All known facts are discussed except the industrial *p*H meter. A large amount of the material in this book has never before appeared in print.

Approximately 318 pages; 122 illustrations; 6 by 9; Probable price, $4.50

JOHN WILEY & SONS, INC.

440 FOURTH AVENUE, NEW YORK, N. Y.