SCIENCE

11 April 1969
Vol. 164, No. 3876

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

meet the new PDP-12

Talk to a computer? How?

JUST GIVE ME ENGLISH THROUGH THE KEYBOARD, I'LL TALK BACK THROUGH MY 7" x 9" SCOPE.

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This is our new LR-310 refrigerator—medium-size cryogenic storage for any temperature, from a relatively warm —100°C (actually within the range of some mechanical refrigerators) all the way down to —196°C. There is room for 8 cu. ft. of vapor-phase storage deep down inside it, with better than 8 days' normal holding time. The Super Insulated storage cylinder provides truly economical service. A wide variety of racking systems and accessories customize the unit to many different laboratory requirements.

For further information, contact Union Carbide Corporation, Linde Division, Cryogenic Products Department, 270 Park Avenue, New York, N.Y. 10017

UNION CARBIDE CRYOGENIC PRODUCTS

11 April 1969
Vol. 164, No. 3876

SCIENCE

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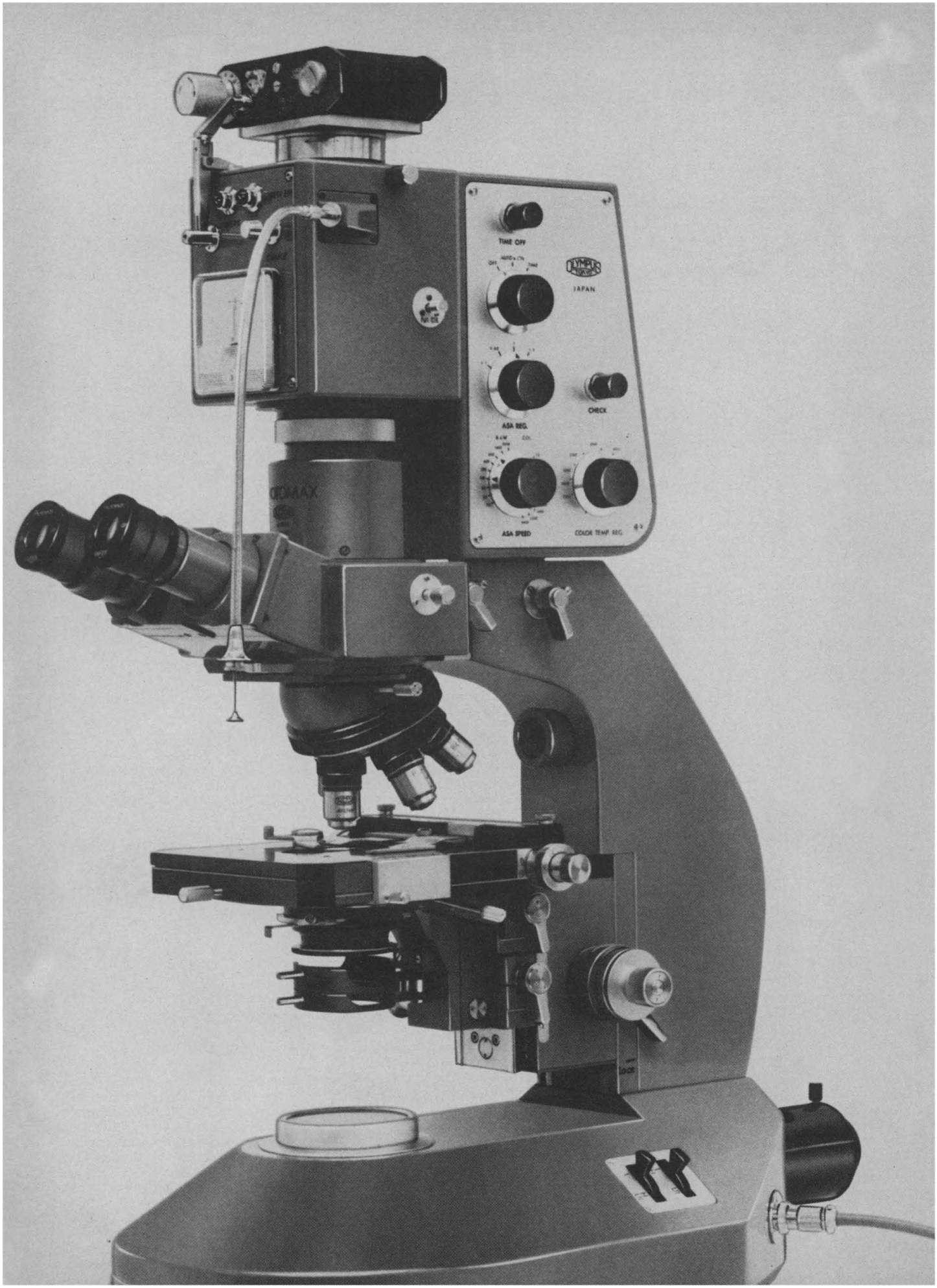
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Bentonite debris flows near Umiat, Alaska. These flows, developed on the banks of the Colville River, are a typical form of slope failure in the bentonitic shale that outcrops in a broad belt between the Brooks Range and the Arctic Ocean. The frequency of occurrence and the distinctive channel morphology are thought to be sufficiently unique to differentiate bentonite debris flows from other types of earth flow with high reliability. See page 173. [T. Marlar, with assistance of the Naval Arctic Research Labora-


TIME OFF
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ASA SPEED
COLOR TEMP. REG.

If the color on your film doesn't match the color of your specimen, you might as well have shot in black and white.

Look at any color photomicrograph. If the white background around the specimen is not pure white, then the colors aren't accurate. If the white is pure, and the colors are accurate—you probably shot it on a Photomax.

The Olympus Photomax is the only photo-microscope that ensures accurate color, because only the Photomax meters the light and tells you, *before you shoot* whether your illumination is too red, too blue, or matched precisely to the color film you're using. No test rolls, no wasted shots.

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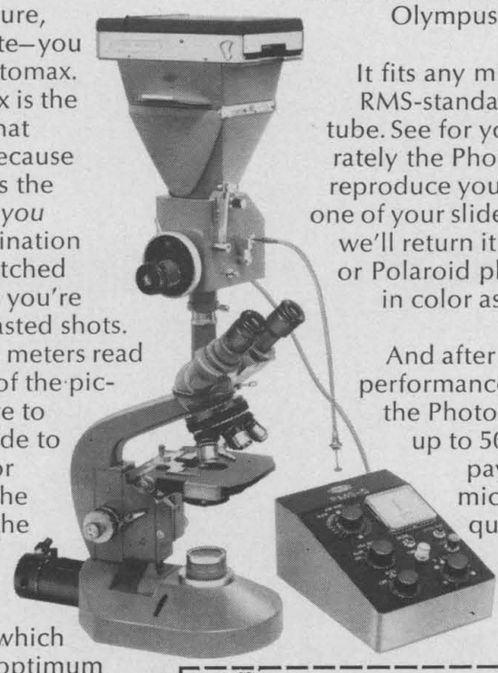

For many applications, you can also add Photomax automation to your current research microscope, with the Olympus PMS-II automatic color camera.

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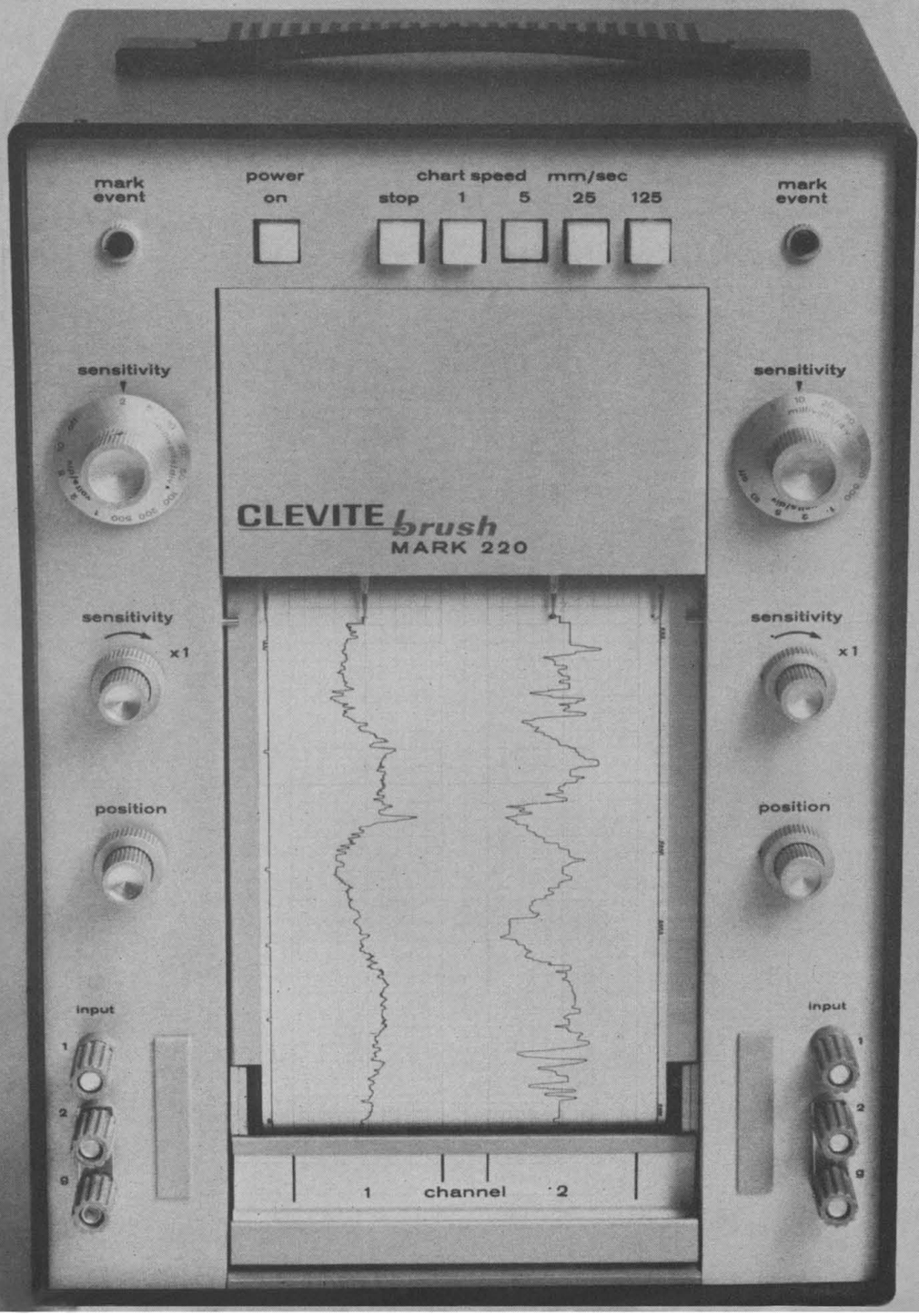
This portable will record more facts in less time, at less cost than any other 2-channel recorder on the market.



We call it the Mark 220.

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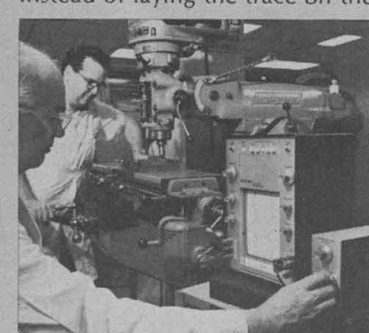
To begin with, we *guarantee* the Mark 220 to be 99½% accurate. Which is a good deal better than almost anything else on the market . . . regardless of size or price. The pressurized ink-writing system is the same one you'll find in our six and eight channel systems. Instead of laying the trace *on* the



paper, it forces it *in*. Run your finger over it. There's no smear, no smudge. And trace crispness and uniformity is in a class by itself.

Built-in preamplifiers give you measurement range from 1 mV per division to 500 V full scale — and you never have to re-calibrate. Pushbutton controlled chart speeds. Two handy event markers. Ink supply is a disposable cartridge, good for a year.

Yes, for a 25 pound portable that's no bigger than a breadbox, the Mark 220 is quite a recorder. Ask your Brush representative for a demonstration. Or, write for complete details. Clevite Corporation, Brush Instruments Division, 37th and Perkins, Cleveland, Ohio 44114. We'll include our informative booklet "Elimination of Noise in Low-Level Circuits".

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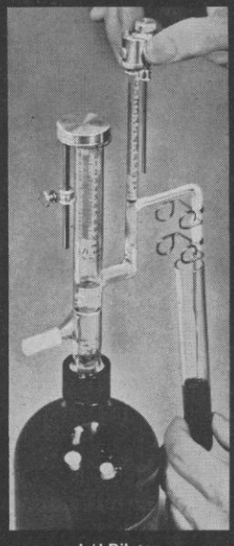

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As shown, L/I instruments fit *directly* on your reagent bottles, ½-ounce and larger. (L/I will supply bottle if desired.) To operate, simply set volume with knife-edge pointer, lift plunger to aspirate, and depress plunger to deliver. In effect, you've automated your reagent bottle! You not only save valuable analysis time, you get more results and more dependable results.

PYREX L/I instruments handle any reagent, including concentrated acids, concentrated alkalies, chlorinated hydrocarbons, etc. Integral air filters keep reagents pure. All-amber instruments are supplied for labile reagents. L/I stocks REPIPETS and Dilutors in ½, 1, 5, 10, 20 and 50 ml sizes. Each instrument is adjustable and accurate over its entire scale. Micro and macro Teflon tips included. Prices: REPIPETS $52.50; Dilutors $99.50; LAMBDA-DIALS $49.50. Write to L/I at 1802M Second Street, Berkeley, California 94710, or contact your distributor. L/I Phone: (415) 843-0220. Cable: GATE-MERC, Los Angeles.

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Enzyme kinetics, immunochemistry, experimental pathology, serology, clinical chemistry and hematology.

How do I learn more about GEMSAEC?

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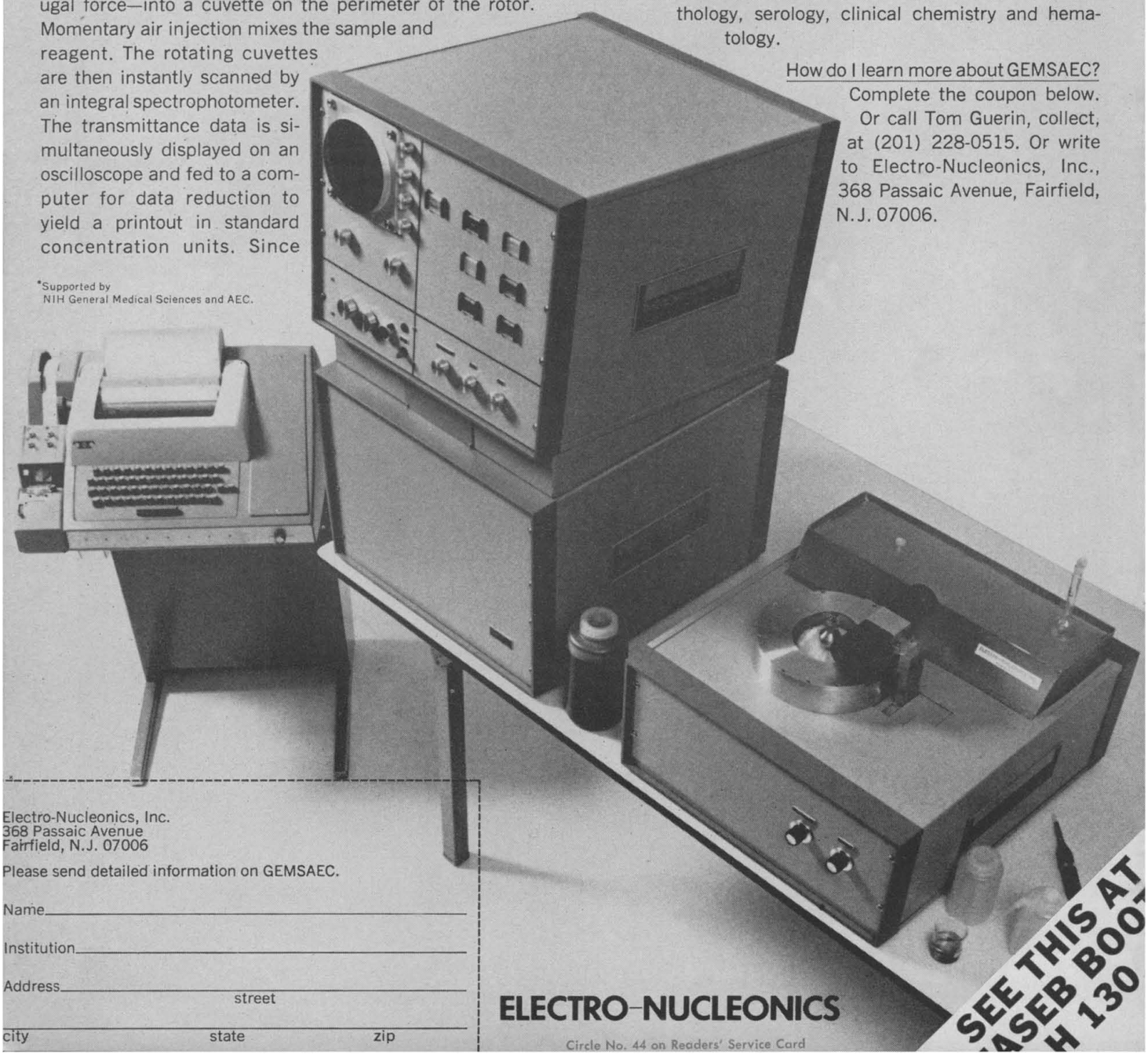
*Supported by NIH General Medical Sciences and AEC.



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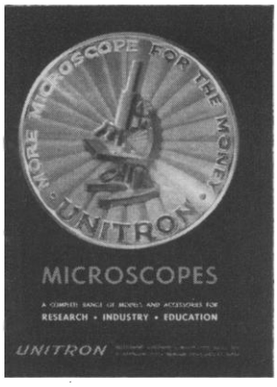
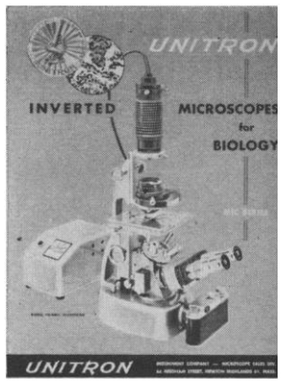
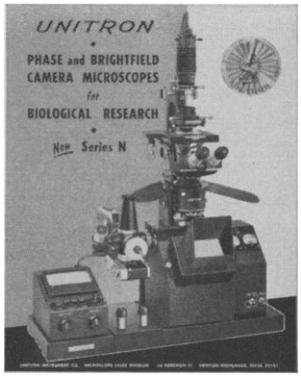


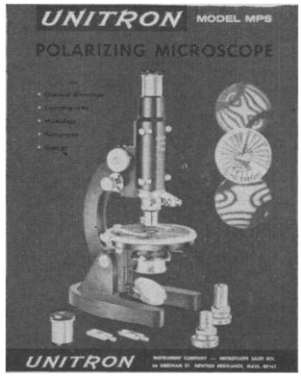
FREE MICROSCOPE BUYING GUIDE

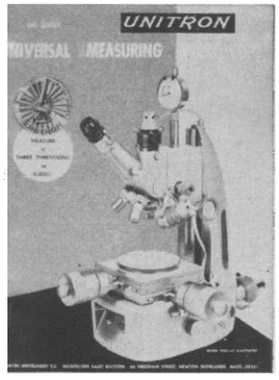
Shown here in miniature are just some of the informative brochures which comprise the UNITRON Catalog . . . your buying guide to quality microscopes at prices within your budget. Whether your application is routine laboratory analysis, advanced biological research, or industrial quality control, you will find the instrument you need in UNITRON's complete line.

A UNITRON MICROSCOPE CATALOG is Yours for the Asking.









TRY ANY UNITRON MICROSCOPE FREE FOR 10 DAYS

A salesman's demonstration gives you only about 30 minutes to examine a microscope, hardly the best conditions for a critical appraisal. But UNITRON's Free 10 Day Trial gives you the opportunity to evaluate any model in your own laboratory and prove its value in your own application before you decide to purchase. See for yourself, as have thousands of other buyers, why . . .

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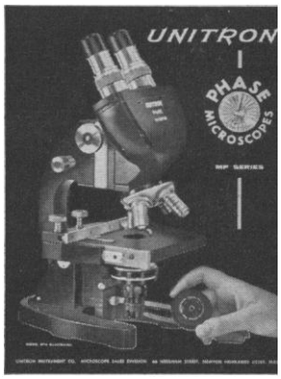

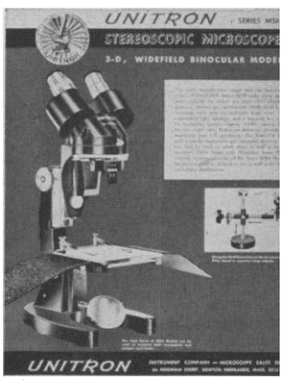

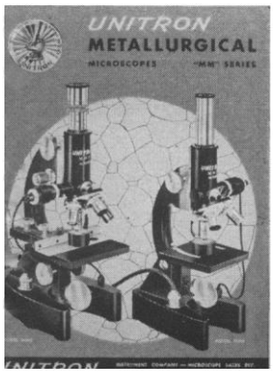

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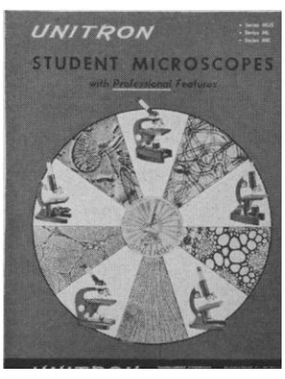

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Now for a better look at what you do get, call your local Picker representative or ask for our new 220 brochure. Write Picker Nuclear, 1275 Mamaroneck Avenue, White Plains, N.Y. 10605. Dept. B.

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*If you're curious as to what some of these omissions were, here are examples: a seldom-used third beta channel, expensive digital display, unnecessary refrigeration.

AUDIOTAPES OF AAAS ANNUAL MEETING SYMPOSIA AND PANEL DISCUSSIONS

Dallas, Texas, 26–31 December 1968

Through a cooperative arrangement between AAAS and Science Service, tape recordings of 15 symposia and panel discussions, presented at the Annual Meeting of the AAAS, are now being released at cost for general distribution. The objective of this undertaking is to make the proceedings of these meetings rapidly available to a wide public. Discussions and comments are included whenever it was possible to record them. A limited amount of editing has been done to remove technical defects but no part of the presentations has been altered or eliminated.

In a number of sessions, some information was presented on slides. Authors should be contacted directly for copies. Because of a serious epidemic of influenza at the time of the Dallas meeting, a few of the contributions were not given by the originally announced authors.

Tapes are sold as self-contained, half-day sessions. They can be purchased as conventional open reels (3¾ inches per second speed) that can be played back on any conventional audiotape player, or as cassettes for playback on a cartridge player. Each half-day session is identified, for ordering purposes, by a number ("1/68," "2/68," and so on). An order form is on the last page of this notice.

Acknowledgment is made to Ampex Corp. for assistance in recording and distribution and to WAMU, American University, for aid in editing.

AAAS INVITED LECTURES AND DISCUSSIONS

The Scientific Research Society of America (RESA) Annual Address and Discussion

• 1/68, 3 hours, $7.00 •

Chairman: CHAUNCEY STARR (*Dean, College of Engineering, University of California, Los Angeles*)

Speaker: ATHELSTAN SPILHAUS (*President, Franklin Institute, Philadelphia*)

Technology, Living Cities, and Human Environment

Discussants:

T. F. ROGERS (*Department of Housing and Urban Development*)

R. G. STUDER (*Pennsylvania State University*)

J. ERIK JONSSON (*Mayor of Dallas*)

The Financial Crisis in Science

• 2/68, 3 hours, $7.00 •

Panel:

Chairman: H. BENTLEY GLASS (*Academic Vice President and Professor of Biology, State University of New York, Stony Brook*)

PHILIP H. ABELSON (*Editor*, Science)

JAMES A. SHANNON (*National Academy of Sciences*)

Review of United States Science Policy

• 3/68, 3 hours, $7.00 •

Chairman: J. HERBERT HOLLOMAN (*President, University of Oklahoma, Norman*)

CONRAD H. WADDINGTON (*Institute of Animal Genetics, Edinburgh University, Scotland*)

P. D. MCTAGGART-COWAN (*Science Council of Canada*)

ALEXANDER KING (*Director for Scientific Affairs, O.E.C.D., Paris, France*)

• 4/68, 3½ hours, $8.50 •

Chairman: DON K. PRICE (*Dean, John Fitzgerald Kennedy School of Government, Harvard University*)

DONALD F. HORNIG (*Special Assistant to the President for Science and Technology*)

Panel discussion with questions from the floor

Science, Technology, and Latin American Development

• 5/68, 3 hours, $7.00 •

Chairman: HARRISON BROWN (*California Institute of Technology*)

Prospects for Food Production

H. F. ROBINSON (*National Academy of Sciences*)

Demographic Problems

HARLEY BROWNING (*Director, Population Research Center, University of Texas, Austin*)

The Social-Political Problems of Development

RICHARD N. ADAMS (*Professor of Anthropology, University of Texas, Austin*)

Round Table Discussion

• 6/68, 3 hours, $7.00 •

Chairman: HARRISON BROWN

Bilateral and Regional Scientific-Technological Development

THERESA TÈLLEZ (*Head, Latin American Affairs, Office of the Foreign Secretary, National Academy of Sciences*)

International Transmission of Technology by Means of Private Investment

DWIGHT BROTHERS (*Associate Director, Harvard Development Advisory Service, Harvard University*)

Science Policy and National Economic Development in Latin America

VICTOR URQUIDI (*Presidente del Colegio de México, Guanajuato, México*)

Round Table Discussion

AAAS COMMITTEE SYMPOSIA

Unanticipated Environmental Hazards Resulting from Technological Intrusions

• 7/68, 3 hours, $7.00 •

Chairman: BARRY COMMONER (*Director, Center for the Biology of Natural Systems, Washington University*)

Introductory Remarks

MARGARET MEAD (*American Museum of Natural History*)

Geological Problems Related to the Storage of Chemical Wastes in Deep Wells

DAVID EVANS (*Mineral Resources Institute, Colorado School of Mines*)

An Ecological Assessment of the Use of Herbicides in Vietnam

FRED TSCHIRLEY (*Deputy Chief, Crops Protection Branch, Agricultural Research Service, USDA*)

Possible Ecological Consequences of the Widespread Use of Herbicides: Two Views

BOYSIE E. DAY (*College of Biological and Agricultural Sciences, University of California, Riverside*)

ARTHUR GALSTON (*Department of Biology, Yale University*)

Discussion and Audience Questions

• 8/68, 3 hours, $7.00 •

Torrey Canyon Pollution and Marine Life

J. E. SMITH (*Director, Plymouth Laboratory, Marine Biological Association of the United Kingdom*)

Widening Spectrum of Asbestos Disease

I. J. SELIKOFF (*Chairman, Division of Environmental Medicine, Mount Sinai School of Medicine, New York*)

Attitudes toward the Environment: A Nearly Fatal Illusion

BARRY COMMONER

• 9/68, 3 hours, $7.00 •

Chairman: WALTER MODELL (*Cornell University Medical College*)

Interactions among Different Drugs

ALBERT SJOERDSMA (*Experimental Therapy Branch, National Heart Institute, National Institutes of Health*)

Environmental Contaminants and Drugs

ALLAN H. CONNEY (*Head, Biochemical and Pharmacological Sections, Burroughs Wellcome Laboratories*)

Discussion and Audience Questions

Summary Remarks

MARGARET MEAD

Water Importation into Arid Lands

• 10/68, 3 hours, $7.00 •

Chairman: JAY M. BAGLEY (*Utah State University*)

Historical Background and Philosophic Basis of Regional Water Transfer

CALVIN WARNICK (*Director, Water Resources Research Institute, University of Idaho*)

Intrastate, Interstate, and International Legal and Administrative Problems of Large-Scale Water Transfer

EDWARD WEINBURG (*Solicitor, Solicitors Office, Department of the Interior, Washington, D.C.*)

Physical Implications (Equilibrium Changes in Hydrologic, Climatologic, Water Quality, etc.)

P. H. MCGAUHEY (*Director, Sanitary Engineering Research Laboratory, Richmond Field Station, Richmond, California*)

Social and Ecological Implications

GERALD W. THOMAS (*Dean of Agriculture, Texas Technological College*)

• 11/68, 3 hours, $7.00 •

Moderator: HENRY P. CAULFIELD, JR. (*Executive Director, Water Resources Council, Washington, D.C.*)

Panel:

E. ROY TINNEY (*Chief, Water Resources Planning, Department of Energy, Mines, and Resources, Ottawa, Canada*)

BRUCE R. BEATTIE (*Oregon State University*)

SOL RESNICK (*Associate Director, Water Resources Research Center, University of Arizona*)

HARVEY O. BANKS (*President, Leeds, Hill, & Jewett, Inc., San Francisco, California*)

AAAS GENERAL SYMPOSIA

Genetic Technology: Some Public Considerations

• 12/68, 3 hours, $7.00 •

Possibilities, Purposes, and Problems of Genetic Manipulation

Moderator: ROBERT L. SINSHEIMER (*Professor of Biophysics, California Institute of Technology*)

Panel:

THEODORE FRIEDMANN (*National Institutes of Health*)

ANTHONY BLACKLER (*Professor of Zoology, Cornell University*)

Discussants:

MARSHALL W. NIRENBERG (*National Institutes of Health*)

DAVID SCHWARZ (*President, Schwarz BioResearch*)

DAVID DAUBE (*Regius Professor of Law, All Souls College, Oxford University, England*)

• 13/68, 3 hours, $7.00 •

Public Policy for Genetic Manipulation

Moderator: J. E. RALL (*Director of Intramural Research, National Institute of Arthritis and Metabolic Diseases, NIH*)

Panel:

HAROLD P. GREEN (*Professor of Law, National Law Center, George Washington University*)

EUGENE B. SKOLNIKOFF (*Professor of Political Science, Massachusetts Institute of Technology*)

Discussants:

DAVID L. BAZELON (*Chief Judge, U.S. Court of Appeals for the District of Columbia Circuit*)

ROLLIN D. HOTCHKISS (*Professor, Rockefeller University*)

GORDON M. TOMKINS (*National Institutes of Health*)

Global Effects of Environmental Pollution

• 14/68, 3 hours, $7.00 •

The Oxygen and Carbon Dioxide Balance in the Earth's Atmosphere

FRANCIS S. JOHNSON *(Director, Earth and Planetary Sciences Laboratory, Southwest Center for Advanced Studies, Dallas)*

Discussants:

ROGER REVELLE *(Director, Center for Population Studies, Harvard University)*

WILLARD F. LIBBY *(Director, Institute of Geophysics, University of California, Los Angeles)*

S. MANABE *(Geophysics Fluid Laboratory, Princeton University)*

LAURISTON MARSHALL *(Department of Physics, Southern Illinois University, Carbondale)*

Nitrogen Compounds in Soil, Water, Atmosphere, and Precipitation

BARRY COMMONER *(Director, Center for the Biology of Natural Systems, Washington University)*

Discussants:

THEODORE C. BYERLY *(Administrator, Cooperative State Research Service, U.S. Department of Agriculture)*

VINCENT J. SCHAEFER *(Director, Atmospheric Sciences Research Center, State University of New York, Albany)*

ARTHUR D. HASLER *(Laboratory of Limnology, University of Wisconsin)*

• 15/68, 4 hours, $10.00 •

Effects of Atmospheric Pollution on Climate

REID A. BRYSON *(Center for Climatic Research, Department of Meteorology, University of Wisconsin, Madison)*

Discussants:

VINCENT J. SCHAEFER *(Director, Atmospheric Sciences Research Center, State University of New York, Albany)*

S. MANABE *(Princeton University)*

MURRAY MITCHELL *(Environmental Data Service, Environmental Science Services Administration, Silver Spring, Maryland)*

Worldwide Ocean Pollution by Toxic Wastes

EDWARD GOLDBERG *(Scripps Institution of Oceanography, University of California at San Diego, La Jolla)*

Discussants:

GEORGE WOODWELL *(Brookhaven National Laboratory)*

BOSTWICK H. KETCHUM *(Environmental and Systematic Biology, National Science Foundation)*

BENGT LUNDHOLM *(Swedish Ecological Research Commission, Natural Science Research Council, Stockholm)*

• 16/68, 3 hours, $7.00 •

Panel:

Chairman: ATHELSTAN SPILHAUS *(Franklin Institute, Philadelphia)*

HARRISON BROWN *(Foreign Secretary, National Academy of Sciences)*

JOHN L. BUCKLEY *(Office of Science and Technology, Washington, D.C.)*

WILLARD F. LIBBY *(University of California, Los Angeles)*

BENGT LUNDHOLM *(Natural Science Research Council, Stockholm, Sweden)*

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WALTER ORR ROBERTS *(President, University Corporation for Atmospheric Research, Boulder, Colorado)*

S. FRED SINGER *(Deputy Assistant Secretary, Department of the Interior, Washington, D.C.)*

Space Applications: Earth Oriented Applications of Unmanned Earth Satellites

• 17/68, 3 hours, $7.00 •

Summary and Panel Discussion

Panel:

Chairman: W. DEMING LEWIS *(President, Lehigh University)*

BEARDSLEY GRAHAM *(Columbia Plaza, Washington, D.C.)*

HOMER NEWELL *(NASA, Washington)*

ALLEN E. PUCKETT *(Hughes Aircraft Co., Culver City, California)*

PAUL ROSENBERG *(Paul Rosenberg Associates, Pelham, New York)*

J. RALPH SHAY *(Oregon State University, Corvallis)*

ERIC A. WALKER *(President, National Academy of Enginering; President, Pennsylvania State University)*

SYMPOSIA OF AAAS SECTIONS AND AFFILIATED SOCIETIES

MATHEMATICS

The Direction of Programming Languages for the Scientist

• 18/68, 3½ hours, $8.50 •

Chairman: STAN SHANNON *(Goddard Computer Science Institute, Dallas)*

Moderator: ROBERT M. MCCLURE *(Associate Professor, Computer Science Center, Southern Methodist University)*

Panel:

R. F. ROSIN *(Associate Professor of Computer Science, State University of New York, Buffalo)*

J. C. BROWNE *(Professor of Physics & Computer Science, University of Texas, Austin)*

CHRISTOPHER SHAW *(Systems Development Corp.)*

RICHARD HAMMING *(Bell Telephone Laboratories)*

JEAN SAMMET *(Boston Programming Center, IBM)*

PHYSICS

The Social Relevance of Physics

• 19/68, 3 hours, $7.00 •

Chairman: RALPH E. GIBSON *(Director, Applied Physics Laboratory, Johns Hopkins University)*

Panel:

HARVEY WHEELER *(Fellow, Center for the Study of Democratic Institutions, Santa Barbara, California)*

LEWIS M. BRANSCOMB *(Chairman, Joint Institute for Laboratory Astrophysics of the National Bureau of Standards and the University of Colorado, Boulder)*

RAYMOND BOWERS *(Associate Professor of Physics, Cornell University)*

J. HERBERT HOLLOMON *(President, University of Oklahoma, Norman)*

ASTRONOMY

Pulsars

• 20/68, 4 hours, $10.00 •

Chairman: F. D. DRAKE (*Center for Radiophysics and Space Research, Cornell University*)

Introduction

F. D. DRAKE

Observational Characteristics of Pulsars

H. D. CRAFT, JR. (*Arecibo Ionospheric Observatory, Arecibo, Puerto Rico)*

Pulsation and Rotation of Superdense Stars

K. S. THORNE *(Kellogg Radiation Laboratory, California Institute of Technology)*

Possible Mechanisms of Pulsar Radiation

T. GOLD *(Director, Center for Radiophysics and Space Research, Cornell University)*

Discussion

ZOOLOGICAL SCIENCES

The Use of Space by Animals and Men

• 21/68, 3 hours, $7.00 •

General Chairman: ARISTIDE H. ESSER (*Rockland State Hospital, Orangeburg, New York*)

Relation of Territoriality to Dominance

Introduction: The Importance of Defining Spatial Behavioral Parameters

ARISTIDE H. ESSER

Ten Phases of the Animal Path

FRED FISCHER (*Zurich Zoological Gardens, Switzerland)*

Dominance and Territoriality as Complements in the Evolution of Social Structure in Mammals

PAUL LEYHAUSEN (*Max-Planck-Institut für Verhaltensphysiologie, Wuppertal, Germany*)

Discussion:

Chairman: CHARLES C. CARPENTER *(Department of Zoology, University of Oklahoma, Norman)*

ROBERT ARDERY *(Piazza dei Mercanti 25, 00153 Roma, Italia)*

KYLE R. BARBEHENN *(Center for the Biology of Natural Systems, Washington University)*

JOHN LEGAY BRERETON (*Department of Zoology, University of New England, Australia*)

JOHN H. KAUFMANN (*Department of Zoology, University of Florida*)

KENNETH P. KINSEY (*Bowling Green, Ohio*)

RICHARD S. PETERSON (*Division of Natural Sciences, University of California, Santa Cruz)*

• 22/68, 3 hours, $7.00 •

Factors Influencing Intraspecific Contact

Theories of Animal Spacing: The Role of Flight, Fight, and Social Distance

GLEN MCBRIDE *(Department of Psychology, University of Queensland, Australia)*

Inter-Animal Control of Space: The Role of Rank Order, Parent-Offspring Relations, and Peer-Play

JOHN LEGAY BRERETON

The Links between Territorial Behavior, Intraspecific Strife, Population Density, and the Environment

ADAM WATSON *(The Nature Conservancy, Scotland)*

Discussion:

Chairman: JAMES A. LLOYD *(Albert Einstein Medical Center, Philadelphia)*

STUART A. ALTMANN *(Yerkes Regional Primate Research Center, Emory University*)

EDWIN M. BANKS *(Department of Zoology, University of Illinois)*

HALSEY M. MARSDEN *(Primate Ecology, Lajas, Puerto Rico)*

EMIL W. MENZEL, JR. *(Delta Regional Primate Research Center, Tulane University)*

WALTER SHEPPE (*Department of Biology, University of Akron, Ohio)*

JOHN G. VANDENBERGH *(North Carolina Department of Mental Health, Raleigh)*

• 23/68, 3 hours, $7.00 •

Population Density and Crowding

Effects of Density and Space on Sociality and Health in Mammals

KENNETH MYERS *(Commonwealth Scientific and Industrial Research Organization, Australia)*

Physiological Aspects of Continued Crowding

DAVID E. DAVIS *(Department of Zoology, North Carolina State University)*

Behavior under Involuntary Confinement

HENRI F. ELLENBERGER *(University of Montreal, Canada)*

Discussion:

Chairman: CHARLES H. SOUTHWICK (*School of Hygiene, Johns Hopkins University*)

JOHN B. CALHOUN *(Unit for Research on Behavioral Systems, NIH)*

FREDERICK R. GEHLBACH *(Department of Biology, Baylor University)*

ULLA OLIN *(United Nations Development Programme)*

DELBERT D. THIESSEN *(Department of Psychology, University of Texas, Austin)*

• 24/68, 3 hours, $7.00 •

The Role of Distance in the Evolution of Communication

The Role of Orienting Behavior in Communication

MARIO VON CRANACH *(Max-Planck-Institut für Psychiatrie, Munich*)

The Facilitation of Communication in a Cultural Environment

EDWARD T. HALL *(Department of Anthropology, Northwestern University)*

Trans-Cultural Patterns of Ritualized Contact Behavior: Illustrated by Filmed Ceremonial Sequences

IRENAUS EIBL-EIBESFELDT *(Max-Planck-Institut für Verhaltensphysiologie, Seewiesen, Germany)*

Discussion:

Chairman: WILLIAM *A. Mason (Delta Primate Research Center, Tulane University)*

CHARLES C. CARPENTER *(Department of Zoology, University of Oklahoma, Norman)*

DANIEL CARSON *(Mental Health Research Institute, University of Michigan)*

ARISTIDE H. ESSER *(Rockland State Hospital)*

JAMES MARSTON FITCH *(School of Architecture, Columbia University)*

DAVID LOWENTHAL *(American Geographical Society, New York)*

GLEN MCBRIDE *(Department of Psychology, University of Queensland, Australia)*

• 25/68, 3 hours, $7.00 •

Environmental Conditions and Human Behavior

An Evolutionary Background to Human Behavior

V. C. WYNNE-EDWARDS *(Natural History Department, University of Aberdeen, Scotland)*

Ecological Aspects of Interpersonal Relationships

IRWIN ALTMAN *(Naval Medical Research Institute, Bethesda, Maryland)*

Spatial Parameters in Naturalistic Social Behavior Research

ROBERT SOMMER *(Department of Psychology, University of California, Davis)*

Discussion:

Chairman: DAVID LOWENTHAL *(American Geographical Society)*

JOHN B. CALHOUN *(NIH)*

KENNETH H. CRAIK *(University of California, Berkeley)*

JAMES MARSTON FITCH *(Columbia University)*

GILBERT GOTTLIEB *(North Carolina Department of Mental Health)*

ULLA OLIN *(U.N. Development Programme)*

RAYMOND G. STUDER *(Pennsylvania State University)*

HISTORY AND PHILOSOPHY OF SCIENCE

Technology and Values

• 26/68, 3 hours, $7.00 •

Chairman: EMMANUEL G. MESTHENE *(Harvard University Program on Technology and Society)*

The Nature of the Relationship and the Mechanism of Change

EMMANUEL G. MESTHENE

The Religious Dimension

HARVEY COX *(Department of Divinity, Harvard University)*

The Mediating Role of the Economy

NATHAN ROSENBERG *(Visiting Professor, Economics Department, Harvard University)*

The How and What of Value Change in Contemporary American Society

IRENE TAVISS *(Harvard University Program on Technology and Society)*

Discussant:

MELVIN KRANZBERG *(Division of Special Interdisciplinary Studies, Case Western Reserve University)*

AGRICULTURE

Research for the World Food Crisis

• 27/68, 3 hours, $7.00 •

Progress of Research and Technology on Food Supply and Population Control

Chairman: DANIEL G. ALDRICH, JR. *(University of California, Irvine)*

World Food-Population Problem, an Overview

WILL M. MYERS *(Vice President for Science, Rockefeller Foundation)*

Africa

A. H. BUNTING *(Professor, Department of Agricultural Botany, University of Reading, England)*

Europe

ROBERT BEST *(State Agricultural School, Wageningen, Netherlands)*

• 28/68, 3 hours, $7.00 •

Chairman: NYLE C. BRADY *(Director, Agricultural Experimental Station, Cornell University)*

India, South Asia

D. L. UMALI *(Vice President for Agricultural and Forestry Affairs, University of the Philippines)*

Latin America

JOSÉ MARULL *(Dean of the Graduate School, Director, Turrialba Education and Research Center, Inter-American Institute of Agricultural Sciences, Costa Rica)*

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SYLVAN H. WITTWER *(Director, Agricultural Experiment Station, Michigan State University)*

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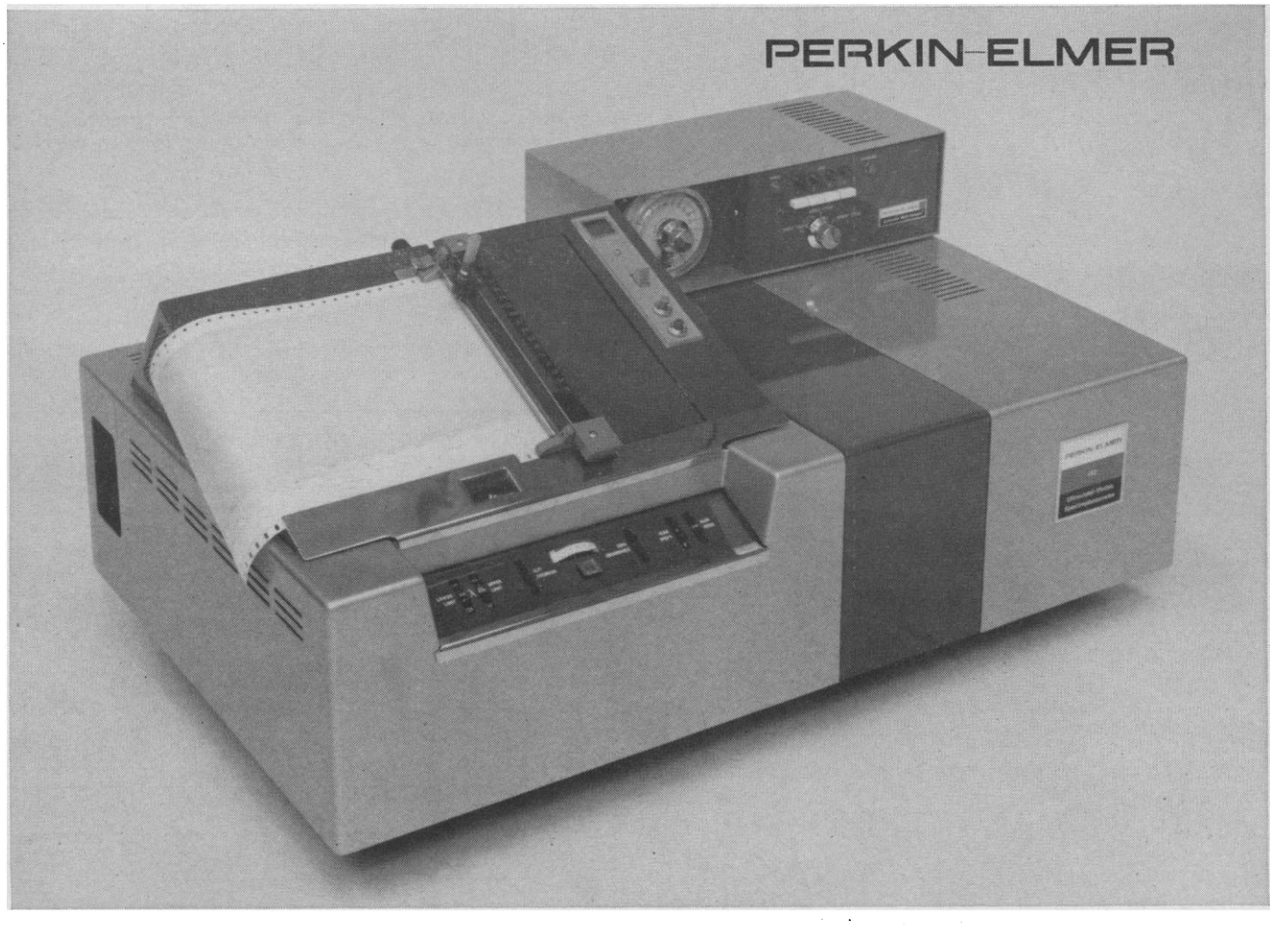

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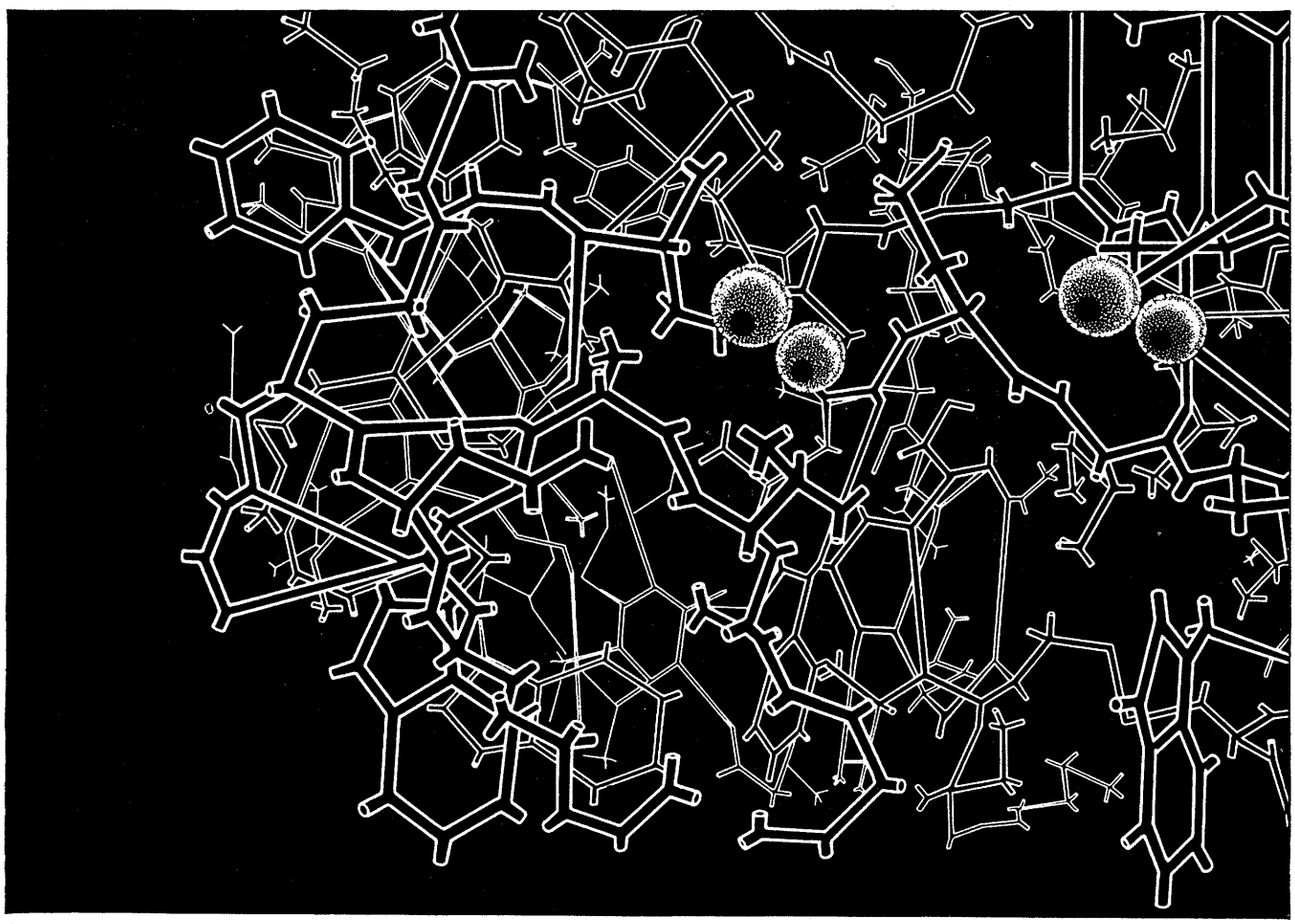

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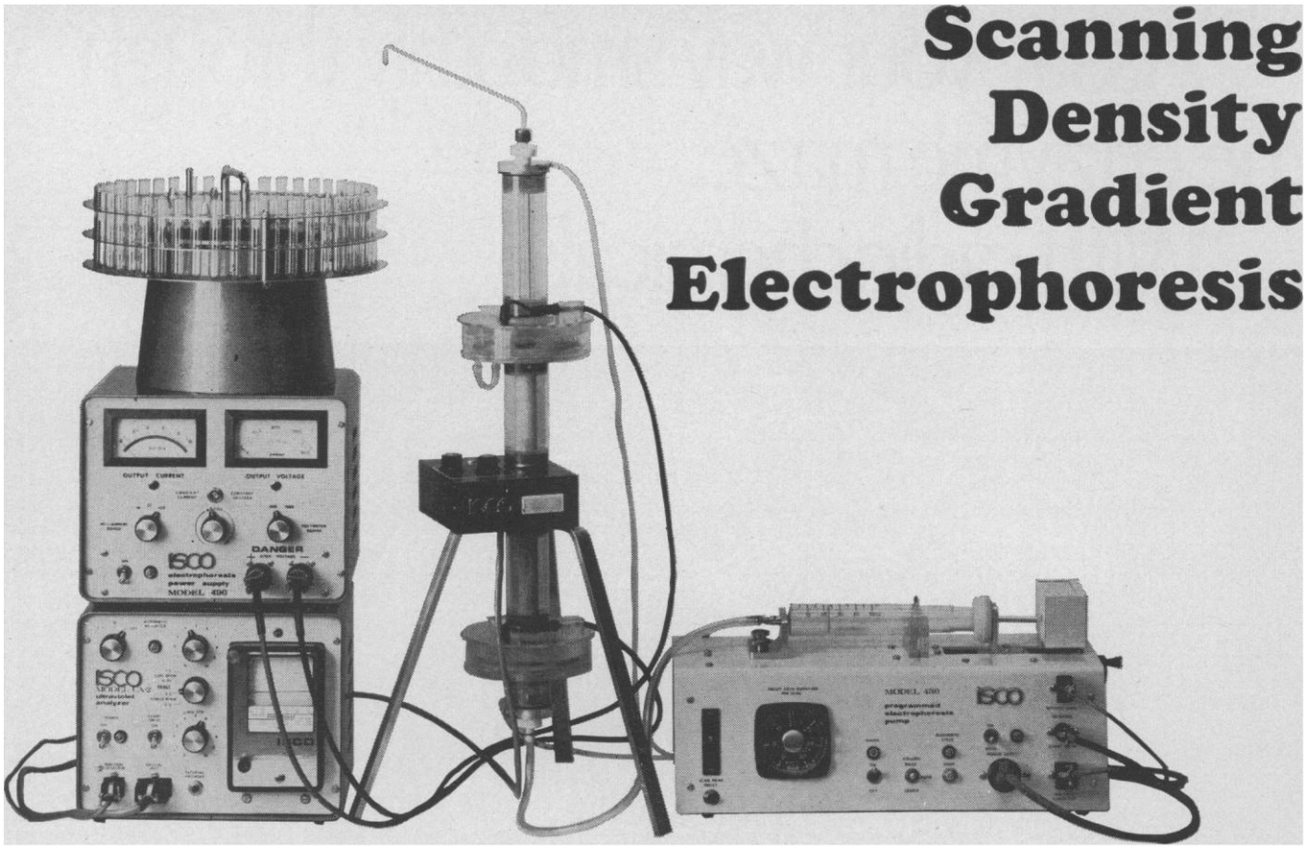
Circle No. 24 on Readers' Service Card

Scanning Density Gradient Electrophoresis



Top: Model 270 Fraction Collector
Center: Electrophoresis Power Supply
Bottom: Model UA-2 UV Monitor

Model 210 Density Gradient Electrophoresis Apparatus

Model 430 Programmed Electrophoresis Pump

Accurate analysis and fractionation of mixtures has been possible for some time with conventional density gradient electrophoresis equipment. Now easy determination of electrophoretic mobilities as well as physical separation of mixtures and quantitative microanalytical results can be obtained with the new ISCO Model 210 Density Gradient Electrophoresis apparatus. Microgram size samples can readily be separated. Low sample concentration permits the use of dilute buffers, resulting in a wide operational temperature range of from 0 to 25° C.

The Model 210 makes repeated scans of zones during migration through a density gradient column. A water-jacketed Teflon central tube contains a gradient which is raised and lowered past a narrow-bandwidth UV-absorbance (O.D.) monitor at programmed intervals. Recorded scans during migration provide data to confirm uniform migration rates or to plot changing migration rates for the purpose of determining electrophoretic mobilities. Quantitative results can be obtained from these scans or from a final chart record made automatically at the conclusion of migration as separated specimen components are discharged into a fraction collector for further assay. Figure 1 is a profile of a typical run showing the relative positions of the same peak during the first and eighth scans. Note that repeated scans have not resulted in loss of resolution.

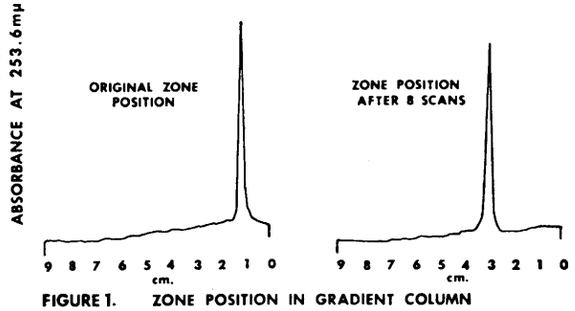


FIGURE 1. ZONE POSITION IN GRADIENT COLUMN

Semipermeable membranes between the buffer and electrode chambers and the gradient column eliminate the difficulties normally associated with loading density gradient electrophoresis equipment. There is no need to maintain hydrostatic equilibrium: the gradient may be pipetted directly into the column. The separating membranes also prevent pH changes at the electrodes from reaching the gradient column.

The Model 430 programmed electrophoresis pump controls the number and timing of scans, the timing of electric field applications, and finally discharges the entire gradient column into a fraction collector. The apparatus need not be attended after setup.

A similar preparative apparatus which has a larger capacity but can monitor the gradient only during discharge is also available. Much of this electrophoresis apparatus can also be used for monitoring column chromatographic eluants or for fractionating centrifuged density gradients.

For more information, please request brochure E121.

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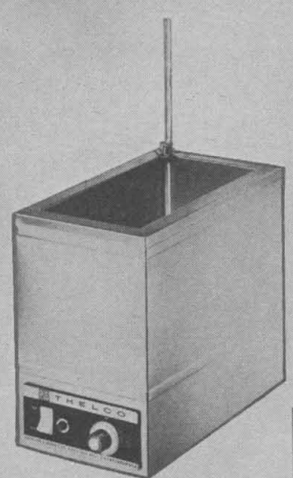
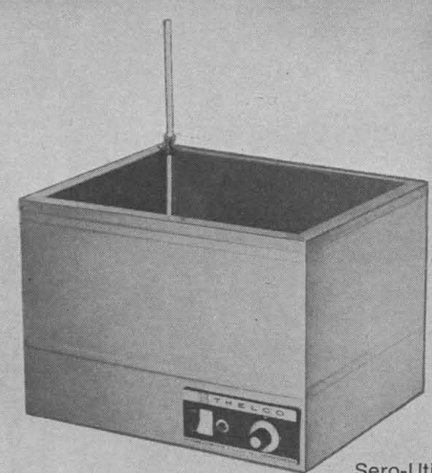


Sero-Utility Bath
Small, Model 82



Sero-Utility Bath
Medium, Model 83

Sero-Utility Bath
Large, Model 84

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PERKIN-ELMER

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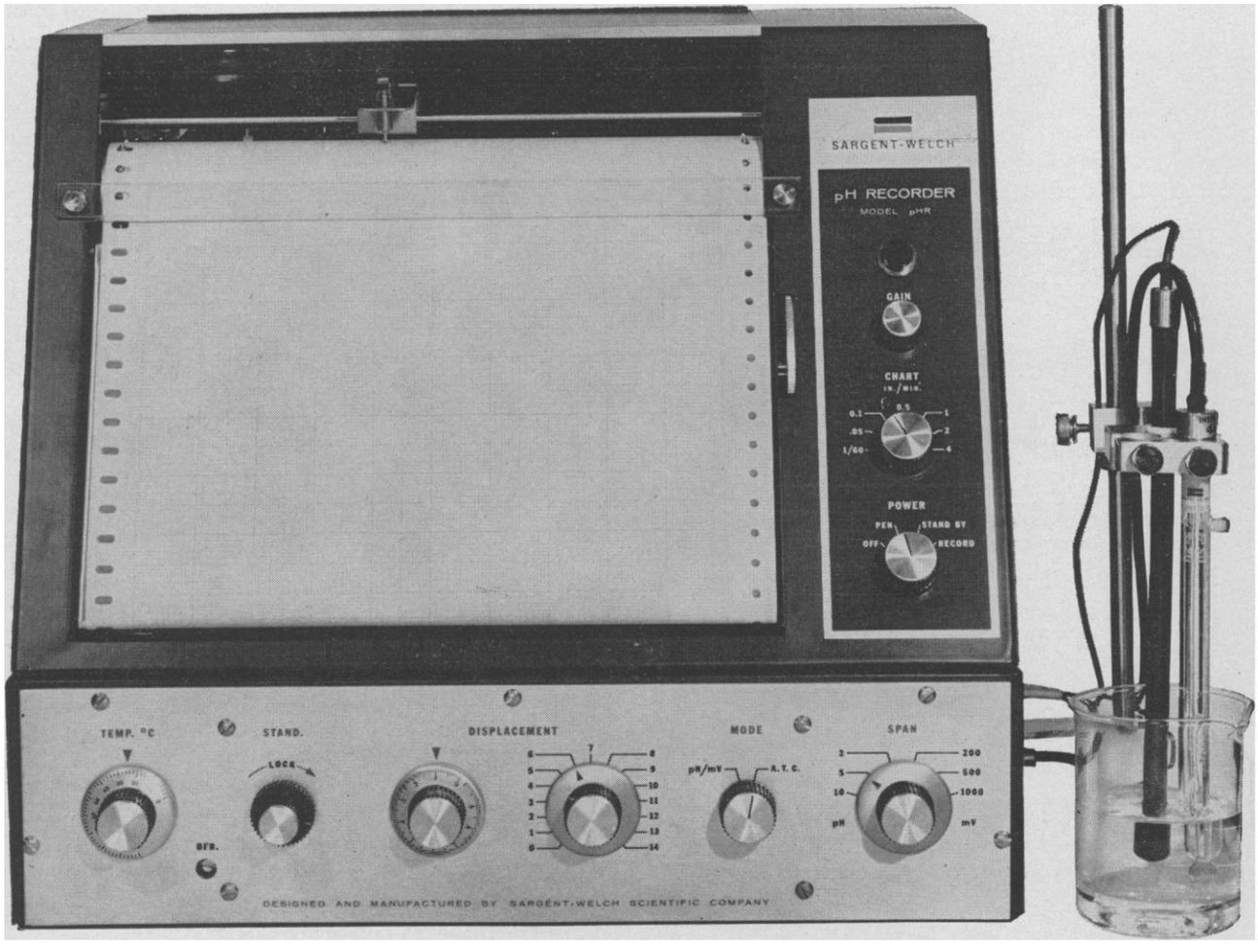
VISIT OUR BOOTH—FASEB MEETING

We ask you:

Is this the face of an ordinary pH meter?



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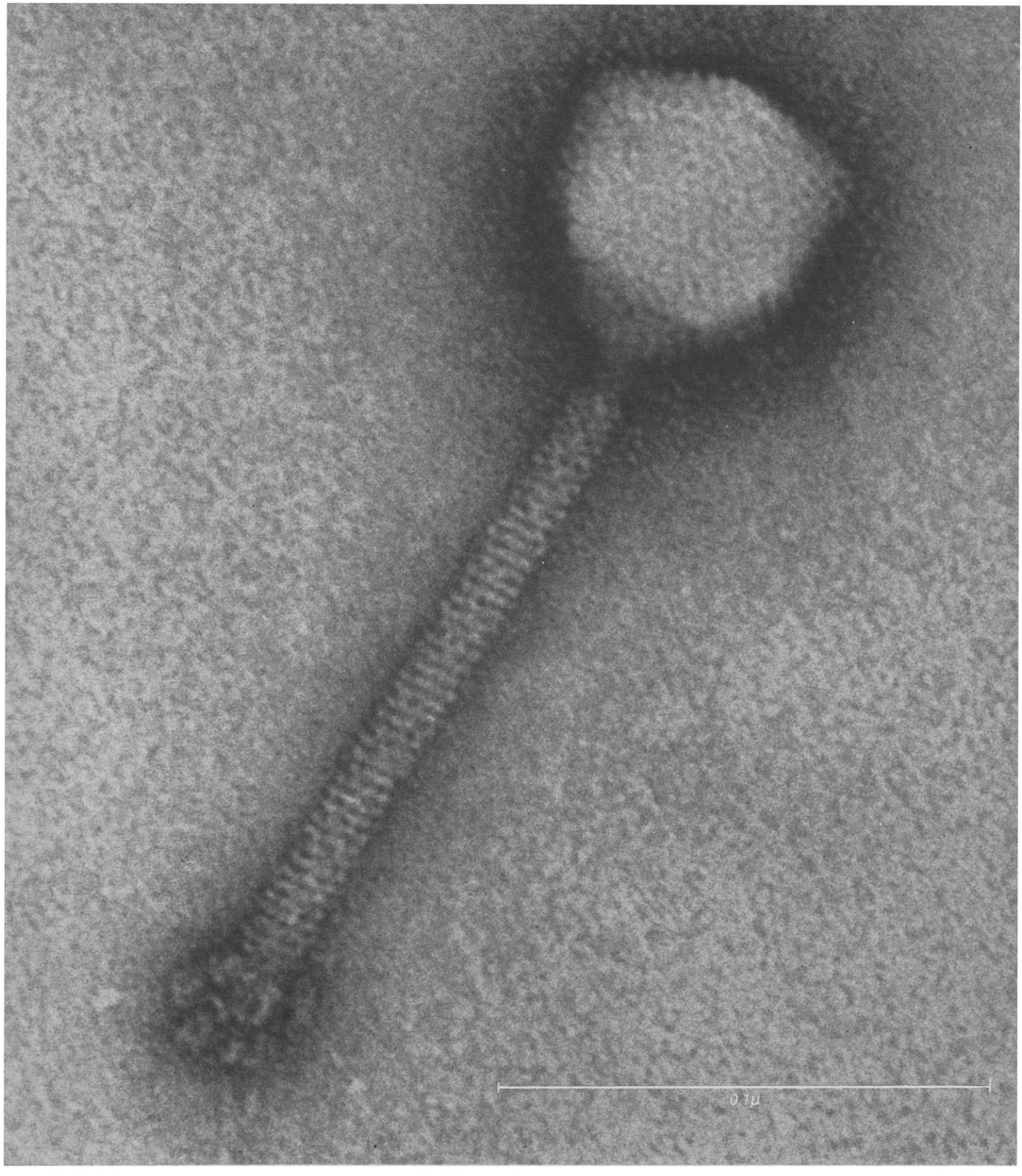

SP50-B Subtilis bacteriophage; photographed at 80,000x in a Siemens-Elmiskop electron microscope; enlarged to 1,500,000x with a Durst S-45EM*(Courtesy of Dr. A. K. Kleinschmidt, New York University School of Medicine, Dept. of Biochemistry.)

The above illustration was reproduced from a 16x20" print — a 19.5x enlarged section of a 3¼x4 EM plate — made with a Durst S-45EM enlarger. The specular point-light source and condenser system used in this enlarger are analogous to Koehler illumination as applied to optical microscopes, and is responsible for the extremely high resolution and contrast obtained, so essential to retaining definition in electron micrograph prints.

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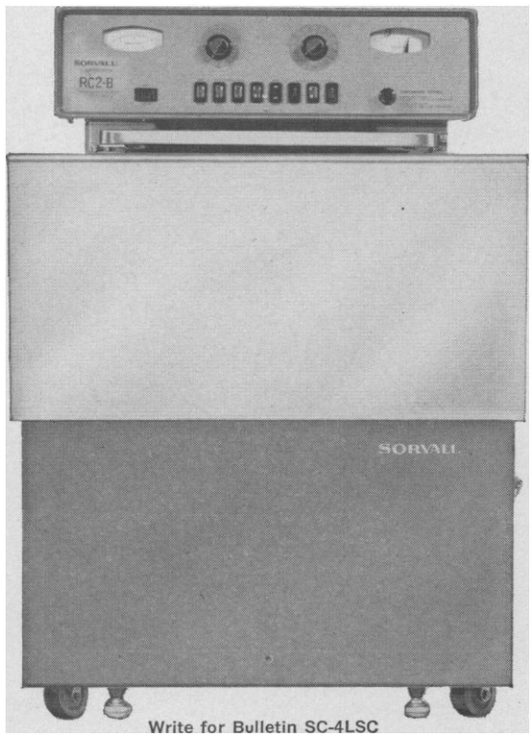
Let's separate centrifuges



Write for Bulletin SC-4LSC

It is just as important when looking for reliable sample separation to look for a reliable "separator." That's why we say "Let's separate centrifuges." All centrifuges are not alike, and it *does* make a difference which one you choose. The SORVALL RC2-B Automatic Refrigerated Superspeed Centrifuge has set the standard in its range for automatic programming, Gyro-Action Self-Centering Direct Drive, control accuracy, big, smooth-wall stainless steel chamber and reliability of performance. Eight angle and horizontal rotors are offered currently. If your need is for low-temperature centrifugation, buy the reliable one — buy the RC2-B. You'll also get personal service! From Ivan Sorvall, Inc., Norwalk, Connecticut 06856.

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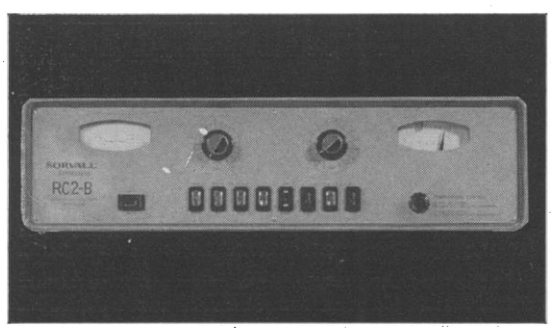

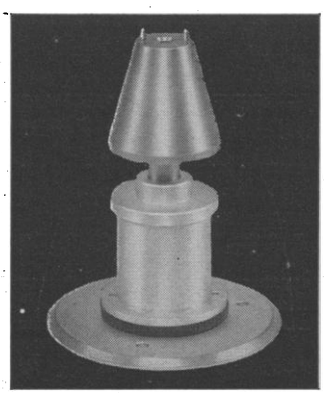

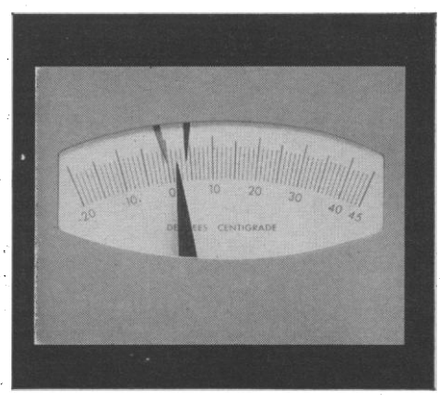

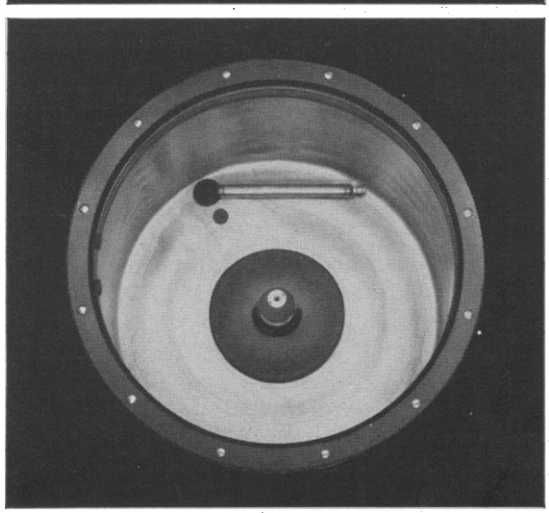

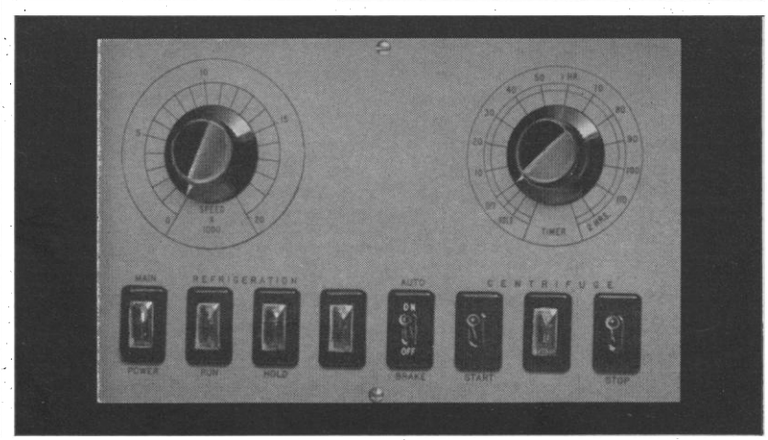

Circle No. 20 on Readers' Service Card

New Publications in Biomedical Science

Bloom & Fawcett: A TEXTBOOK OF HISTOLOGY

By WILLIAM BLOOM (*Emeritus*), *University of Chicago,* and DON W. FAWCETT, *Harvard Medical School.*

Internationally known for its thorough, authoritative coverage of microanatomy, this lavishly illustrated medical text describes the minute structure, composition, and function of all human tissues and organs. The New (9th) Edition reflects recent advances in the basic sciences and includes nearly 400 new photomicrographs, electron micrographs, and schematic drawings.

858 pages with 818 figures. $17.50. Ninth Edition published January, 1968.

Rubin & Casarett: CLINICAL RADIATION PATHOLOGY

By PHILIP RUBIN and GEORGE CASARETT, *both of the University of Rochester School of Medicine.*

This two-volume reference systematically describes the adverse effects of therapeutic radiation on every tissue of the human body. The differential sensitivity to radiation of cells is related to their proliferation, differentiation, and individual life span, and the symptoms, diagnosis, treatment, and prognosis of radiation reactions in each part of the body are presented in detail.

1057 pages with 457 figures. $45.00. Published May, 1968.

Davidsohn & Henry: TODD SANFORD CLINICAL DIAGNOSIS BY LABORATORY METHODS

Edited by ISRAEL DAVIDSOHN, *The Chicago Medical School,* and JOHN BERNARD HENRY, *State University of New York Upstate Medical Center,* with 27 contributors.

Now in a thoroughly revised New (14th) Edition, this classic work in clinical pathology includes unusually complete discussions of immunohematology and of blood groups, and entire chapter on blood coagulation, and extensive new articles on quality control and statistics, enzymes, hormones, lipoproteins, and immunoglobulins. Such new techniques as atomic absorption spectrophotometry, immunoelectrophoresis, thin-layer chromatography, and instant thin-layer chromatography are included.

1308 pages with 698 figures, 94 in color. $24.00. Fourteenth Edition published January, 1969.

Andrews: THE RADIOBIOLOGY OF HUMAN CANCER RADIOTHERAPY

By J. ROBERT ANDREWS, *Georgetown University.*

Although plentiful, information on the biophysical mechanisms of radiation effects has been difficult to locate. Dr. Andrews has correlated and evaluated a vast literature and related it to the central problem of human cancer radiotherapy, in a book that will be valuable to radiologists and researchers.

271 pages with 70 figures. $19.00. Published May, 1968.

Felson: ROENTGEN TECHNIQUES IN LABORATORY ANIMALS

Edited by BENJAMIN FELSON, *Cincinnati General Hospital.*

This handbook brings together previously scattered information on the radiography of dogs and other experimental animals—from anesthesia and contrast media to positioning and radiation protection. It will be of value to researchers who work with animals and to veterinary medical practitioners.

245 pages with 215 illustrations. $17.50. Published October, 1968.

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make the point that involuntary methods of population control, which are now considered unacceptable, may become acceptable when society realizes that the alternative is mass starvation. If we wait until massive starvation is upon us to begin to develop such methods, millions of people will suffer and die unnecessarily while the effective methods are being developed. As scientists, we should provide society as soon as possible with adequate means to cope with the problem, even though such methods would not be used at this time. As informed citizens, we should try to make society aware of the consequences of inaction in reducing the birth rate. Ultimately, whether or not involuntary methods are used is a decision which should be made by society, not by scientists; but if scientists wait to develop effective involuntary methods until they are acceptable to society, the time lost may result in an enormous amount of avoidable death and suffering.

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Pharmacology Institute Proposed

Rockliff's comments (Letters, 20 Dec.) on the Food and Drug Administration requirements for filing toxicity reports by pharmaceutical companies and his reply to my letter (16 Aug.) call for some explanation. . . . The Kefauver-Harris amendments requiring that drugs be both safe and *efficacious* became effective 1 June 1963. Since that time, we have made four studies, two of which were not submitted to the FDA. The legal status of toxicity data of a specific drug at a certain time and place is for government and industry attorneys to determine in court. This is a legal ambiguity that needs clarification. In the meantime, who protects the drug consumer? The seriousness of the problem to the patient and doctor is illustrated in a drug surveillance study by Borda (*1*) which showed that 35 percent of hospital patients on a medical service have adverse drug reactions. Prevention of drug reactions begins with the original evaluation of a new drug.

It appears to me that the coordina-

tion of clinical drug evaluation is beyond the capacity of the investigator, the university, the government, and the pharmaceutical industry. A National Institute of Pharmacology with legal and scientific responsibility is essential. This would be a federally sponsored institute which would stimulate and supervise basic and clinical drug research with an emphasis on new drug investigation. The primary involvement of the FDA with food, cosmetics, manufacturing, and advertising indicates that new drug investigation should be in a separate program patterned on the National Institutes of Health. The work of such an Institute of Pharmacology should be conducted by universities and research facilities which conform to the highest standards of personnel, equipment, and research design. The pharmaceutical industry would not be relieved of its obligation to demonstrate the effectiveness and safety of its products and to underwrite the cost of this work but there would be a federal capability which would set standards and enforce them. Such a program would insure the badly needed financial support of new drug research. It would also require complete and prompt reports of new drugs which would be available to the investigators as well as to the government.

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Reference

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Overhead Costs during Austerity

The austerity program for scientific research is requiring some adaptations. For example, in our department the cost of publication page charges for a 12-man faculty was $15,000 last year. This means that page charges cost as much as an additional faculty member. We have been wondering whether the actual scientific communication achieved by the present method is worth the cost. Because we are skeptical, we are trying the following method. Work which is supplementary to an existing key publication will not be published per se but will be written up with no regard to saving space, then will be multilithed, and made available as a numbered "Supplemental Publication"

of our department. We intend to deposit two bound volumes of these in the university library each year so that Xerox copies can be sent to anyone for the normal cost. In this way we can provide the information whenever it is needed and we can publish the key parts of the research with more brevity. We would also welcome two new avenues of publication: 1000-word summaries and current reviews covering about 10 to 15 papers in one area. We feel this latter exercise would serve to advance the faculty, rather than produce an inchoate mass of publications whose usefulness is in question. This threefold method of publication would save costs, reduce the mass of literature on the shelves, and appreciably increase scientific communication.

Our second area of adaptation causes more concern. It has been our practice to employ undergraduates and high school students in the laboratory. Many of these have become first-rate scientists: all have benefited in increased maturity and responsibility. Now we have to cut them off. If funds from an appropriate agency, such as the Office of Education, could be added to each research grant for this purpose, a real human value would be retained.

In the atmosphere of austerity the overhead which is incurred becomes of real importance and forms a strong point of division between scientists in the laboratory and administrators. Faiman's recent remarks (Letters, 27 Dec., 1968) are pertinent. I suggest that granting agencies require that the use of overhead be explained by the institution to the principal investigators, that discussion of the manner of its use be permitted, and that the agency be aware of what takes place in such discussion.

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What Makes Oysters Grow?

A letter from Adler (29 Nov.) comments on Bardach's article "Aquaculture" (13 Sept., p. 1098). It is Adler's opinion that Bardach created a wrong impression in a statement to the effect that oyster larvae need flagellate algae for food. Adler says further that "Good larval growth has even been achieved with some nonliving substitute food like corn flour." We are not familiar with any success at rearing larvae with nonliving foods. Either Adler has created a wrong impression of the state of marine animal husbandry, or he knows of a very important breakthrough not generally known to practitioners and scientists in aquaculture. . . .

RICHARD J. BENOIT
EDWARD A. ZURAW
DONALD E. LEONE
Marine Sciences Research and Development, General Dynamics, Groton, Connecticut 06340

The search for artificial foods for marine bivalves and their larvae began in the early 1930's (*1*). In 1940 Bruce *et al.* (*2*) showed that live, naked flagellates were superior to some other algae for rearing larvae and spat. These studies have been confirmed many times during the past 28 years and laid the foundations for present-day hatchery techniques. Investigators have continued to search for other algae or substances which would give better results. Walne (*3*), evaluating the food value of seven algal species for oyster larvae, found that the diatom *Phaeodactylum tricornutum* promoted growth comparable to that of flagellates, while Imaya (*4*) indicated that both *Cyclotella nana* and *Chaetoceros* spp. are well utilized. Somewhat questionable results were obtained by Loosanoff and his co-workers (*5*) by feeding dried powdered *Ulva* and *Laminaria* to larvae, but when freeze-dried *Schedesmas obliquus* was used, Hidu and Ukeles (*6*) reported excellent results. Corn starch and corn meal or both were employed in oyster feeding experiments by Haven and an enthusiastic evaluation of its successful application was published by Ingle (*7*). Benoit and his co-workers might discover additional references by consulting the literature or the researchers mentioned above.

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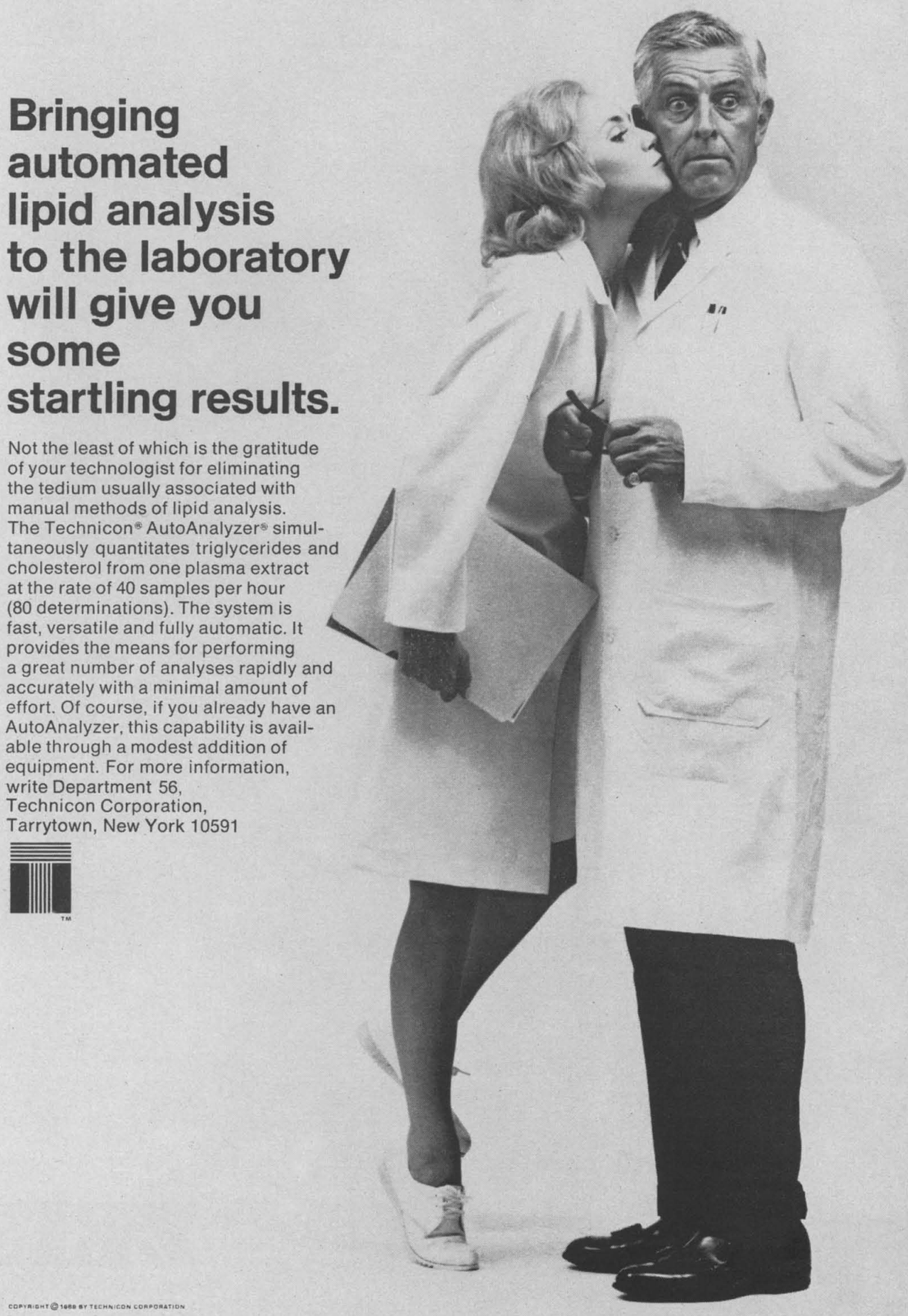

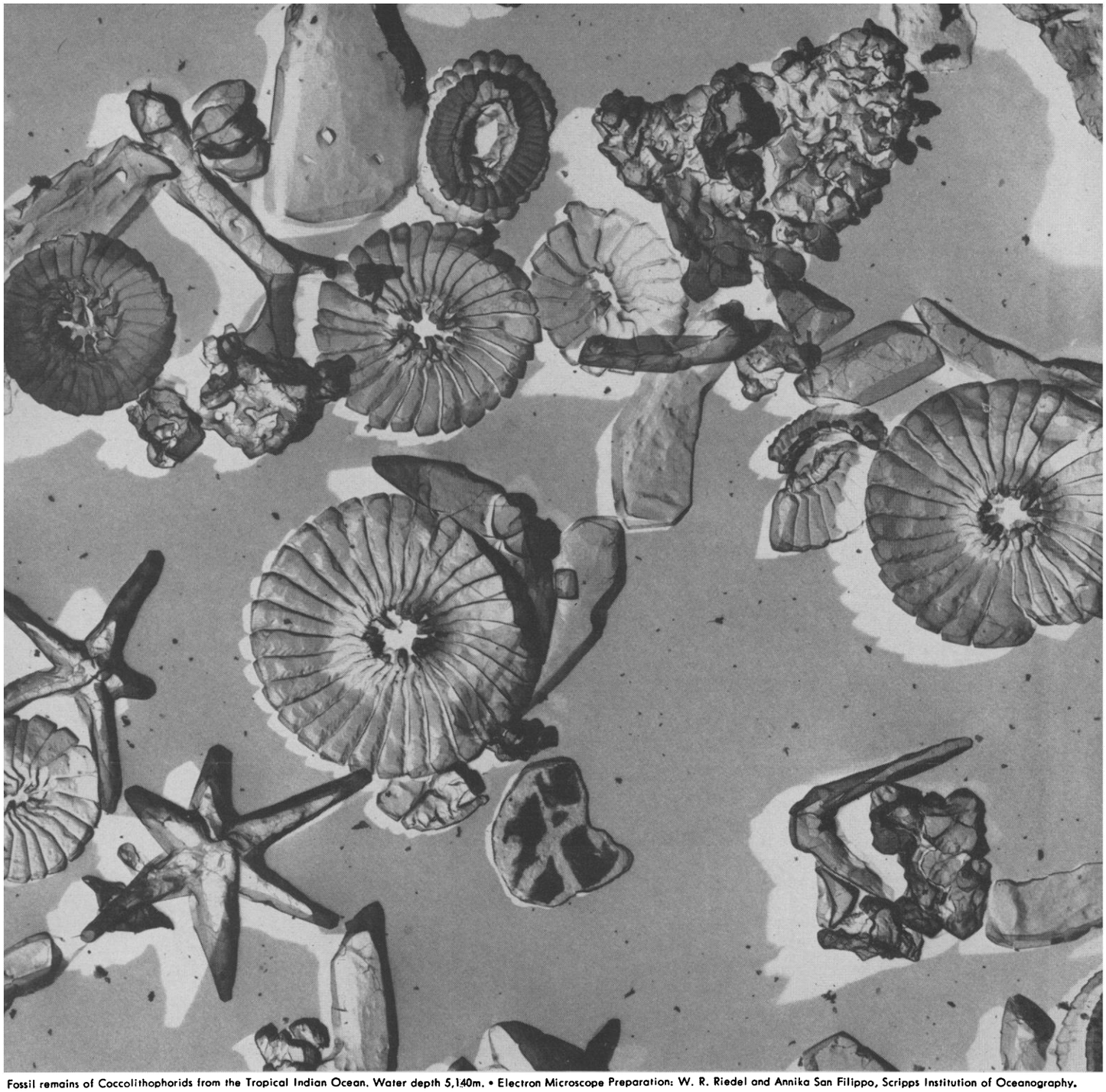

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11 April 1969, Volume 164, Number 3876 **SCIENCE**

The Generation Gap

The young people who are rebelling all around the world, rebelling against whatever form the governmental and educational systems take, are like the first generation born in a new country listening to their parents' tales of the old country and watching their parents grapple, often clumsily, often unsuccessfully, with the new conditions. They have no firsthand knowledge of the way their parents lived far across the seas, of how differently wood responded to tools, or land to the hoe. They see the tasks which their unaccustomed elders are performing as poorly done; they feel that there must be a better way, and that they must find it.

For now, nowhere in the whole world are there any elders who know what the children know, no matter how remote and simple the societies in which the children live. In the past there were always some elders who knew more—in terms of experience, of having grown up within a system—than any children. Today there are none. It is not only that parents are no longer a guide, but that there are no guides, in the older sense of the term, whether one seeks them in one's own country, or in China, or in India. There are no elders who know what those who have been reared in the last 20 years know about what the next 20 years will be.

All of us who grew up before the war are immigrants in time, immigrants from an earlier world, living in an age essentially different from anything we knew before. We still hold the seats of power and command the resources and the skills which have been used in the past to keep order and organize large societies. We control the educational systems, the apprenticeship systems, the career ladders up which the young are required to climb, step by step.

The elders are separated from the young by the fact that they too are a strangely isolated generation. No generation has ever known, experienced, and incorporated such rapid changes, watched the sources of power, the means of communication, the definition of humanity, the limits of their explorable universe, the certainties of a known and limited world, the fundamental imperatives of life and death—all change before their eyes. They know more about change than any generation has ever known and so stand, over, against, and vastly alienated from the young, who, by the very nature of their position, have had to reject their elders' past. Just as the early Americans had to teach themselves not to daydream of the past but to concentrate on the present, and so in turn taught their children not to daydream but to act, so today's elders have treated their own pasts as incommunicable, and teach their children, even in the midst of lamenting that it is so, not to ask, because they can never understand. We have to realize that no other generation will ever experience what we have experienced. In this sense we have no descendants. At this breaking point between two radically different and closely related groups, both are inevitably very lonely, as we face each other knowing that they will never experience what we have experienced and that we can never experience what they have experienced.

As long as any adult thinks that he, like the parents and teachers of old, can become introspective, invoke his own youth to understand the youth before him, he is lost. But once the fact of a deep, new, unprecedented, worldwide generation gap is firmly established, in the minds of both the young and the old, communication can be established again.

—MARGARET MEAD

Adapted from lecture III, "Culture and Commitment," of the American Museum of Natural History's "Man and Nature Lectures, Series V."

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ful attraction of methyl disulfide for the female black blowfly, *Phormia regina,* and allyl isothiocyanate for a flea beetle, *Phyllotreta cruciferae.* Twenty-seven sulfur compounds, including sulfides, disulfides, and mercaptans, attracted the newly hatched larvae of the onion maggot.

Houseflies, especially *Musca domestica,* have long been known to be attracted to mushrooms belonging to the Tricholomataceae and Amanitaceae. T. Muto (Tokyo University of Education) and co-workers extracted the attractive components from the fruiting bodies of *Amanita muscaria* and isolated one of them as a colorless, crystalline substance with the molecular formula $C_{39}H_{72}O_5$ and a melting point of 22° to 23°C, which coincides well with 1,3-diolein. Some related compounds were prepared and 1-monoolein was found to be much more attractive than 1,3-diolein. Ethylene glycol monooleate and monolaurate were the most active compounds tested.

Extracts of the plant *Actinidia polygama* has long been of interest because of its peculiar excitatory effect on both vertebrates (Felidae) and invertebrates (Chrysopidae). T. Sakan (Osaka City University) and co-workers isolated several components from the neutral fraction of both leaves and galls that were attractive to lacewing species. These compounds were identified as neo- and isoneomatatabiol, matatabiol, dehydroiridodiol, iridodiol, 5-hydroxymatatabiether, 7-hydroxymatatabiether, and allo-metatabiol. It was remarkable that these cyclopentanoid monoterpene alcohols were found to be attractive only to the male adults of *Chrysopa septempunctata* and *C. japana.* Only 10^{-6} μg of neo- and isoneomatatabiol, and 10^{-3} μg of matatabiol and dehydroiridodiol were needed to evoke a response.

K. Munakata (Nagoya University) reported on his interesting studies of insect antifeeding compounds contained in plant leaves. Extracts of *Cocculus trilolus, Clerodendron tricotomum,* and *Parabenzoin trilobum* produced strong antifeeding activity for the larvae of *Prodenia litura* when applied to sweetpotato leaves. A known alkaloid, isoboldine, was identified from *C. trilobus*; two new terpene crystals, clerodendrin A, $C_{31}H_{42}O_{12}$ and clerodendrin B, $C_{31}H_{44}O_{12}$ were identified from *C. tricotomum*; and a new sesquiterpene, $C_{19}H_{30}O_5$ (tentative structure, shiromodiol diacetate) was identified from *P. trilobum.*

The contributions of the American scientists emphasized insect pheromones. M. Jacobson (U.S. Department of Agriculture, Beltsville) reviewed his pioneering research with the moth pheromones. The first insect sex phenomone was identified and synthesized in 1960 and was isolated from the virgin female gypsy moth, *Porthetria dispar*. The structure of the attractant was shown to be (+)-10-acetoxy-*cis*-7-hexadecen-1-ol, as determined by ultraviolet and infrared spectra, hydrogenation, and oxidation. Also synthesized was an active homolog, (+)-12-acetoxy-*cis*-9-octadecen-1-ol, designated "gyplure," which is used as a field survey tool. Also isolated, identified, and synthesized (by Jacobsen and others) were the sex pheromones produced by female cabbage looper moths (*Trichoplusia ni*), fall armyworm moths (*Spodoptera frugiperda*), and pink bollworm moths (*Pectinophora gossypiella*), shown to be the acetates of *cis*-7-dodecen-1-ol, *cis*-9-tetradecen-1-ol, and 10-propyl-*trans*-5,9-tridecadien-1-ol, respectively.

H. Shorey (University of California, Riverside) discussed the importance of sex pheromone research in providing basic information that may be useful in the design of behavioral control programs. Quantitative bioassays are used to assess male responsiveness to pheromones and other chemicals under various environmental and physiological conditions. They require the establishment of concentration-response curves, that is, the number or proportion of males responding plotted against the logarithmic series of concentrations tested. Essentially all quantitative bioassays to date have been based on the known amount of chemical or extract placed on the substrate for evaporation, with the actual rate of evaporation unknown. Since various substrates and assay techniques are used by different laboratories, results cannot be compared. The ideal quantity is the amount of pheromone per unit volume of air required to induce the specified behavioral response among a specified proportion of males. A consideration of the chemical evolution of lepidopteran sex pheromones suggests that a mechanism is available for the insects to become resistant to such compounds utilized in a control program. More research is necessary to fully elucidate the mechanisms by which male moths orient upwind toward pheromone sources. Control techniques may be based on the use of pheromone-baited traps or on a pheromone-permeated

atmosphere to prevent orientation of males to wild females.

The methodology for isolation and identification of insect pheromones with examples from the Coleoptera was presented by R. M. Silverstein (Stanford Research Institute, Menlo Park, California). A mixture of three terpene alcohols constitutes the sex attractant in the frass of male *Ips confusus*; they are compound I—(−)-2-methyl-6-methylene-7-octen-4-ol; compound II—(+)-*cis*-verbenol; and compound III—(+)-2-methyl-6-methylene-2,7-octadien-4-ol. Exo-7-ethyl-5-methyl-6-8-dioxabicyclo [3.2.1]octane is the major component of the sex attractant in the frass of female *Dendroctonus brevicomis*. The synthesized compound is active by itself in laboratory tests, but its activity is enhanced by the terpene hydrocarbon, myrcene, and other components not yet identified. The acid, *trans*-3,*cis*-5-tetradecadienoic, is the sex attractant of female *Attagenus megatoma*.

Laboratory and field bioassay methods utilized in identifying the attractants of *Ips confusus* and *Dendroctonus brevicomis* (see above) were described by D. Wood (University of California, Berkeley). The individual compounds were not active in the laboratory, but the combinations of compound I with either II or III, and the ternary mixture were attractive to both sexes at the submicrogram level. In nature the ternary synthetic mixture was the most potent, and compound I + III was slightly active. Surprisingly, *Ips latidens* was attracted by compound I alone and by I + II. In the laboratory, compound III added to the mixture of I + II eliminated or masked the attraction for *I. latidens*. Two predators of these bark beetles, *Enoclerus lecontei* and *Temnochila virescens chlorodia*, also responded. Attractants produced by sympatric species of *Ips* from different species groups are species-specific while the closely related and allopatric *I. montanus*, *I. lecontei*, and a new species from the same species group are cross-responsive. These species respond to the synthetic compounds at higher concentrations and in different combinations than *I. confusus*.

W. Burkholder (U.S. Department of Agriculture, Madison, Wisconsin) presented his research on the response of the male black carpet beetle, *Attagenus megatoma*, to the synthetic sex attractant (see above). Bioassay conditions for this insect in the laboratory closely approximate those under natural conditions. Preliminary trapping studies with

the synthetic attractant have been successful. The sex pheromones of several stored-product species in this genus are apparently not species-specific. The production of the pheromone generally begins 1 day after metamorphsis to the adult and increases with age. Females gradually lose their attractiveness following mating.

Studies of the sex pheromones of moths that infest stored grains were reported by M. Nakajima (Kyoto University). The whole bodies of 94,000 female almond moths, *Cadra cautella,* were extracted with methylene chloride, and after separations of the inactive fractions by precipitation from cold methanol and from cold *n*-hexane, 7.3 grams of a yellow oil were obtained. This was further purified by chromatography on silicic acid. The colorless oil thus obtained (about 240 mg) was active to male moths at a concentration of 0.1 μg/ml. Functional group tests and gas chromatographic behavior of the oil suggested that the pheromone may be an acetate of a C_{14} unsaturated alcohol. The species specificity for sex pheromones of the closely related stored grain moths was also discussed. The male moths of *C. cautella, Plodia interpunctella,* and *Anagasta kuehniella* exhibited sexual excitement to the pheromone extracted from the female moths of not only their own species but also the other species. However, these species failed to respond to the extracted pheromone of *Phralis farinaris.*

Newly emerged nymphs of the german cockroach, *Blattella germanica,* exhibit strong aggregation behavior (S. Ishii, Kyoto University). Nymphs reared individually are delayed in their growth and development. The active principle(s) was found in the feces and in an ether wash of the body surface, especially the posterior portion of the abdomen. Histological studies show that the epithelium of the anterior rectum consists of six rectal pads. The active principle appears to be secreted from the cells lining these pads into the lumen of the rectum and is excreted with feces. Isolation studies of this aggregation pheromone are in progress.

Pheromone systems have reached their highest development in the social insects where they trigger many complex behavior patterns. Best known are the "alarm" substances typified by 4-methyl-3-heptanone, which is coded to release several types of behavior in *Atta texana* (J. Moser, U.S. Forest Service, Alexandria, Louisiana). In the laboratory bioassay, workers are attracted by a

concentration of 27×10^6 molecules per cubic centimeter, but alarm is released at 270×10^6 molecules per cubic centimeter. In the field low concentrations attract and alarm, and high concentrations repel and alarm. The same pheromone compound can be utilized by diverse groups of insects. Citral repels *A. texana* but is a powerful attractant for honeybees. Inquilines whose biologies are closely tied to those of social insects may use the host's pheromones. Roaches, silverfish, millipedes, and beetles following odor-trail substances of their host ants are good examples.

In honeybees, the behavioral interactions that facilitate social organization are coordinated by a complex pheromone system (N. Gary, University of California, Davis). The enclosed nest, characterized by a high population density and precisely regulated environment, enhances the communication potential of pheromones. Certain aspects of intranest behavior were considered, including defense, food acquisition, exchange, and storage, nest construction, and dominance hierarchies and social organization. Alarm pheromones, isopentyl acetate from the sting gland, and 2-heptanone from mandibular glands, elicit aggression. Attractive pheromones (geraniol, citral, and nerolic and geranic acids) are released by foragers near rich food sources. Queen pheromones, primarily 9-oxo-dec-*trans*-2-enoic acid, released inside the hive inhibit ovary development in workers and queen cell construction. Outside the hive, queen pheromones attract drones during mating flights and stabilize swarm clusters.

Three scientists reported on their electrophysiological studies of insect chemoreception. The reaction of an insect to the chemicals in its environment may be immediate or delayed (V. Dethier, Princeton University, New Jersey). Delayed reactions include symptoms of toxicity, growth responses, hormonal changes, reproductive variation, and responses mediated through internal feedback systems operating through the agency of interoceptors. Immediate reactions are overt behavioral responses triggered by extroceptive sense organs. The resulting behavior falls into a number of well-defined categories. Plant chemicals are capable of evoking any or all kinds of these behavior patterns. Most of the reactions are related to feeding. Understanding of the relationship is hampered by an almost total lack of knowledge of

the relevant plant chemistry. The operation of the sensory systems involved is becoming increasingly clear as a result of electrophysiological studies. The stimuli that shape feeding are predominantly gustatory and olfactory. The best understood case is that of Cruciferae-feeders. New evidence indicates that marked modification of innate feeding behavior can be brought about by experience.

The chemoreceptors of insects which feed on specific host plants have been studied electrophysiologically by a number of workers (F. Hanson, University of Texas, Austin). As shown by Schoonhoven, some insects have receptors sensitive to phagostimulants which are secondary plant substances. However, no evidence of such was found in *Bombyx mori* by Ishikawa and co-workers; the receptors appear to be stimulated only by nutrients. Recent electrophysiological evidence indicates that the larvae of *Manduca sexta*, the tobacco hornworm, detects volatile secondary plant substances by way of antennal receptors, but may not require specific gustatory phagostimulants other than nutrients.

Antennae of the fruit-piercing moth, *Oraesia excavata*, gave very similar EAG responses to their food attractants and to their repellents (M. Yamada, Nagoya University). Single olfactory receptor cells of this species responded to both materials with an increase in impulse frequency. The single unit activity was extracellularly recorded from the brain of the American cockroach, *Periplaneta americana*. The crude extract of the sex attractant from the female elicited an electrical response from extremely specialized neurons in the brain of the male and female of this species. Many other odorous substances did not excite these neurons.

The papers presented at this seminar will be published early in 1969 by Academic Press, Inc. We recognize the criticism that such symposium volumes are often outdated by the time they are published. Therefore, we have elected to update these articles as of 1 July 1968.

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ROBERT M. SILVERSTEIN
Stanford Research Institute, Menlo Park, California

MINORU NAKAJIMA
Faculty of Agriculture, Kyoto University, Japan

Calendar of Events

May

2–3. **Laser**, 2nd conf., New York, N.Y. (L. Goldman, Laser Lab., Children's Hospital Research Foundation, Elland Ave. and Bethesda, Cincinnati, Ohio 45229)

2–3. Soc. for **Pediatric Research**, Atlantic City, N.J. (R. E. Greenberg, Dept. of Pediatrics, Stanford Medical Center, Stanford, Calif. 94305)

2–3. American Assoc. of **University Professors**, Minneapolis, Minn. (B. H. Davis, The Association, 1785 Massachusetts Ave, NW, Washington, D.C. 20036)

2–4. Soc. of **Biological Psychiatry**, Miami Beach, Fla. (G. N. Thompson, 2010 Wilshire Blvd. Los Angeles, Calif. 90057)

2–4. Wisconsin Acad. of **Sciences, Arts and Letters**, Whitewater, Wis. (W. Sarles, Dept. of Bacteriology, Univ. of Wisconsin, Madison 53706)

2–5. American **Psychoanalytic** Assoc., Miami Beach, Fla. (H. Fisher, 1 E. 57 St., New York 10022)

3. American Soc. for **Clinical Nutrition**, Atlantic City, N.J. (A. B. Eisenstein, 818 S. Meramec Ave., St. Louis, Mo. 63105)

3. American College of **Psychiatrists**, Bal Harbour, Fla. (M. Sabshin, P.O. Box 6998, Chicago, Ill. 60680)

3–8. American **Ceramic** Soc., 71st., Washington, D.C. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

4–5. American Soc. for **Clinical Investigation**, Atlantic City, N.J. (D. H. Nelson, Latter-Day Saints Hospital, Salt Lake City, Utah 84103)

4–6. American Soc. for **Adolescent Psychiatry**, Miami Beach, Fla. (H. D. Staples, 24 Green Valley Rd., Wallingford, Pa. 19086)

4–7. American Inst. of **Chemical Engineers**, 65th natl. mtg., Cleveland Ohio. (The Institute, 345 E. 47 St., New York 10017)

4–7. American **Mining** Congr., Pittsburgh, Pa. (The Congress, 1100 Ring Building, Washington, D.C. 20036)

4–8. American Soc. of **Brewing Chemists**, Baltimore, Md. (Executive Secretary, The Society, 501 N. Walnut St., Madison, Wis.)

4–8. Soc. of **Plastics Engineers**, 27th, Chicago, Ill. (Director, Member Activities, The Society, 65 Prospect St., Stamford, Conn.

4–9. **Electrochemical** Soc., New York, N.Y. (The Society, 30 E. 42 St., New York 10017)

5. **Aerospace Dynamic Balancing**, 2nd symp., San Francisco, Calif. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

5–6. **Theory of Computing** Symp., Marina del Ray, Calif. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

5–7. Instrumentation Soc. of America, **Aerospace Instrumentation** Symp., Las Vegas, Nev. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

5–7. American **Gynecological** Soc., New

Orleans, La. (D. J. Lund, Univ. of Rochester Medical Center, 260 Crittenden Blvd., Rochester, N.Y. 14620)

5–7. **Practical Applications of Radioisotopes to Industry**, Pullman, Wash. (R. M. Chatters, Washington State Univ., Pullman 99163)

5–8. Society of **Aeronautical Weight Engineers**, 28th, San Francisco, Calif. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

5–8. **Aerospace Medical** Assoc., 40th, San Francisco, Calif. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

5–8. **Metal Powder** Industrial Federation and American **Powder Metallurgy**, Inst., 25th, New York, N.Y. (P. K. Johnson, Metal Powder Industries Federation, 201 E. 42 St., New York 10017)

5–8. **Radiation Biology of the Fetal and Juvenile Mammal** Symp., Richland, Wash. (M. R. Sikov, Biology Dept., Battelle-Northwest, P.O. Box 999, Richland 99352)

5–9. American **Psychiatric** Assoc., 125th, Bal Harbour, Fla. (Public Information Officer, 1700 18th St., NW, Washington, D.C. 20009)

6–7. Conference on **Waste Management and Disposal for the Food Processing Industry**, University Park, Pa. (J. O. Keller Conf. Center, Pennsylvania State Univ., University Park 16802)

6–8. **Frequency Control** Symp., Atlantic City, N.J. (Director, Electronic Components Lab., U.S. Army Electronics Command, Fort Monmouth, N.J. 07703)

6–8. **Industrial Waste** Conf., Lafayette, Ind. (D. E. Bloodgood, Sanitary Engineering, Purdue Univ., Lafayette 47907)

6–8. **Microfilm** Assoc., 18th natl., Boston, Mass. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

7–9. American Assoc. of **Genito-Urinary Surgeons**, Pebble Beach, Calif. (H. M. Spence, 4105 Live Oak St., Dallas, Tex. 75221)

7–10. American Assoc. for **Child Care in Hospitals**, Ann Arbor, Mich. (D. E. Lidgard, University Hospital, Univ. of Michigan Medical Center, Ann Arbor 48104)

7–10. Association of **University Radiologists**, San Francisco, Calif. (A. Gottschalk, 950 E. 59 St., Chicago, Ill. 60037)

8–10. **Breast Cancer**, natl. conf., Washington, D.C. (R. N. Grant, The Conference, 219 E. 42 St., New York 10017)

8–10. American Assoc. for the **History of Medicine**, Baltimore, Md. (C. W. Bodemer, Biomedical History Dept., Univ. of Washington Medical School, Seattle 98105)

8–9. **Military History**, 3rd symp., U.S. Air Force Academy, Colo. (Lt. Col. W. Geffen, Dept. of History, U.S. Air Force Academy, Colo. 80840)

9–10. **Arthritis** Seminar, Roanoke, Va. (R. H. Brumfield, Jr., P.O. Box 1531, Roanoke, 24007)

9–10. American Natl. **Red Cross**, 2nd research symp., Washington, D.C. (G. A. Jamieson, American Natl. Red Cross, Washington, D.C. 20006)

11–14. **Fluid Controls** Inst., Inc., Sea Island, Ga. (P.O. Box 1485, Pompano Beach, Fla. 33061)

11–15. Institute of **Food Technologists**, 29th, Chicago, Ill. (C. L. Willey, 221 N. Lasalle St., Chicago 60601)

12–14. American Soc. for **Gastrointestinal Endoscopy**, Washington, D.C. (V. M. Smith, 301 St. Paul Pl., Baltimore, Md. 21202)

12–14. Workshop on **Computer Stimulation of Microbial Processes**, Clemson, S.C. (Office of Industrial and Municipal Relations, College of Engineering, 109 Riggs Hall, Clemson 29631)

12–15. Seminar on **Physical and Chemical Properties of Woodpulp Fibers**, Appleton, Wis. (Technical Assoc. of the Pulp and Paper Industry, 360 Lexington Ave., New York, N.Y.)

12–15. Mid-America Symp. on **Spectroscopy**, 20th, Chicago, Ill. (Illinois Inst. of Technology Research Inst., 10 W. 35 St., Chicago, 60616)

12–15. American **Urological** Assoc., Inc., San Francisco, Calif. (W. P. Didusch, 1120 N. Charles St., Baltimore, Md.)

12–16. American **Industrial Hygiene** Conf., Denver, Colo. (The Association, 14125 Prevost, Detroit, Mich. 48227)

12–16. Soc. of **Photographic Scientists and Engineers**, Los Angeles, Calif. (The Society, 1330 Massachusetts Ave., NW, Washington, D.C. 20005)

12–17. American Assoc. on **Mental Deficiency**, San Francisco, Calif. (J. J. Noone, 5201 Connecticut Ave., NW, Washington, D.C. 20015)

13–16. Society for **Experimental Stress Analysis**, Philadelphia, Pa. (P. Monchamp, 21 Bridge Sq., Westport, Conn. 06880)

14–16. Spring Joint **Computer** Conf., Boston, Mass. (A. Levine, 105 Newbury St., Boston 02116)

14–16. American **Helicopter** Soc., 25th, natl. forum, Washington, D.C. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

14–17. American **Gastroenterological** Assoc., Washington, D.C. (D. Cayer, 2240 Cloverdale Ave., Winston-Salem, N.C. 27103)

14–17. Society of **Technical Writers and Publishers**, 16th, Washington, D.C. (C. T. Youngblood, Suite 421, 1010 Vermont Ave., NW, Washington, D.C. 20005)

15–16. Southern **Textile Research** Conf., Hilton Head Island, S.C. (G. F. Walz, Proximity Print Works, Greensboro, N.C. 27405)

16. Symp. on **Oil Pollution of the Sea**, Cambridge, Mass. (J. A. Fay, Room 30246, Massachusetts Inst. of Technology, Cambridge 02139)

16–17. **Nature and Function of Peroxisomes**, New York, N.Y. (J. F. Hoff, Dept. of Chemistry, Queens College, Flushing, N.Y. 11367)

18–19. Council of **Biology Editors**, Cambridge, Mass. (R. E. Gordon, Dean's Office, College of Science, Univ. of Notre Dame, Notre Dame, Ind. 46556)

18–21. Institute of Electronic and Electrical Engineers **Power Industry Computer Applications** Conf., Denver, Colo. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

18–21. **Radiation Research** Soc., 17th, Cincinnati, Ohio. (F. Smith, Biology Dept. American Univ., Washington, D.C. 20016)

18–21. American **Thoracic** Soc., Miami Beach, Fla. (Executive Secretary, 1790 Broadway, New York 10019)

18–22. National **Tuberculosis** Assoc., 65th, Miami Beach, Fla. (J. E. Perkins, 1790 Broadway, New York 10019)

18–23. Conf. on **Mass Spectrometry and Applied Topics**, 17th, Dallas, Tex. (J. M. McCrea, c/o Applied Research Lab., U.S. Steel Corp., Monroeville, Pa. 15146)

19–20. **Rolamite Technology** Seminar, Chicago, Ill. (J. Weidman, III, Director of Public Relations, Hamilton Watch Co., Lancaster, Pa. 17604)

19–21. **Aerospace Electronics** Conf., Dayton, Ohio. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

19–21. **Interdisciplinary** Conf., 1st, Houston, Tex. (M. A. Wright, Humble Oil and Refining Company, Box 2180, Houston 77001)

19–21. **New Dimensions in Legal and Ethical Concepts for Human Research**, New York, N.Y. (I. Ladimer, Mt. Sinai Medical School, Fifth Ave. and 100 St., New York 10029)

19–23. Western **Anesthesiology** Conf., Salt Lake City, Utah. (J. Stringham, 11 S. 5th E., Salt Lake City 84106)

19–30. Selected **Applications of Computers in Engineering**, Ann Arbor, Mich.

(Engineering Summer Conf., Univ. of Michigan, Chrysler Center, Dept. 58, Ann Arbor 48105)

19–30. **Numerical Methods, Optimization Techniques, and Process Simulation for Engineeers**, Ann Arbor, Mich. (Engineers Summer Conf., Univ. of Michigan, Chrysler Center, Dept. 58, Ann Arbor 48105)

20. Association for the Advancement of **Psychoanalysis**, New York, N.Y. (M. Lee, Public Relations Committee, The Association, 329 E. 62 St., New York 10021)

21–23. Symp. on **Electron, Ion, and Laser Beam Technology**, Gaithersburg, Md. (L. Marton, Natl. Bureau of Standards, Washington, D.C. 20234)

21–24. **Acute Medicine**, 3rd symp., Pittsburgh, Pa. (Postgraduate Medical Program, Univ. of Pittsburgh, 1188 Scaife Hall, Pittsburgh 15213)

22–23. IEEE Workshop on **Applied Magnetics**, Washington, D.C. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

22–23. **Diseases in Nature Transmissible to Man**, 19th southwestern conf., San Antonio, Tex. (S. S. Kalter, P.O. Box 2296, San Antonio 78206)

24–26. National **Tuberculosis and Respiratory Disease** Assoc., Miami Beach, Fla. (J. E. Perkins, The Association, 1740 Broadway, New York 10019)

25–27. **Drug Information** Assoc., Detroit, Mich. (J. J. Harris, Public and Professional Relations Committee, c/o Schering Labs, 1011 Morris Ave., Union, N.J. 07083)

25–29. National Conf. on **Social Welfare**, 96th, New York, N.Y. (B. B. Shepherd, The Conference, 22 West Gay St., Columbus, Ohio 43215)

26–27. **Rheumatoid Factors**, New York, N.Y. (H. Bartfeld, St. Vincent's Hospital, 153 W. 11 St., New York 10011)

26–28. Symp. on Advances in Instrumentation for **Air Pollution Control**, Cincinnati, Ohio. (A. P. Altshuller, Natl. Air Pollution Control Administration, 5710 Wooster Pike, Cincinnati 45227)

26–28. IEEE Conf. on **Laser Engineering and Applications**, Washington, D.C. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

26–28. Advanced **Marine Vehicle and Propulsion** Mtg., Seattle, Wash. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

26–28. American **Ophthalmological** Soc., Hot Springs, Va. (S. D. McPherson, Jr., 1110 W. Main St., Durham, N.C. 27701)

29–1. Congress on Medical and Related Aspects of **Motor Vehicle Accidents**, New York, N.Y. (Secretariat, Internatl. Assoc. for Accident and Traffic Medicine, 520 First Ave., New York 10016)

International and Foreign Meetings

May

11–18. International Exhibition on **Diagnostics**, Munich, Germany. (Munchener Messe-und Ausstellungs-Gesellschaft MBH, Theresienhohe 13, 8 Munich 12)

15–18. International **Revolving-Shutter** Products Fair, Stuttgart, Germany. (Stutt-

garter Ausstellungs GMBH, Postfach 990, 700 Stuttgart 1)

26–30. **Spectroscopy,** 15th intern. colloquium, Madrid, Spain. (Secretary, XV Colloquium Spectroscopium Internationale, Serrano 119, Madrid 6)

27–31. International Assoc. of **Thalassotherapy,** 14th, Eforie Nord, Roumania. (Prof. Binculescu, Strada Transilvaniei 47, Bucharest, Roumania)

27–1. German Congr. for **Medical Continuation Studies,** 18th, Berlin. (Kongressgesellschaft fur Artliche Fortbildung, Klingsortstr. 21, Berlin 41)

28–7. **Pro Aqua** Congr., 4th, Basel, Switzerland. (O. Jaag, % Secretariat Pro Aqua, Basel 21)

29–3. International Assoc. for **Accident and Traffic Medicine,** 3rd, New York, N.Y. (M. Helpern, % Office of Chief Medical Examiner, 520 First Ave., New York 10016)

29–19. General Assembly of Pan-American Inst. of **Geography and History,** Washington, D.C. (C. A. Forray Rojas, Ex-Arzobispado 29, Mexico, D.F. Mexico)

June

1–12. Symposium on **Non-Destructive Testing of Concrete and Timber,** London, England. (Institution of Civil Engineers, Great George St., London, S.W.1)

2–6. International Symp. on **Yeasts,** Delft and The Hague, Netherlands. (L. Rodrigues de Miranda, Organizing Committee, Julianalaan 67A, Delft)

3–13. International Conf. on **Arid Lands in a Changing World,** Tucson, Ariz. (International Arid Lands Conf., % Dept. of Geochronology, Univ. of Arizona, Tucson 85721)

4–6. **Automated Analysis,** intern. congr., Chicago, Ill. (J. E. Golin, Technicon Corp., Ardsley, N.Y. 10502)

4–7. Union of Textile **Chemists and Colorists,** 21st congr., Baden-Baden, Germany. (The Union, Rohsbacherstr. 78, Heidelberg, Germany)

5. European Federation of International College of **Surgeons,** London, England. (F. P. Fitzgerald, 129 Harley St., London, W.1)

5–7. **Mineralogical** Assoc. of Canada, Montreal, P.Q. (J. Beland, Dept. of Geology, Univ. of Montreal, Montreal)

5–11. **Forensic Sciences,** 5th intern., Toronto, Ont., Canada. (L. Ball, Center of Forensic Sciences, Dept. of Attorney General, 8 Jarvis Street, Toronto 2)

6–9. Canadian **Pediatric** Soc., Montreal, P.Q. (J. H. V., Marchessault, 14 Green Ave., St. Lambert, Quebec City, P.Q.)

8–14. Canadian **Medical** Assoc., 102nd, Toronto, Ont., Canada. (The Association, 170 St. George Street, Toronto, Canada)

9–11. International **Communications** Conf., Boulder, Colo. (M. Nesenbergs, Environmental Science Services Administration, Inst. for Telecommunication Sciences, R614, Boulder 80302)

9–12. International **Food** Congr. and Exhibition, 7th, Madrid, Spain. (L. Naranon, % Federacion Nacional de Almacenistas de Alimentacion, Paseo del Prado 18–20, Planta 11, Madrid)

9–13. **Clean Air** Congr. and Exhibition, Dusseldorf, Germany. (V. Deutscher, Postfach 1139, 4 Dusseldorf 1)

BOOKS RECEIVED

(*Continued from page 172*)

Computer Programs for Chemistry. Vol. 1. DeLos F. DeTar, Ed. Benjamin, New York, 1968. xx + 208 pp., illus. $14.75.

Contributions to Sensory Physiology. Vol. 3. William D. Neff, Ed. Academic Press, New York, 1968. xvi + 240 pp., illus. $9.50.

Cultural Geography. An Evolutionary Introduction to Our Humanized Earth. J. E. Spencer and William L. Thomas. Cartography by Robert E. Winter. Wiley, New York, 1969. xx + 596 pp., illus. + 5 plates. $10.95.

Deserts of the World. An Appraisal of Research into Their Physical and Biological Environments. William G. McGinnies, Bram J. Goldman, and Patricia Paylore, Eds. University of Arizona Press, Tucson, 1969. xxviii + 788 pp., illus. $15.

Designing with Linear Integrated Circuits. Jerry Eimbinder, Ed. Wiley, New York, 1969. xvi + 306 pp., illus. $10.95.

Development in Human Learning. E. A. Lunzer and J. F. Morris, Eds. Elsevier, New York, 1969. xx + 492 pp., illus. $10.50. Development in Learning, vol. 2.

Diffuse Matter in Space. Lyman Spitzer, Jr. Interscience (Wiley), New York, 1968. xvi + 272 pp., illus. $11.50. Interscience Tracts on Physics and Astronomy, No. 28.

Discovery, Invention, Research. Through the Morphological Approach. Fritz Zwicky. Translated from the German edition (Munich, 1966). Macmillan, New York, 1969. xii + 276 pp., illus. $6.95.

A Discussion on the Origin and Treatment of Noise in Industrial Environments. Organized by E. J. Richards. Royal Society, London, 1968. Illus. Paper, $14. *Philosophical Transactions of the Royal Society of London, Series A*, No. 1142, vol. 263, pp. 267–482.

The Dream in Psychoanalysis. Leon L. Altman. International Universities Press, New York, 1969. viii + 232 pp. $7.50.

Dynamics of Thrombus Formation and Dissolution. Shirley A. Johnson and M. Mason Guest, Eds. Lippincott, Philadelphia, 1969. 376 pp., illus. $15.50.

The Earth Sciences in Canada. A Centennial Appraisal and Forecast. A symposium, Ottawa, 1967. E. R. W. Neale, Ed. University of Toronto Press, Toronto, 1968. xii + 260 pp., illus. $8.50. Royal Society of Canada Special Publications, No. 11.

Elementary Differential Equations. Earl D. Rainville and Phillip E. Bedient. Macmillan, New York; Collier-Macmillan, London, ed. 4, 1969. xiv + 466 pp., illus. $8.95.

Elements of Detection and Signal Design. Charles L. Weber. McGraw-Hill, New York, 1968. $13.50 McGraw-Hill Series in Systems Science.

Encyclopedia of Industrial Chemical Analysis. Foster Dee Snell and Clifford L. Hilton, Eds. Vol. 7, Benzene to Brewery Products. Interscience (Wiley), New York, 1968. xii + 724 pp., illus. $45.

Energy Systems of Extended Endurance in the 1–100 Kilowatt Range for Undersea Applications. Panel on Energy Sources of the Committee on Undersea Warfare, National Research Council. National

Academy of Sciences, Washington, D.C., 1968. viii + 136 pp., illus. Paper, $4.50. NAS Publication 1702.

Error Correcting Codes. Proceedings of a symposium, Madison, Wis., 1968. Henry B. Mann, Ed. Wiley, New York, 1968. xii + 246 pp., illus. $7.95. University of Wisconsin Mathematical Research Center Series, No. 21.

Final Report of the Scientific Study of Unidentified Flying Objects. Conducted by the University of Colorado under Contract to the U.S. Air Force. Edward U. Condon, Scientific Director. Daniel S. Gillmor, Ed. Bantam, New York, 1969. xxiv + 968 pp., illus. + 32 plates. Paper, $1.95.

Flora Europaea. Vol. 2. Rosaceae to Umbelliferae. T. G. Tutin, V. H. Heywood, N. A. Burges, D. M. Moore, D. H. Valentine, S. M. Walters, and D. A. Webb, Eds. Cambridge University Press, New York, 1968. xxviii + 456 pp. + 5 maps. $23.50.

Food Goals, Future Structural Changes, and Agricultural Policy. A National Basebook. Iowa State University Center for Agricultural and Economic Development. Iowa State University Press, Ames, 1969. x + 326 pp. $5.95.

Foundations of Quantum Chemistry. T. E. Peacock. Wiley, New York, 1969. x + 162 pp., illus. $6.50.

Frontiers of Judicial Research. Joel B. Grossman, Joseph Tanenhaus, and Edward N. Muller, Eds. Wiley, New York, 1969. xx + 49 pp., illus. $14.95.

Function Theoretic Methods in Partial Differential Equations. Robert P. Gilbert. Academic Press, New York, 1969. xx + 316 pp., illus. $17.50. Mathematics in Science and Engineering, vol. 54.

Functional Equations in a Single Variable. Marek Kuczma. Polish Scientific Publishers, Warsaw, 1968 (U.S. distributor, Hafner, New York). 384 pp. $10. Monografie Matematyczne, vol. 46.

Fundamental Problems in Elementary Particle Physics. Proceedings of the 14th Solvay Conference on Physics, Brussels, 1967. Interscience (Wiley), New York, 1968. xii + 252 pp., illus. $13.50.

Fundamentals of Temperature, Pressure, and Flow Measurements. Robert P. Benedict. Wiley, New York, 1969. xiv + 354 pp., illus. $14.75.

The Geography of Life. Wilfred T. Neill. Columbia University Press, New York, 1969. xvi + 440 pp., illus. + plates. $12.95.

Der gerechtfertigte Haeckel. Einblicke in seine Schriften aus Anlass des Erscheinens seines Hauptwerkes "Generelle Morphologie der Organismen" vor 100 Jahren. Gerhard Heberer. Fischer, Stuttgart, 1968 (U.S. distributor, Abel, Portland, Ore.). xii + 588 pp., illus. $19.50.

The Gold of Ancient America. Catalogue of an exhibition. Allen Wardwell. Museum of Fine Arts, Boston; Art Institute of Chicago, Chicago; Virginia Museum, Richmond, 1968 (distributor, New York Graphic Society, Greenwich, Conn.). 158 pp., illus. $12.

The Great Alaska Earthquake of 1964. Hydrology. In two parts. Committee on the Alaska Earthquake of the National Research Council. National Academy of Sciences, Washington, D.C., 1968. Part A,

xviii + 446 pp., illus.; Part B, A Portfolio Containing Seven Charts. $19.75. NAS Publication 1603.

The Great Art. Or The Rules of Algebra. Girolamo Cardano. Translated from the Latin edition (Nuremberg, 1545). T. Richard Witmer, Transl. Ed. M.I.T. Press, Cambridge, 1968. xxvi + 270 pp., illus. $10.

The Great Orm of Loch Ness. A Practical Inquiry into the Nature and Habits of Water-Monsters. F. W. Holiday. Norton, New York, 1969. xxii + 226 pp., illus. + 8 plates. $5.95.

Halides of the Lanthanides and Actinides. D. Brown. Interscience (Wiley), New York, 1969. x + 282 pp., illus. $11. Halides of the Transition Elements.

Handbook of Ocean and Underwater Engineering. John J. Myers, Carl H. Holm, and Raymond F. McAllister, Eds. McGraw-Hill, New York, 1969. xviii + 1100 pp., illus. $32.50.

Harry Frauca's Book of Insects. Photographs by Harry and Claudy Frauca. Jacaranda Press, Brisbane, Australia, 1968. x + 150 pp. $4.50.

How Did You Think of That? An Introduction to the Scientific Method. David H. Killeffer. Doubleday, Garden City, N.Y., 1969. xiv + 154 pp. Cloth, $4.50; paper, $1.45. Chemistry in Action Series.

How To Know the Grasses. Pictured keys for determining the common and important American grasses with suggestions and aids for their study. Richard W. Pohl. Brown, Dubuque, Iowa, ed. 2, 1968. xii + 244 pp., illus. $4. Pictured-Key Nature Series.

Human Resources Research Office Bibliography of Publications. As of 30 June 1968. George Washington University, HumRRO, Alexandria, Va., 1968. viii + 290 pp. Paper. No charge.

Ifa Divination. Communication Between Gods and Men in West Africa. William Bascom. Indiana University Press, Bloomington, 1969. xii + 580 pp., illus., + 15 plates. $20.

The Individual and the System. Personalizing Higher Education. Ninth Annual College and University Self-Study Institute, Berkeley, Calif., 1967. W. John Minter, Ed. Western Interstate Commission for Higher Education, Boulder, Colo., 1967. viii + 188 pp. Paper, $3.50.

Industrial Hygiene Highlights. Vol. 1. Lester V. Cralley, Lewis J. Cralley, and George D. Clayton, Eds. Industrial Hygiene Foundation of America, Pittsburgh, 1968. xvi + 384 pp., illus. $20.

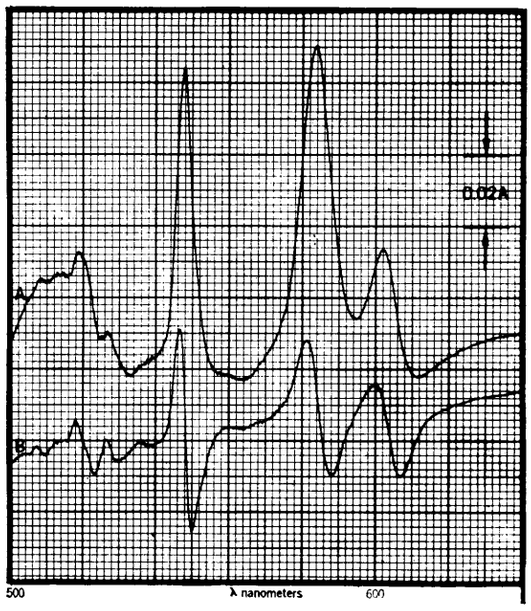
Infinite Abelian Groups. Irving Kaplansky. University of Michigan Press, Ann Arbor, ed. 2, 1969. viii + 96 pp. Paper, $4.

Introduction to the Theory of Categories and Functors. Ion Bucur and Aristide Deleanu, with the collaboration of Peter J. Hilton. Wiley (Interscience), New York, 1969. x + 226 pp., illus. $13.50. Pure and Applied Mathematics, vol. 19.

Introduction to the Theory of Kinetic Equations. Richard L. Liboff, Wiley, New York, 1969. xiv + 402 pp., illus. $15.95.

An Invitation to Modern Psychology. Howard F. Gallup. Free Press, New York; Collier-Macmillan, London, 1969. xx + 252 pp., illus. Paper, $2.95.

Late Somatic Effects of Ionizing Radiation. Charles D. Van Cleave. U.S. Atomic



Low Temperature Difference Spectrum (A) and low temperature Derivative Spectrum (B) of electron transport membranes (1 mg of particle protein per ml) isolated from the chemoautotrophic microorganism *Nitrobacter winogradskyi*. Courtesy of L. A. Kiesow, Naval Medical Research Institute, Bethesda, Md.

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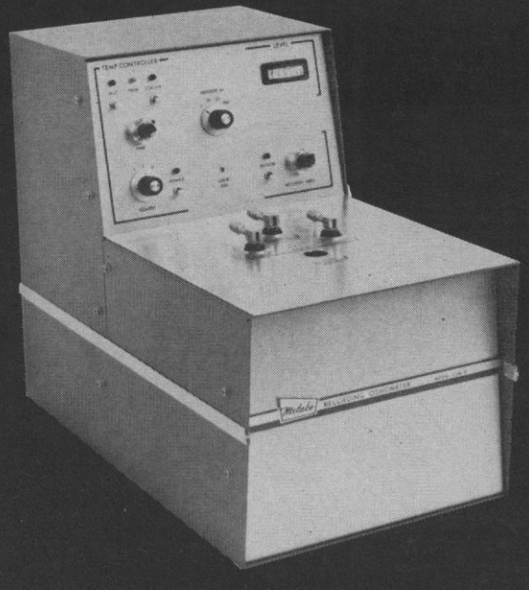

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