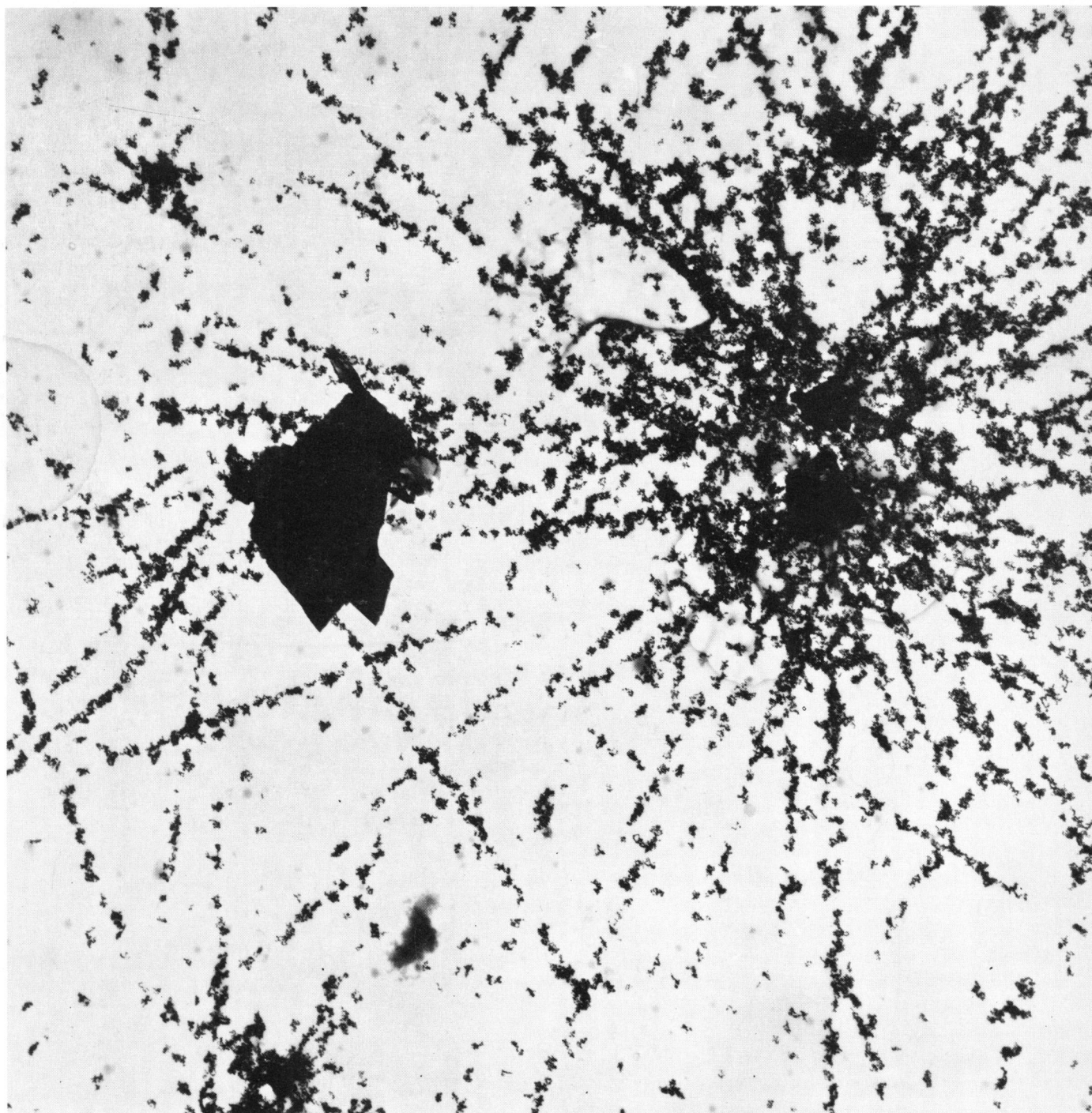


SCIENCE

5 May 1961

Vol. 133, No. 3462

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

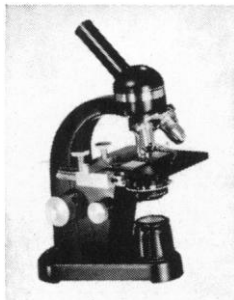


LEITZ EXCLUSIVE: *the only quality microscope that combines these important features...*



BINOCULAR MEDICAL AND LABORATORY MICROSCOPE SM. Equipped with inclined binocular body; mechanical stage; two-lens condenser with swing-out upper element and iris diaphragm; quadruple nosepiece; mirror and fork. Optical outfit with achromats 3.5x, 10x, and 45x and 100x oil immersion with spring-loaded mounts plus 10x eyepieces.

MONOCULAR MEDICAL AND LABORATORY MICROSCOPE SM. Same as above, but equipped with inclined monocular tube. If desired, monocular microscope can be converted to a binocular unit in a simple one-step operation.



LEITZ TECHNICAL SERVICE is unique in the United States, providing one of the most extensive service and repair facilities in the field of scientific instruments.

1. *Single-knob focusing* combines coarse and fine focusing for faster, more convenient operation...saves time...simplifies your microscope studies...lets you work in greater comfort and ease.
2. *The world's finest optics*...high precision construction...the most exacting operation — all in a moderately priced instrument.
3. *Accepts all standard slide sizes.* Mechanical stage accepts both 3" x 1" and 3" x 2" slides.
4. *Retractable spring-load mounts* on high-powered objectives provide positive protection against damage to slide or front lens.
5. *Anti-reflection coating* on tubes and optics throughout.
6. *Extra-wide objective magnification range 45-1250x.*
7. *Monocular or binocular body rotatable 360°* with one-step locking at any point.
8. *Variety of mechanical stages* available.
9. *Selection of attachable illuminators*, interchangeable with mirror.
10. *Wide-field or high-eyepoint eyepieces* (for wearers of glasses) available at slight extra cost.
11. *Contour-fitted carrying case* protects microscope.

GET ALL THE FACTS...WRITE FOR LITERATURE... for full information on all the important new features and conveniences built into the latest SM microscope.

FILL OUT COUPON...MAIL TODAY!

E. LEITZ, INC.		Dept: SC-55
468 Park Avenue South, New York 16, New York		
Gentlemen: Please send me complete information on the:		
<input type="checkbox"/> Model SM microscope.		
<input type="checkbox"/> Kindly have representative <input type="checkbox"/> phone or <input type="checkbox"/> write me		
for appointment to demonstrate SM microscope at no obligation to me.		
Name _____		
Address _____		
City _____ Zone _____ State _____		
Telephone _____		

37761



E. LEITZ, INC., 468 PARK AVENUE SOUTH, NEW YORK 16, N. Y.
Distributors of the world-famous products of
Ernst Leitz G. m. b. H., Wetzlar, Germany—Ernst Leitz Canada Ltd.
LEICA CAMERAS · LENSES · PROJECTORS · MICROSCOPES · BINOCULARS

SAUNDERS *Important Books* **science texts** *to Fill Your Needs* *for Fall College Classes*

— Balinsky —

AN INTRODUCTION TO EMBRYOLOGY

*Sound guidance
on ontogenetic
development*

Here is an unusual text designed to provide students with a general understanding of the complicated processes of development. Dr. Balinsky presents embryology as a single science—logically integrating the traditional “descriptive” and the modern “experimental” approaches.

You'll find in this book a thorough introduction to the broad field of embryology, including gametogenesis—fertilization—cleavage—gastrulation—determination of the primary organ rudiments—embryonic adaptations—the genetic control of organogenesis—metamorphosis—asexual reproduction—development of the mesodermal organs in vertebrates—the genetic factors during gas-

trulation and formation of primary organ rudiments.

The author provides a solid background for the student, showing embryonic development of vertebrates by processes and by development of organ systems. He cites and explains experimental evidence for the interpretation of developmental and growth processes, emphasizing the physiology of development.

This unique volume equips the student with the knowledge he needs to understand and critically evaluate further information on the science of embryology.

By B. L. BALINSKY, Dr. Biol. Sc., Professor of Zoology, University of the Witwatersrand, Johannesburg, South Africa. 562 pages, 6" x 9 1/4", 291 illustrations. \$7.75.

— Newby —

A GUIDE TO THE STUDY OF DEVELOPMENT

*A unique
laboratory manual*

Here is an ideal laboratory manual that serves as an excellent companion for the Balinsky book. It includes the directions for the microscopic examinations of the serial sections of progressive stages in the development of the chick and pig embryos. Unlike other manuals, it also includes extensive discussions on what causes the changes in the development of these two examples. These discussions cite experimental studies not covered in classroom laboratory work, shedding additional light on the nature and causes of development. They include: The Organization of the Egg; Formation of the Embryo; Development of the Organs; Interrelationships Between

Developing Organs. The laboratory exercises themselves cover: Life Cycle of an Animal—Reproduction and Fertilization—Earliest Stages of Chick Development—The Young Embryo—Organ Primordia—Mammalian Development Including Early Stages and Formation—Etc.

Well organized, clearly written, and graphically illustrated, this unique manual gives the student a better understanding of embryological processes.

By WILLIAM W. NEWBY, Ph.D., Division of Biological Sciences, University of Utah. 217 pages, 8 1/4" x 11", illustrated. \$4.00.

— Davenport —

HISTOLOGICAL AND HISTOCHEMICAL TECHNIQS

*A penetrating
examination of
methods*

This concise, clearly-written text gives the student a thorough understanding of modern processing and examination of biological materials for microscopic study, including methods of preparing organs, tissues or tissue components of vertebrates, invertebrates, and plants.

Fundamental information is provided on the nature of tissues, the technics of fixation, washing, dehydrating, clearing, embedding, sectioning, mounting, and staining. Staining methods, staining solutions and fixing fluids are fully presented.

The section of histochemistry gives a brief and up-to-date survey of representative histochemical procedures. Technics to determine inorganic and organic constituents of tissues and enzymes are described. An entire chapter is devoted to applications of Schiff's Reagent.

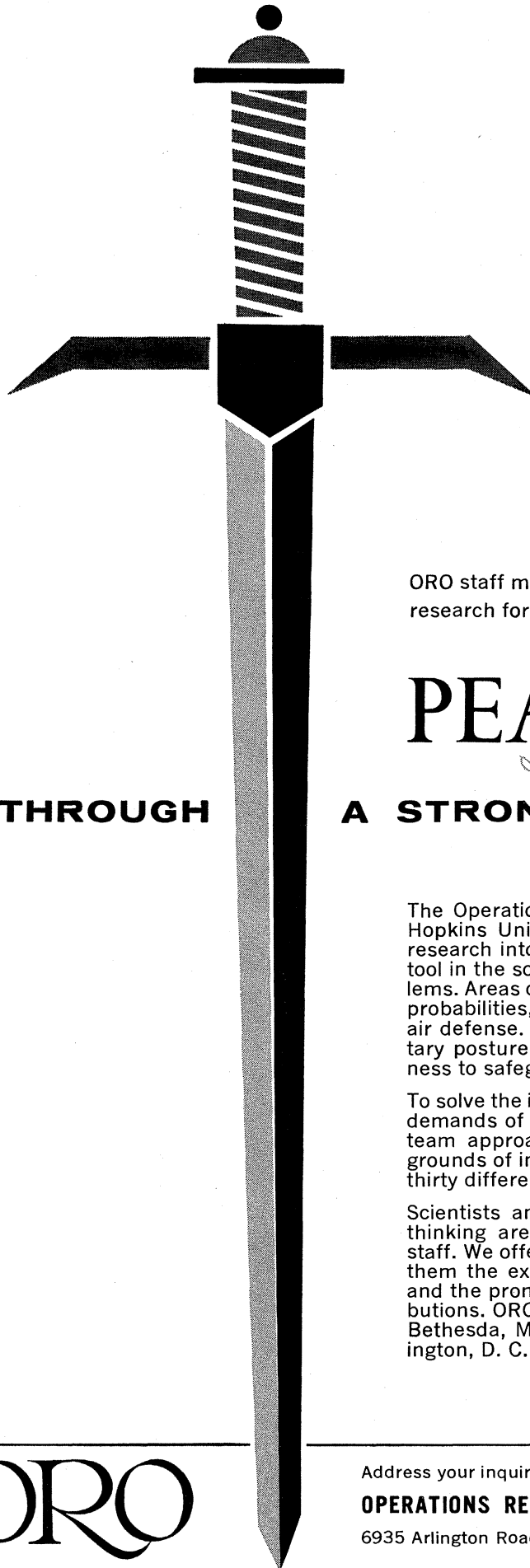
This book logically covers not only the technical methods of histology, but also presents the reasons behind the methods.

By HAROLD A. DAVENPORT, M.D., Professor of Anatomy, Northwestern University Medical School, Chicago, Illinois. 401 pages, 6" x 9", illustrated. \$7.00.

Gladly sent to college teachers on approval

W. B. SAUNDERS COMPANY West Washington Square • Philadelphia 5

SCIENCE is published weekly by the AAAS, 1515 Massachusetts Ave., NW, Washington 5, D.C. Second-class postage paid at Washington, D.C., and additional mailing office. Annual subscriptions: \$8.50; foreign postage, \$1.50; Canadian postage, 75¢.



ORO staff members pioneer operations
research for . . .

PEACE

THROUGH

A STRONG DEFENSE

The Operations Research Office of the Johns Hopkins University has pioneered operations research into a powerful and flexible scientific tool in the solution of world-wide military problems. Areas of application include strategy, war probabilities, tactics, logistics, intelligence, and air defense. The result: a strong national military posture with improved operational readiness to safeguard the peace.

To solve the intricate problems posed by future demands of the Army, ORO employs a mixed-team approach combining the diverse backgrounds of individuals representing more than thirty different disciplines.

Scientists and engineers capable of creative thinking are invited to join our professional staff. We offer you assignments that carry with them the excitement of a pioneering venture and the promise of significant scientific contributions. ORO's modern facilities are located in Bethesda, Md., a residential suburb of Washington, D. C.

ORO

Address your inquiry to: John C. Burke, Research Personnel Officer
OPERATIONS RESEARCH OFFICE / The Johns Hopkins University
6935 Arlington Road • Bethesda 14, Maryland

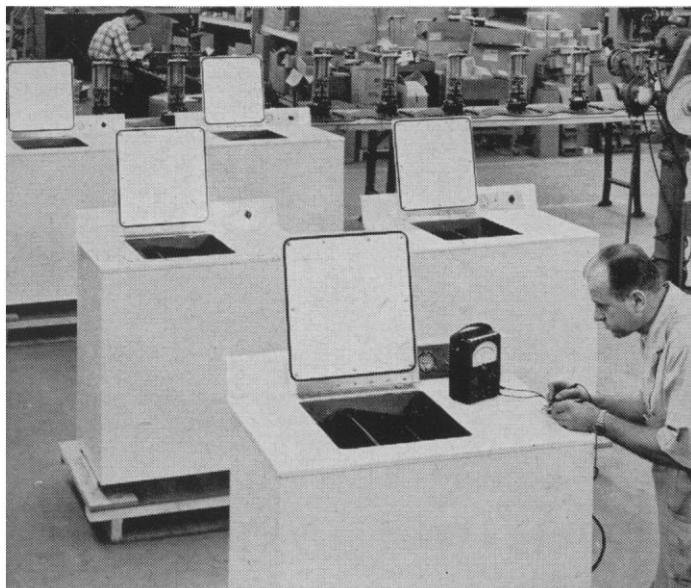
Editorial	How Helpful Is Freedom?	1393
Articles	Information Theory: <i>H. H. Goldstine</i>	1395
	A brief survey is made of the recent developments and the current status of information theory.	
	Chromosome Cytology and Evolution in Primates: <i>E. H. Y. Chu</i> and <i>M. A. Bender</i>	1399
	Study of chromosomes adds to our knowledge of evolutionary relationships among primates.	
	Human Behavior during the Tsunami of May 1960: <i>R. Lachman, M. Tatsuoka, W. J. Bonk</i>	1405
	Research on the Hawaiian disaster explores the consequences of an ambiguous warning system.	
Science in the News	Science in the Courts: The Supreme Court Is Asked To Decide on the Inherent Dangers of Nuclear Reactors	1410
Book Reviews	<i>The Atom Within Us</i> and <i>The Coil of Life</i> , reviewed by <i>G. Hardin</i> ; other reviews	1414
Reports	Afferent Units in Dorsal Roots of Cat Driven by Respiration: <i>A. A. Siebens</i> and <i>F. Puletti</i>	1418
	Density of the Lunar Atmosphere: <i>E. J. Öpik</i> and <i>S. F. Singer</i>	1419
	Rare Tumor in Coast Redwood, <i>Sequoia sempervirens</i> : <i>C. F. Emanuel</i>	1420
	Alternation as Function of Preliminary Training and Type of Deprivation: <i>S. Hellyer</i> and <i>J. H. Straughan</i>	1422
	Electron Microscopy and Autoradiography: <i>L. A. George II</i>	1423
	Phototropic Inversion in <i>Phycomyces</i> : <i>E. S. Castle</i>	1424
	Nitrogen Deficiency and Fluoride Susceptibility of Bean Seedlings: <i>D. F. Adams</i> and <i>C. W. Sulzbach</i>	1425
	Spinal Reflexes and Seizure Patterns in the Two-Toed Sloth: <i>D. W. Esplin</i> and <i>D. M. Woodbury</i>	1426
	Haptoglobin Types in Poland: <i>K. Murawski</i> and <i>T. Mischak</i>	1427
	Recovery from Electroconvulsive Shock as a Function of Infantile Stimulation: <i>R. W. Bell, G. Reisner, T. Linn</i>	1428
Association Affairs	The Third Denver Meeting: Some Background	1429
Departments	Forthcoming Events; New Products	1432
Cover	Radioactive and nonradioactive particles collected on a membrane filter used in sampling air for radioelements. The many alpha tracks observed as reduced silver grains emanating from the plutonium dioxide particles distinguished them from nonradioactive material. See page 1423 (electron microscope, $\times 8400$). [<i>L. A. George II</i> , Hanford Laboratories, General Electric Co.]	

FISHER STOCKS WHAT

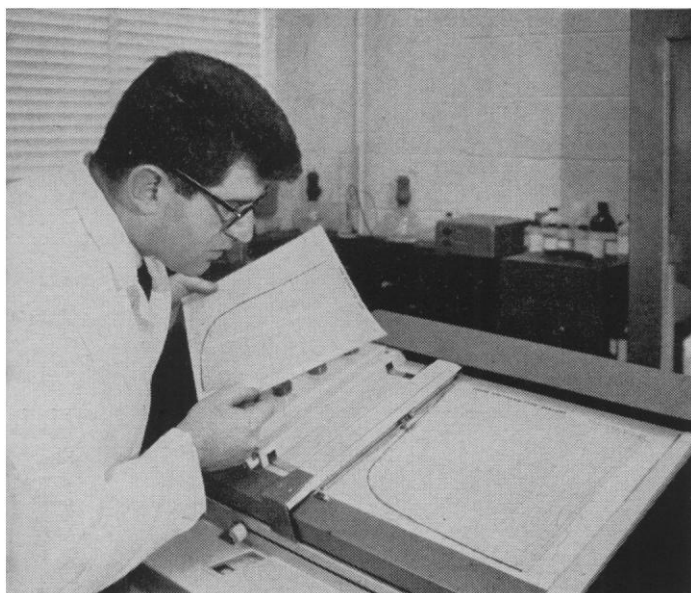


Depend on fast delivery from Fisher's 14 convenient branches. Newest is in Boston, boosting Fisher's total warehouse space to more than three-quarters of a million square feet. In each strategically located branch, skilled crews fill your order carefully, ship it promptly.

YOU NEED!



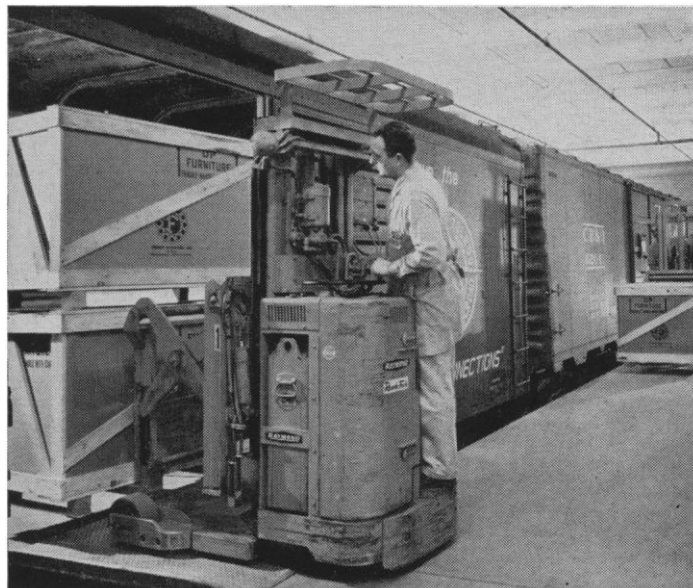
Reduce "housekeeping" time, costs. New Standard Washer gets glassware sparkling clean . . . quickly, economically, safely. It was developed for small labs by Fisher engineers who pioneered much of the apparatus you use.



Get rigidly controlled purity in reagent-grade chemicals, "spectranalyzed" solvents from Fisher. In its modern plant, Fisher makes these and other high-purity chemicals under strict controls to assure uniform quality.

WELL-STOCKED shelves at Fisher Scientific's new Boston branch (left) attest to the huge Fisher inventory: over 20,000 different instruments, appliances, glassware items and furniture units . . . over 7000 different chemicals. Each Fisher branch maintains its own comprehensive stocks so one order can bring your laboratory everything it requires . . . a **single source** that saves you time and money.

Comprehensive stocks are just one feature of the Fisher organization . . . others are noted below. In total, they are the reason Fisher Scientific is a leader in the field of laboratory instrumentation and reagent manufacture.



Speed lab expansion, avoid delays. Order Fisher Unitized Furniture that's quickly available from stock. And take advantage of Fisher's many other services such as lab planning, free technical information, expert instrument repairs.

Want to have more facts about how Fisher can help you? Details in free, data-packed bulletins. Clip, fill out and mail coupon to Fisher Scientific Company, 139 Fisher Building, Pittsburgh 19, Pa.

Fisher Scientific Company
139 Fisher Building
Pittsburgh 19, Pa.

Please send me the following information:

- | | |
|---|---|
| <input type="checkbox"/> "This Is Fisher" | <input type="checkbox"/> Fisher "Spectranalyzed" Solvents |
| <input type="checkbox"/> Fisher Glassware Washers | <input type="checkbox"/> Fisher "Unitized" Furniture |

Name _____ Title _____
Please Print

Company _____

Street _____

City _____ Zone _____ State _____

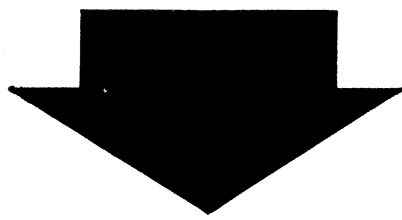
G-175



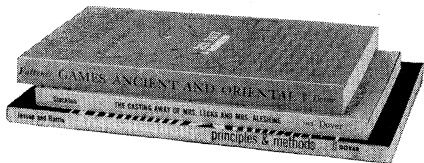
FISHER SCIENTIFIC

World's Largest Manufacturer-Distributor of Laboratory Appliances & Reagent Chemicals

Boston • Chicago • Fort Worth • Houston • New York • Odessa, Texas
Philadelphia • Pittsburgh • St. Louis • Washington • Montreal • Toronto



unusual values in
hard-to-find books!
many now printed
in low-priced editions
for the first time!
only 75c to \$2.95!
DOVER



Biological, Medical Science

- CP614. Unabridged! **CONDITIONED REFLEXES**, I. Pavlov. Pavlov's own final presentation of 20 years experimentation on cerebral cortex and its functions. Classic of physiology, one of world's most influential books. Authorized Anrep translation. 455pp. Paperbd. \$2.25
- CP526. **CULTURE METHODS FOR INVERTEBRATE ANIMALS**, J. G. Needham, et al. Indispensable lab compendium of culture methods for invertebrates from protozoa to chordata. Hundreds of species in 33 classes covered in 313 articles. Describes food, environment, reproductive conditions, etc. 621pp. Paperbd. \$2.75
- CP632. **THE LIFE OF PASTEUR**, Rene Vallery-Radot. The definitive biography, by Pasteur's son-in-law, famed for detailed explanations of Pasteur's world-shaking discoveries in crystallography, fermentation, infectious wounds, contagious diseases, etc. Unavailable for years. 500pp. Paperbd. \$2.00
- CP598. **HEREDITY AND YOUR LIFE**, A. Winchester. Lively, thorough, non-technical coverage of genes, mutations, heredity, genius & idioecy, etc. 60 illus. 353pp. Paperbd. \$1.45
- CP206. **BIOLOGY OF THE LABORATORY MOUSE**, G. Snell, ed. Comprehensive lab manual prepared by staff of Roscoe B. Jackson Memorial Lab. Embryology, reproduction, histology, mutation, anatomy, diseases, cancer research, etc. 172 illus. 508pp. 6 x 9. Clothbd. \$6.00
- CP574-5. 3rd, revised edition! **MATHEMATICAL BIOPHYSICS**, Physico-Mathematical Foundations of Biology, N. Rashevsky. The greatest systematic application of math to biological processes. Authoritative presentation-introduction of one of most exciting areas of modern biophysics. 236 illus. 985pp. 2 vols. The set, paperbd. \$5.00

Mathematics

- CP747. First English translation! **ELEMENTARY CONCEPTS OF TOPOLOGY**, P. Alexandroff. For mathematicians who want a lucid, intuitive survey; students intending to continue; researchers in other fields. "A glowing example of the harmony between intuition and thought," David Hilbert, in his introduction. 73pp. Paperbd. \$1.00
- CP750-1. New! **TEXT BOOK IN ALGEBRA**, G. Chrystal. One of most famous texts ever written. Not survey, but exhaustive, complete coverage and background for topics of elementary algebra. Total of 113pp. 2 vols. The set, paperbd. \$4.70
- CP737. Just out! **HIGHER GEOMETRY: An Introduction to Advanced Methods in Analytic Geometry**, F. Woods. Rigorous development of 1-, 2-, 3-, 4-, and n-dimensional coordinate systems. Highly respected. 423pp. Paperbd. \$2.00
- CP728. New! **AN ELEMENTARY TREATISE ON ELEMENTARY FUNCTIONS**, Arthur Cayley. Long out of print. Jacobi-Legendre theorems. 398pp. Paperbd. \$2.00

Applied Mathematics & Engineering

- CP727. New! **THEORY AND OPERATION OF THE SLIDE RULE**, J. Ellis. Original Dover publication. Not skimpy manual, but extensive, thorough course developed at U. of Kansas. Fast methods, hundreds of short-cuts, full ground in theory, plenty of practice problems. Save hundreds of hours. 321pp. Paperbd. \$1.50
- CP193. **HIGHER MATHEMATICS FOR STUDENTS OF CHEMISTRY & PHYSICS**, H. Mellor. Diff. & integ. calculus, infinite series, differential equations, etc., in terms of chemistry and physics subject matter. Invaluable desk companion, self-study text. 800 problems. 641pp. Paperbd. \$2.00

CP734-5. Just off the presses! **MATHEMATICS OF MODERN ENGINEERING**, E. G. Keller, R. E. Doherty. Revolutionary working text, reference, developed by world-famous mathematician-aerodynamicist for G. E.'s famous advanced engineering course. Determinants, tensors, Heaviside operational calculus, other higher math topics presented in way that engineer or researcher can use them to set up, analyze, and solve actual problems of modern technology: linear and non-linear networks, rotating machinery, electrical systems, aerodynamic and missile motion, vibration, etc. Based on full recognition that technical researcher's and mathematician's needs differ considerably. Internationally used and acclaimed. Total of 633pp. 2 vols. The set, paperbd. \$3.30

CP755. New! **STRENGTH OF MATERIALS**, J. P. Den Hartog. Developed to meet needs of M.I.T. students. Principles, plus considerable emphasis on practical methods, hundreds of problems. 331pp. Paperbd. \$1.95

CP726. **APPLIED ELASTICITY**, J. Prescott. "Should be on the shelf of anyone interested in the more rigorous mathematical analysis of problems in engineering," American Math Monthly. 672pp. Paperbd. \$2.95

TEACH YOURSELF BOOKS

Learn the basic mathematics of science, industry, at home in less than one hour a day. These are serious, well-designed courses for fast, efficient self-study, with lesson-sized chapters, simplified teaching methods, graded exercises and problems (with answers in the back of the book), other aids. We feel these are the best elementary self-instruction manuals on the market, and back them with our usual money-back guarantee. Only \$2.00 each for fine English imports.

CP680. **TEACH YOURSELF ALGEBRA**, 307pp. Clothbound \$2.00

CP681. **TEACH YOURSELF GEOMETRY**, 334pp. Clothbound \$2.00

CP682. **TEACH YOURSELF TRIGONOMETRY**, 204pp. Clothbound \$2.00

CP683. **TEACH YOURSELF CALCULUS**, 380pp. Clothbound \$2.00

CP684. **TEACH YOURSELF MECHANICS**, 271pp. Clothbound \$2.00

CP685. **TEACH YOURSELF THE SLIDE RULE**, 207pp. Clothbound \$2.00

CP237. **TEACH YOURSELF HEAT ENGINES**, 220pp. Clothbound \$2.00

CP230. **TEACH YOURSELF ELECTRICITY**, 184pp. Clothbound \$2.00

Non-Technical & Elementary Science

- CP756. Just out! **AN ELEMENTARY SURVEY OF CELESTIAL MECHANICS**, Y. Ryabov. First American printing of unusual Russian exposition of gravity, orbits, solar system, natural and artificial satellites (including Sputnik I), and more. Only elementary math needed to follow actual computations, methods actually used. 165pp. Paperbd. \$1.25
- CP587. **GREAT IDEAS OF MODERN MATHEMATICS: Their Nature and Use**, J. Singh. Unusually successful elementary explanations of sets, groups, number theory, matrices, non-Euclidean geometry, etc., and their surprising uses in physics, biology, other fields. 320pp. Paperbd. \$1.55
- CP711. **THE FOURTH DIMENSION SIMPLIFIED**, H. Manning. Best non-technical explanations of 4th dimension available. 22 different essays. 251pp. Paperbd. \$1.35
- CP608-9. **HISTORY OF THE WARFARE OF SCIENCE WITH THEOLOGY**, A. D. White. Classic of historical scholarship by founder of Cornell U. exposes crank theories, crackpot explanations of religiously detailed long struggle of scientific truth against theological orthodoxy. Thousands of little-known facts, amusing (and sometimes frightening) hypotheses developed to defend literal truth of Bible through the ages. Absolutely reputable work by great scholar whose target is human stupidity, not true spirituality. Total of 925pp. 2 vols. The set, paperbd. \$3.70

WRITE FOR FREE CATALOGUE

Dover publishes the largest list in English of low-priced technical & scientific paperbacks, treatises, texts, etc. in physics, mathematics, chemistry, biology, geology, etc., at prices far below clothbound or out-of-print prices for these works. Free science catalogue sent on request.

Physics

- CP745. Just out! **FUNDAMENTALS OF ELECTRICITY & MAGNETISM**, L. Loeb. Unusually thorough, lucid first course developed at U. of California. Over one-third of book deals with modern material not usually covered in beginning texts. 669pp. Paperbd. \$2.75
- CP723. New! **THE THERMODYNAMICS OF ELECTRICAL PHENOMENA IN METALS and a Condensed Collection of Thermodynamical Formulas**, P. W. Bridgman. Much valued intuitive approach by Nobel Prize-winner. 2 works bound as one. 305pp. Paperbd. \$1.65
- CP720. New! **PHOTOELASTICITY: PRINCIPLES & METHODS**, H. Jessop, F. Harris. Best introduction to two- and three-dimensional stress-analysis techniques. 192pp. Paperbd. \$2.00
- CP707. **ELEMENTARY PRINCIPLES IN STATISTICAL MECHANICS**, J. Willard Gibbs. First enunciation of principles behind modern thermodynamics by greatest 19th century American physicist. 223pp. Paperbd. \$1.45
- CP754. Just out! **MECHANICS**, J. P. Den Hartog, Prof. of Mech. Eng., M.I.T. Exceptionally clear beginning text, noted for wide coverage, hundreds of concrete examples. "Very thoroughly recommended," Mechanical World. 471pp. Paperbd. \$2.00

Chemistry, Physical Chemistry

- CP700-1. New! **ORGANIC CHEMISTRY**, F. Whitmore. First full-price edition of one of most valuable compilations of organic chemistry information ever assembled. "Dr. Whitmore deserves thanks and congratulations," Industrial and Engineering Chemistry. Total of 1013pp. 2 vols. The set, paperbd. \$4.00
- CP757. Just out! **THE CHEMISTRY OF URANIUM**, J. Katz, E. Rabinowitch. Reprinted through arrangement with AEC. "One of the most exhaustive critical surveys of any single element," Chemical Engineering. Indispensable lab reference on "dry" uranium chemistry. 630pp. Paperbd. \$2.95
- CP721-2. New! **THE SCIENTIFIC PAPERS OF J. WILLARD GIBBS**. Unavailable for years. Includes 300-page "Great Paper" that founded phase theory, rational thermodynamics, plus 30 other papers. 745pp. 2 vols. The set, paperbd. \$4.00

ABSOLUTELY FREE

A DOVER SCIENCE SAMPLER, George Barkin, ed. A 64-page book containing interesting, self-contained passages from more than 20 Dover books explaining science or examining scientific concepts: Edwin Hubble, George Sarton, Ernst Mach, Newton, Galileo, etc. Thought-provoking, enjoyable passages on biology, physics, astronomy, many other fields of science give you hours of pleasure. Just write for it. One to a customer. No obligation to buy any other books. Free

Games & Amusements

- CPI. **FLATLAND**, E. Abbot. Classic story of life in 2-dimensional world; also, excellent introduction to dimension concepts. 128pp. Paperbd. \$1.00
- CP732. Just out! **DIVERSIONS & DIGRESSIONS OF LEWIS CARROLL**, S. Collingwood, ed. Unabridged reprinting of rare satires intended for private circulation. 32 pages of photographs added. 385pp. Paperbd. \$1.50
- CP739. New! **GAMES ANCIENT & ORIENTAL and How to Play them**, E. Falkener. Shogi, Tamerlane's Chess, Egyptian game of the bowl, Roman latruncles, others. Classic among game books. 235pp. Paperbd. \$1.85
- CP613. **GO & GO-MOKU**, Edward Lasker. Full principles, strategy of increasingly popular Oriental game that rivals chess. New, much-enlarged edition. 235pp. Paperbd. \$1.45
- CP640. **MANUAL OF CHESS**, Dr. Emanuel Lasker, World Champion for 25 years. Insight-packed coverage of all aspects of chess. 580pp. Paperbd. \$2.00
- CP528. **CHESS STRATEGY**, Edward Lasker. Principles, not memory: long-range play, etc., by greatest chess teacher. Taught Keres, Fine 282pp. Paperbd. \$1.50
- CP748. New! **HOW TO SOLVE CHESS PROBLEMS**, K. Howard. Over 150 choice works of internationally known chess problemist. Full solutions, principles of construction. 178pp. Paperbd. \$1.00
- CP772. Just out! **THE COMPLETE KANO JIU-JITSU (JUDO)**, H. Haneock, K. Higashi. In the opinion of many experts, the finest book on the subject. 487 stopped-action photos of holds, throws; full text. 589pp. Paperbd. \$2.00

Puzzles

- CP736. Just out! **CALIBAN'S PROBLEM BOOK: Mathematical, Inferential and Cryptographic Puzzles**, H. Phillips, et al. Chief work of greatest contemporary British puzzle creator. 192pp. Paperbd. \$1.25
- CP731. New! **MAZES & LABYRINTHS: A BOOK OF PUZZLES**, W. Shepherd. Nothing else like it in print. Hours of intellectual amusement. 122pp. Paperbd. \$1.00
- CP498. **MATHEMATICAL PUZZLES OF SAM LOYD, VOLUME I**, Martin Gardner, ed. 117 ingenious creations of America's greatest originator. 187pp. Paperbd. \$1.00
- CP709. New! **MATHEMATICAL PUZZLES OF SAM LOYD, VOLUME II**, Martin Gardner, ed. For those who already have Volume I. 187pp. Paperbd. \$1.00
- CP367. **101 PUZZLES IN THOUGHT & LOGIC**, C. Wylie. No math needed, only mental agility. Full solutions, methods of solving. 128pp. Paperbd. \$1.00
- CP473. **AMUSEMENTS IN MATHEMATICS**, H. Dudeney. One of largest collections of math puzzles anywhere. Double columns solutions. 264pp. Paperbd. \$1.25
- CP108. **MATHEMATICAL PUZZLES FOR BEGINNERS & ENTHUSIASTS**, G. Mott-Smith. 188 puzzles on all levels of difficulty. 248pp. Paperbd. \$1.00
- CP493. **Connaisseurs! PILLOW PROBLEMS & A TANGLED TALE**, Lewis Carroll. Rare math puzzle books by author of "Alice" reprinted for first time! 280pp. Paperbd. \$1.50

Humor & Entertainments

- CP759. Just reprinted! **ODDITIES & CURIOSITIES OF WORDS & LITERATURE**, C. C. Bombaugh. New enlarged edition, edited by Martin Gardner. Almost legendary collection of literary oddities, eccentricia, amusements, acrostics, macaronic verse, famous puns, notorious misprints, literary hoaxes, etc. 368pp. Paperbd. \$1.50
- CP749. New! **THE BAD CHILD'S BOOK OF BEASTS. MORE BEASTS FOR WORSE CHILDREN. A MORAL ALPHABET**, Hilaire Belloc. Complete verse, all original illus. of famous humor favorites. 157pp. Paperbd. \$1.00
- CP743. New! **THE CASTING AWAY OF MRS. LECKS & MRS. ALESHINE**, F. Stockton. American humor classic. 239pp. Paperbd. \$1.00
- CP758. New! **PHRASE & WORD ORIGINS: A Study of Familiar Expressions**, A. Holt. "Let George do it." "By book or by crook." 1500 others traced to often surprising sources. New, enlarged edition. 259pp. Paperbd. \$1.35
- CP713. Just out! **PAPER FOLDING FOR BEGINNERS**, W. Murray, F. Rigney. Create scores of beautiful, unusual, useful objects and figures just by folding paper. Easiest-to-follow book on Japanese art of Origami ever written. 95pp. Paperbd. \$1.00
- CP487. **THE DEVIL'S DICTIONARY**, Ambrose Bierce. "Some of the most gorgeous witticisms in the English language," H. L. Mencken. 144pp. Paperbd. \$1.00
- CP523. **HOW TO TELL THE BIRDS FROM THE FLOWERS**, R. Wood. Classic puns in drawings and verse by eminent physicist. 64pp. Paperbd. 75¢
- CP602. **THE WIT & HUMOR OF OSCAR WILDE**, A. Redman, ed. 1,000 quotable epigrams of England's greatest wit. 260pp. Paperbd. \$1.00
- CP698. **BARON MUNCHAUSEN**, R. Raspe. Only complete edition in print. Carswell edition, with 90 Doré illustrations. 233pp. Paperbd. \$1.00
- CP691. **THE WIZARD OF OZ**, L. Baum. Only edition with all 153 original Denslow drawings (the ones you remember) in full color. 272pp. Paperbd. \$1.45

Dept. CP353, Dover Publications, Inc.
180 Varick Street, New York 14, New York
Please send me the following books (give key numbers):

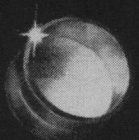
I am enclosing \$_____ in full payment. Payment in full must accompany all orders, except those from libraries and public institutions, who may be billed. Please add 10¢ per book for handling and postage on orders less than \$5.00. Please print

Name _____
Address _____
City _____ Zone _____ State _____

GUARANTEE: All Dover books are unconditionally guaranteed, and may be returned within 10 days for full and complete cash refund.



B/A All-Dielectric INTERFERENCE FILTERS



Baird-Atomic announces the introduction of their radically improved Ultra-violet Filters and all-dielectric Visible Spectrum Interference Filters.

The new 'block shape' \square passband in the Visible Spectrum Filters enables the user to obtain the greatest degree of spectral purity.

If the filter you require is not available in stock, normal delivery time is within thirty to thirty-five days.

Standard filter sizes are 1" x 1" and 2" x 2"; other sizes and shapes are available on special order. Write for your copy of our new filter brochure.

Engineers and scientists — investigate challenging opportunities with Baird-Atomic. Write Industrial Relations Department.

Visible Spectrum

- 4000Å - 8000Å
- New block shape \square passband
- Absorption filters and/or evaporated blocking components provide for maximum blocking, reduced thickness, and improved signal-to-noise ratio
- Transmission outside of passband: under 0.1%
- Half bandwidths from 1.6Å to 1600Å
- Total transmission from fully blocked filter: up to 70%
- Blocking — complete on low side — high side blocking to at least 8000Å (Additional blocking at extra cost)

Ultraviolet Spectrum

- 2100Å to 3400Å and 3900Å to 3999Å



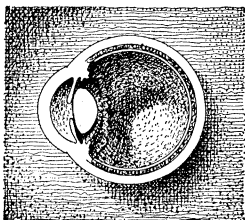
BAIRD-ATOMIC, INC.

33 university road • cambridge 38, mass.

ADVANCED OPTICS AND ELECTRONICS... SERVING SCIENCE

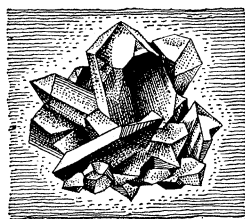
IT HAPPENED THIS MONTH...

a glance at yesterday in relation to today



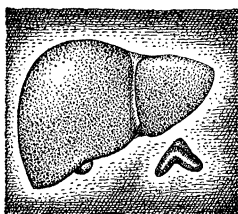
IN MAY—(1874)—James Clerk Maxwell philosophizes about colour vision. “I have here . . . a picture of the structure upon which the light falls at the back of the eye. There is a minute structure of bodies like rods and cones or pegs, and it is conceivable that the mode in which we become aware of the shapes of things is by a consciousness which differs according to the particular rods on the ends of which the light falls, just as the pattern formed by a Jacquard loom depends on the mode in which the perforated cards act on the system of movable rods in that machine. In the eye we have on the one hand light falling on this wonderful structure, and on the other hand we have the sensation of sight. We cannot compare these two things; they belong to opposite categories. The whole of Metaphysics lies like a great gulf between them.”¹

While the gulf between light and sight remains, it is narrowing; we know more about the intermediate processes. DPN has been shown to play an important role in the metabolic transformations triggered by light-activated bleaching of the visual purple or rhodopsin. ATP provides the chemical energy for the neurophysiological mechanisms that follow. For workers who are reducing the gulf still further, Schwarz BioResearch supplies DPN, ATP, and other important metabolic cofactors such as adenylic acid, cocarboxylase, flavin adenine dinucleotide, guanosine diphosphate, and guanosine triphosphate.



IN MAY—(1934)—Max Bergmann has yet to leave Dresden for the United States, but his papers are already appearing in American journals. This month, in *Science*, he discusses the use of carbobenzoxy amino acids in the synthesis of peptides. These “beautiful crystalline” substances can easily be transformed into their acid chlorides or azides, and the latter in turn condensed with other amino acids to yield carbobenzoxy peptides. The carbobenzoxy residue can then be readily eliminated without using a hydrolytic agent and thereby without risking a split in the peptide bond. Since carbobenzoxy amino acids are surprisingly stable to racemizing influences, it is now simple to prepare many optically active peptides previously considered practically inaccessible.²

It is an even simpler matter to order many optically active peptides. Schwarz BioResearch is the exclusive distributor for more than 40 carbobenzoxy amino acid derivatives produced by the Yeda Research and Development Company, Ltd. at the Weizmann Institute of Science in Israel. Yeda also produces a large number of polyamino acids and O¹⁸ compounds. A catalog is yours on request.



IN MAY—(1956)—Lowe and Rand discuss the ability of cortisone to produce certain changes in liver metabolism of RNA in rats.³ They suggest that a variant RNA may be synthesized under the influence of cortisone or that normal RNA may be converted to this variant. This “new” RNA differs in solubility properties and rate of P³² incorporation. One of the more significant aspects of this variation is that it may be unable to act as a template for normal protein synthesis.

The influence of drugs and hormones on nucleic acid metabolism is of enormous practical interest in medical and biological research. Endocrinologists, pharmacologists, and others working in this field make increasing use of the full line of nucleic acid compounds supplied by Schwarz BioResearch: DNA, RNA, nucleate salts, nucleotides, nucleosides, purines and pyrimidines. Many have been labeled with C¹⁴ or H³. Write for our catalog and price list.

1. Maxwell, J. C.: On colour vision. *Nature* 4:13 (May) 1874. 2. Bergmann, M.: Synthesis and degradation of proteins in the laboratory and in metabolism. *Science* 79:218 (May 18) 1934. 3. Lowe, C. U., and Rand, R. N.: Alterations in biochemical composition and ribonucleic acid metabolism induced in rat liver by cortisone. *J. Biophys. and Biochem. Cytology* 2:331 (May 25) 1956.



SCHWARZ BIORESEARCH, INC. • Dept. 5B • Mount Vernon, New York
BIOCHEMICALS • RADIOCHEMICALS • PHARMACEUTICALS *for research, for medicine, for industry*



PRECISION SYRINGES FROM 1ul to 500ul

Hamilton Microliter Syringes meet the demands of precision analysis with accuracy, greater sensitivity, speed and minute—yet accurate discharge. By meeting critical demands they have become the standard in gas chromatography, chemistry, biology and medicine.

Each syringe is individually fitted with stainless steel plungers in precision bore NC glass to assure leak tight performance . . . even when tested with water at 150 psi.

MODEL	SIZE	PRICE
#7001 N	1.0 ul	\$35.00
#701 N	10.0 ul	18.00
#705 N	50.0 ul	18.00
#710 N	100.0 ul	18.00
#725 N	250.0 ul	18.00
#750 N	500.0 ul	18.00

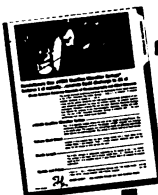
Order direct . . . also available through your supply house.



HAMILTON COMPANY, INC.

PRECISION MEASURING EQUIPMENT
FOR CLINICAL AND CHEMICAL RESEARCH

FREE LITERATURE
on Hamilton
Microliter Syringes,
with complete
information,
write today . . .



Hamilton Company, Inc.
P.O. Box 307-K
Whittier, California

Send me a copy of your equipment brochure.

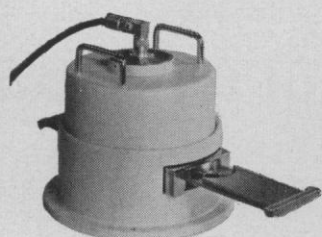
Name _____

Attach to company letterhead and mail

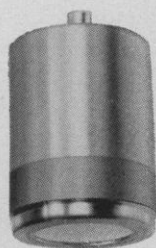
Now you can do ALL your sample counting

AUTOMATICALLY...with the New *Tracerlab*

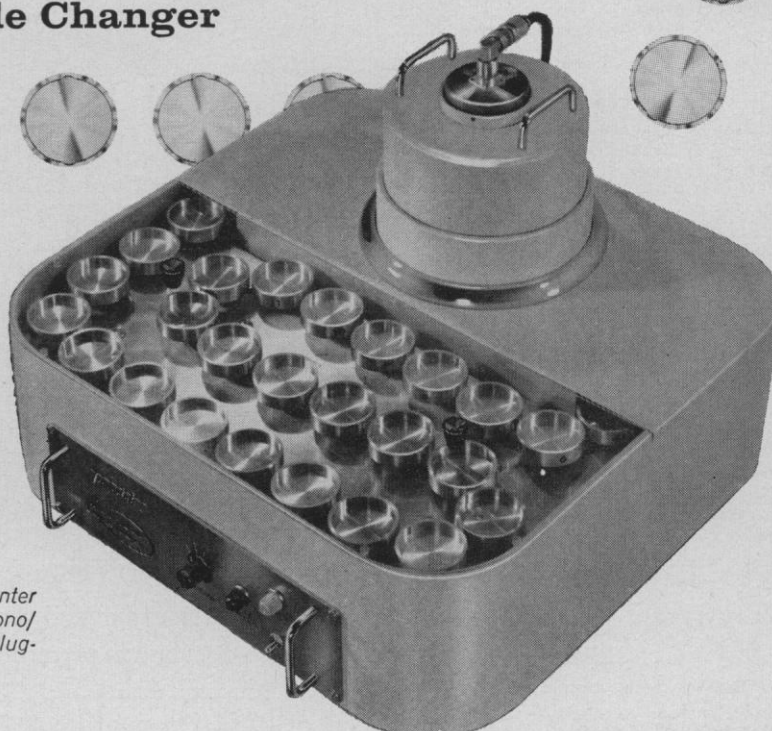
multi/matic Sample Changer



The SC-101 Manual Flow Counter with ultra-thin Mono/mol Window Detector.



New FD Series Flow Counter with the ultra-thin Mono/mol Window features plug-in assembly.



Fifty sample capacity . . . any size up to two inch . . . any type of detector (Scintillation, Flow Counters, GM Tube) . . . simple one-knob operation . . . these exclusive advantages plus low initial cost and low operating costs . . . are all yours in the outstanding new Tracerlab MULTI/MATIC Sample Counting System.

Only from Tracerlab — the world's largest and *first* manufacturer of Sample Changers could you expect — and get — such a revolutionary new system.

The New SC-100 MULTI/MATIC Sample Changer provides positive, accurate positioning of samples. Samples are readily accessible because they are loaded and driven on a horizontal plane (in contrast to tower or stack types). Automatic recycling of a single sample, automatic bypass of empty sample positions, automatic recycling to the starting position plus the ability to operate with all types of detectors are other features of this most versatile new Tracerlab development.

The New Tracerlab FD-1 and FD-2 Flow Counters feature the ultra-thin Tracerlab Mono/mol window (less than $125\mu\text{g}/\text{cm}^2$). These low cost units, available in 1" or 2" window diameters plug in to a common shield and feature low background . . . excellent plateau characteristics . . . very low gas consumption and will operate with a wide

variety of counting gases including helium-isobutane, argon-methane, methane or natural gas.

The New Tracerlab SH-1 Shield operates with either the automatic changer or the SC-101 Manual Changer pictured. It accommodates both the 1" and 2" FD Series Flow Counters, windowless flow counters, P-20D Scintillation Detectors or standard GM detectors. Convenient handles make it easy to insert or remove from any changer, shield thickness of 2 inches of lead provides low reproducible backgrounds.

The Tracerlab MULTI/MATIC Sample Counting System when combined with other Tracer/matic components . . . scalers, time and count printers, or time, count and CPM printers . . . provides more specific sample information than any other system.

For complete specifications on the new low cost, economical-to-operate Tracerlab MULTI/MATIC Sample Changer write for Bulletin M.

Tracerlab 

1601 Trapelo Road, Waltham 54, Massachusetts
2030 Wright Avenue, Richmond 3, California

AMERICAN ASSOCIATION
FOR THE
ADVANCEMENT OF SCIENCE

Board of Directors

CHAUNCEY D. LEAKE, *Retiring President, Chairman*
THOMAS PARK, *President*
PAUL M. GROSS, *President Elect*
HARRISON BROWN DON K. PRICE
HENRY EYRING ALFRED S. ROMER
H. BENTLEY GLASS WILLIAM W. RUBEY
MARGARET MEAD ALAN T. WATERMAN
PAUL A. SCHERER, *Treasurer*
DAEL WOLFLE, *Executive Officer*

Editorial Board

KONRAD B. KRAUSKOPF H. BURR STEINBACH
EDWIN M. LERNER WILLIAM L. STRAUS, JR.
PHILIP M. MORSE EDWARD L. TATUM

Editorial Staff

DAEL WOLFLE HANS NUSSBAUM
Publisher Business Manager

GRAHAM DUSHANE
Editor

JOSEPH TURNER ROBERT V. ORMES
Associate Editor Managing Editor

ELLEN E. MURPHY, *Assistant Editor*

NANCY TEIMOURIAN, *Assistant to the Editor*
News: HOWARD MARGOLIS

Book Reviews: SARAH S. DEES

Editorial Assistants: NANCY S. HAMILTON, EDGAR C. RICH, BARBARA SUTHERLAND, CONRAD YUNG-KWAI

Staff Assistants: GENEVIEVE M. KIRBY, PATRICIA D. PADDOCK, LOIS W. WOODWORTH

Advertising Staff

EARL J. SCHERAGO, *Director*

BERNICE SCHWARTZ, *Production Manager*

Sales: RICHARD L. CHARLES (New York, N.Y., PE 6-1858); C. RICHARD CALLIS (Old Bridge, N.J., CL 4-3680); HERBERT BURKLUND (Chicago, Ill., DE 7-4973); DILLENBECK-GALAVAN (Los Angeles, Calif., DU 5-3991)

SCIENCE, now combined with THE SCIENTIFIC MONTHLY, is published each Friday by the American Association for the Advancement of Science at National Publishing Company, Washington, D.C. SCIENCE is indexed in the *Reader's Guide to Periodical Literature*.

Editorial correspondence should be addressed to SCIENCE, 1515 Massachusetts Ave., NW, Washington 5, D.C. Manuscripts should be typed with double spacing and submitted in duplicate. The AAAS assumes no responsibility for the safety of manuscripts or for the opinions expressed by contributors. For detailed suggestions on the preparation of manuscripts, see *Science* 125, 16 (4 Jan. 1957).

Advertising correspondence should be addressed to SCIENCE, Room 1740, 11 West 42 St., New York 36, N.Y.

Change of address notification should be sent to 1515 Massachusetts Ave., NW, Washington 5, D.C., 4 weeks in advance. If possible, furnish an address label from a recent issue. Give both old and new addresses, including zone numbers, if any.

Annual subscriptions: \$8.50; foreign postage, \$1.50; Canadian postage, 75¢. Single copies, 35¢. Cable address: Advancesci, Washington.

Copyright © 1961 by the American Association for the Advancement of Science.

How Helpful Is Freedom?

Because science depends so immediately on freedom of inquiry, partisans of political freedom are tempted to believe that democracy, whatever its shortcomings in producing space spectaculars, must in the end be the form of government best designed to produce pure science. The argument is that the individual must be free to propose hypotheses and test them. Heinrich Schliemann in the 19th century, for example, had to be free both to believe that Hissarlik was the site of Homer's Troy and to go to the spot and dig. If some government had held, as a consequence of its metaphysics, that Troy never existed, or if some government had feared that the practice of digging for Troy might lead to a penchant for digging into other matters as well, then there would have been no archeological confirmation of the Achaean heroes.

This argument is sound, but the implications for the superiority of democracy as an environment for science are limited. For one thing, freedom by itself is not enough. Although Schliemann may have been free to dig as deeply as he liked, he had first to amass the fortune necessary to finance his digging. But what is more interesting is that science has other characteristics besides the need for freedom, and these other characteristics suggest that this need if deep may not be broad.

Besides the posing and testing of hypotheses, science is also characterized by its procedure of not attempting to answer all questions at once. Scientific knowledge is possible because it is compartmentalized, because it is possible to discover truths about one question and at the same time ignore other questions. Hydrodynamics, for example, can be studied independently of thermodynamics, and the two disciplines together have nothing to say about the sensory qualities of a cold drink of water on a hot day. It may well be that freedom of the most complete sort in one part of knowledge is entirely compatible with total bondage in another part.

Research in its later stages, it is true, has a way of breaking down the very barriers that made earlier progress possible. If science is compartmentalized, it also strives toward unity. The turn of the century saw how increased knowledge about the structure of the atom broke down the barriers between chemistry and physics, and we are now watching our growing knowledge of the structure of the gene break down the barriers between biology and the physical sciences. But unity, in turn, produces new compartments. If where once stood a fence there is now a house, the house itself is a kind of enclosure and within it lives a new group of specialists.

One point about a totalitarian government is clear. To the extent that it chooses to meddle with the methods of research, or to dictate the results of research, science will be the loser. But without claiming that the pull in science toward specialization is somehow stronger than the pull toward unity, it is still possible to say that freedom to study a particular problem is not immediately dependent on freedom to study every problem. What has yet to be fully determined is what happens when a totalitarian government chooses to support some parts of science vigorously and intelligently, because it sees the achievements of science as contributing to its own greater glory.—J.T.



Hours of analyses in easy minutes

BAUSCH & LOMB Spectronic 20 COLORIMETER

This best-selling laboratory workhorse (above) gives you split-second readings, easy as tuning your radio. No color filters to fuss with. Just turn a dial for the right wavelength for each procedure. Narrow band pass (only 20 mμ!) assures highest spectral purity. You get the double value of a colorimeter and a spectrophotometer in one trouble-free unit... with prices starting at only \$255!

BAUSCH & LOMB Serum Protein Meter

Now you can analyze protein in one-tenth the time of other methods. Centrifuge the sample. Put it on the Serum Protein Meter. Read the results, in protein grams per 100 milliliters, on the scale. Just like that! Any busy lab will write off the low cost of this super-speed unit in a matter of days—only \$175!



BAUSCH & LOMB INCORPORATED
64217 Bausch Street, Rochester 2, N.Y.

I'd like a demonstration of:

- ☐ Serum Protein Meter
☐ Spectronic 20 Colorimeter

Please send catalog on:

- ☐ Serum Protein Meter—D-2013
☐ Spectronic 20 Colorimeter—D-266

Name

Title

Professional
Address

BAUSCH & LOMB

SINCE  1853

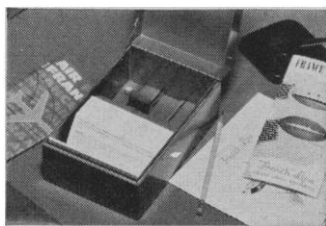
Made in America, to the world's highest standards.

Kodak reports on:

where a disciple can look for details . . . a reagent for alkyl halides . . . the competitive assault on salt

Small print

This little file holds some 10,000 unabridged pages of technical reports of the French Atomic Energy Commission. The lady who lives in the house across the road may find this astonishing. Your boss may be astonished. Even you may be astonished. But to the reasonably alert librarian the micro-opaque card idea is old hat. Anything we can tell you about it your librarian can tell you better.* We merely draw attention to the following accretions to the available micro-opaque literature:



• **All the unclassified scientific reports released by the U. S. Atomic Energy Commission.**

Even reduced 20X as they are in micro-opaque form, the complete set published to date would fill 250 boxes like the one above. The indexing mechanism for this incredible mass of information is *Nuclear Science Abstracts*, a periodical sold by the Superintendent of Documents, Washington 25, D. C.

• **Reports of the Commissariat à l'Energie Atomique.**

Naked-eye abstracts in French and English on the front of each card, the complete paper in microform on the back. Sold at 50¢ per card by Microcard Editions, Inc. (901 26th St. N. W., Washington 7, D. C.), who will explain indexing system.

• **The 1st Decennial Index to Chemical Abstracts, the brilliant chemical years 1907 to 1916.**

Contains the roots of many a chemical concept since proliferated beyond the scope of a single mind. On some 60 3" x 5" cards sold by the American Chemical Society (1155 16th St. N. W., Washington 6, D. C.).

• **All the meteorological data gathered for the International Geophysical Year.**

Purpose of whole shebang was to gather lots of data, remember? Here they are, ready to make use of. Ask the World Meteorological Organization (IGY Meteorological Data Centre, 1, Avenue de la Paix, Geneva, Switzerland).

• **A project under the auspices of the Committee on Oceanography of the National Academy of Sciences-National Research Council to effect transmittal from all who have to all who want any data or maps on any parameter, physical, chemical, or biological, of the marine environment.**

Details from The American Geographical Society (Broadway at 156th St., New York 32).

• **Justus Liebig's Annalen der Chemie from 1832 to 1958 and Berichte der Deutschen Chemischen Gesellschaft from 1868 to 1958.**

The New Testament comprises four Gospels; the science of chemistry seems to be founded on only three gospels, less influential spiritually but vastly more voluminous. Microprint overcomes the voluminousness but accomplishes nothing spiritually. The third gospel, *Beilstein*, got the treatment earlier. Microcard Editions, Inc.

• **The First Six Million Prime Numbers, 1 (controversial) to 104,395,289.**

Result of a 4-day holiday weekend with a large computer and nothing better to do than a favor for mathematicians working in number theory. Microcard Editions, Inc.

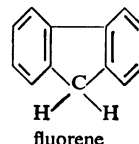
For any sustained use of micro-opaques, you need a micro-opaque reader. Ten years ago they were rare. Today the central research library that lacks one is rare. Any scientific discipline that needs to communicate large masses of data to a limited number of its disciples should consider microprint. For suggestions on how to proceed, write Recordak Corporation, 415 Madison Avenue, New York 17, New York (Subsidiary of Eastman Kodak Company).

One week last summer

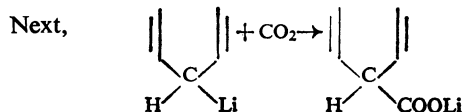
For many years we have been hiring chemistry graduate students for summer jobs. It gives them a chance to look us over and vice versa. Some of the biggest wheels in the corporation came that way. Others found three months of estival service to mammon sufficient for a lifetime and have become famous professors of chemistry. Still others have slipped through our fingers to become wheels in other companies. (You can't win them all.)

Methyl Fluorene - 9 - Carboxylate (Eastman 8164) represents a week's work last summer by one of these young men. The man he was hired to assist specializes in organometallic reactions. The mentor found a lithium reaction to give him in the April 1960 *Analytical Chemistry* on page 554. The summer man reacted lithium wire with bromobenzene to

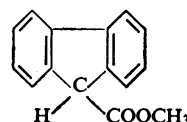
produce phenyllithium. He used this to replace one of the central hydrogens in



by lithium.



On acidification, an H replaced the Li. He then esterified with methanol, with HCl as catalyst. His product,



was good enough to overcome the skepticism of our genial but skeptical chief control chemist.

Nobody patted him on the head for his accomplishment. All he accomplished was to make it unnecessary for other chemists who look up the *Anal. Chem.* reference to spend a week of their own time preparing the reagent that has been found to react with a wide variety of alkyl halides to yield sharp-melting derivatives. Since such reagents are few and far between, you may even wish to send for a procedural abstract. Or for an employment application form.

Or for Catalog No. 42, listing some 3900 Eastman Organic Chemicals we stock at Distillation Products Industries, Rochester 3, N. Y. (Division of Eastman Kodak Company).

Cellmakers



Charles W. Warren



Paul A. Wilks, Jr.

Meet the founders of Connecticut Instrument Corporation, Wilton, Conn., PORT 2-5545. You can call them up and order any of a number of infrared accessories, including one they call a "C.I.C. Irtran-2 Fixed Thickness Absorption Cell" for \$160. This fits directly into the standard cell slides of two of the more popular infrared spectrophotometers. Transmittance: better than 60% from 2 to 12μ. Clear aperture: 25 x 5mm. Nominal path-lengths available: 0.015mm to 1.0mm. Construction of mount: aluminum, with polytetrafluoroethylene spacer.

We are supposed to be angry with these boys. "Irtran-2" is our trademark, not theirs. They buy our Irtran-2 optical flats and build cells with them. Anybody who has the skill and the price can buy Irtran optical parts from Eastman Kodak Company, Special Products Division, Rochester 4, N. Y., and build with them.

Irtran-2 optical material is almost completely insoluble in water, which is more than can be said of the rock salt hitherto used for such cells. It can even be boiled in water and detergent to clean out contamination. It can be used in contact with reasonable concentrations of bases and most acids, including the hydrofluoric. Transmittance extends out several microns beyond that of the slightly water-soluble CaF₂. It resists thermal shock much better than BaF₂. It is about as strong as glass. It has a hardness of 354 Knoop.

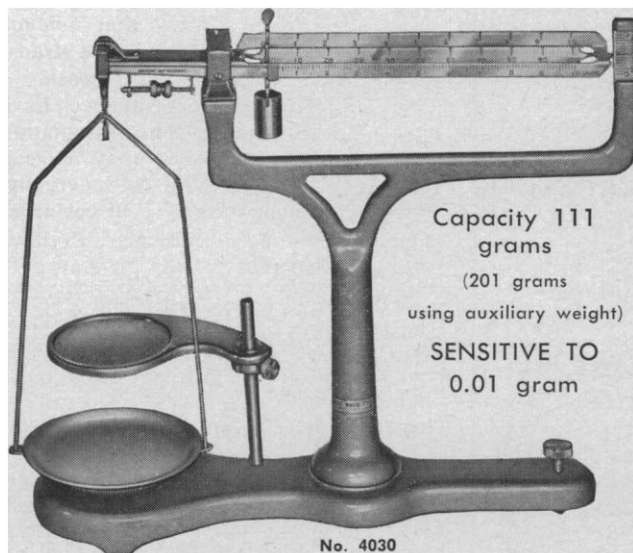
A cell made out of it does not change path-length, as does one of NaCl.

Messrs. Warren and Wilks and associates are making and selling cells of Irtran material as fast as we can shoot the Irtran plates to them. We are so angry that we are giving them this advertising for free.

Kodak
TRADE MARK

*The reason we try to tell you is that we want to sell the raw photographic materials on which microprint cards are printed. We also want to sell microfilm. The librarian can tell you about that, too. A new conventional-sized reference, "Guide to Microforms in Print" (\$4, Microcard Editions, Inc.), summarizes everything available.

● Good Sensitivity ● High Stability ● Long Service
TRIPLE-BEAM BALANCE
 SPEEDY, ACCURATE WEIGHING
 All Exposed Parts of *Stainless Steel*



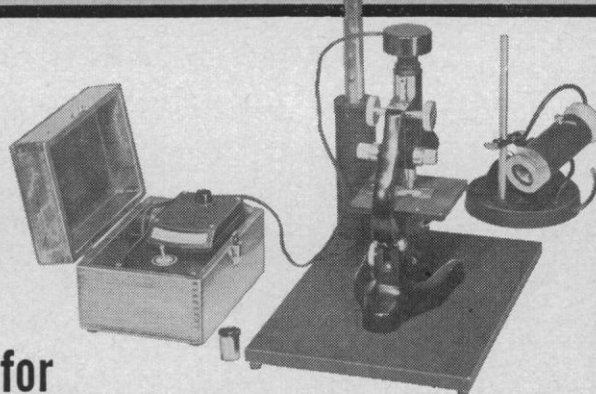
4030. TRIPLE-BEAM BALANCE, High Form. Each \$27.50
 4031. AUXILIARY WEIGHT. Each \$1.50
 4030C. PLASTIC COVER For No. 4030. Each \$1.60

THE WELCH SCIENTIFIC COMPANY
 ESTABLISHED 1880

1515 Sedgwick Street, Dept. E, Chicago 10, Illinois, U.S.A.
 Manufacturers of Scientific Instruments and Laboratory Apparatus

PHOTOVOLT
 EXPOSURE
 PHOTOMETER

Mod.
 200-M



for
PHOTOMICROGRAPHY

Accurate determination of exposure time in
 black-and-white and color photomicrography

Write for Bulletin #810 to **Price \$125.00**

PHOTOVOLT CORP.
 1115 Broadway New York 10, N. Y.

Needed Now

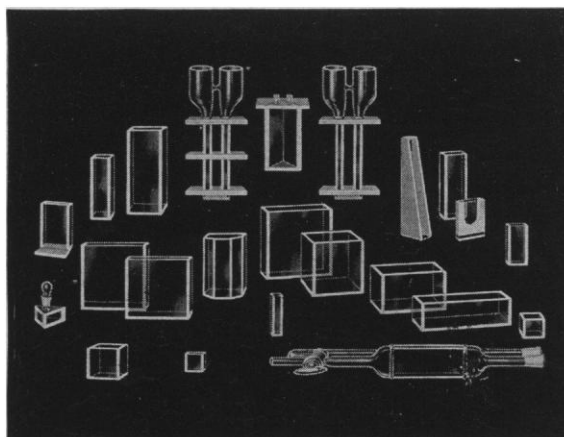
Health Physicist:

To direct and perform health physics and industrial hygiene work at various WTR facilities. Work will also include non-health physics engineering that pertains to reactor and hot lab work. Must have A.B. or B.S. degree and additional training in health physics.

If you qualify for any one of the above positions, write immediately to: Mr. C. S. Southard, Westinghouse Atomic Power Division, P.O. Box 355, Dept. X-76, Pittsburgh 30, Pa.

Westinghouse
ATOMIC POWER DIVISION
 FIRST IN ATOMIC POWER

**GLASS ABSORPTION
 CELLS** made by **KLETT**

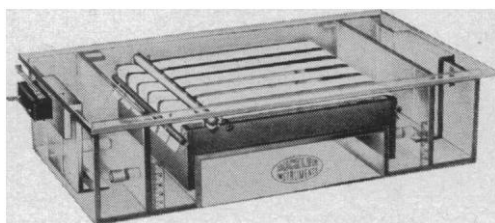


SCIENTIFIC APPARATUS
 Klett-Summerson Photoelectric Colorimeters—
 Colorimeters — Nephelometers — Fluorimeters—
 Bio-Colorimeters — Comparators — Glass Stand-
 ards—Klett Reagents.

Klett Manufacturing Co.
 179 East 87 Street, New York, New York

COMPLETE APPARATUS for ZONE ELECTROPHORESIS

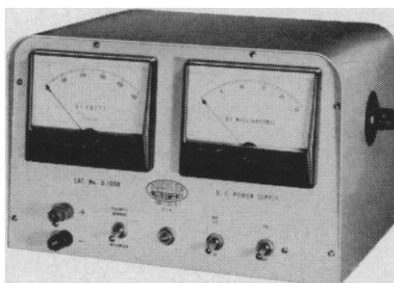
with PAPER, STARCH, AGAR
and almost all other known media!



The most complete and flexible electrophoresis apparatus available, with accessories for all electrophoretic methods using solid media.

- ONE BASIC MIGRATION CHAMBER can be adapted to all media
- D.C. POWER SUPPLIES
- AGAR CUTTERS FOR IMMUNO SLIDES

For complete information and price, please send for Bulletin S3-1000



LABORATORY APPARATUS



PRECISION INSTRUMENTS

BUCHLER INSTRUMENTS, INC.

514 West 147th Street, New York 31, N. Y.

ADirondack 4-2626

HERE'S A QUALITY STUDENT MICROSCOPE AT A BUDGET PRICE!

Although budget priced, the UNITRON Model MUS is definitely not just another student microscope. It includes these significant features often lacking in much more costly student models:

- NOT JUST a disc diaphragm... but an iris diaphragm for perfect control of aperture and contrast.
- NOT JUST a single focusing control... but both coarse and fine.
- NOT JUST a mirror... but a 0.65N.A. condenser for optimum illumination and resolution.
- NOT JUST two objectives... but three: achromatic 5X, 10X, 40X.
- NOT JUST an ordinary eyepiece... but a coated 10X Wide Field for large, flat fields.
- PLUS THESE SPECIAL FEATURES... larger stage projects beyond objective preventing damage to objectives and nosepiece. Automatic stop for fast focusing and to prevent breakage of specimen slides and optics. Durable, sturdy — withstands the use and abuse of classroom and laboratory.



Price: **\$75**
Only

(\$67.50 each in lots 5-10)

ASK FOR A FREE 10 DAY TRIAL

Even higher discounts on quantities more than 10.

UNITRON

INSTRUMENT COMPANY • MICROSCOPE SALES DIV.
66 NEEDHAM ST., NEWTON HIGHLANDS 61, MASS.

Please rush UNITRON's Microscope Catalog.

4-P-1

Name _____

Company _____

Address _____

City _____

State _____

AAAS Symposium Volume 63

CONGENITAL HEART DISEASE

Allen D. Bass and Gordon K. Moe, Editors June 1960

Presented at the AAAS Washington meeting, December 1958.

372 pp., 147 illus., references, index \$7.50

AAAS members' cash orders... \$6.50

The recent spectacular advances in cardiac surgery have resulted from the intimate and fruitful collaboration of the surgeons with embryologists, pathologists, internists, pediatricians, physiologists, and engineers. The present volume summarizes the current status of knowledge of congenital heart disease, ranging from the experimental production of developmental anomalies, through the morphology and pathologic physiology, to the diagnosis and surgical repair of congenital lesions, and includes an introductory chapter by the dean of cardiac embryologists, Professor Bradley M. Patten.

British Agents: Bailey Bros. & Swinfen, Ltd.
Hyde House, W. Central St.
London W.C.1, England

American Association for the Advancement of Science

1515 Massachusetts Ave., NW,
Washington 5, D.C.

lan Memorial Inst., 1025 Pine Ave. West, Montreal 2, P.Q.)

4-12. Cellular Regulatory Mechanisms, 26th Cold Spring Harbor Symp. on Quantitative Biology, Cold Spring Harbor, N.Y. (A. Chovnick, Long Island Biological Assoc., Cold Spring Harbor)

5-7. American Soc. for Quality Control, Philadelphia, Pa. (W. P. Youngclaus, Jr., 161 W. Wisconsin Ave., Milwaukee 3, Wis.)

5-7. Fundamental Aspects of Radiosensitivity, symp., Upton, N.Y. (A. H. Sparrow, Brookhaven National Laboratory, Upton, L.I.)

5-8. International Instrument-Automation Conf. and Exhibit, Instrument Soc. of America, Toronto, Canada. (I.S.A., 313 Sixth Ave., Pittsburgh 22, Pa.)

5-9. Animal Reproduction, 4th intern. cong., Amsterdam, Netherlands. (Secretariat, Burgemeester de Monchyplein 14, The Hague, Netherlands)

5-9. Effects of Ionizing Radiation on the Nervous System, symp., Vienna, Austria. (J. Burt, International Atomic Energy Agency, United Nations, New York, N.Y.)

5-10. International Colloquium on Spectroscopy, 9th, Lyon, France. (Secretariat, Groupement pour l'Avancement des Méthodes Spectrographiques, 1, rue Gaston Boissier, Paris 15)

5-16. Operations Research and Systems Engineering, Baltimore, Md. (Dean, School of Engineering, Johns Hopkins Univ., Baltimore 18)

6-8. Tissue Culture Assoc., 12th annual, Detroit, Mich. (F. E. Payne, Dept. of Epidemiology, Univ. of Michigan, Ann Arbor)

8-11. American Electroencephalographic Soc., Atlantic City, N.J. (G. A. Ulett, Malcolm Bliss Mental Health Center, 1420 Grattan, St. Louis 4, Mo.)

8-18. International Organization for Standardization, general assembly (members only), Finland. (American Standards Association, 70 East 45 St., New York 17)

9-11. Society of Biological Psychiatry, Atlantic City, N.J. (G. N. Thompson, 2010 Wilshire Blvd., Los Angeles 57, Calif.)

9-17. European Convention of Chemical Engineering, Frankfurt, Germany. (DECHEMA, Postfach No. 7746, Frankfurt/Main 7)

11-15. American Soc. of Mechanical Engineers, summer annual, Los Angeles, Calif. (O. B. Schier II, 29 W. 39 St., New York 18)

12-13. Radio Frequency Interference, 3rd natl. symp., Washington, D.C. (E. F. Mischler, National Engineering Service, Washington, D.C.)

12-14. American Dairy Science Assoc., Madison, Wis. (H. F. Judkins, 32 Ridgeway Circle, White Plains, N.Y.)

12-14. American Neurological Assoc., Atlantic City, N.J. (M. D. Yahr, Neurological Inst., 710 W. 168 St., New York 32)

12-14. Society for the Study of Development and Growth, regeneration symp., Williamstown, Mass. (A. C. Braun, Rockefeller Inst., New York 21)

12-15. Nature of the Real, conf., Milwaukee, Wis. (E. D. Simmons, Dept. of