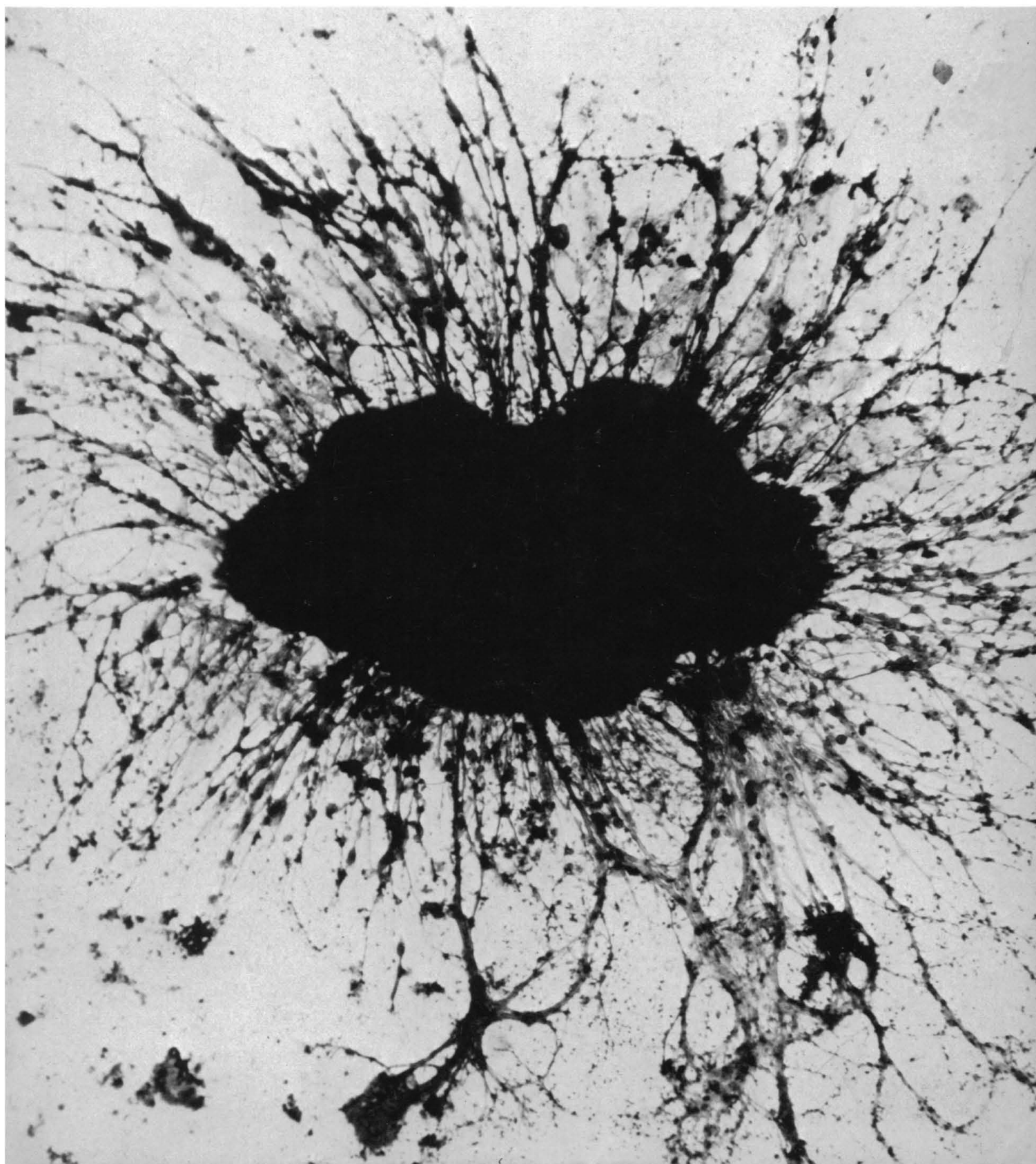


# SCIENCE

31 October 1969

Vol. 166, No. 3905

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





## Radioactive enzymes ... new tools for biochemical research from Worthington

The first radioactive enzymes in other-than-custom quantities now are available from Worthington Biochemical Corporation. They give the life scientist some new, precise, and versatile tools for his investigative work.

The Worthington group of radioactive biochemicals is comprised at present of seven hydrolytic enzymes which are currently receiving considerable investigative attention. They include radioactive ribonuclease, pepsin, chymotrypsin, lysozyme, deoxyribonuclease, trypsin, and collagenase. Four radioactive substrates—deoxyribonucleic acid, ribonucleic acid, soybean trypsin inhibitor and  $\alpha$ -casein—also are included in the product line.

The Worthington radioactive enzymes offer the researcher advantages of sensitivity, specificity, and convenience:

- with radioactivity levels ranging from 3 to 30  $\mu$ C/mg, the enzymes can be detected with much greater sensitivity than is allowed by current procedures.
- radiation detection and quantitation with standard laboratory scintillation counters is simple and rapid.
- the presence of radioactive enzymes can be detected despite their being inactivated or inhibited.

Worthington assay data indicate that the radioactive label is on the individual amino acid molecules making up the enzyme. This avoids complications of using iodination or other "external" labels. That the enzyme remains catalytically active is analytically established.

See what impact internally-labeled enzymes can have on your work. Write for product literature, technical data and working sample.



**Worthington Biochemical Corporation**  
Freehold, New Jersey 07728

Please send information on  
radioactive enzymes.

Name

Title

Institution

Address

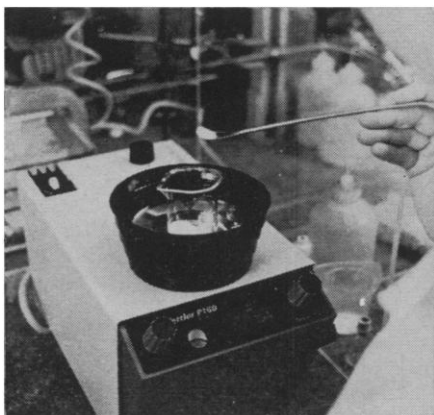
City

State  Zip



# Mettler fits economy plus performance into your balance budget.

Want weighing performance, but worried about exceeding your budget? Here are 38 solutions to the balance buyer's dilemma. Mettler's 16 top-loading and 22 analytical balances.



## **SPEED + PRECISION = PERFORMANCE**

Our top-loaders are tops when it comes to speed and weighing ease. Put the sample on the pan. Then read the weight. If you are filling a container to a target weight, Mettler's helpful filling guide shows the approximate weight on the pan throughout the filling . . . without interruptions.

Newest of the Mettler top-loaders is Model P162. It weighs up to 160 g with a precision of  $\pm 1$  mg and features 10-g taring ability. Like other Mettler top-loaders, it provides digital and analog readout. Your new personnel will get the same precise results as the old hands in the department.

## **MANY TO CHOOSE FROM**

Select the balance you need for your work from one of our top-loaders. We have one that weighs to 10 kg; another that takes arithmetic out of weight loss studies. Some automatically compensate for changes in level. All will carry out five types of weighings. Weighing unknowns. Check-weighing. Weighing-in. Batching. Weighing objects below the balance.

## **THE ECONOMICAL ANALYTICALS**

One of the major features of all Mettler analytical balances is the impressive precision-capacity ratio. Take our low-cost Model H10. It weighs to 0.1 mg over the 0 to 160-g range. That's one part in 1,600,000.

You get two balances for the price of one with our Mettler Model H20. It combines the capacity of a macro analytical with the precision of a semi-micro. Some Mettler analyticals give an instant reading of the approximate weight on the pan. We call this feature preweighing.

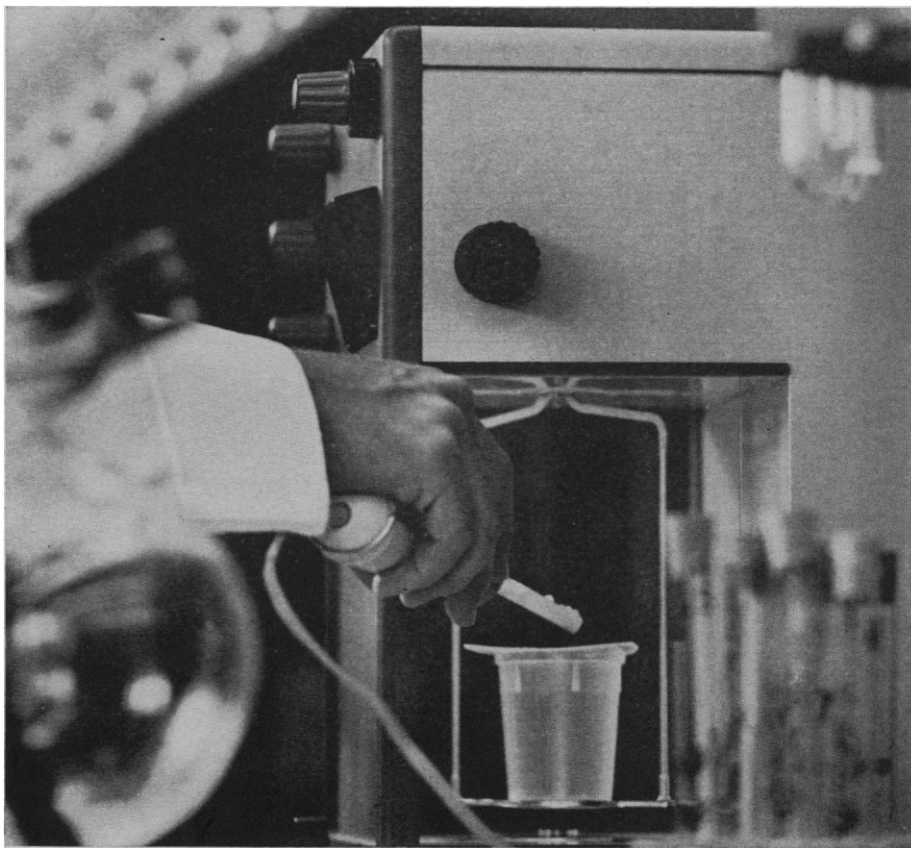
## **WEIGHT WATCHING MADE EASY**

With digital readout—standard on many Mettler analyticals—you'll weigh with unsurpassed speed, convenience and accuracy. A filling guide

cuts your weighing-in time by 50 percent. Optical taring allows you to compensate for container weights.

Need clearly printed records of your weighings? Check our Models H10P and H20P which print out results on adhesive-backed paper. Then there's our sophisticated H20E electronic. As it weighs, it generates an analog signal which can be fed to compatible instrumentation such as recorders. The H20E can also be interfaced with computer or other control equipment to continuously monitor and keep weight changes within predetermined limits.

There are more: from our \$550 basic balance that's ideal for classroom use to our \$2,550 ultra-micro with  $\pm 0.1$  microgram precision.



Write Mettler Instrument Corporation, 20 Nassau Street, Princeton, New Jersey 08540

**METTLER®**

31 October 1969

Vol. 166, No. 3905

# SCIENCE

<b>LETTERS</b>	Youthful Activism: Who Is To Be Faulted?: <i>L. S. Minckler; M. Hare</i> ; America's Legacies to Europe: <i>A. B. Mason</i> ; Lead Poison in Putty: <i>A. M. Aronow</i> ; Sequoias' Dependence on Fire: <i>R. J. Hartesveldt et al.</i> ; Comparative Pathology: <i>R. W. Leader</i> .....	551
<b>EDITORIAL</b>	Energy for Man and Environmental Protection: <i>P. Sporn</i> .....	555
<b>ARTICLES</b>	Settlement, Farming Technology, and Environment in the Nochixtlan Valley: <i>R. Spores</i> .....	557
	Delayed Radiation Effects in Atomic-Bomb Survivors: <i>R. W. Miller</i> .....	569
	The Computer and Individualized Instruction: <i>W. W. Cooley and R. Glaser</i> .....	574
<b>NEWS AND COMMENT</b>	A Surplus of Scientists? The Job Market Is Tightening .....	582
	Behavioral and Social Sciences: NAS Report Stresses Applications .....	585
	Denmark: A Late but Hurrying Entry in Science Policy Planning .....	586
	Criminal Justice R&D: New Agency Stresses Police over Corrections .....	588
<b>BOOK REVIEWS</b>	<i>Peregrine Falcon Populations</i> , reviewed by <i>G. H. Lowery, Jr.</i> ; other reviews by <i>E. O. Wilson, B. K. Gilbert, A. E. Dimond, J. W. Hastings, D. Redfield, A. J. Dessler, S. N. Davis, R. L. Duncombe</i> .....	591
<b>REPORTS</b>	Pioneer 6: Measurement of Transient Faraday Rotation Phenomena Observed during Solar Occultation: <i>G. S. Levy et al.</i> .....	596
	Superior Conjunction of Pioneer 6: <i>R. M. Goldstein</i> .....	598
	Seismic Activity and Faulting Associated with a Large Underground Nuclear Explosion: <i>R. M. Hamilton, F. A. McKeown, J. H. Healy</i> .....	601
	Freshwater Ferromanganese Concretions: Chemistry and Internal Structure: <i>R. C. Harriss and A. G. Troup</i> .....	604
	Particle Track Enhancement in Cellulose Nitrate by Application of an Electric Field: <i>H. Crannell et al.</i> .....	606
	Alaskan Upper Miocene Marine Glacial Deposits and the <i>Turborotalia pachyderma</i> Datum Plane: <i>O. L. Bandy, E. A. Butler, R. C. Wright</i> .....	607
	Topological Inconsistency of Continental Drift on the Present-Sized Earth: <i>R. Meservey</i> .....	609
	Shallow Scattering Layer in the Subarctic Pacific Ocean: Detection by High-Frequency Echo Sounder: <i>W. E. Barraclough, R. J. LeBrasseur, O. D. Kennedy</i> .....	611

## BOARD OF DIRECTORS

WALTER ORR ROBERTS  
Retiring President, Chairman

H. BENTLEY GLASS  
President

ATHELSTAN SPILHAUS  
President-Elect

RICHARD H. BOLT  
BARRY COMMONER

HUDSON HOAG  
GERALD HOLTO

## VICE PRESIDENTS AND SECTION SECRETARIES

MATHEMATICS (A)  
Mark Kac  
F. A. Ficken

PHYSICS (B)  
Nathaniel H. Frank  
Albert M. Stone

CHEMISTRY (C)  
Charles G. Overberger  
Leo Schubert

ASTRONOMY (D)  
John W. Fidor  
Frank Bradshaw Wood

ANTHROPOLOGY (H)  
Jesse D. Jennings  
Anthony Leeds

PSYCHOLOGY (I)  
Wendell R. Garner  
William D. Garvey

SOCIAL AND ECONOMIC SCIENCES (K)  
Sheldon and Eleanor Glueck  
Harvey Sapolsky

HISTORY AND PHILOSOPHY OF SCIENCE (L)  
Loren C. Eiseley  
Raymond J. Seeger

PHARMACEUTICAL SCIENCES (Np)  
Joseph P. Buckley  
Joseph A. Oddis

AGRICULTURE (O)  
T. C. Byerly  
Michael A. Farrell

INDUSTRIAL SCIENCE (P)  
Gordon K. Teal  
Burton V. Dean

EDUCATION (Q)  
R. Will Burner  
J. Myron Atkin

## DIVISIONS

### ALASKA DIVISION

Victor Fischer  
President

Irma Duncan  
Executive Secretary

### PACIFIC DIVISION

William C. Snyder  
President

Robert C. Miller  
Secretary

### SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION

Newell A. Younggren  
President

Marlowe G. Anderson  
Executive Secretary

SCIENCE is published weekly on Friday and on the fourth Tuesday in September by the American Association for the Advancement of Science, 1515 Massachusetts Ave., Washington, D.C. 20005. Now combined with *The Scientific Monthly*. Second-class postage paid at Washington, D.C. Copyright © 1969 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 *Guide to Scientific Instruments*, 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 return address label. SCIENCE is indexed in the *Reader's Guide to Periodical Literature*.

# AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Seawater Teleosts: Evidence for a Sodium-Potassium Exchange in the Branchial Sodium-Excreting Pump: <i>J. Maetz</i> .....	613
Trypsin and Papain Covalently Coupled to Porous Glass: Preparation and Characterization: <i>H. H. Weetall</i> .....	615
Artificial Placenta: Two Days of Total Extrauterine Support of the Isolated Premature Lamb Fetus: <i>W. M. Zapol et al.</i> .....	617
Inhibition of Hydroid Aging in <i>Campanularia flexuosa</i> : <i>S. E. Toth</i> .....	619
Carcinogen-Induced Immune Depression Absence in Mice Resistant to Chemical Oncogenesis: <i>O. Stutman</i> .....	620
Cytochrome $a_3$ : Destruction by Light: <i>B. Epel</i> and <i>W. L. Butler</i> .....	621
Thrombin-Induced Release of Calcium from Blood Platelets: <i>E. H. Mürrer</i> .....	623
Alcohol Dehydrogenase in Maize: Genetic Basis for Isozymes: <i>J. G. Scandalios</i> .....	623
Postsynaptic Inhibition: Intracellular Effects of Various Ions in Spinal Motoneurons: <i>H. D. Lux</i> and <i>P. Schubert</i> .....	625
A Molecular Basis for Heterosis: <i>D. Schwartz</i> and <i>W. J. Laughner</i> .....	626
Alcohol Metabolism: Role of Microsomal Oxidation in vivo: <i>T. R. Tephly</i> , <i>F. Tinelli</i> , <i>W. D. Watkins</i> .....	627
Phosphorylation of Dipteran Chromosomes and Rat Liver Nuclei: <i>W. B. Benjamin</i> and <i>R. M. Goodman</i> .....	629
Axonal Outgrowth and Cell Migration in vitro from Nervous System of Cockroach Embryos: <i>J. S. Chen</i> and <i>R. Levi-Montalcini</i> .....	631
Cortisol Induction of Growth Hormone Synthesis in a Clonal Line of Rat Pituitary Tumor Cells in Culture: <i>P. O. Kohler et al.</i> .....	633
Bivalve Mollusk Burrowing Aided by Discordant Shell Ornamentation: <i>S. M. Stanley</i> .....	634
Ontogeny of Adrenergic Arousal and Cholinergic Inhibitory Mechanisms in the Rat: <i>B. A. Campbell</i> , <i>L. D. Lytle</i> , <i>H. C. Fibiger</i> .....	635
<i>Technical Comments</i> : Dendritic Spikes Revisited: <i>W. H. Calvin</i> ; Cable Theory and Gross Potential Analysis: <i>D. Hellerstein</i> ; Gene Regulation in Higher Cells: <i>C. H. Waddington</i> ; Marihuana and Simulated Driving: <i>H. Kalant</i> ; <i>A. Crancer, Jr.</i> ....	637

## ASSOCIATION AFFAIRS

AAAS Annual Meeting: Two Musical Events; Tours; Special Exhibits; Educational Exhibits, Science Film Theater, Special Events .....	641
Technology Assessment and Human Possibilities: <i>R. A. Carpenter</i> ; Pattern Perception: <i>P. C. Vitz</i> ; Youth: Ego Ideals and the Impact of Culture: <i>H. M. Serota</i> .....	653
Courses .....	657

W. A. S. REES	H. BURR STEINBACH	WILLIAM T. GOLDEN	DAEL WOLFLE
EDWARD M. RIESER	KENNETH V. THIMANN	Treasurer	Executive Officer

<b>BIOLOGY AND GEOGRAPHY (E)</b> Richard H. Mahard William E. Benson <b>ENGINEERING (M)</b> Paul Rosenberg Herman A. Hall <b>FORMATION AND COMMUNICATION (T)</b> Paul B. Baker Helen E. Stewart	<b>ZOOLOGICAL SCIENCES (F)</b> David Bishop David E. Davis <b>MEDICAL SCIENCES (N)</b> Allan D. Bass F. Douglas Lawrason <b>STATISTICS (U)</b> Ezra Glaser Rosedith Sitgreaves	<b>BOTANICAL SCIENCES (G)</b> William A. Jensen Arthur W. Cooper <b>DENTISTRY (Nd)</b> Robert S. Harris Richard S. Manly <b>ATMOSPHERIC AND HYDROSPHERIC SCIENCES (W)</b> Robert M. White Louis J. Battan
---	--	---

## COVER

Intact brain of a 16-day-old embryo of cockroach *Periplaneta americana* after 2 weeks of culture. Nerve fiber outgrowth and cell migration from the entire brain circumference appear (about  $\times 700$ ). See page 631. [Rita Levi-Montalcini, Washington University, St. Louis, Missouri]

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 prove 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.

# WANG 700



## Calculator or computer?

It's compact enough to be a calculator, thanks to the most advanced integrated circuit technology. But who ever heard of a calculator with 960 step programming capability? Or one with an 8192-bit magnetic core memory organized as 120 data registers, each of which can add, subtract, multiply and divide like 120 individual calculators? The 700 is very computer-like in its ability to loop, branch, do subroutines and make decisions. But unlike most computers, you don't have to wait to get on-line and you don't have to know a special language to use it. You'll get calculator-like convenience from its instantaneous dual NIXIE® display for both X and Y registers and computer-like efficiency from an optional automatic typewriter. You can use the 700 to conquer large and small numbers from  $10^{+98}$  to  $10^{-100}$ , to invert a  $10 \times 10$  matrix, or to perform special functions like bond yields, life expectancy, nuclear half-life, or process formulas. It will execute + and - functions in  $300 \mu\text{sec}$ ,  $\times$  and  $\div$  in 3 to 5 msec.  $\text{Log}_e^x$  and  $e^x$  in 17 to 35 msec and trig functions in 250 msec. The 700 can give you the right answer to a complex statistical, financial, or scientific problem before an ordinary calculator understands it or a full-scale computer is even aware of it.

To simplify matters we're calling the 700 an electronic calculator, because who ever heard of a computer for \$4900? \*



Dept. 10Q, 836 North St.,  
Tewksbury, Massachusetts 01876  
Tel. 617 851-7311

### SALES/SERVICE OFFICES

<b>Alabama</b> (205) 881-5360	<b>New Jersey</b> (201) 272-7160
<b>Arizona</b> (602) 274-2110	<b>New Mexico</b> (505) 265-5608
<b>Arkansas</b> (501) 666-7115	<b>New York</b> (212) 682-5921
<b>California</b> (213) 776-2985 (714) 276-8464 (415) 692-0584 (805) 962-6112	(516) 437-2500 (518) 463-8877 (716) 381-5440 (315) 463-9770
<b>Colorado</b> (303) 364-7361	<b>North Carolina</b> (919) 272-5683
<b>Connecticut</b> (203) 288-8481	<b>Ohio</b> (216) 331-6525 (614) 488-9753
<b>Florida</b> (305) 841-3691 (305) 563-8458 (813) 872-7347	(216) 333-6611 (513) 531-2729
<b>Georgia</b> (404) 633-6327	<b>Oregon</b> (206) 525-2000
<b>Hawaii</b> (808) 536-5359	<b>Oklahoma</b> (405) 524-4489 (918) 743-2571
<b>Illinois</b> (309) 674-8931 (312) 297-4323	<b>Pennsylvania</b> (215) 642-4321 (717) 236-4782 (401) 421-0710 (412) 366-1906
<b>Indiana</b> (317) 631-0909	<b>Tennessee</b> (615) 266-5055 (615) 889-1408 (615) 524-8648 (901) 327-8241
<b>Iowa</b> (515) 288-5991	<b>Texas</b> (915) 683-3304 (512) 454-4324 (214) 361-7156 (915) 565-9927 (713) 666-2451 (214) 758-1810
<b>Kansas</b> (316) 262-1388	<b>Utah</b> (801) 487-2551
<b>Kentucky</b> (502) 426-1116	<b>Virginia</b> (703) 595-6777 (703) 359-6320
<b>Louisiana</b> (504) 729-6858	<b>Washington</b> (206) 525-2000
<b>Maryland</b> (301) 588-3711 (301) 821-8212	<b>West Virginia</b> (304) 344-9431
<b>Massachusetts</b> (617) 851-7311 (617) 542-7160	<b>Wisconsin</b> (608) 255-4411 (414) 442-0160
<b>Michigan</b> (313) 352-7112 (616) 454-4212 (517) 835-7300	<b>Wyoming</b> (303) 364-7361
<b>Minnesota</b> (612) 881-5324	
<b>Mississippi</b> (601) 875-5588	
<b>Missouri</b> (816) 444-8388 (314) 727-0256	
<b>Nevada</b> (702) 322-4692	

\* Price in Continental U.S.A.

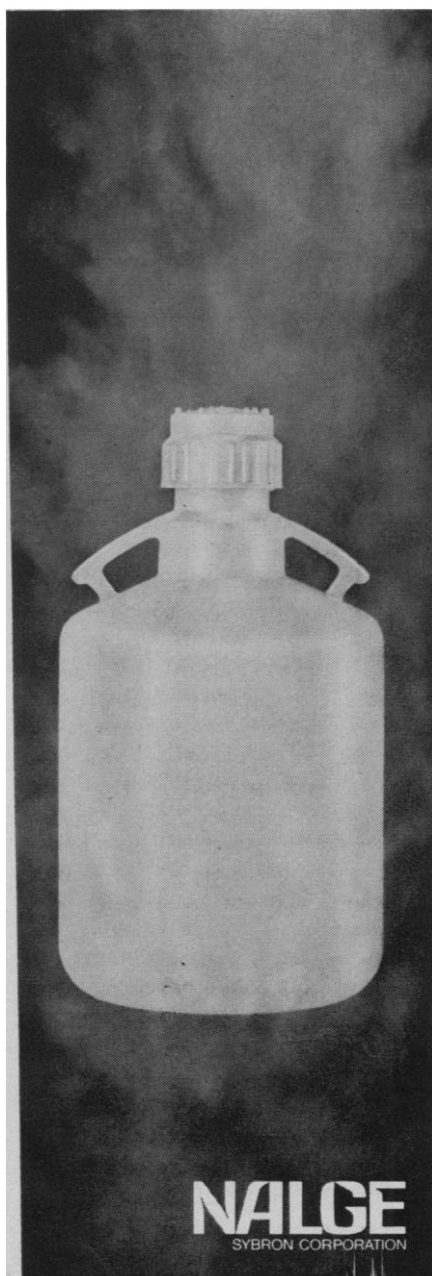


# Autoclavable

## ...the extra dimension

Use the new Nalgene® Carboy to prepare, store, and autoclave 5-gallon batches of culture media, distilled water, and other solutions. This carboy (Cat. No. 2250) is precision molded of heavy-duty polypropylene to withstand repeated autoclaving. Only 2½ pounds light, has screw closure and two carrying handles for maximum safety and convenience.

Specify Nalgene Labware from your lab supply dealer. Ask for our Catalog or write Dept. 21101, Nalgene Labware Division, Rochester, N.Y. 14602.



It may turn out, then, that Europe seems to have good solutions to problems because she hasn't really had the problems. Certainly there are many others in which Europe has lived with the situation longer than we have, and really has the answers. But I suspect we will find fewer of these, and more of the former, than either we or the Europeans expect at the present time.

ALFRED B. MASON  
136 Flushing Avenue, New York 11251

### Lead Poison in Putty

Oberle's article "Lead poisoning: A preventable childhood disease of the slums" (5 Sept., p. 991) contains some errors of omission. Not only has titanium dioxide been used as an opacifier since the 1940's, but previously zinc sulfide pigments (such as lithopone) were used for a number of years. Kalsomine has also been used for many years for very cheap paint jobs.

However, the most serious omission is the failure to mention the most important lead hazard to all children: old sticks of glazing putty. Anyone who has repainted housing, where windows have been installed in wooden frames, has had to replace defective putty, which is brittle and comes loose from the window, often in sticks 1 to 4 or 5 inches long. This putty contains a high percentage of lead; the dry sticks resemble lollipops or candy bars and children will suck on them or chew them. I think that a thorough study of this problem will show that glazing putty is far more of a hazard than paint as a cause of lead poisoning in children.

ALBERT M. ARONOW  
P. O. Box 3548, Terminal Annex,  
Los Angeles, California 90054

### Sequoias' Dependence on Fire

We were greatly pleased to read Oberle's commentary on the ecological drawbacks of forest suppression (8 Aug., p. 568), and we appreciate your assistance in changing the long-standing American philosophy that all fire in the forest is bad. The concept of fire as a natural environmental factor before the advent of man has been a most difficult one to establish. Perhaps this has been due to man's role in starting forest fires and perhaps to the fact that man has too long been inclined to see trees as

individuals rather than as dynamic communities in which fire has always played a significant role.

Inasmuch as we are engaged in a 10-year study of the relationship of fire to sequoia regeneration, some of our findings may be of interest. It became evident that long-time fire prevention and suppression had created two conditions in many of the national park sequoia groves, both of which were contrary to established park policy:

1) Fuels, once consumed by regular fires, had accumulated to unprecedented amounts, presenting uncommonly great fire hazards.

2) Plant succession, which was previously reversed by fire, had progressed in most groves to the point that the giant sequoia was almost completely unsuccessful in reseeding itself. Where protection is complete, there is a tendency for the sequoia to disappear.

We recommended to the National Park Service that fire be used on an experimental basis, primarily to determine just what the optimum conditions for sequoia regeneration were. In March 1964, four study areas were approved by NPS for our use in the Redwood Mountain Grove of Kings Canyon National Park. Few young sequoias were growing on any of the areas. It became abundantly evident that accumulations of fuel on three of the four areas were so great as to preclude broadcast burning. At these areas, it was necessary to pile logs and limbs by machine. In addition to increasing the costs, the machinery greatly disturbed the natural soil conditions we wished to study. We discovered, however, that where light and soil moisture conditions were adequate, seedling establishment tended to be proportional to the intensity of the fire. In short, seedling survival was better in burn pile soils where incineration temperatures penetrated several inches into the soil. Such temperatures probably aided in sterilization against pathogenic fungi, reduced competition with established plants, improved the soil wetability and structure, and may have removed ectocrines. But this created a problem of controlling fires of sufficient intensity to provide conditions for sequoia regeneration while still protecting the primary resources—the parent giant sequoias and other valuable species making up the community.

Recently, the administration of Sequoia and Kings Canyon National Park began a fuel reduction program in one of the critical areas of the Redwood Mountain Grove. Under carefully prescribed

conditions for burning, ground fuels could be reduced effectively and cheaply and, at the same time, create sufficiently hot spots of fire to provide good reseeding conditions for sequoia. This initial plan involves about 35 acres. While this may seem like a modest beginning, it is a beginning and the NPS stands to learn much, both about burning techniques, and the ecology of the giant sequoia.

The NPS is now recognized as one of the leaders in accepting fire as a manipulative tool in land management. While we do not advocate fire as a panacea for forest problems, we do feel that it has useful applications in many situations.

RICHARD J. HARTESVELDT  
H. THOMAS HARVEY  
HOWARD S. SHELLHAMMER  
RONALD E. STECKER

*Department of Biological Sciences,  
San Jose State College,  
San Jose, California 95114*

### Comparative Pathology

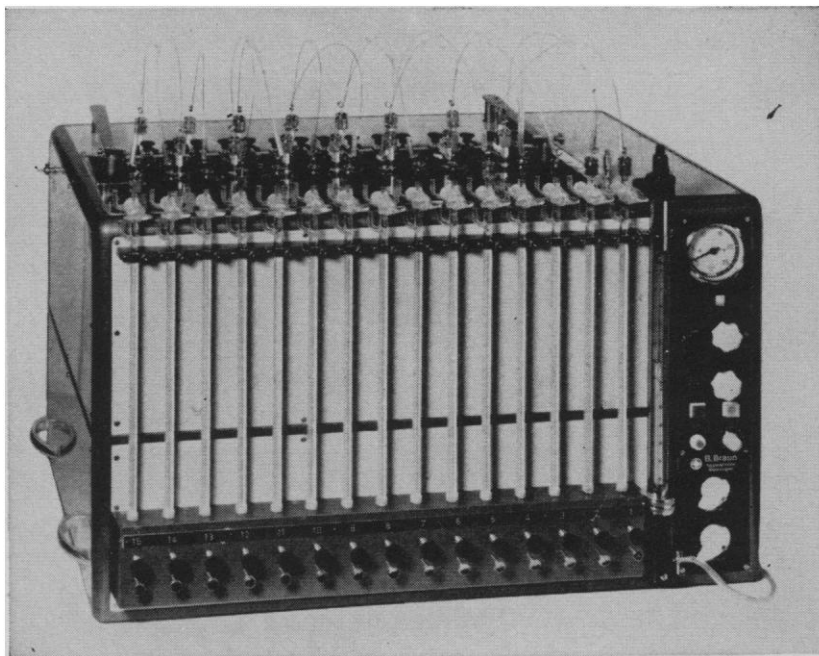
The Registry of Comparative Pathology has been established at the Armed Forces Institute of Pathology as a part of the American Registry of Pathology. This new registry is operated jointly by the Armed Forces Institute of Pathology and Universities Associated for Research and Education in Pathology. The objective of the center is to serve as an information exchange for scientists interested in the study of animal models of human disease and other aspects of comparative pathobiology. Information will be gathered about primates, domestic animals, such as horses and cattle, zoo animals, laboratory animals, fish, birds, and, to some extent, invertebrates.

A news bulletin will be published, beginning in October 1969, to describe the activities of the Registry of Comparative Pathology. This will be available without charge to scientists throughout the world. Those interested in receiving this bulletin should request it from the Registrar, Registry of Comparative Pathology, Armed Forces Institute of Pathology, Washington, D.C. 20305.

Members of the advisory committee of the Registry of Cooperative Pathology are: Robert W. Wissler, T. C. Jones, Kurt Benirschke, Robert W. Leader, Donald B. Hackel, and Robert W. Squire.

ROBERT W. LEADER  
*Rockefeller University, New York 10021*

# Gas Exchange Studies? THE WARBURG RESEARCH MODEL UFL



— the newest answer from Bronwill

- 15 stations with stationary manometers, shaking flasks
- flexible stainless steel capillaries couple fixed manometers to shaking flasks — you can read the manometers while the flasks are shaking
- all components of each manometric system are interchangeable — and pre-calibrated
- complete system is impermeable to all gases
- cold light illumination for studies of photosynthesis
- shaking frequency and amplitude continuously variable
- bath uniformity better than  $\pm 0.01^\circ\text{C}$
- fully solid state electronics
- all controls — including contact thermometer — grouped at eye level

*Ask your Bronwill dealer for a demonstration and for your copy of the new catalog which describes the complete line of Warburg instrumentation. Or write directly to us.*



**BRONWILL SCIENTIFIC, INC.**

*A leader in scientific instrumentation*  
Box 7824 — Rochester, New York 14606





**Pick a slide.**

**You can show them all—and without any danger to the slide—on the new Prado Universal slide projector.**

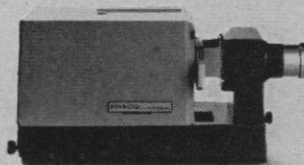
You can do things with the new PRADO® UNIVERSAL that you can't do with any other projector on the market. It takes a wide variety of attachments so you can use it as a slide projector for 18 x 24 mm, 24 x 36 mm and 2¼" x 2¼" slides. And also as a microprojector, a microprojector with a horizontal stage for projecting wet mounts, a macroprojector and a projector for polarized light microscopy.

THE PRADO UNIVERSAL takes Leitz projection lenses from 35 to 300 mm. Has 5 objective lenses for the projection of microscope slides (the previous model had 3). Has a high-intensity 250 watt tungsten halogen lamp that gives just as much light as a 500 watt lamp, but much less heat—to

protect slides. This new lamp has better color temperature for truer rendition. And lasts twice as long as an ordinary projection lamp and never blackens; you get full light output for the entire life of the lamp.

Of course, the superb Leitz optics of the PRADO UNIVERSAL mean slides projected with all the brilliance and definition of the original; with a flatter field of view and no distortion at the edges.

For more information, write:



**Leitz**

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

72469

**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****1969**

EMIL HAURY	KENNETH S. PITZER
WILLARD F. LIBBY	ALEXANDER RICH
EVERETT I. MENDELSON	CLARENCE M. ZENER
JOHN R. PIERCE	

**1970**

GUSTAF O. ARRHENIUS	RICHARD C. LEWONTIN
FRED R. EGGAN	ALFRED O. C. NIER
HARRY F. HARLOW	FRANK W. PUTNAM
MILTON HARRIS	

**Editorial Staff****Editor**

PHILIP H. ABELSON

**Publisher**

DAEL WOLFLE

**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:** JOHN WALSH**Foreign Editor:** DANIEL S. GREENBERG\***News and Comment:** LUTHER J. CARTER, BRYCE NELSON, PHILIP M. BOFFEY, MARTI MUELLER, JOEL R. KRAMER, SCHERRAINE MACK**Research Topics:** ROBERT W. HOLCOMB**Book Reviews:** SYLVIA EBERHART

**Editorial Assistants:** JOANNE BELK, ISABELLA BOULDIN, ELEANORE BUTZ, LINDA FARMER, GRAYCE FINGER, NANCY HAMILTON, OLIVER HEATWOLE, ANNE HOLDSWORTH, PAULA LECKY, KATHERINE LIVINGTON, VIRGINIA NUSSLE, PATRICIA ROWE, LEAH RYAN, LOIS SCHMITT, BARBARA SHEFFER, RICHARD SOMMER, YA LI SWIGART, ALICE THEILE, MARLENE TUCKER

\* **European Office:** 22 Mulberry Walk, London, S.W. 3, England (Telephone: 352-9749)

**Advertising Staff****Director**

EARL J. SCHERAGO

**Production Manager**

KAY GOLDSTEIN

**Advertising Sales Manager:** RICHARD L. CHARLES

**Sales:** NEW YORK, N.Y. 10036: Robert S. Bugbee, 11 W. 42 St. (212-PE-6-1858); SCOTCH PLAINS, N.J. 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); MEDFIELD, MASS. 02052: Richard M. Ezequelle, 4 Rolling Lane (617-444-1439); CHICAGO, ILL. 60611: Herbert L. Burklund, Room 2107, 919 N. Michigan Ave. (312-DE-7-4973); BEVERLY HILLS, CALIF. 90211: Winn Nance, 111 N. La Cienega Blvd. (213-657-2772)

**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. See also page 7, *Science*, 4 July 1969. **ADVERTISING CORRESPONDENCE:** Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE-6-1858.

**Energy for Man and Environmental Protection**

Recently, the expansion of electric-power-generating capacity has been stopped or delayed at a growing number of points in the United States. These delays are a result of well-intentioned activities that have caused rising public anxiety about the environmental impact of the operation of electric generating stations and, particularly, of atomic generating plants. This concern has solid basis, and in the long run can prove to be socially beneficial.

But concern over environmental effects has now reached a point where those charged with the responsibility of maintaining the needed growth in the energy supply find themselves unable to carry on effectively. Progress on developing hydraulic energy sources is stalled due to concern for the landscape; management is inhibited from constructing fossil-fuel generating plants due to considerations of atmospheric pollution, and in some localities cannot either construct, or operate after construction, atomic energy sources because of concern about the release of radioactive substances to the atmosphere and to water. Another cause for delay is objection to the thermal pollution of the water bodies utilized to condense the exhaust steam. Because of delays in the installation of new generating capacity many major power grids are without comfortable reserves to meet emergencies. And if this opposition to expanding our electric energy supply continues, surely we are going to bring about a catastrophic situation. This we simply must avoid. The implication this carries for our national policy is clear. A major effort is called for to make possible continuing and expanding use of energy by man and to assure compatibility of this energy with a healthy environment.

Three distinct segments of our society need to join in this long-term effort. Foremost is the government of the United States. Through its legislative and executive branches it needs to give leadership in research to evaluate the effects of the polluting phenomena and to develop both remedial devices and alternatives such as new sources of energy (for example, controlled nuclear fusion), new methods of conversion, new methods of shielding, and new safety measures and devices.

The scientific and technological community has a vital role to play. It, above all others, is in a position to appreciate the importance to the future of our society of placing no obstacles in the way of providing adequate energy. And it must rise to the social challenge of achieving, through knowledge enhanced by research, compatibility between expanding use of energy and environmental health.

The managers of the energy-producing industries must assume their share of the heavy burden of responsibility for maintaining a clean environment, but they must do so without sacrificing efficiency, prudent investment, and responsibility for continuity of production. There is no real occasion for panic provided we set about the task with vigor and determination. Neither is there any need to doubt the feasibility of obtaining both increased energy for man and environmental protection. It may be difficult, but the two are, or can be made, compatible. —PHILLIP SPORN, *Member, National Academy of Sciences and National Academy of Engineering; former President (1947–61) of American Electric Power Co.*

# AAAS Symposium Volumes

## #89. Biology of the Mouth

1968. 320 pages. Editor: Philip Person. A collection of comprehensive, multidisciplinary articles dealing with problems of the biology of the mouth and oral disease and also the borderlands where fundamental approaches and investigations in physics and chemistry relate to, and can be brought to bear on, such problems.

Price: \$10.00. AAAS Member's Cash Price: \$8.75.

## #88. Folk Song Style and Culture

1968. 384 pages. A Staff Report on Cantometrics. Alan Lomax. The book affirms that song characteristics trace the main paths of many cultures; it also shows that specific qualities of song performance are directly related to identifiable attributes of ancient, modern, and primitive cultures.

Price: \$16.75. AAAS Member's Cash Price: \$14.50.

## #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; 2nd printing, 1968. 776 pages. Editor: George H. Lauff. The first comprehensive collection of scientific papers covering the comparatively new field of estuarine research. "Estuaries is recommended; it is likely to be the reference compendium on the subject for many years to come." (*Geotimes*, May-June 1968)

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

## #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; 2nd printing, 1968. 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; 2nd printing, 1967. 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.

## #67. Oceanography

1961; 5th printing, 1969. 665 pages, 146 illustrations. Editor: Mary Sears. A collection of 30 papers presented at the first International Oceanographic Congress by world-renowned authorities. An interdisciplinary reference that deals with some of mankind's most profound questions . . . the origin and history of living things, for example, and the history of our galaxy as recorded in marine sediments. Of interest to both the scientist and the layman concerned with oceans as a potential source of food for an overcrowded planet, the influence of oceans on our weather, and other similar phases of oceanography.

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 . . .

89	88	87
86	85	84
83	81	80
79	78	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*.