

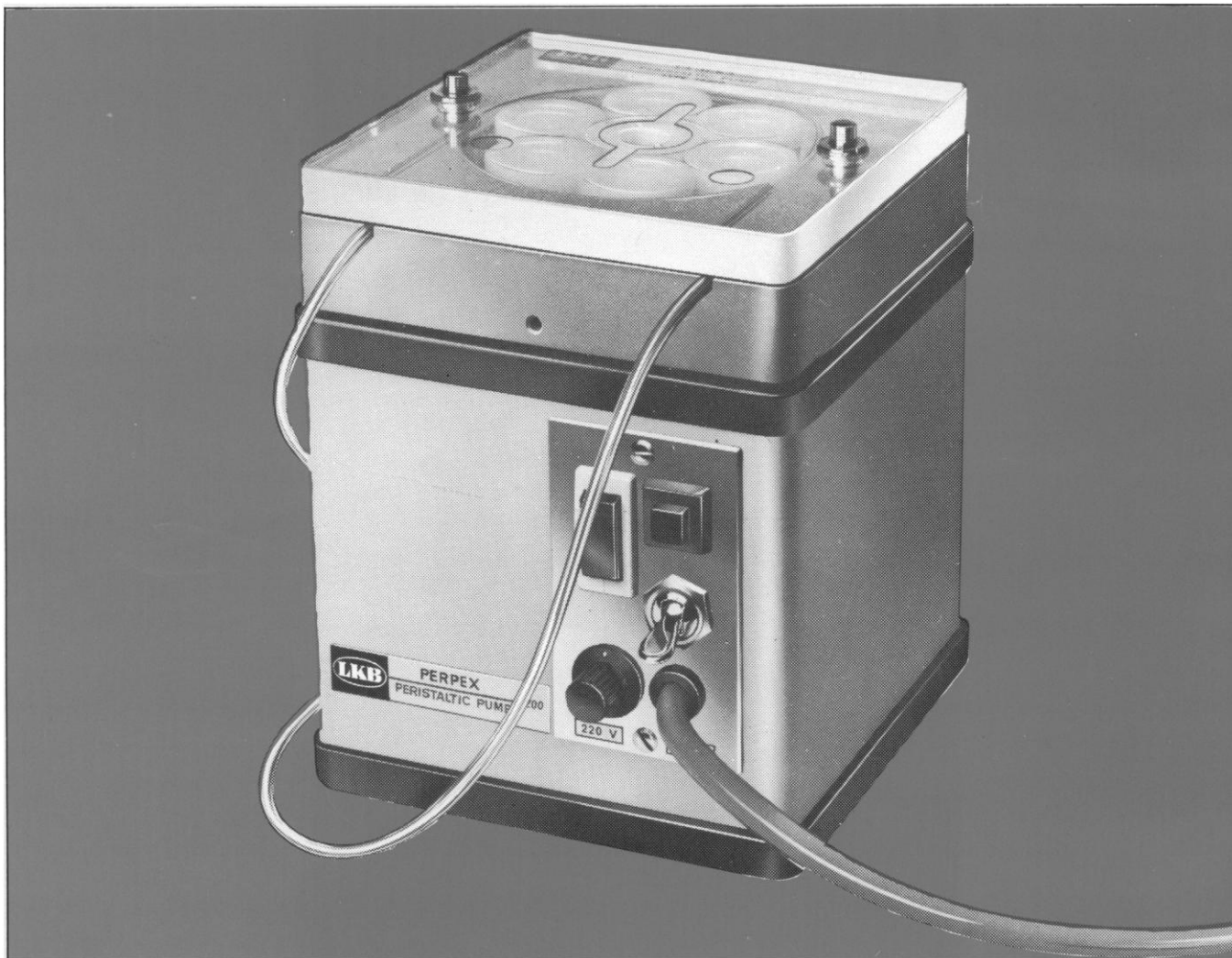
# SCIENCE

9 February 1968

Vol. 159, No. 3815

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





# THE PERPEX PUMP

*With peristaltic operation – but NO PULSATION*

Continuous, precise delivery of a great variety of liquids and gases without pulsation even at the lowest speeds.

## FEATURES:

**six gears available:**

Choose between 5 : 10 : 20 : 40 : 80 : 150 ml/h

**excellent repeatability:**

Choice of drive ensures accurate, repeatable pumping speeds

**ease of maintenance:**

At no point does gas or fluid come in direct contact with pump parts

**corrosion resistant:**

Quickly and easily disassembled when cleaning is required

**minimal tube wear:**

Patented roller system eliminates friction, gives long life to chemically resistant, mechanically weak silicon tubing



Ask for the new folder in the actual size of this remarkably compact pump.



**LKB INSTRUMENTS INC. • 12221 PARKLAWN DRIVE • ROCKVILLE Md. 20852**

**OTHER HEADQUARTERS FOR SALES AND SERVICE**

**SWEDEN**  
LKB-Produkter AB  
Fack  
Stockholm—Bromma 1

**UK**  
LKB Instruments Ltd.  
232 Addington Rd.  
S. Croydon, Surrey CR2 8YD

**NETHERLANDS**  
LKB-Produkten N.V.  
Zeekant 35,  
The Hague

**DENMARK**  
LKB Instrument A/S  
Amagerbrogade 34,  
Copenhagen S

# In Press Now—Ready Soon

## **Arey: HUMAN HISTOLOGY**

*New (3rd) Edition*

By **LESLIE B. AREY, Ph.D., Sc.D., LL.D. (Emeritus)** *Northwestern University Medical School.*

This concisely written and lavishly illustrated guide to the complexities of histology is suitable for use either as a basic text or as a supplement to a conventional histology textbook. The author discusses cells, tissues, and organs in that order, using a compact outline form that enables the student to see and grasp all the important facts at a glance. Facing the text are plates with nearly 400 illustrations, reproduced in two colors, that show every important type of tissue as it is seen in stained sections. For each tissue or organ, Dr. Arey describes location, gross appearance, structure, diagnostic features, and regenerative capacity. The correlations between structure and function are summarized. In this New (3rd) Edition, Dr. Arey has made extensive revisions in line with recent advances and has added 59 superb electron micrographs.

*About 480 pages with about 450 illustrations.*

*About \$10.50.*

*New (3rd) Edition ready April, 1968.*

## **Frobisher: FUNDAMENTALS OF MICROBIOLOGY** *New (8th) Ed.*

By **MARTIN FROBISHER, Sc.D.,** *formerly of the U.S. Public Health Service.*

The New (8th) Edition of this leading text gives the undergraduate a solid introduction to microbiology, from its historical foundations to current ideas of macromolecular structure. In this edition microorganisms are presented as protista and differentiated as eucaryotic and procaryotic, which clarifies their evolutionary status and relationships and simplifies their descriptions. The author gives an especially detailed discussion of the procaryons—bacteria (including PPLO, rickettsias, and chlamydias), viruses, and cyanophyceae. Throughout the book he emphasizes such important topics as enzymes, the chemical bases of microbial life, genetic phenomena and mutation, immune tolerance and allergy, and chemotherapy. The most recent developments have been included in this revised edition.

*About 625 pages with about 350 illustrations.*

*About \$8.50.*

*New (8th) Edition ready April, 1968.*

## **Giese: CELL PHYSIOLOGY**

*New (3rd) Edition*

By **ARTHUR C. GIESE, Ph.D.,** *Stanford University.*

This newly revised book fills the need for a comprehensive, up-to-date text for a one-semester undergraduate course in cell physiology. In clear, simple language, Dr. Giese gives a complete picture of the functioning of the single cell. The New (3rd) Edition has been rewritten to incorporate the great number of recent discoveries concerning cell processes and functions. Two entirely new chapters have been added—one on biosynthesis, the other on regulation of cell activities. The book opens with a chapter on the Application of the Laws of Thermodynamics to the Cell, which provides the student with the basic information on the conversion of energy that he will need to understand the later chapters.

*About 625 pages with about 375 illustrations.*

*About \$11.50.*

*New (3rd) Edition ready May, 1968.*



*Texts Gladly Sent to Teachers on Approval*

**W. B. SAUNDERS COMPANY, West Washington Sq., Philadelphia, Pa. 19105**



9 February 1968  
Vol. 159, No. 3815

# SCIENCE

<b>LETTERS</b>	Brain Drain from Midwest: <i>W. Papier</i> ; Reserve of Physics Teachers: <i>K. J. Rockensies</i> ; Computerized Journal: <i>S. A. Weinstein</i> ; Televised AAAS Symposia: <i>M. D. Wilde</i> . . . . .	581
<b>EDITORIAL</b>	Custodians of Knowledge . . . . .	585
<b>ARTICLES</b>	Molecular Beams and a Chemical Reaction: <i>E. F. Greene</i> and <i>J. Ross</i> . . . . .	587
	The Role of Systematics in Biology: <i>E. Mayr</i> . . . . .	595
	Metastable Atoms and Molecules: <i>E. E. Muschlitz, Jr.</i> . . . . .	599
	Government, Medical Research, and Education: <i>A. Leaf</i> . . . . .	604
<b>NEWS AND COMMENT</b>	"Pot" and Politics: How They "Busted" Stony Brook . . . . .	607
	Population Control: U.S. Aid Program Leaps Forward . . . . .	611
	Defense Issues Summary of Defoliation Study . . . . .	613
	British Budget: Tight Funding To Continue in Research Field . . . . .	614
<b>BOOK REVIEWS</b>	<i>The Great Monkey Trial</i> : reviewed by <i>K. F. Mather</i> ; other reviews by <i>C. Callan</i> , <i>R. G. A. Dolby</i> , <i>H. Friedmann</i> , <i>H. Woolf</i> , <i>T. N. Andersen</i> , <i>S. Raymond</i> , <i>J. D. Ebert</i> , <i>H. Babad</i> , <i>G. E. Brown</i> . . . . .	616
<b>REPORTS</b>	Diatremes with Kimberlitic Affinities in North-Central Montana: <i>B. C. Hearn, Jr.</i> . . . .	622
	Lunar Gravity: Preliminary Estimates from Lunar Orbiter: <i>J. Lorell</i> and <i>W. L. Sjogren</i> . . . . .	625

<b>BOARD OF DIRECTORS</b>	DON K. PRICE Retiring President, Chairman	WALTER ORR ROBERTS President	H. BENTLEY GLASS President Elect	BARRY COMMONER HUDSON HOAGLAND	GERALD HOLTON MINA S. REES
<b>VICE PRESIDENTS AND SECTION SECRETARIES</b>	MATHEMATICS (A) A. M. Gleason Wallace Givens	PHYSICS (B) W. W. Havens, Jr. Stanley S. Ballard	CHEMISTRY (C) Herman F. Mark Milton Orchin	ASTRONOMY (D) John S. Hall Frank Bradshaw Wood	
	ANTHROPOLOGY (H) Alexander Spoehr Anthony Leeds	PSYCHOLOGY (I) Leo J. Postman Frank W. Finger	SOCIAL AND ECONOMIC SCIENCES (K) David Truman Eugene B. Skolnikoff	HISTORY AND PHILOSOPHY OF SCIENCE (L) Peter J. Caws Raymond J. Seeger	
	PHARMACEUTICAL SCIENCES (Np) Curtis Waldon Joseph P. Buckley	AGRICULTURE (O) Richard Geyer Ned D. Bayley	INDUSTRIAL SCIENCE (P) Allen V. Astin Burton V. Dean	EDUCATION (Q) Herbert A. Smith Frederic B. Dutton	
<b>DIVISIONS</b>	<b>ALASKA DIVISION</b> Richard Hill President Irma Duncan Executive Secretary		<b>PACIFIC DIVISION</b> Garrett Hardin President Robert C. Miller Secretary		<b>SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION</b> Howard J. Dittmer President Marlowe G. Anderson Executive Secretary
SCIENCE is published weekly on Friday and on the fourth Tuesday in November by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Now combined with <b>The Scientific Monthly</b> . Second-class postage paid at Washington, D.C. Copyright © 1968 by the American Association for the Advancement of Science. Annual subscriptions \$12; foreign postage: Americas \$3; overseas \$5; single copies, 50¢ (back issues, \$1) except <b>Guide to Scientific Instruments</b> , which is \$2. School year subscriptions: 9 months, \$9; 10 months, \$10. Provide 4 weeks' notice for change of address, giving new and old address and zip codes. Send a recent address label. SCIENCE is indexed in the <b>Reader's Guide to Periodical Literature</b> .					

# AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Crescentic Landforms along the Atlantic Coast of the United States: <i>R. Dolan and J. C. Ferm</i> .....	627
Carbon Tetrachloride: Plastic Properties: <i>L. C. Towle</i> .....	629
6-Methylpurine-H <sup>3</sup> : Intracellular Localization in Pea Root Tip Cells: <i>H.-R. Chen</i> ....	631
Tyrosine Enteroreceptor of <i>Hydra</i> : Its Function in Eliciting a Behavior Modification: <i>R. S. Blanquet and H. M. Lenhoff</i> .....	633
Cyclic Changes in Enzyme Activity in Synchronized Mammalian Cell Cultures: <i>R. R. Klevecz and F. H. Ruddle</i> .....	634
Composite Membranes: The Permeation of Gases through Deposited Monolayers: <i>G. D. Rose and J. A. Quinn</i> .....	636
Blood Catalase Polymorphism: Some Immunological Aspects: <i>R. N. Feinstein,</i> <i>H. Suter, B. N. Jaroslow</i> .....	638
Nerve Growth Factor of Very High Yield and Specific Activity: <i>I. Schenkein et al.</i> ....	640
Tetanus Toxin: Fine Structure Localization of Binding Sites in Striated Muscle: <i>S. I. Zacks and M. F. Sheff</i> .....	643
Computer Calculation of Molecular Crystal Structures: <i>D. E. Williams</i> .....	645
Immunologic Defenses against Metastases: Impairment by Excision of an Allotransplanted Lymphoma: <i>R. K. Gershon, R. L. Carter, K. Kondo</i> .....	646
Somatic Reduction in Cycads: <i>W. B. Storey</i> .....	648
<i>Technical Comments:</i> Hexokinase Isozymes in Human Erythrocytes: <i>G. J. Brewer and</i> <i>C. A. Knutsen; E. W. Holmes, Jr., et al.; Vitamin D, Sunlight, and Natural</i> <i>Selection: M. S. Blois; H. F. Blum; W. F. Loomis</i> .....	652

<b>MEETING REPORTS</b>	Cytochromes: Chemical and Structural Aspects: <i>B. Chance</i> ; Phenotype: Postnatal Development: <i>J. P. Scott</i> ; Systematics Workshop: <i>T. J. M. Schopf</i> and <i>P. L. Ames</i> ; Human Histocompatibility Locus HL-A: <i>D. B. Amos</i> ; Calendar of Events (Grant Program; Courses) .....	654
------------------------	--	-----

LEONARD M. RIESER  
H. BURR STEINBACH

KENNETH V. THIMANN  
JOHN A. WHEELER

PAUL E. KLOPSTEG  
Treasurer

DAEL WOLFLE  
Executive Officer

GEOLOGY AND OCEANOGRAPHY (E)  
Louis Quam  
Richard H. Mahard

ZOOLOGICAL SCIENCES (F)  
Colin S. Pittendrigh  
David E. Davis

BOTANICAL SCIENCES (G)  
William C. Steere  
Warren H. Wagner

ENGINEERING (M)  
Paul Rosenberg  
Newman A. Hall

MEDICAL SCIENCES (N)  
Julius H. Comroe

DENTISTRY (Nd)  
Lester R. Cahn  
Richard S. Manly

INFORMATION AND COMMUNICATION (T)  
Phyllis V. Parkins  
Ileen H. Stewart

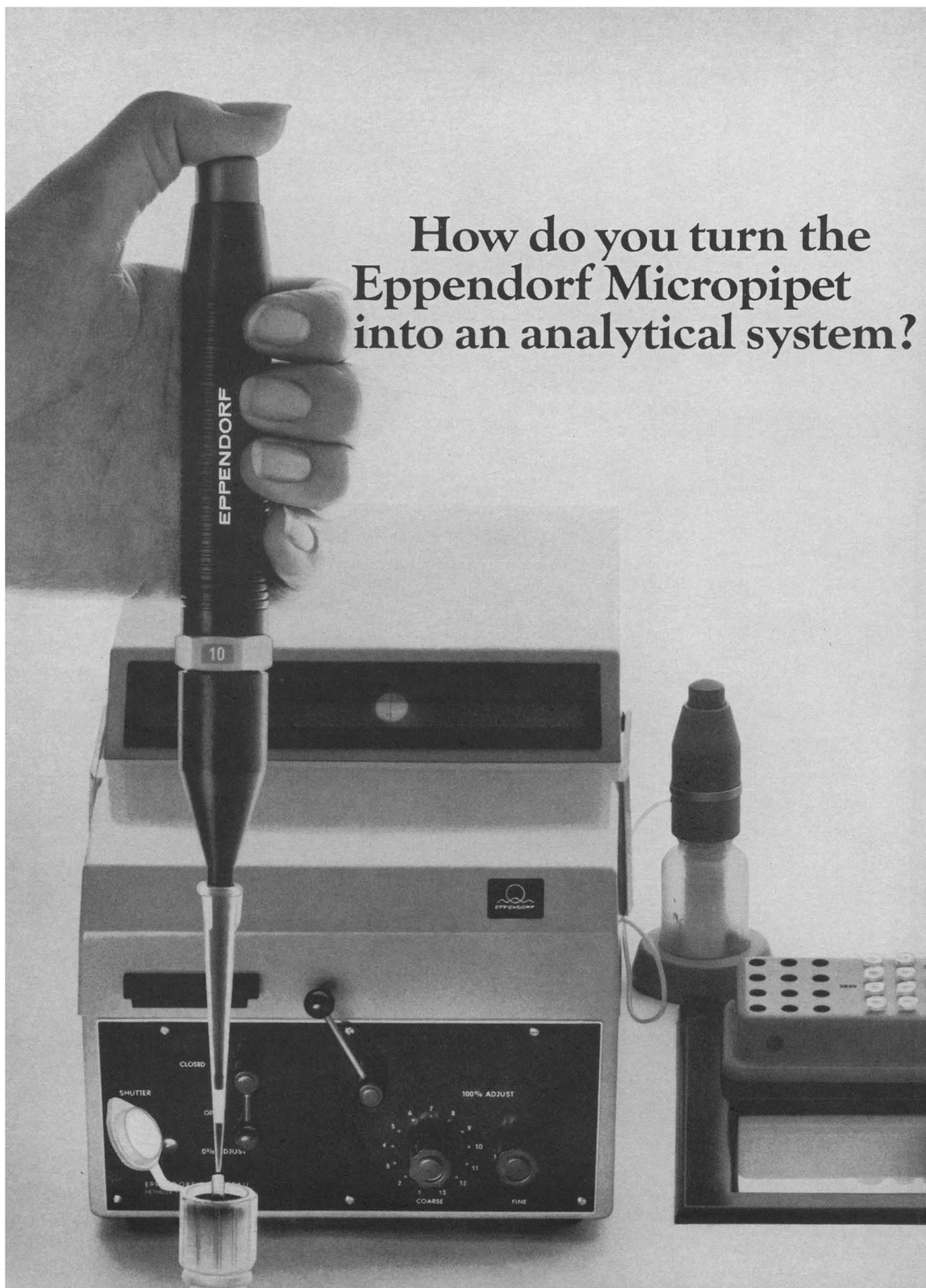
STATISTICS (U)  
George E. P. Box  
Rosedith Sitgreaves

## COVER

Military machine designed by Renaissance engineer, Roberto Valturio (1413-1484). Valturio's treatise on military techniques, *De re militari*, was printed in 1472 and went through four editions before 1500. The increasingly important role of engineers in the life of this period led to the publication of such works. See review of *Engineers of the Renaissance*, page 618. [M.I.T. Press, Cambridge, Massachusetts]

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

How do you turn the  
Eppendorf Micropipet  
into an analytical system?





# Just add the Eppendorf Photometer, Centrifuge, Thermostat, Agitator, Sample Tubes and Reagent Flasks.

Perhaps you're already familiar with the amazing new Eppendorf Micropipet. Perhaps you've already discovered for yourself the revolutionary ease and speed it brings to pipetting, thanks to its disposable plastic tips, automatic push-button sample blowout, and its unbelievable accuracy and precision.

Now an entire micro-analytical system based on this pipet is available. It encompasses over 30 different manual photometric methods for clinical and biochemical analysis for use where fully automated methods are impossible or impractical.

The new Eppendorf Photometer forms a cornerstone of the system. Its galvanometer comes to a dead-stop in less than 1 sec. to provide fast, accurate readings. Twelve amplification steps permit

readings of highly turbid or dense solutions without prior dilution. Narrow bandwidths insure linear calibration curves to an optical density of 3.000.

The Eppendorf system also includes a centrifuge, thermostat, agitator and reagent flasks, all for use with Eppendorf plastic disposable sample tubes and the Eppendorf Micropipet. These components may be purchased separately, or with their own Microbench for table-top lab installation.

Care to know more about our system? Just write: Eppendorf Division, Brinkmann Instruments, Cantiague Road, Westbury, New York 11590.

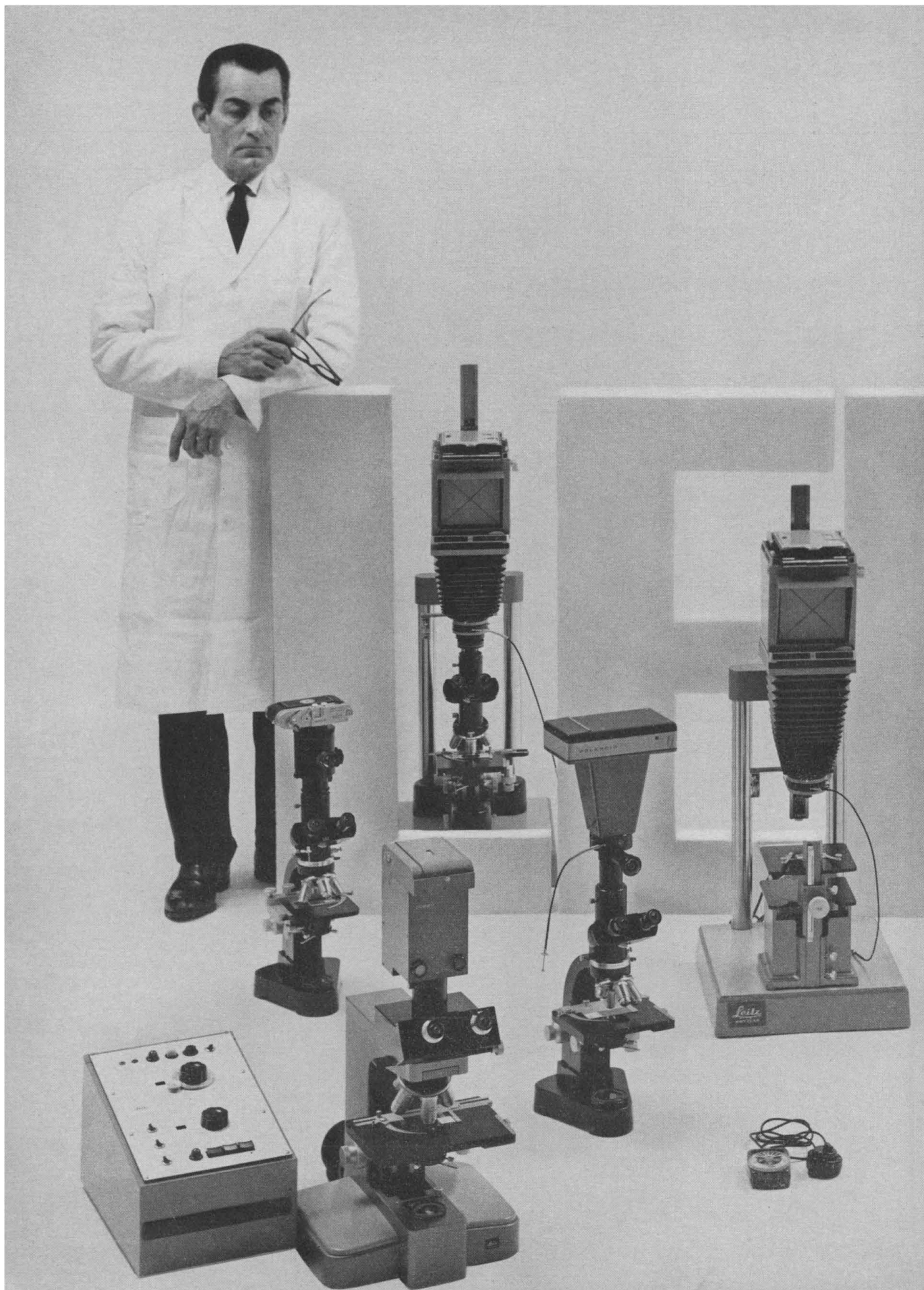
A DIVISION OF



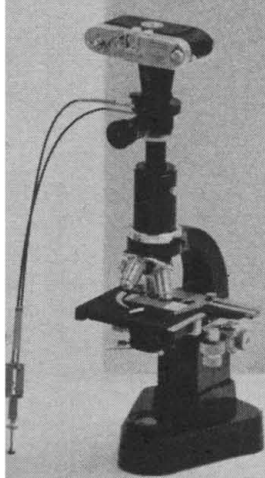
BRINKMANN

**Eppendorf®**  
**MICROLITER SYSTEM**









...quality  
photomicrographic  
equipment  
with  
a unit for every need and budget

Meet the most versatile and talented of performers with one common denominator—Leitz quality. Whether your need is an occasional photomicrograph to illustrate a lecture, routine recording, or a specialized apparatus for a research project, Leitz can provide the widest possible range of instruments and illuminators.

Crisp, clear, and critically sharp photomicrographs can be achieved with minimal photographic skills. This Leitz fuss-free operation is a result of many years of imaginative design by men who know both cameras and microscopes.

From a modest microscope attachment to the sophisticated Orthomat—a fully automatic microscope-camera—Leitz photomicrographic units offer the ultimate in smooth, uncomplicated, maintenance-free operation. With Leitz equipment, good photomicrography becomes a routine procedure. Request Cat. No. 54.

**Leitz®**

E. Leitz, Inc., 468 Park Avenue South, New York, N.Y. 10016

66867

# Recent AAAS Symposium Volumes

**#87. Formulation of Research Policies**  
1967. 218 pages. Editors: Lawrence W. Bass and Bruce S. Old. Collected papers from a Gordon Research Conference held in Santa Barbara, California, in 1966. Goals, accomplishments—and weaknesses—of past and present science policies of nations, government agencies, individual industries, and international organizations are given expert and candid appraisal in this work—the record of an exciting conference.

Price: \$7.75. AAAS Member's Cash Price: \$6.75.

**#86. Ground Level Climatology**  
1967. 408 pages. Editor: Robert H. Shaw. Relation of climate to the distribution and abundance of plants and animals; the effects of weather modification on physical processes within the microclimate; and the effects of moisture, temperature, and energy balance on physiological functions.

Price: \$12.50. AAAS Member's Cash Price: \$10.50

**#85. Agriculture and the Quality of Our Environment**  
1967. 480 pages. Editor: N. C. Brady. Damage resulting from air pollutants; extent and consequences to agriculture of salt buildup in soils and water; dangers from radionuclide contamination of soil, water, and air. Extent of pesticide buildup in soil and water and of means to minimize potential hazards from pesticide use; siltation of reservoirs and streams and their nutrient enrichment; disposal of animal wastes.

Price: \$13.50. AAAS Member's Cash Price: \$11.50.

**#84. Molecular Mechanisms of Temperature Adaptation**  
1967. 398 pages. Editor: C. Ladd Prosser. A collection of papers on the general physiology of temperature adaptation in cold-blooded animals, plants, and microorganisms.

Price: \$12.50. AAAS Member's Cash Price: \$10.50.

**#83. Estuaries**  
1967. 776 pages. Editor: George H. Lauff. The first comprehensive collection of scientific papers covering the comparatively new field of estuarine research.

Price: \$27.00. AAAS Member's Cash Price: \$24.00.

**#82. Civil Defense**  
1966. 154 pages, paper. Editor: Henry Eyring. Scientists report their findings on problems related to modern warfare and passive civil defense systems.

Price: \$4.00. AAAS Member's Cash Price: \$3.50.

**#81. Environmental Variables in Oral Disease**  
1966. 328 pages. Editors: S. J. Kreshover and F. J. McClure. Contents: Geographical and clinical considerations; the oral environment—nutrition and dental caries; experimental considerations in oral soft lesions; prenatally occurring influences.

Price: \$8.75. AAAS Member's Cash Price: \$7.75.

**#80. Air Conservation**  
1965. 348 pages. "The result of a 2-year study by the AAAS Air Conservation Commission, all aspects—sociological, technical, political and biological—of air pollution are considered concisely." (*Chemical Processing for Operating Management*, May 1966)

Price: \$8.00. AAAS Member's Cash Price: \$7.00.

**#79. Science in Japan**  
1965. 496 pages. Editor: Arthur H. Livermore. A broad and detailed review of recent scientific and technological developments in Japan.

Price: \$13.00. AAAS Member's Cash Price: \$11.00.

**#78. Man, Culture, and Animals**  
1965. 304 pages. Editors: Anthony Leeds and Andrew P. Vayda. "This volume contains articles pertaining to the relationship between man and animals in different parts of the world, covering the influence of domesticated and non-domesticated animals on a variety of cultures." (*Biological Abstracts*, 1 February 1966)

Price: \$8.00. AAAS Member's Cash Price: \$7.00.

**#77. Food Quality**  
1965. 306 pages. Editors: George W. Irving, Jr., and Sam R. Hoover. "It is an excellent, well-edited review of the agronomical production and processing problems of the basic commodities, fruits and vegetables, cereals, dairy products, poultry and eggs, and meat products." (*Cereal Science Today*, November 1965)

Price: \$8.50. AAAS Member's Cash Price: \$7.50.

**#76. Agricultural Sciences for the Developing Nations**  
1964. 230 pages. Editor: Albert H. Moseman. "The book . . . is especially useful because of the author's combined experience with the situations and problems of agriculture in the less developed countries. . . . This book will be a valuable reference for many years." (*BioScience*, March 1966)

Price: \$6.75. AAAS Member's Cash Price: \$6.00.

**#75. Mechanisms of Hard Tissue Destruction**  
1963. 776 pages, 430 illustrations. Editor: R. F. Sognnaes. "Scientists in the fields of dentistry, medicine, and zoology presented a multidisciplinary symposium in 1962, dealing with varied but cognate topics such as coral reefs, dental caries, deer antlers, osteoclastic diseases, bone metabolism, chelation. It is a refreshingly well-planned, well-edited, and interesting symposium." (*Journal of the American Medical Association*, July 1964)

Price: \$13.00. AAAS Member's Cash Price: \$11.00.

**#74. Aridity and Man**  
1963; 2nd printing, 1965. 604 pages, 98 illustrations. Editors: Carle Hodge and Peter C. Duisberg.

Price: \$12.00. AAAS Member's Cash Price: \$10.00.

**#72. Spermatozoan Motility**  
1962. 322 pages, 113 illustrations. Editor: David W. Bishop.

Price: \$7.50. AAAS Member's Cash Price: \$6.50.

**#67. Oceanography**  
1961; 4th printing, 1966. 665 pages, 146 illustrations. Editor: Mary Sears.

Price: \$14.75. AAAS Member's Cash Price: \$12.50.

British Agents: Bailey Bros. & Swinfen, Ltd., Warner House, Folkestone, Kent, England

Clip out this form. Fill in and Mail Today

Circle Volumes  
You Wish To Order . . .

87	86	85
84	83	82
81	80	79
78	77	76
75	74	72
67		

American Association for the Advancement of Science  
1515 Massachusetts Avenue, NW  
Washington, D.C. 20005

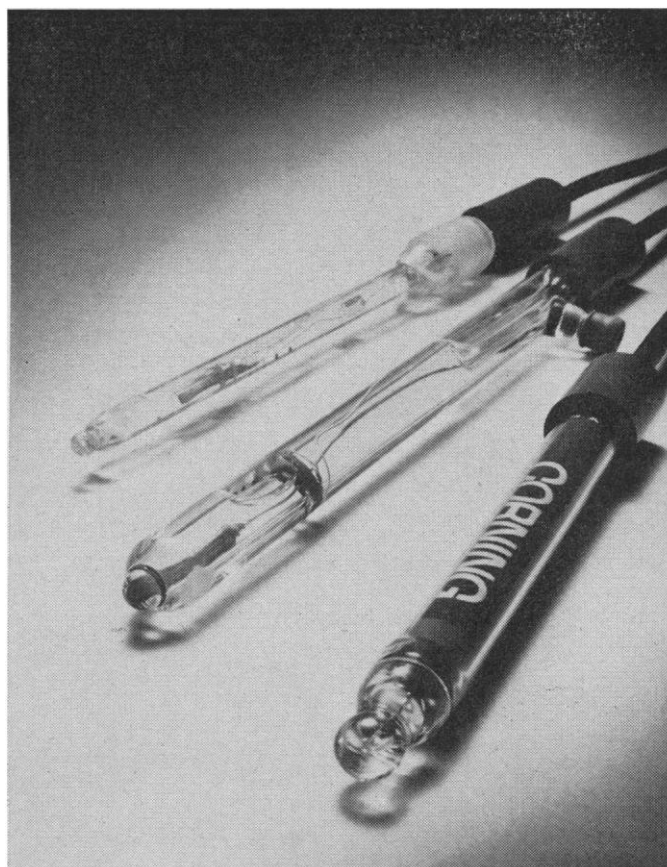
Please send the symposium volumes circled on this form, to:

Name . . . . .  
Address . . . . .  
City . . . . . State . . . . . Zip Code . . . . .

Note: Special prices are allowed only to AAAS members for orders submitted directly to AAAS with payment. Individual membership at \$12.00 per year includes a subscription to SCIENCE.



# END THE CONFUSION!

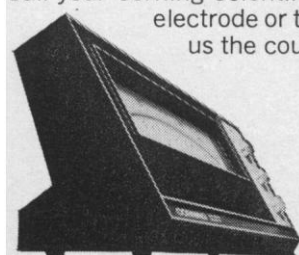


Both speed  
and strength are yours  
in new CORNING®  
pH Electrodes

**Borrow a CORNING pH Meter.** To evaluate the finest pH electrodes on the market in the finest pH system on the market, borrow a CORNING pH meter.

Our solid-state circuitry is designed to take full advantage of the sensitivity and accuracy of our electrodes.

Call your Corning Scientific Instruments dealer to buy an electrode or to borrow a pH meter. Or send us the coupon.



**CORNING®**  
SCIENTIFIC INSTRUMENTS

You used to have to decide between durability and fast response. No more. New CORNING pH Electrodes give you both.

There's a totally new sensing glass in every one of our dipping, miniature, and combination electrodes. It's markedly stronger than any other, and has fast response.

What's more, every CORNING electrode still gives you triple-purpose versatility. Each one measures from 0 to 14 pH, from  $-5^{\circ}$  to  $+100^{\circ}\text{C}$ .—so you can use *one* electrode for general-purpose, high-alkaline, and high-temperature work.

Try a new CORNING electrode with whatever kind of pH meter you now have. See if its performance doesn't improve, and see how the electrode proves itself in speed and durability.

**Corning Glass Works,  
Scientific Instruments,  
Dept. SC  
Medfield, Mass. 02052**

I'd like more information on:

- |  |  |
|--|--|
| <input type="checkbox"/> pH electrodes   | <input type="checkbox"/> expanded-scale  |
| <input type="checkbox"/> general purpose | <input type="checkbox"/> research meter, |
| meters, \$215-\$355                      | \$645                                    |
| <input type="checkbox"/> expanded-scale  | <input type="checkbox"/> pH controller   |
| meter, \$495                             | meter, \$895.                            |

Name \_\_\_\_\_

Title \_\_\_\_\_

Organization \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

ZIP \_\_\_\_\_

Telephone \_\_\_\_\_



"... it is a curious fact that of all the communicating animals the only one whose language man has been able to translate in much detail is the bee. We owe this breakthrough into animal language to the sharp observation and dedicated curiosity of the Austrian zoologist Karl von Frisch."

—HARALD ESCH,  
*Scientific American*

# KARL VON FRISCH

## The Dance Language and Orientation of Bees



What do bees say to each other? What do the various "dances" performed in the hive mean? How does a scout bee tell other workers she has found nectar, what its value is, exactly where it is, and from what flower it originates? How do bees use landmarks and the sun to determine and communicate direction? How do they manage when the sun is invisible? Can bees hear, see color, make out form, smell, taste? How do different species of bees, other insects, and animals differ in their methods of communication?

In this fascinating book, the man who is the world's most renowned authority on bees describes in detail, in lucid, non-technical prose, what he has discovered about these most sophisticated of insects during a half-century of study and experimentation. 580 pages, with 450 illustrations.

*A Belknap Press Book*

\$15.00

### COMMUNICATION AMONG SOCIAL BEES

Martin Lindauer. "One of the greatest discoveries in this century is undoubtedly that of von Frisch when he deciphered the language of the bees . . . his student and now colleague M. Lindauer has continued the tradition . . . first-rate." — *American Scientist*. Illus. 1961. *Harvard Books in Biology*. \$4.75

### NERVE CELLS AND INSECT BEHAVIOR

Kenneth D. Roeder. Revised and enlarged. The activities of insects in language readily understood by non-specialists. "Roeder," said *Science* of the book's first edition, "is a careful scholar, a facile writer, but above all, he is an excited scientist." Illus. 1967. *Harvard Books in Biology*. \$5.50

### THE COMPARATIVE ETHOLOGY AND EVOLUTION OF THE SAND WASPS

Howard E. Evans. "Probably the most detailed comparative behavioral study of a large group of wasps that has ever been published . . . a mine of facts." — *Nature*. Illus. 1966. \$15.00

### ANIMAL SPECIES AND EVOLUTION

Ernst Mayr. Winner of The Daniel Giraud Elliot Medal of the National Academy of Sciences, this work is, as JULIAN HUXLEY says, "certainly the most important study of evolution that has appeared for many years — perhaps even since the publication of *The Origin of Species*." 3rd printing. 1963. *A Belknap Press Book*. \$11.95

### LEARNING AND INSTINCT IN ANIMALS

W. H. Thorpe. Revised and enlarged. "This masterly work . . . surveys present knowledge in the discipline of ethology . . . and evaluates the theories of various investigators concerning learning and instinct." — *Scientific American*. Illus. 1963. \$11.00

### BIRDS AND MEN

*American Birds in Science, Art, Literature and Conservation, 1800-1900*

Robert Henry Welker. "Engaging . . . engrossing . . . here is history of men and birds at its best. The author writes entertainingly and with humor . . . holds so much of value and interest." — *Nature*. Illus. 1955. *A Belknap Press Book*. \$5.75

### HARVARD UNIVERSITY PRESS



## In hope of doing each other some good

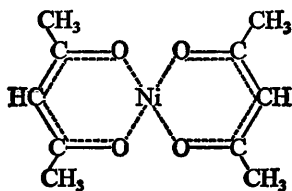
Kodak

### To grasp a nickel

One of us was called in by his boss one day and told to become an expert on coordination complexes. This is not to say that among a thousand or two chemists among us there were not already several who had done a doctoral thesis on some aspect of organometallic chemistry. Those fellows, if any, had their own work to do. This man's job is to make chemicals for other organizations' laboratories.

He took his organometallic assignment seriously and realistically. He wasn't being asked to know everything about the properties of organometallics—merely to make as many of them as he might consider justified by trends in chemical interest among the customer population. Since the assignment was given some years ago, the list of EASTMAN Organic Chemicals now includes a goodly number of metal chelates in general,  $\beta$ -diketone chelates in particular, and  $\beta$ -diketones from which customers can make their own chelates.

The simplest  $\beta$ -diketone is 2,4-Pentanedione (EASTMAN 1088). Two molecules of this, shifting protons and delocalizing electrons for stability, grasp a nickel ion to yield EASTMAN 8009, Bis(2,4-pentanediono)nickel,



Now we read in *Chem. Commun.* 17:856 (1967) that in the solid state this compound really trimerizes into a cluster of three nickel ions in a straight line, surrounded by a dozen oxygen atoms, half of them serving as bridges between the nickels. This couples the spins of the nickels in a way to make a ferromagnetic ground state possible.

What this leads to may some day become apparent even to the man who is making this type of compound for the convenience of those who already see light.

For List No. 44 of all EASTMAN Organic Chemicals and for Cumulative Supplement 44-3 which updates it, write Distillation Products Industries, Rochester, N.Y. 14603 (Division of Eastman Kodak Company).

### False color for the serious worker

The frankly false colors in which EKTACHROME Infrared AERO Film, Type 8443, depicts the face of the land are now widely recognized to help significantly in the hunt for truth. Whether the truth be sufficient unto itself (as in investigating possible Viking contacts with the peoples of the Missouri River Valley in the 14th century) or is being pursued by such unromantic types as plant pathologists, the daily flow of discourse about this product in our mail and in the literature of several scientific disciplines induces within us a warm glow. To have had impact on science while directly, if moderately, benefiting the shareowners feels good. The euphoria is further enhanced by the technical depth of the product and the depths still to be plumbed in making it work better.

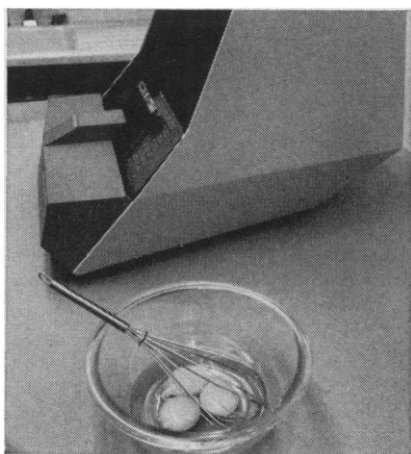
We supply this film both in the spoolings required by various aerial cameras\* and in 20-exposure 135 cassettes† for familiar hand-held 35mm cameras. Much of the plumbing of the depths will redound to the credit of the dedicated, serious user. He will find himself engrossed not only in the phenomena of his own specialty but in a glorious complex of phenomena in chemistry, optics, and the visual centers of his own cerebrum. By comparison, it will be no strain at all to process the 135 film with a KODAK EKTACHROME Film Processing Kit, Process E-3.†

The 710-910m $\mu$  band will come out in red tones, and so will live foliage, because of its high infrared reflectance. Without such an overload of infrared, the band of the visible spectrum seen as green by the eye comes out blue on the film. The red of the spectrum comes out green. The true blue and ultraviolet of nature had better be cut out with a KODAK WRATTEN Filter No. 12 in front of the camera lens.

*There will also be some other filters brought into play by a user prepared to go to some lengths to wring out maximum amplification of his color sensitivity for the sake of his particular brand of objective truth about the world beneath his feet. Norman L. Fritz of the Kodak Research Laboratories gives details on the selection of these filters in a paper in Photogrammetric Engineering for October, 1967. Fourteen pages further on in that journal is a paper on this film in photoarcheology.*

\*For information on ordering and processing, write Eastman Kodak Company, Industrial Photo Methods Division, Rochester, N.Y. 14650.

†Stocked by some Kodak dealers serving scientific clientele. Can be ordered for you by almost any camera shop.

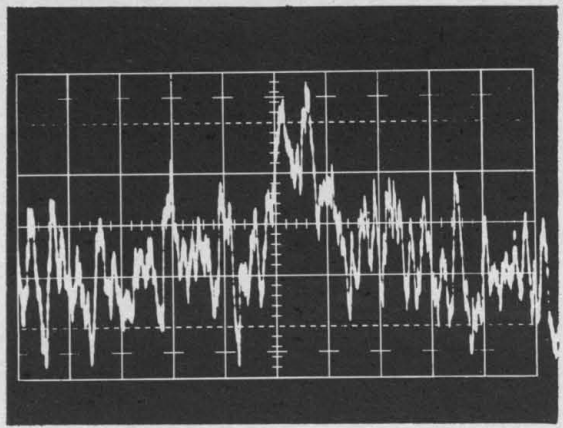


Vision  
of a  
well-  
equipped  
home

The low price of the RECORDAK EASAMATIC Reader PFCS is significant. It gives quick access to data such as parts lists, catalog pages, and buyers' guides, many pages of which can be compacted on a 4 x 6" or 3 1/4 x 7 3/8" microfiche. In truth, very few of this particular model are likely to be purchased for use in the home. Nevertheless, as microfilm readers become mass-produced items and the unit price continues to drop with rising volume, the more pervasive will microfilm become. When microfiche readers are found in as many homes as dishwashers are today, there may be quite an effect on the manner of publishing anything of a nature at all specialized.

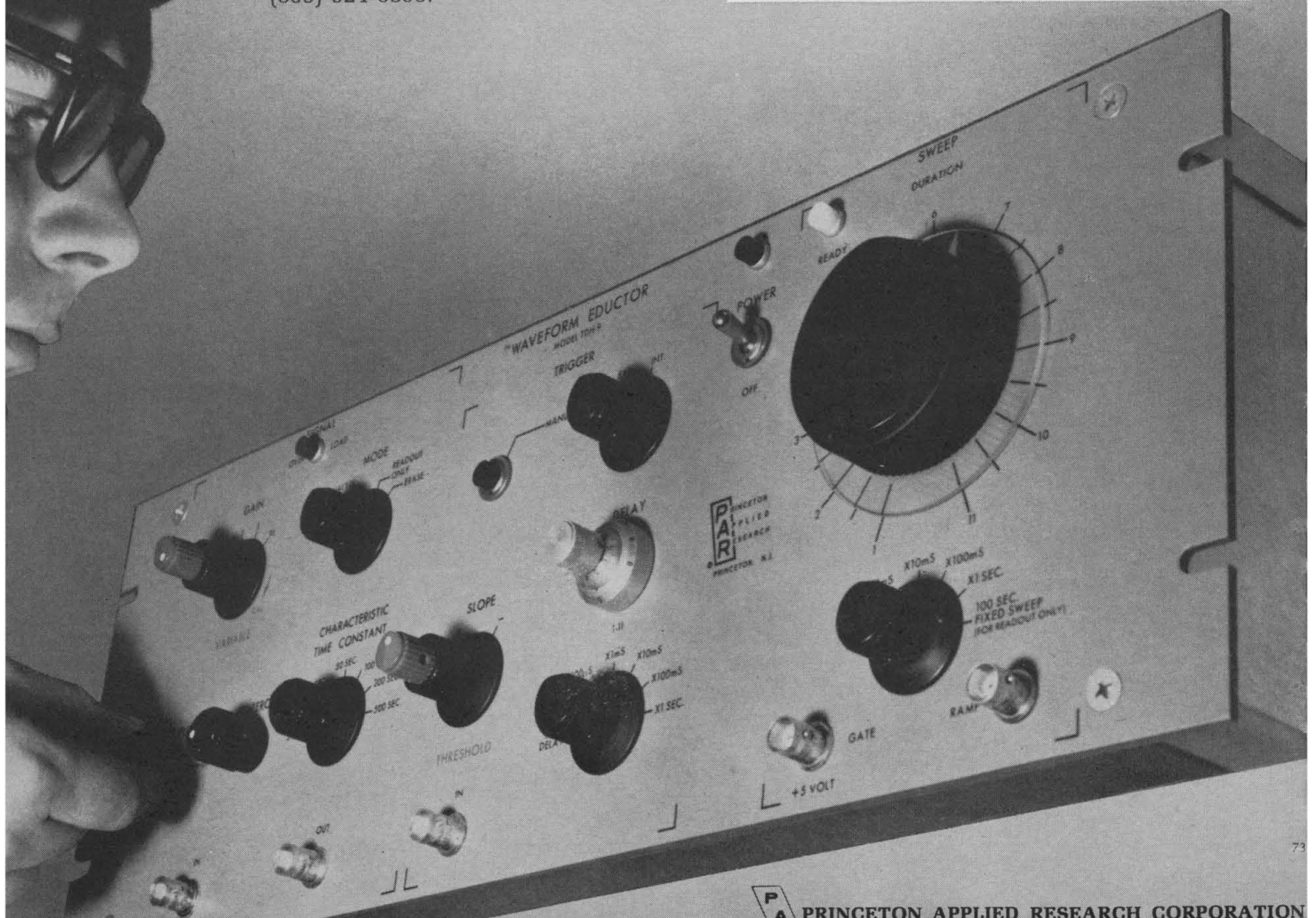
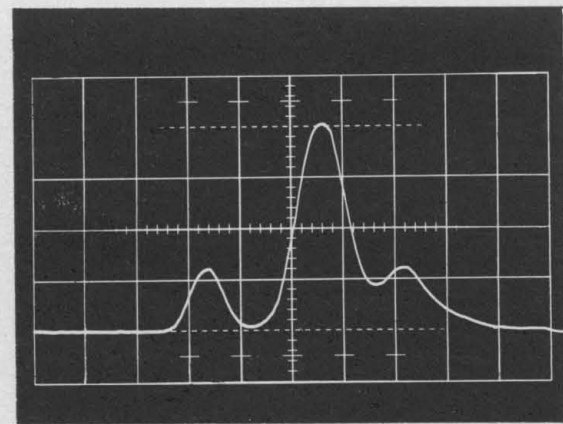
*Questions about the RECORDAK EASAMATIC Reader or about any other aspect of microfilming are answered by Business Systems Division, Eastman Kodak Company, Rochester, N.Y. 14650.*

# Noisy Signal?



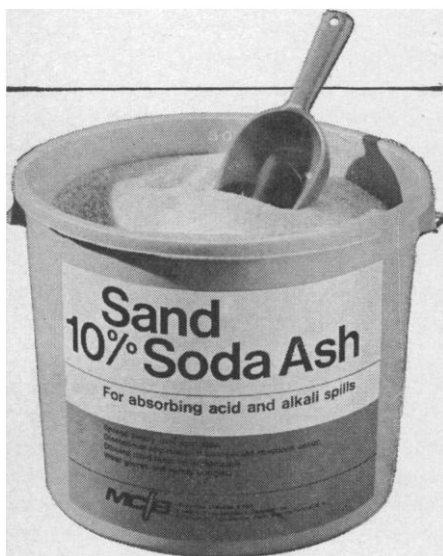
## Extract it with a PAR Waveform Eductor™

The PAR Waveform Eductor is a signal averager used to extract repetitive signals from noise. For complete information or to arrange a demonstration of this instrument, which is priced at only \$4,200, write Princeton Applied Research Corporation, P.O. Box 565, Princeton, New Jersey 08540, or call (609) 924-6835.





# It Doesn't Make Sense Not To Have One Of These Nearby, Does It?



## Order yours today

We're sure you agree that a nearby Spills Bucket is one of the most basic safety aids for any lab. So where is yours?

Too many of us overlook this unglamorous essential, so we're conducting a campaign to put a Spills Bucket near every lab bench. The MC&B Spills Bucket contains about 7 lbs. of sand and soda ash, as recommended by safety engineers, and is packed with a plastic scoop. You need it.

## Order Now!

**\$3.75 Delivered in U.S.**

Send order to MC&B,  
2909 Highland, Norwood, Ohio 45212

**MC&B**

Norwood, Ohio  
East Rutherford, New Jersey  
Los Angeles

## Computerized Journal

In their article, "The future of scientific journals" (1 Dec., p. 1153), Brown, Pierce, and Traub describe the journal of the future for which their Mercury service is the model. Their suggestions are timely and their experience with the Mercury system is invaluable. A parallel effort formed the basis for the publication of *Communications in Behavioral Biology*, an information system and primary publisher of scientific reports (8 Sept., p. 1149). *CBB* is a computerized journal and consists of two primary sections: (i) the abstracts and indices and (ii) the original articles. All articles are published as singles, prepunched for insertion in binders provided with the subscription. Articles are preindexed by the Brain Information Service (UCLA), utilizing a hierarchical index having many of the characteristics described by Brown. These are processed and printed at the Johns Hopkins Medical Computing Center and are immediately available (as preprints from xerographic copies). The abstract section of *CBB*, in conjunction with the indices, allows readers to select articles of interest, or they may request that all articles in selected index categories or by selected authors be sent to them, either as preprints or, a month later, in their final form. Articles are obtained with prepaid article-request cards supplied with subscriptions to the index and abstract section or purchased directly from the editorial offices. Libraries will also carry article request cards permitting users to order the article at a cost less than that of reproduction by xerography.

Among the journals that provide *CBB* with prepublication abstracts of accepted articles are: *Journal of Applied Physiology*, *Journal of Neurophysiology*, *American Journal of Physiology*, *Physiological Reviews*, *Electroencephalography and Clinical Neurophysiology*, *Life Sciences*, *Journal of Comparative and Physiological Psychology*, *Journal of Pharmacology and Experimental Therapeutics*, *Psychosomatic Medicine*, *British Journal of Psychiatry*, and *European Journal of Pharmacology*, plus other independent journals including several published in Czechoslovakia, Hungary, Poland, and France.

*CBB* was organized with funding from the National Science Foundation and the National Aeronautics and Space Administration, with the techni-

cal assistance of the Academic Press and University Microfilms. Readers will be able to subscribe to categories of information, preprint distribution will be available, magnetic tape and microform editions will be produced, separate article and abstract-index editions can be purchased, and finally, publication lags will be reduced to less than 3 months. A large interdisciplinary review board will provide constructive review of papers in behavioral biology.

STEPHEN A. WEINSTEIN  
*Laboratory of Behavioral Physiology,*  
*Johns Hopkins University,*  
*Baltimore, Maryland 21205*

## Televised AAAS Symposia

Although my mobility has recently been limited by the arrival of a new baby, my interests have not, and I would like to thank the AAAS, its members, and the participants in its annual meeting for having made so widely available the opportunity to witness some of the proceedings through educational TV. The choice of televised sessions was exceptionally good. The topics were of the broadest general interest; the speakers neither engaged in superficialities—talking down to the television audience—nor resorted to esoteric vocabulary and the discussion of fine points.

One of the most significant achievements was to help refute the notion (still prevalent despite Hiroshima) that scientific progress is a neutral entity, neither good nor evil in itself and laying no ethical burden on the scientist. Frank discussions of the impact of systems analysis and birth control on social and individual well-being, of ethical limits on secret and subsidized research, of privacy invasion by modern technology, and of the conflicting effects of modern agriculture on the life of underdeveloped countries, all showed scientists accepting the responsibility of their discoveries.

The medium is the message: television is a prime example of technological progress as a mixed blessing, and the excellent use the AAAS made of it is a hopeful sign for the future. I hope this fine contribution to public education will be repeated at future meetings.

MARGARET DICKEY WILDE  
*1707 Columbia Road, NW,*  
*Washington, D.C. 20009*

**Wouldn't it be great if  
someone designed a 160 g  
top-loader with 1 mg accuracy  
and all-digital readout?**

**Someone has.  
Sartorius.**

There are other top-loading balances with 160g capacity, but none is as accurate and easy to read as the new Sartorius 2255... and none is as stable.

To eliminate interpolation error with 'between the line' results, the Model 2255 provides all-digital readout to 1 mg. To further insure accuracy, there is absolutely no discernible swing—this balance stays at the indicated weight. There's no need to squint, either. Its huge new optical scale is a pleasure to read, even under the most adverse lighting conditions.

At only \$725, the above features alone would make the 2255 a great buy, but there are more. The Taramatic® single knob taring system and below-balance weighing accessories are included at no extra cost.

For research, quality control, student use, or any other application requiring 1 mg weighing accuracy at loads up to 160g, this is



the simplest, yet most advanced top-loading balance available.

Sartorius all-digital top-loaders also come with higher capacities. Our 40-page catalog describes them all. For your copy, just write: Sartorius Division, Brinkmann Instruments, Cantiague Road, Westbury, N.Y. 11590.

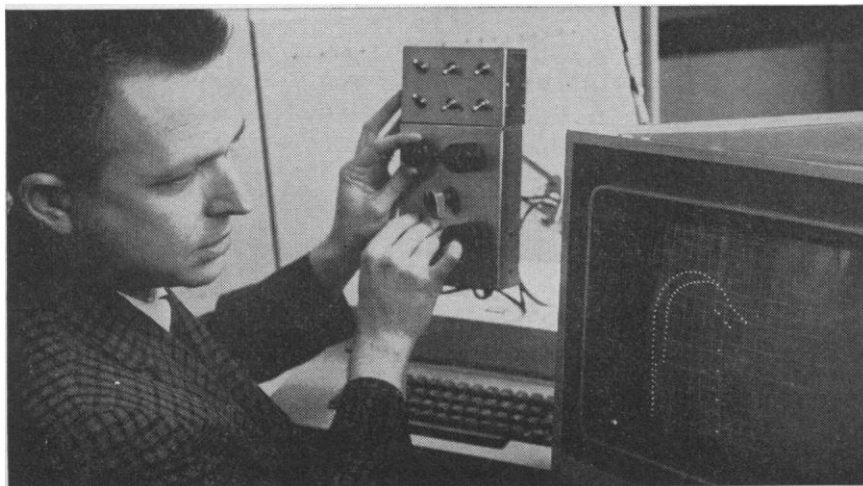
**sartorius balances**



Report from

**BELL  
LABORATORIES**

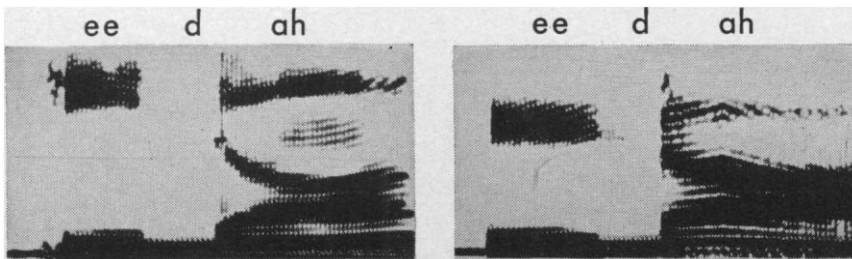
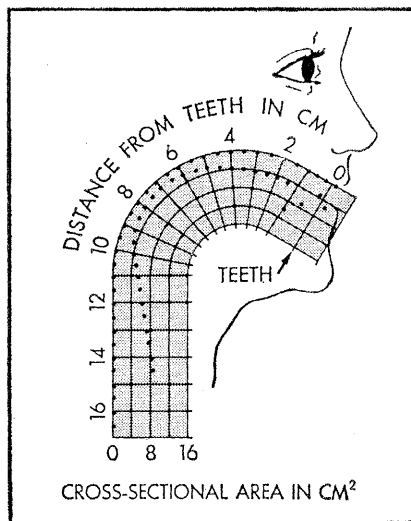
# See a computer talk



C. H. Coker adjusts controls which change the outline of the "vocal tract" simulated on the oscilloscope. At the same time, he hears the sound corresponding to the displayed shape. Desired vocal-tract shapes (representing sounds) can be stored in the computer memory.

Bell Laboratories' computerized vocal-tract model. (Head outline added.) The various parts can be positioned to imitate any speech sound. The model displays tract length versus cross-sectional area. It is based on anatomical measurements of the vocal tract made by a number of acousticians.

A feature of the model is that it reproduces the transition sounds between word fragments. The nonsense word *eedah*, for example, consists of *ee* plus *d* plus *ah*. But the *d* is not the same as in, say, *eedee*. That is, the *d* is noticeably affected by context. Coker handles this by storing dynamic properties of the vocal articulators (the tongue, lips and jaw). The program automatically incorporates these properties in assembling word fragments.



Comparison of nonsense word "eedah," pronounced by a human (left) and by Coker's program. These speech spectrographic patterns represent time (horizontal scale), frequency (vertical), and intensity (line density). The dark bars are called "formants" and are characteristic of speech sounds. The technique for making these diagrams was conceived and developed in the early 40's at Bell Telephone Laboratories.

Speech, one of the most complex of human activities, is studied as part of the continuing communications research at Bell Telephone Laboratories. But the speech mechanism has always been difficult to analyze: vocal-tract movements—crucial to the formation of meaningful acoustic signals—are mostly obscured from sight and are not easily measured. Now our understanding of speech is being advanced through a computerized simulation of the vocal tract devised by Cecil H. Coker of Bell Laboratories and Osamu Fujimura of the University of Tokyo, who worked at Bell Labs as a consultant.

The model (displayed on an oscilloscope, left) resembles the actual vocal tract and shows its principal parts. The parts can be moved either automatically by the computer program or by manual controls on the computer panel. The program calculates speech data corresponding to the displayed vocal-tract shape and delivers these data to an electronic speech synthesizer, designed by Coker. The synthesizer then generates a sound corresponding to the tract shape. Hence the researcher can hear the synthetic output at the same time he sees the tract motion.

The model accurately reproduces not only individual speech sounds but, for the first time, the subtle transitions that connect these sounds. It also demonstrates that these transitions are vital to clarity and realism.

The system produces patterns of frequency and energy (spectrograms) very like a human's (left). And it passes a more difficult test: pronouncing speech sounds which are understandable even when taken out of context.



**Bell Telephone Laboratories**  
Research and Development Unit of the Bell System



AMERICAN ASSOCIATION FOR  
THE ADVANCEMENT OF SCIENCE

*Science* serves its readers as a forum for the presentation and discussion of important issues related to the advancement of science, including the presentation of minority or conflicting points of view, rather than by publishing only material on which a consensus has been reached. Accordingly, all articles published in *Science*—including editorials, news and comment, and book reviews—are signed and reflect the individual views of the authors and not official points of view adopted by the AAAS or the institutions with which the authors are affiliated.

## Editorial Board

ROBERT L. BOWMAN	EVERETT I. MENDELSON
JOSEPH W. CHAMBERLAIN	NEAL E. MILLER
JOHN T. EDSALL	JOHN R. PIERCE
EMIL HAURY	KENNETH S. PITZER
ALEXANDER HOLLAENDER	ALEXANDER RICH
WILLARD F. LIBBY	DEWITT STETTIN, JR.
GORDON J. F. MACDONALD	CLARENCE M. ZENER

## Editorial Staff

## Editor

PHILIP H. ABELSON

## Publisher

DAEL WOLFE

## Business Manager

HANS NUSSBAUM

Managing Editor: ROBERT V. ORMES

Assistant Editors: ELLEN E. MURPHY, JOHN E. RINGLE

Assistant to the Editor: NANCY TEIMOURIAN

News Editor: DANIEL S. GREENBERG

News and Comment: JOHN WALSH\*, LUTHER J. CARTER, BRYCE NELSON, PHILIP M. BOFFEY, KATHLEEN SPERRY, FRANK CLIFFORD, GILLIAN PARRILLO, Contributing correspondents: ELINOR LANGER, NIGEL CALDER, VICTOR K. McELHENY, ROBERT J. SAMUELSON

Book Reviews: SYLVIA EBERHART

Editorial Assistants: JOANNE BELK, ISABELLA BOULDIN, ELEANORE BUTZ, BEN CARLIN, HELEN CARTER, GRAYCE FINGER, NANCY HAMILTON, OLIVER HEATWOLE, ANNE HOLDSWORTH, KONSLYNNIETTA HUTCHINSON, ELEANOR JOHNSON, PAULA LECKY, KATHERINE LIVINGSTON, HELEN OLNEY, SANDRA RATTLE, LEAH RYAN, BARBARA SHEFFER

\*European Office: Lime Tree Farm, East Haggbourne, Berkshire, England. Telephone Didcot 3317

## Advertising Staff

## Director

EARL J. SCHERAGO

## Production Manager

ROSE MARIE ROMAGNOLO

Advertising Sales Manager: RICHARD L. CHARLES

Sales: New York, N.Y., 11 W. 42 St. (212-PE-6-1858): ROBERT S. BUGBEE

Scotch Plains, N.J., 12 Unami Lane (201-889-4873): C. RICHARD CALLIS

Medfield, Mass. 02052, 4 Rolling Lane (617-359-2370): RICHARD M. EZEQUELLE

Chicago, Ill. 60611, 919 N. Michigan Ave., Room 426 (312-DE-7-4973): HERBERT L. BURKLUND

Los Angeles 45, Calif., 8255 Beverly Blvd. (213-653-9817): WINN NANCE

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-7171. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE 6-1858.

## Custodians of Knowledge

This generation's major contribution to the human heritage is a great fund of new knowledge and the means of using scientific principles effectively. This knowledge was accumulated at a cost to society of billions of dollars, and scientists should consider how the facts that have been discovered can continue to be made available. So long as books and archives are preserved, information can be retrieved, if scholars are willing to spend enough time working at it. However, to many scientists the continuing increase in information is a source of worry. They wonder how anyone can keep up with the flood of publications. The answer, of course, is that no one, unaided, can. The situation is difficult enough in one's own field. The difficulty is compounded when one wants to become aware of, and locate, facts in adjacent or distant disciplines. Some scientists look hopefully to electronic data processing as a means of meeting the problem. Others manage to cope with the information explosion. They keep current in their own fields through participation in "invisible colleges." Outside their own specialties they rely on colleagues they can trust to lead them to experts who can be trusted, who in turn either directly provide the needed information or guide them to the most reliable relevant literature. In a short time and after a few telephone calls, the skilled scholar is in a position to tap much of the world's store of knowledge. Reliance on this human network provides more than raw information. It provides judgment, and suggestions of more feasible approaches to the problem being considered. In view of the many strengths of this information network, computer technology has far to go to match it in effectiveness and especially in cost.

Maintenance of a comprehensive network of this kind is not automatic. If the system is to be effective and if knowledge is to be easily accessible, there must exist living, communicative custodians of that knowledge. This is the case when the subject area is widely taught, or when at least a few scientists are actively pursuing research in the field in question. However, the social instincts of men repeatedly lead to fads and fashions in research. At one time, most areas of physics were depopulated as the majority of physicists turned to nuclear research. Today the center of attention is solid-state physics.

Almost everywhere in science one can note examples of virtual abandonment of once-flourishing fields. To a degree this is desirable, but it can be overdone. If information developed by research in an area is truly fundamental, there will be continuing demands for it, and indeed that information will often be of importance to new research. For example, Gerhard H. Dieke of Johns Hopkins was a spectroscopist who did not join the rush to nuclear physics. He continued his work on energy levels in molecules. When physicists turned to work on masers and lasers, Dieke and his publications were an invaluable source of information.

Today the latest fads in research enjoy support and attention. In considering priorities for support of research, we should recognize and weigh the desirability of maintaining at least minimal activity in all fundamental fields of science. We should also consider how the present human information network can be made even more effective.—PHILIP H. ABELSON

# Having trouble communicating with the modern generation?

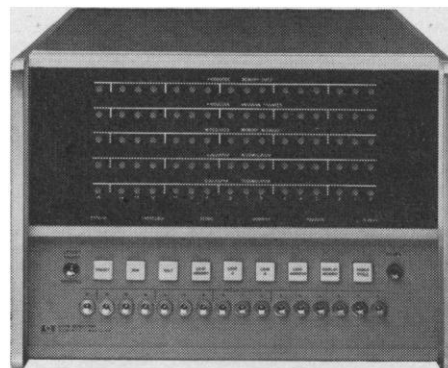
## HP software makes it easy.

Not only do Hewlett-Packard computers speak many common languages, but they also let you change your mind, your program and your equipment configuration—with minimum effort.

HP computers speak three higher level languages: FORTRAN, ALGOL and Conversational BASIC...and in these languages you can perform scientific calculations or converse with the most elaborate instrumentation system.

The compilers are only part of the package. A Basic Control System (BCS) simplifies programming and execution of all I/O operations—permitting device-independent programming. Assemblers (and compilers) generate relocatable code. Communication is easy on the hardware end, too—using standard plug-in cards.

The two computers—the HP 2115A and the 2116A—offer a choice of memory and I/O capacity, and they're completely software compatible. Make it easy on yourself. Call your local HP field engineer for all the details. Or write Hewlett-Packard, Palo Alto, California 94304; Europe: 54 Route des Acacias, Geneva.

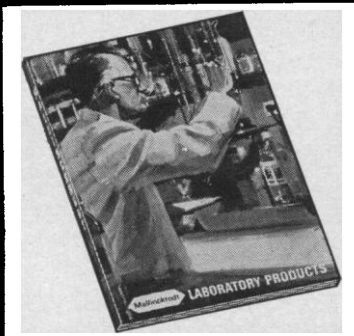


The 2115A Computer has 16-bit words, 2  $\mu$ sec cycle time, 4K memory. Price, including Teleprinter, \$16,500. Additional memory and options available.

HEWLETT  PACKARD

DIGITAL COMPUTERS

# FREE... SIX CATALOGS IN ONE!



Send today for your copy of the new, 1968 Mallinckrodt Laboratory Products Catalog. Contains hundreds of AR reagents (biggest list ever), plus your most-wanted organic reagents; SilicAR and ChromAR products for chromatography; solvents for spectrophotometry, NMR work, and GLC including pesticide residue analysis; plastic labware packed with new ideas and a host of other items—more than 1,000 products in the laboratory chemist's most complete book of tools. Fill out the coupon now.

**Mallinckrodt**®

Mail coupon to:  
Lab Products ICD  
Mallinckrodt Chemical Works  
2nd and Mallinckrodt Streets  
St. Louis, Mo. 63160

NAME \_\_\_\_\_  
COMPANY \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_  
STATE \_\_\_\_\_  
ZIP \_\_\_\_\_

crete antigens in a random population, the concept was derived that these factors were components of a single complex system. Similar conclusions were drawn from linkage studies. In certain families, including those recently studied at the Torino workshop (Torino, Italy, June 1967), the patterns of the isoantigens in the children's leukocytes can be explained on the basis of the inheritance of an "allelic" unit of inheritance from each parent. Further confirmation has come from a comparison of serologic findings with survival of experimental skin grafts exchanged between siblings and from culture reactions. Other isoantigenic systems independent of the main locus have been described. In some of these, the antigens are widely distributed on the tissues; in others, the antigens appear to be restricted to a single cell lineage.

Several names have been proposed for the major locus: Group IV, after the first leukocyte "group" to be detected; Hu-1, for the association shown among ten antigens; Du-1, from the relationship of three complex subgroups; LA, because of the intricate relationship among the four antigens of the LA system; TO, for the antigens detected in Torino; and LC, emphasizing the expression of these antigens on the lymphocyte. Some investigators have used simple numbers. Yet another nomenclature was devised in which each antigen was identified by its cellular or tissue distribution, for example, on platelets or granulocytes, and so forth.

A World Health Organization (WHO) committee is being formed to discuss and formulate terminology. As an interim measure, the investigators listed below, who agreed as a result of discussions held at a meeting at Williamsburg, Virginia, in November 1967, suggest that the major locus be designated HL-A. We hope that this designation will be generally accepted.

Investigators accepting the proposed terminology HL-A for the major locus were: F. H. Allen, D. B. Amos, H. Balner, J. R. Batchelor, W. Bodmer, R. Ceppellini, J. Dausset, V. Eijssvoogel, C. P. Engelfriet, P. Ivanyi, F. Kissmeyer-Neilson, P. Lalazari, S. Lawler, J. J. van Loghem, R. S. Metzgar, V. Miggiano, R. D. Owen, R. Payne, N. Rogentine, J. J. van Rood, P. Terasaki, R. Walford, Ch. M. van der Weerd, and C. M. Zmijewski.

D. B. AMOS

*Department of Microbiology and Immunology, Duke University Medical Center, Durham, North Carolina*



## Why (Almost) Everybody Re-Orders L I REPIPETS and Dilutors

93% of all chemists who buy L/I instruments re-order within 90 days! Here's why: 1. Precision—1% accuracy; 0.1% reproducibility. 2. Time saved—pipeting and diluting time is cut by 50% to 90% for all research analyses. 3. Safety—REPIPETS and Dilutors fit directly on your reagent containers, completely eliminating the hazards of mouth pipeting and the dangerous transfer of reagents. 4. No clean-up—the instruments are self-cleaning. 5. You can handle any liquid—acids, concentrated alkalis, volatile solvents, chlorinated hydrocarbons, etc. 6. No cross-contamination. 7. Air filters keep reagents pure. 8. Complete selection—REPIPETS and Dilutors are supplied in 1, 5, 10, 20, and 50 ml sizes. REPIPETS \$47.50, Automatic Dilutors \$89.50. For 4-minute water determinations in the range 1 ppm to 100% water, use Labindustries Aquametry apparatus. \$295, including reagent. Join the 93% Club! Please write for more information.

**LABINDUSTRIES**

1802 H Second St.  
Berkeley, Calif. 94710  
Phone (415) 843-0220