

Vol. 133, No. 3449

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



NEW*leitz model m photrometer*



THE ONLY PHOTOMETER THAT COMBINES THESE IMPORTANT FEATURES

1. Larger...more easily readable meter! Accurate readings are obtained quickly and easily. New streamlined design incorporates unequalled stability.

2. Only 1.5 ml of solution needed! Precise determinations can now be made with less than half the quantities formerly required. The Leitz Model M Photrometer gives you the accurate and dependable readings that have set the standard for optimum requirements in clinical chemistry.

3. Precalibrated or uncalibrated! Leitz continues to offer the unique feature of calibrating each instrument individually for forty of the most commonly used determinations. Also available uncalibrated.



468 Park Avenue South, New York 16, New York

36861

Leitz dependability. Since you're experienced with laboratory equipment, you know the enduring dependability of a Leitz Photrometer is the surest way to obtain reliable results *every* time-year after year.

Get all the facts ... write for literature providing full information on all the important new features and conveniences built into the latest Model M. Fill out coupon... MAIL TODAY!

Gentlemen:		Dept. Sc-23	
□ Please send me complete informatio on the New Leitz Model M Photrometer.			
☐ Kindly ha phone for app Photrometer at	ve Leitz re ointment to no obligation	presentative demonstrate n to me.	
Name			
Address			
City	Zone	State	

MEMO Order my research biochemicals from N.B.Co. NUTRITIONAL BIOCHEMICALS CORP. Send for our free October, 1960 Catalog containing more than 2600 items. Fill 21010 Miles Avenue . Cleveland 28, Ohio N-B-G out coupon and mail today for your copy. SC Name..... Organization Address..... City ... StateZone.

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¢.

*American Journal of Clinical Pathology Vol. 33. No. 2. February 1960, pp 144-151 "Application of Refrigerated Microtome in Surgical Pathology" by Bernard Klionsky, M.D. and Othello D. Smith, M.D.

The Journal of Histochemistry and Cytochemistry Vol. 8, No. 5. September, 1960, pp 310 "A Frozen Section Freeze Substitutions Technique and an Improved Cryostat" by Jeffrey P. Chang and Samuel H. Hori.

> from fresh tissue to finished slide ...in

TITITITI

3 minutes or less!

New Harris-International MICROTOME-CRYOSTAT revolutionizes frozen sectioning!

COMPLETE FROZEN SECTIONING PACKAGE includes: Model CT Microtome Cryostat; rust-proof International Minot Rotary Microtome; Quick Freeze Attachment for freezing fresh tissue directly to Minot chuck; Anti-Roll Attachment for keeping sections flat; Suction Pickup for transferring sections.

A demonstration will convince you that this pathologistdirected* development of International Equipment Co. combines speed, accuracy and economy as never before resulting in finished slides which offer exceptional cytological detail. It brings rewarding advantages to pathology laboratories of all sizes.

1. By reducing fresh-tissue-to-finished-slide cycles to 3 minutes or less, it speeds diagnostic service.

2. By producing large or small, thin, unwrinkled sections of single or multiple pieces of fresh frozen tissue, it provides undistorted cytological detail for research or regular pathological work.

3. By employing supermarket-proved "open-top cold box" principles, it maintains safe temperature between -10° C and -20° C even with the cover open.

4. By meeting budgetary limitations of small laboratories with a price based on mass-precision productive skills and experience, it makes frozen sectioning practical even for small-volume pathologic diagnosis.

Your nearby authorized International Dealer will gladly arrange for a convenient demonstration. Write for descriptive brochure.

K. INTERNATIONAL (IEC) EQUIPMENT CO.

BUILDING NO. 3B, 1219 SOLDIERS FIELD ROAD, BOSTON 35, MASS.

3 February 1961, Volume 133, Number 3449

SCIENCE

Editorial	Irony Compounded	301
Articles	Immunological Tolerance: <i>P. B. Medawar</i> The phenomenon of tolerance provides a testing ground for theories of the immune response.	303
	Immunological Recognition of Self: F. M. Burnet Such recognition suggests a relationship with processes through which functional integrity is maintained.	307
	Limitations on Space Flight due to Cosmic Radiations: <i>H. J. Curtis</i>	312
Science in the News	A Few Headaches: Priorities for Science; Preparing for the Test Ban Talks; the Rules Committee	317
Book Reviews	C. H. Waddington's The Ethical Animal, reviewed by T. Dobzhansky; other reviews	323
Reports	Painless Killing of Crabs and Other Large Crustaceans: G. Gunter	327
	Depression of Taste Sensitivity to Specific Sugars by Their Presence during Development: D. R. Evans	327
	Pliable, Root-Permeable Layers for Separation of Portions of Experimental Plant Root Systems: J. F. Stone and J. R. Mulkey, Jr.	329
	Effect of Mitomycin C on Lateral Root-Tip Chromosomes of Vicia faba: T. Merz	329
	Sensory Deprivation and Pain Thresholds: J. Vernon and T. E. McGill	330
	Selective Viral and Rickettsial Serum Antibody Absorption by a Chromatographic Column: N. K. Brown	331
	A "D"-like Antigen in Rhesus Red Blood Cells and in Rh-Positive and Rh-Negative Red Cells: P. Levine et al.	332
	Effect of Strychnine upon the Electrical Activity of an Isolated Nerve Cell: Y. Washizu, G. W. Bonewell, C. A. Terzuolo	333
Departments	Forthcoming Events; New Products	336
Cover	Portion of a leaf of the palm <i>Thrinax parviflora</i> in Fairchild Tropical Garden Miami	

Fla. See page 325. [W. H. Hodge, Longwood Gardens, Kennett Square, Pa.]

A new technique for separation of substances of different molecular sizes **Separation Separation Separation**

SEPHADEX is now available in three types, for a multiplicity of applications, such as: Desalting of protein solutions Fractionation of polymers Group separation of biological extracts

GEL FILTRATION with SEPHADEX is simpler and far more rapid than previous procedures



Lower limit for complete exclusion:

 Sephadex
 G
 25
 Mw
 3,500
 4,500

 Sephadex
 G
 50
 Mw
 8,000
 10,000

 Sephadex
 G
 75
 Mw
 40,000
 50,000



Pharmacia Fine Chemicals, Inc., Sales Office, Box 1010, Rochester, Minn.

For complete information, please write for our brochure.

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



BINOCULAR MEDICAL AND LABORATORY MICRO-SCOPE 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 $3^{"} \ge 1^{"}$ and $3^{"} \ge 2^{"}$ 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 onestep 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 largest SM microscope.

FILL OUT COUPON ... MAIL TODAY!

68 Park Avenue So	•• uth New Vork 16 N	Jour Vork
Gentlemen: Please s	send me complete ir scope. esentative □ phone	or \square write me
for appointment obligation to me.	to demonstrate SM	I microscope at no
for appointment obligation to me.	to demonstrate SM	I microscope at no
I Kindly have repr for appointment obligation to me. Name Address	to demonstrate SM	[microscope at no
Kindly have repr for appointment obligation to me. Name Address City	to demonstrate SM	I microscope at no



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



Today, exploring in all of the physical sciences, Melpar is probing in many areas of fundamental research, such as:

- **Physical Chemistry,** encompassing the relation of physical properties of biological materials to biological functions.
- **Physical Techniques and Measurements** in such fields as electron spin resonance, in conjunction with the studies of molecular structure to determine Zeeman effects on free radicals.
- **Chemistry Studies** in fluorescence, organic reactions, electrochemistry, polymer research, and gas chromatography and radiochemistry.

Why use gas chromatography? Why use electron spin resonance? These represent but a few of the areas Melpar is now exploring. <u>This</u> is Melpar: Project Probe.

Scientists with advanced degrees in any of the Physical Sciences, who are interested in participating in **Melpar: Project Probe**, are invited to write to F. J. Drummond, Professional Placement Manager, Melpar, 3354 Arlington Boulevard, Falls Church, Virginia.



3 February 1961, Volume 133, Number 3449

SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Board of Directors

CHAUNCEY D. LEAKE, Ro	etiring President, Chairman
THOMAS P.	ARK, President
PAUL M. GROS	s, 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. SCH	ierer, 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, BETHSABE ASENJO Book Reviews: SARAH S. DEES

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

Staff Assistants: 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, III., DE 7-4973); DILENBECK-GALLAVAN (Los Angeles, Calif., DU 5-3991)

SCIENCE, now combined with THE SCIENTIF-IC 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 740, 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.

Irony Compounded

There is irony in the circumstance that the present overhauling of American education is being led in good part by the sciences, for one of the thinkers whose work helped produce the view of education under attack, John Dewey, was himself much influenced by science, and this influence is reflected in his educational doctrines. To simplify a complex matter, the change sought is from a learner-centered curriculum, favored by many professional educators, toward a subject-centered curriculum, favored by lay critics of education. In the effort at overhaul, Dewey has sometimes been taken as the symbol of what is wrong with education, but at least some of the readers of his views on science would find this symbol poorly chosen.

Dewey was one of the most prolific of writers, but certain key ideas run through much of what he wrote. He saw science as *the* method of finding things out. In his interpretation of science, he was at pains to elaborate the view that scientific inquiry does not begin with the gathering of data. Rather it begins with a problem, a conflict, a difficulty. The problem suggests a possible solution, or hypothesis, and it is this hypothesis that guides the gathering of data. The data then serve to prove or disprove the hypothesis, and to solve or leave unresolved the problem. Such, very briefly, was Dewey's vision of science, a vision reflected in his educational doctrines. He was opposed to authoritarianism and believed in inculcating an experimental attitude in students. Emphasis in education was to be on method, on solving problems.

At the same time, Dewey's interpretation of science has been the subject of some criticism by scientifically oriented thinkers. Another theme running through much of his work, motivated perhaps by his great concern with social and moral matters, is his attack on "dualisms," such as the one he saw existing between theory and practice, between intelligence and conduct. This attack, so the criticism runs, has resulted in a view of science in which scientific problems arise too immediately out of practical problems, and in which the solution to scientific problems is tied too closely to the solution of practical problems. According to the critics, not all distinctions are "dualisms," and the truth of the matter is that scientific activity is related to a much wider universe than the one we meet in daily life. Astronomy is a bigger subject than navigation.

This misinterpretation of science introduces a second note of irony in the bearing of Dewey's thought on present educational tendencies. If we are to be guided in education by the values of science, and if science does make reference to this wider universe, then, so the criticism concludes, education must find a place for disinterested curiosity and understanding. Education should foster a love of subject matter for its own sake. True, the occurrence of a storm can be used in the classroom to initiate a discussion of climatic conditions in the United States, but pedagogy so conceived has its limits.

Two wrongs, of course, do not make a right, nor does irony compounded cancel itself out. A moral is suggested, however. If some of the partisans of a subject-centered curriculum too readily take Dewey as the philosopher of all they oppose, then some of our professional educators are equally hasty when they make Dewey into a philosopher who is above reproach.—J.T.



It's What's Inside That Counts!

If you are counting radioactive isotopes . . .

tritium, carbon-14, iodine-131, iron-59 or any other alpha, beta or gamma tracer isotope... you should know about the latest transistorized instruments designed and manufactured by Packard.



Whether or not you are planning to purchase new equipment, you will be interested in our latest bulletins which show "what's inside" these instruments that makes them count so well...so reliably.

Write or telephone requesting new instrument bulletins.

TRI-CARB LIQUID SCINTILLATION SPECTROMETERS • AUTO-GAMMA SPECTROMETER SYSTEMS FLOW DETECTORS • SCALERS • RATEMETERS



Series 250A Automatic Scaler

BOX 428-A · LA GRANGE, ILLINOIS · Phone HUnter 5-6330 CHICAGO · ALBUQUERQUE · ATLANTA · BOSTON · LOS ANGELES · NEW YORK · PHILADELPHIA PITTSBURGH · SAN FRANCISCO · WASHINGTON, D. C. · ZURICH · PARIS



FERMENTATION PILOT PLANT

For Research and Pilot Plant Investigations of Aerobic and Anaerobic Fermentations.

For Tissue Culture and Metabolic Studies.

Six stainless steel fermentors, with Pyrex jars of 5, 7.5, or 14 liter capacity, are removable for autoclaving. The nonfreezing agitators are in stainless steel, ball-bearing housings which incorporate leakproof seals for *repeated* autoclaving. Performance is cool, quiet, and dependable even under continuous operation.

Temperature, agitation-speed, air volume and pressure are measured and precisely regulated. The stainless steel water baths, with a temperature range up to 60°C. are thermostatically controlled within ± 0.5 °C.

Twin anti-friction drives provide a wide range of agitation rates. The apparatus can be equipped with an automatic pH system and electronic foam control.



UNCONDITIONAL ONE-YEAR WARRANTY

WRITE FOR CATALOG FS-231S

PRECISION LABORATORY APPARATUS P.O. BOX 606, NEW BRUNSWICK, NEW JERSEY

NEW BRUNSWICK SCIENTIFIC CO., INC.

3 FEBRUARY 1961



Meetings

Forthcoming Events

February

26-1. American Inst. of Chemical Engineers, natl., New Orleans, La. (F. J. Van Antwerpen, AICHE, 25 W. 45 St., New York 36)

26-2. American Inst. of Mining, Metallurgical, and Petroleum Engineers, annual, St. Louis, Mo. (AIME, 29 W. 39 St., New York 18)

27-3. Conference on Analytical Chem-istry and Applied Spectroscopy, 12th, Pittsburgh, Pa. (L. P. Melnich, U.S. Steel Corp., Monroeville, Pa.)

March

1-3. Chemistry Symp., intern. (by invitation), Stanford, Calif. (B. Lamar, Stanford Univ. News Service, Stanford, Calif.) 2–4. Optical Soc. of America, spring meeting, Pittsburgh, Pa. (Miss M. Warga, 1155 16th St., NW, Washington 6, D.C.)

2-5. National Wildlife Federation, 25th annual, Washington, D.C. (Natl. Wildlife

Federation, 1412 16th St., NW, Washington 6) 5-9. Gas Turbine Conf. and Products

Show, 6th annual, Washington, D.C. (Meetings Dept., American Soc. of Mechanical Engineers, 29 W. 39 St., New York 18)

6-8. North American Wildlife and Natural Resources Conf., 26th, Washington, D.C. (C. R. Gutermuth, Wildlife Management Inst., 709 Wire Bldg., Washington 5)

7-9. American Railway Engineering Assoc., annual, Chicago, Ill. (N. D. Howard, 59 E. Van Buren St., Chicago 5)

8-10. Instrument Soc. of America Conf., 11th annual, Pittsburgh, Pa. (R. R. Web-

ster, 900 Agnew Ave., Pittsburgh 30) &-11. Neurosurgical Soc. of America, Boca Raton, Fla. (R. K. Thompson, 803 Cathedral St., Baltimore 1, Md.)

9-10. Magnetohydrodynamics, symp. on engineering aspects of, Philadelphia, Pa. (N. W. Mather, Project Matterhorn, P.O. Box 451, Princeton, N.J.)

12-17. American College of Allergists, annual, Dallas, Tex. (P. Gottlieb, 818

annual, Danas, 1 ex. (P. Gottlieb, 818 Medical Arts Bldg., Philadelphia, Pa.) 13-17. National Assoc. of Corrosion Engineers, annual, Buffalo, N.Y. (W. A. Mapler, 18263 W. McNichols Rd., De-troit 19, Mich.)

13-24. Radiological Health, course in, Cincinnati, Ohio. (Chief, Training Program, Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26) 14–16. Clinico-Pathological Significance

of Renal Biopsy, Ciba Foundation symp. (by invitation only), London, England. (Ciba Foundation, 41 Portland Place, London, W.1)

14-16. Inter-Station Supersonic Track Conf., 6th symp., China Lake, Calif. (U.S. Naval Ordnance Test Station, Code 307, China Lake, Calif.) 15-17. Medical Photography and Cine-

matography, intern. cong., Cologne, Ger-many. (Deutsche Ges. für Photographie, Neumarkt 49, Cologne)

SCIENCE, VOL. 133