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23 April 1976

Volume 192, No. 4237

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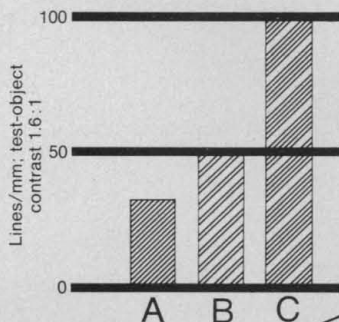
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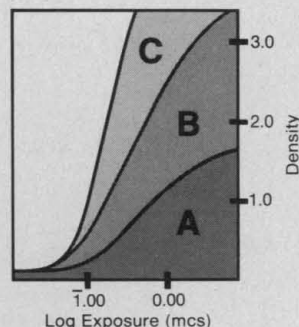
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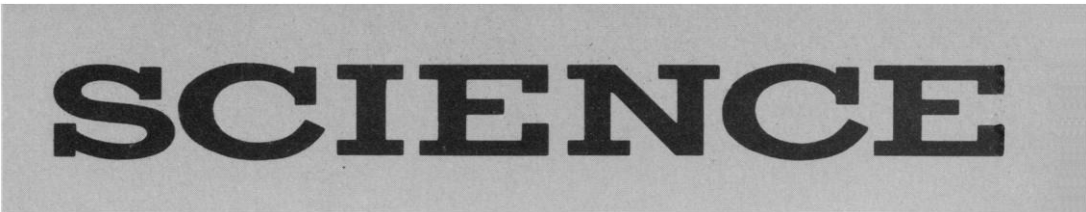
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## COVER

"Pincushion grid." Note the illusion of criss-crossing diagonal white lines, which are intensified by rotating the cover 45 degrees. See page 389. [R. A. Schachar, Texoma Eye Institute, Denison, Texas 75020]

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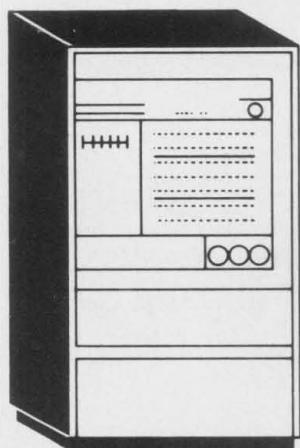
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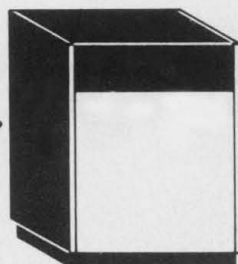
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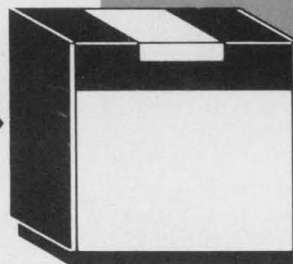
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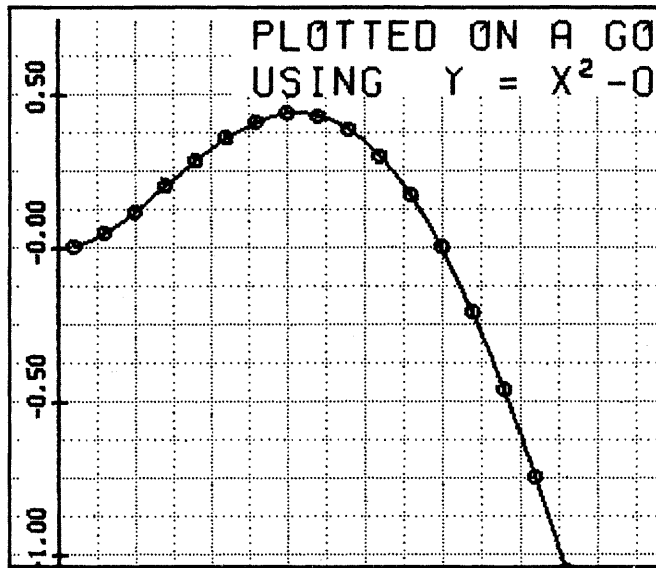


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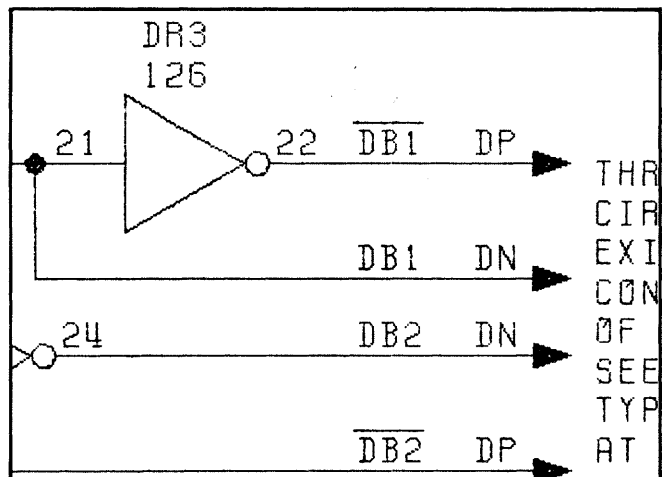
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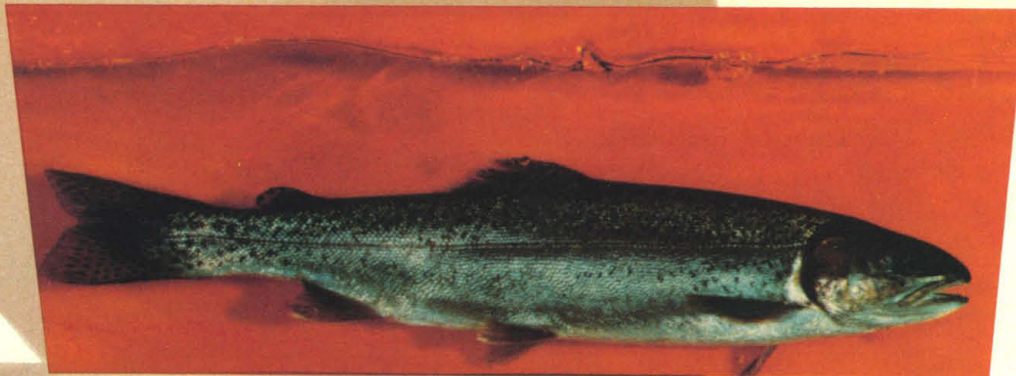
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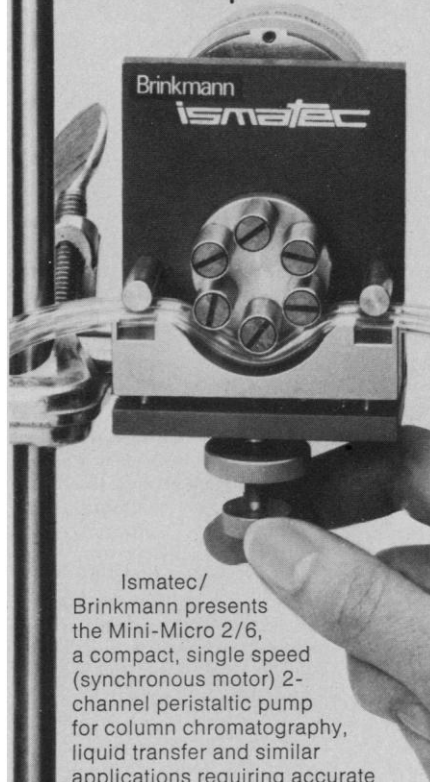
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## LETTERS

### EPA Pesticides Regulation

In his article "Pesticides: Three EPA [Environmental Protection Agency] attorneys quit and hoist a warning flag" (News and Comment, 19 Mar., p. 1155) Luther J. Carter seems to have fallen into the trap of journalistic sensationalism, something which should not be tolerated in a scientific journal. Carter should have done the necessary research to write an article which described the dilemmas of pesticide regulation and the honest struggle to reach sound solutions. Simply to put the white hats on the quitting lawyers and the black hats on the indecisive and fumbling bureaucrats serves little purpose.

What then are some of the real problems? First, scientific knowledge is incomplete on such questions as how to unequivocally identify carcinogens and how to translate laboratory results to the human experience, both with regard to species differences as well as exposure rates.

Second, there is a difference between the legal and the scientific approach to a problem. The scientist can and must consider all available information; the lawyer's argument includes only those aspects beneficial to his client. At first glance this often makes the scientist appear to be indecisive and contradictory, whereas the lawyer appears uncompromisingly clear. But in order to arrive at the truth, the legal approach calls for an adversary opinion and finally for a jury or a judge to render a verdict. The scientific approach is based on argumentation among peers in order to come to a consensus opinion. A split decision is an acceptable outcome, but it does not indicate that someone is right and someone is wrong. Rather, it indicates that the available information can be interpreted in more than one way and that probably more detailed data are needed to arrive at a consensus.

I am not on the side of those who want to poison mankind and the environment for personal gain and treat our gene pool with noxious chemicals. I am on the scientific side, the side which does not quit when things get rough, the side which keeps asking questions and tries to resolve the problems. For the quitting EPA lawyers, the episode is merely another experience under their belt; for the scientists remaining at EPA the struggle goes on.

The EPA has many scientists whose training and experience *have* in fact prepared them for confronting the questions of chemical carcinogenesis, as well as

other problems relating to pesticide safety. The question arises of how legal training prepares an individual for confronting these problems.

There is no doubt that the regulation of pesticides needs both legal and scientific support, but these two aspects must complement each other. A "prima donna" attitude on the part of either the lawyers or the scientists does not serve the purpose. We should also not lose sight of the fact that the problems related to pesticides are basically scientific (food production, carcinogenesis, disease eradication, public health, toxicology, biology, and biochemistry) and not legal.

RETO ENGLER

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I take issue with Carter's insinuation that the pesticide decision-making process of the Environmental Protection Agency (EPA) should be the responsibility of its Office of General Counsel (OGC) rather than its Office of Pesticide Programs (OPP). This would not be in the best interest of either agriculturalists or environmentalists.

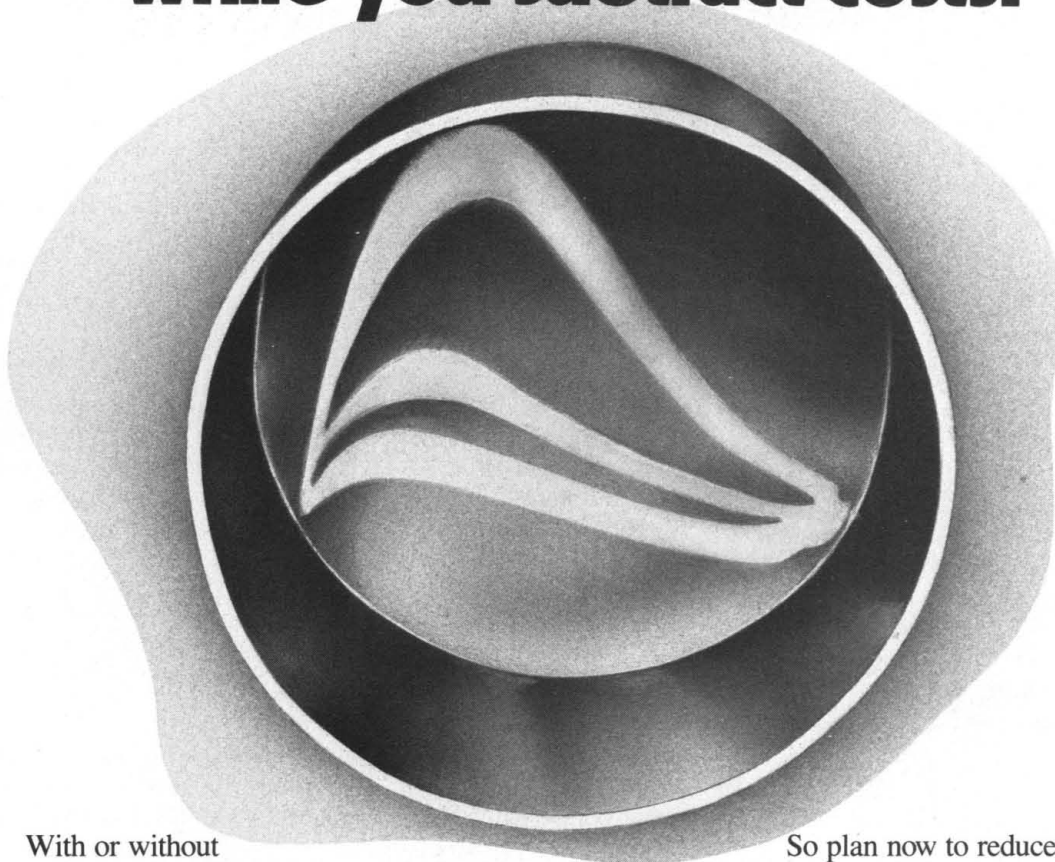
While I realize that scientists are not always unbiased, I cannot believe that decisions made by the scientists in the OPP will be more biased than those made by the lawyers of the OGC, who confess to having close ties with the Environmental Defense Fund. Although the course of study required to receive a law degree is rigorous, the receipt of a law degree does not instantaneously give an individual perfect insight into ecology or the science of carcinogenesis. To allow lawyers in the OGC to formulate pesticide decisions makes about as much sense as allowing the scientists in the OPP to handle the legal matters of the EPA.

As a member of the staff of the House Committee on Agriculture, I have known and worked with Edwin Johnson, EPA's deputy assistant administrator for pesticide programs. I feel that he is one of the most capable young men in Washington. His decisions have not always been agreeable to environmentalists, nor have they all been accepted with enthusiasm by agriculturalists; but no one can say they have been made with disregard for scientific evidence.

There are always at least two sides to most issues, and pesticide policy is no exception. Environmentalists seemingly are dedicated to banning all potentially toxic substances regardless of the effects on the economy and food production. Agriculturalists, on the other hand, see the benefits of pesticides to their industry and are hesitant to understand



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the justification for pesticide cancellations. The only rational decision-making process is one which will balance costs versus benefits and utilize scientific data as a basis for pesticide policy.

It was with this goal in mind that Congress passed legislation amending the Federal Insecticide, Fungicide, and Rodenticide Act to require EPA to prepare and file statements on the impact of pesticide decisions on the agricultural economy, the supplies of food and fiber, and consumer food prices. Since this requirement can only act to benefit all Americans, it would seem to refute Carter's implication that Congress bowed to the agricultural lobby. It is more likely that special interest groups have had an undue influence on the three EPA lawyers, who admit turning to environmental groups for guidance and assistance in their policy-making efforts. The transfer of pesticide decisions back to the OPP should rectify this problem by putting the decisions back in the hands of scientists, who will base their decisions on scientific evidence rather than emotionalism.

JOHN C. BAIZE

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Washington, D.C. 20515

In response to the suggestion that I have engaged in "journalistic sensationalism," I merely point out that the resignation of the three attorneys—made in protest at what they perceived to be a bad turn in EPA policy—was in fact highly unusual, or, if you will, "sensational." Furthermore, I said quite plainly that the merits of their criticism of the organizational and policy changes at EPA must be judged later in light of how well or badly these changes work out in practice.

By insisting that I should have described the dilemma inherent in pesticide regulation, Engler really seems to mean that I should have emphasized how difficult it is for scientists in the Office of Pesticide Programs (OPP) to arrive at judgments on which regulatory decisions can be based. He shows little interest in the other horn of the regulatory dilemma—the necessity of protecting people and the environment from possibly harmful chemicals, even though the evidence as to their effects may be incomplete or ambiguous. When this dilemma is not squarely faced, the result is regulatory paralysis.

Baize speaks highly of Edwin Johnson, the current head of the OPP, and seems to imply that my article puts him in a bad light. The fact is, Johnson, whose predecessor was transferred for failing to deliver, was only mentioned in order to point out that Administrator

Russell E. Train has told him that the OPP is now on its mettle to "move ahead aggressively."

Baize also refers to my "implication that Congress bowed to the agricultural lobby." What I wrote was that, at the urging of chemical industry and agricultural interests, the House of Representatives came within only a few votes of adopting an amendment that would have gutted the Federal Insecticide, Fungicide, and Rodenticide Act by giving the Secretary of Agriculture an effective veto over the EPA administrator's decisions.—LUTHER J. CARTER

## ESCA Systems

I wish to commend Arthur L. Robinson for the comprehensive nature of his article "Surface analysis: Multiple techniques for monolayers" (Research News, 26 Mar., p. 1255). However, there are some errors in the section on electron spectroscopy for chemical analysis (ESCA). Robinson notes that prices for ESCA instruments range from about \$110,000 to more than \$350,000 for our most complex machine. Much as we at AEI would like to be able to charge \$350,000 for an ESCA system, we do appreciate that this is a highly competitive world and that such a price would severely limit our sales.

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One of the main accessories for an ESCA machine is the ultraviolet source; while Robinson singles out two other manufacturers as the only suppliers of this accessory, we have been a supplier for some years.

Finally, the availability of a monochromatic source on the AEI machine is a point of sufficient uniqueness to warrant some comment.

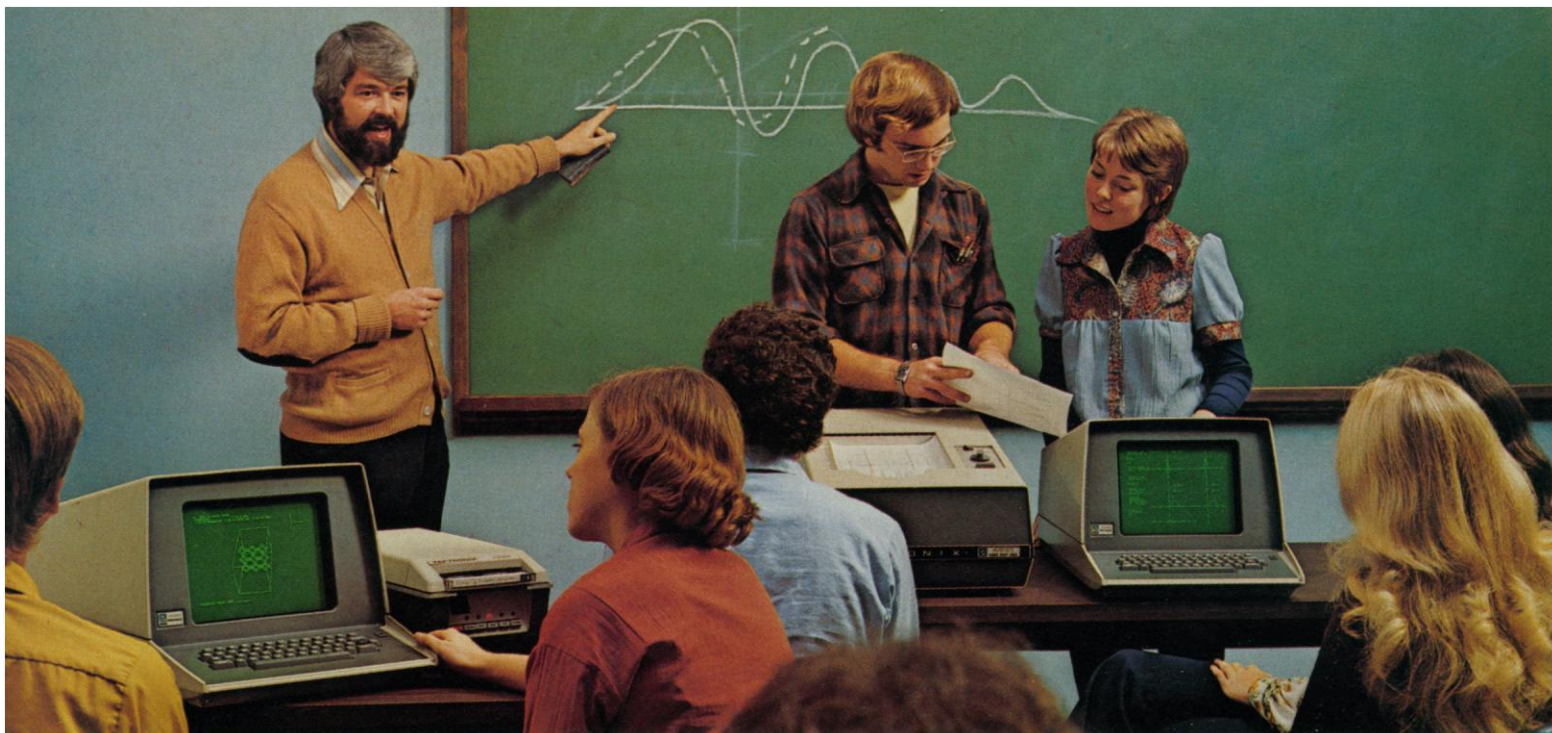
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## Protection of Archeological Sites

I would like to clarify a statement made by Rhodes W. Fairbridge in his article "Shellfish-eating Prehistoric Indians in coastal Brazil" (30 Jan., p. 353). Fairbridge states that "although shell middens are theoretically protected by law in both Brazil and the United States,





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almost nothing is done to enforce it." In the United States, archeological sites, including shell middens, are provided a measure of protection by a variety of federal and state laws and regulations, the most important of which, at the federal level, are the Antiquities Act of 1906, the Historic Sites Act of 1935, the National Historic Preservation Act of 1966, the National Environmental Policy Act of 1969, Executive Order 11593, and the Archeological and Historic Preservation Act of 1974.

Only sites located on federal lands are provided any total statutory protection. Unlike more recent laws which emphasize protection of sites from land development actions by federal agencies, the Antiquities Act, as well as many state and local laws, is aimed at preventing the indiscriminate excavation and sale of antiquities from public properties by unauthorized individuals. It is true that enforcement of the Antiquities Act has been difficult because of the vast extent of public lands; however, it has been our experience that vandalism of archeological sites has been most severe in the western portion of the United States. Rock art is particularly vulnerable to vandalism, as are midden sites, from which artifacts are stolen for collections, and small surface sites which are destroyed by off-road recreational vehicles. Shell middens are probably the least vandalized type of archeological site on public lands.

All of the recent historic preservation laws have emphasized identification, protection, and enhancement of those cultural resources in this country which are subject to adverse effects by federal or federally assisted projects. These laws have created the basis of a system whereby early planning affords substantial protection to archeological sites, as well as to other cultural resources. Compliance by federal agencies is still imperfect but is steadily improving.

It is primarily through the coordination and cooperation of federal, state, and local planning and preservation programs that these national laws can be fully implemented to provide better protection for our cultural heritage.

REX L. WILSON

*National Park Service,  
Department of the Interior,  
Washington, D.C. 20240*

Wilson's notes on the protection offered to midden sites on federal lands are helpful, though unfortunately a little late. In many cases, along our East Coast the middens were exploited for lime by the farmers in pre-Revolutionary days. At that time, however, I do not think the

term "vandalism" would have been appropriate, but rather, "the exploitation of nature's bounty."

RHODES W. FAIRBRIDGE

*Department of Geology,  
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DAVID K. BORAKER

*Department of Medical Microbiology,  
College of Medicine, Given Medical  
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## Disclaimer

In his review (29 Aug. 1975, p. 712) of *Primate Aggression, Territoriality, and Xenophobia* (1), to which I contributed a chapter, Glenn Hausfater attributes to me the "conclusion" that "quantitative data on any aspect of monkey aggression is lacking despite many hours of observation by many different field workers." Nowhere in my contribution to that volume did I make such a statement, nor have I ever believed it.

LEWIS L. KLEIN

*Department of Zoology,  
University of Alberta, Edmonton, Canada*

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1. R. Holloway, Ed., *Primate Aggression, Territoriality, and Xenophobia* (Academic Press, New York, 1974).



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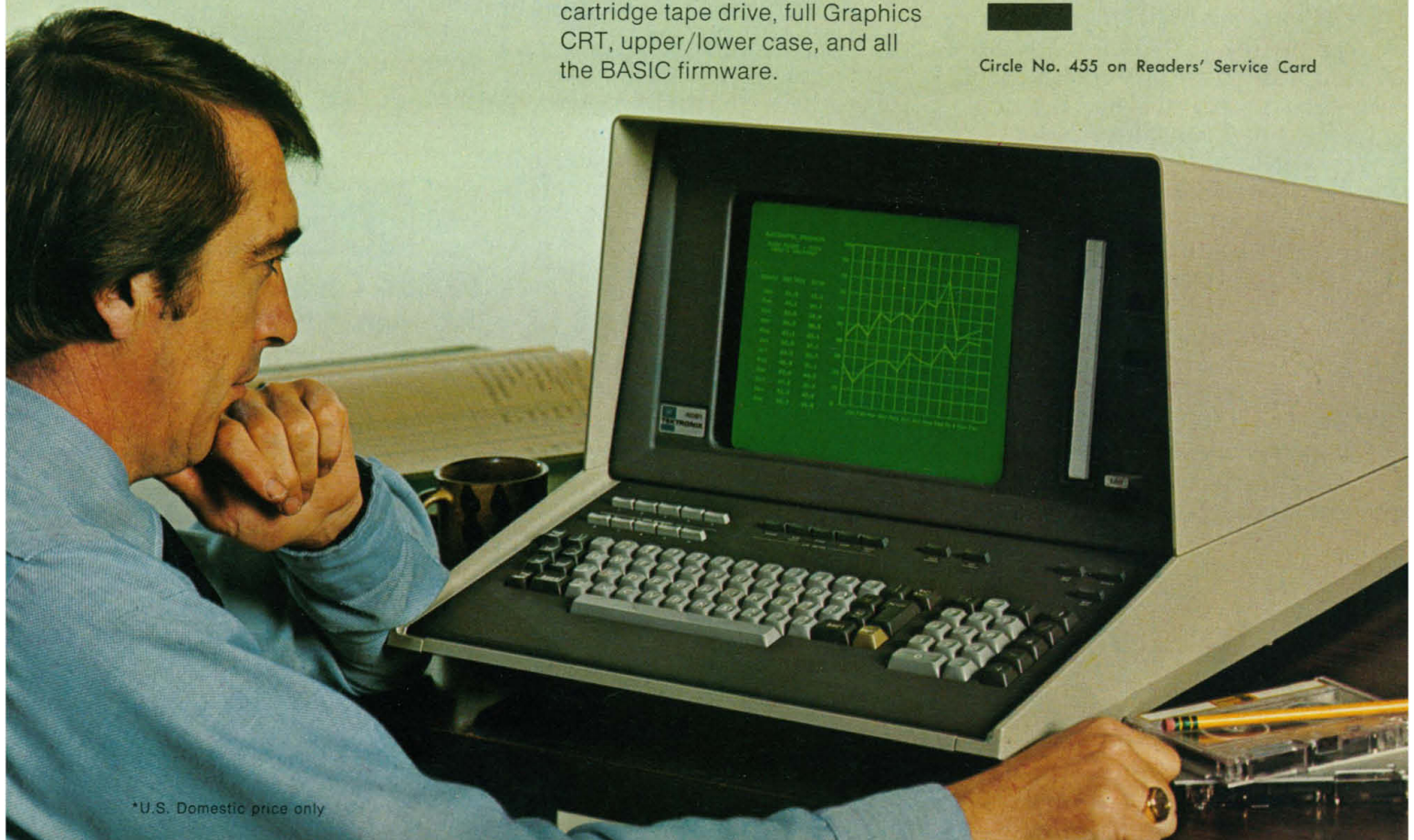
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## Paper Mills

Public and campus concern with the term-paper industry has shifted rapidly from indignation to inattention, leaving the paper mills churning at higher speed. A recent study\* concludes that "students at every major university in the country have access to at least one commercial firm that offers a variety of writing and research services ranging from term papers on any subject for undergraduates to M.A. theses and Ph.D. dissertations." Prices are reported to range from a bargain basement \$2 per page for an undergraduate term paper (very likely one of many photocopies) to \$10,000 for a custom-tailored "original" doctoral dissertation. According to the study cited, demand far outstrips supply; sales are limited chiefly by the firms' inability to retain a sufficient number of "qualified" ghostwriters. Other evidence suggests that some term-paper entrepreneurs overcome this limitation by making use of unwitting labor: papers are stolen from departmental offices and sold, with already-graded "A" papers commanding the highest rate.

Several university administrators and public officials concerned with higher education engaged in a short-lived, largely unsuccessful effort to close down the mills. The obstacles they encountered included the defense of private enterprise, First Amendment freedoms, and the individual's right to privacy. Paper mill executives argued that they sold the papers as "research material" and could scarcely be held responsible for the unethical usage many students made of them. Quite a few faculty, disgusted with the paper mills, became even more dismayed by what they saw as the "police tactics" their administrations advocated to catch students involved.

Indeed it does seem that the proper place for an educational institution to combat the unethical and anti-intellectual patronage of paper mills is at its source: student cynicism regarding the true aims and values of the educational process. A good deal more is at stake than the authenticity of the credentials the university provides its graduates, or the maintenance of academic standards. A university must view as one of its main missions to instill in its students a respect for intellectual integrity and a sense of the value of learning for its own sake and of advancing their careers by legitimate means. After all, there is only a short distance from submitting a purchased Ph.D. to doctoring one's research findings and to other unprofessional and unethical practices.

The task is a very difficult one. Society is undergoing a period of soul-searching in which the media carry daily reports of unethical conduct by corporation executives, government officials, and professionals. Contact between the faculty and the students in many colleges is limited in scope and intensity, which curbs the opportunities for moral standard setting, emulation, and education. Nor is it quite clear how best to proceed.

Preaching in classrooms, exhorting the student government (if one exists), and having chaplains make appeals are measures that are hardly going to help. A grand dialogue of the faculty and the students on the issues involved may help but may be neither attainable nor sufficient. A highly punitive approach might well be rejected by many faculties, and might not educate the students, even if it led them to purchase fewer papers.

Possibly, as a first step, the American Council on Education, the AAAS, and the many other associations available to academia should set aside more of their symposia, workshops, and convention time to face the question: What is to be done about students who, in effect, purchase their degrees, cheat themselves of education, and drain their degrees of substance? Can colleges disregard this reportedly rampant practice, and not in a sense be paper mills themselves?—AMITAI ETZIONI, *Center for Policy Research, Inc.*, 475 Riverside Drive, New York 10027

\*R. J. Simon, E. Smith, J. Leckenby, M. Long, S. Young, "The term paper business," unpublished report, University of Illinois, p. 1.



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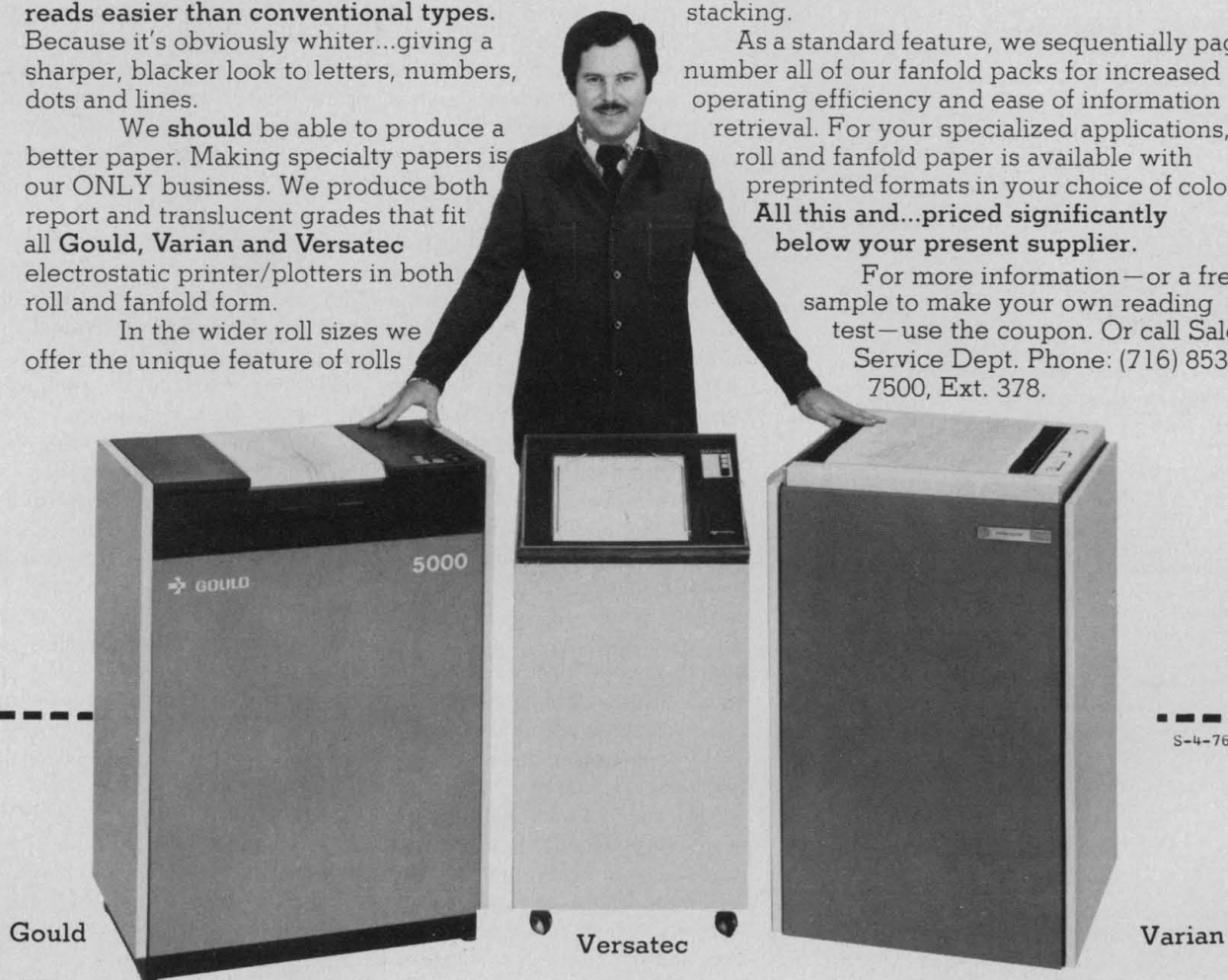
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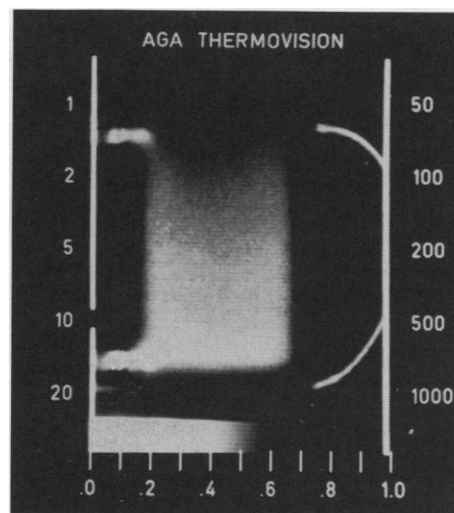
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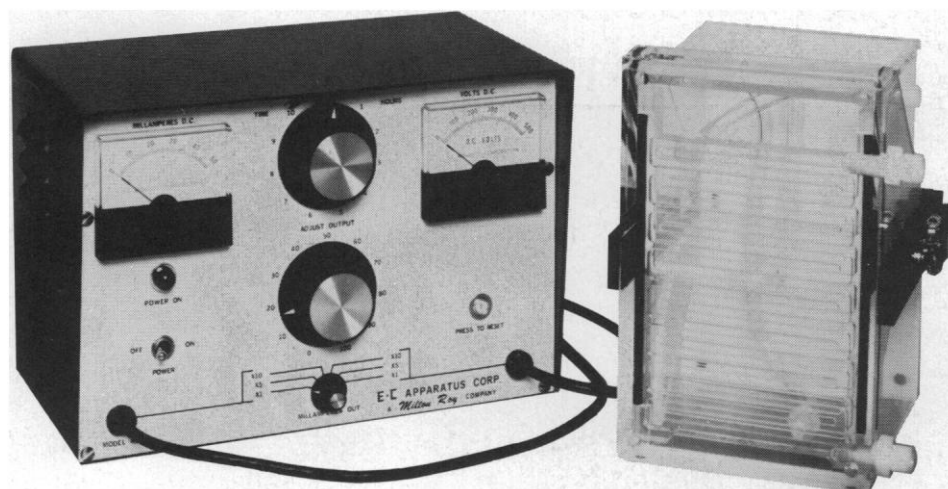
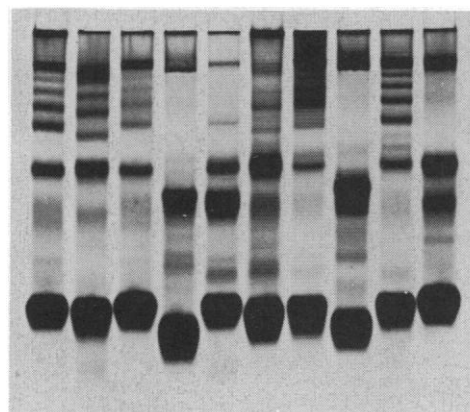


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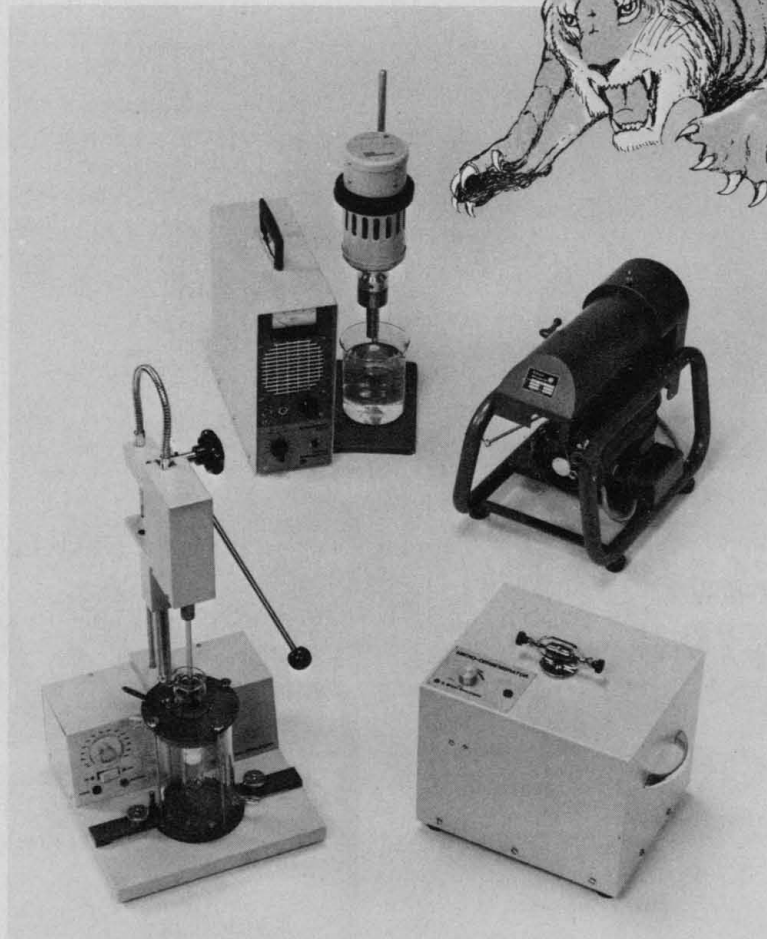
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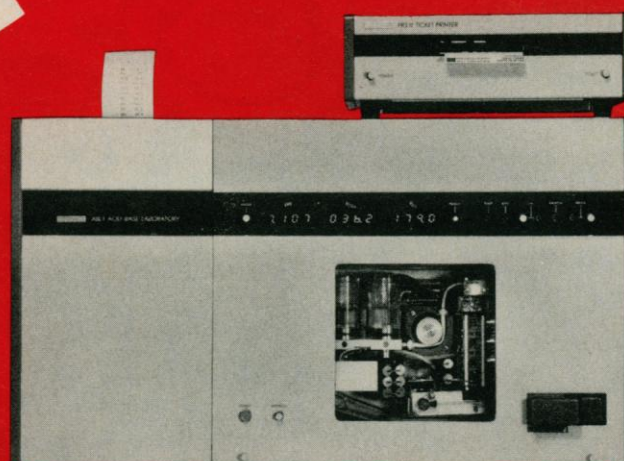
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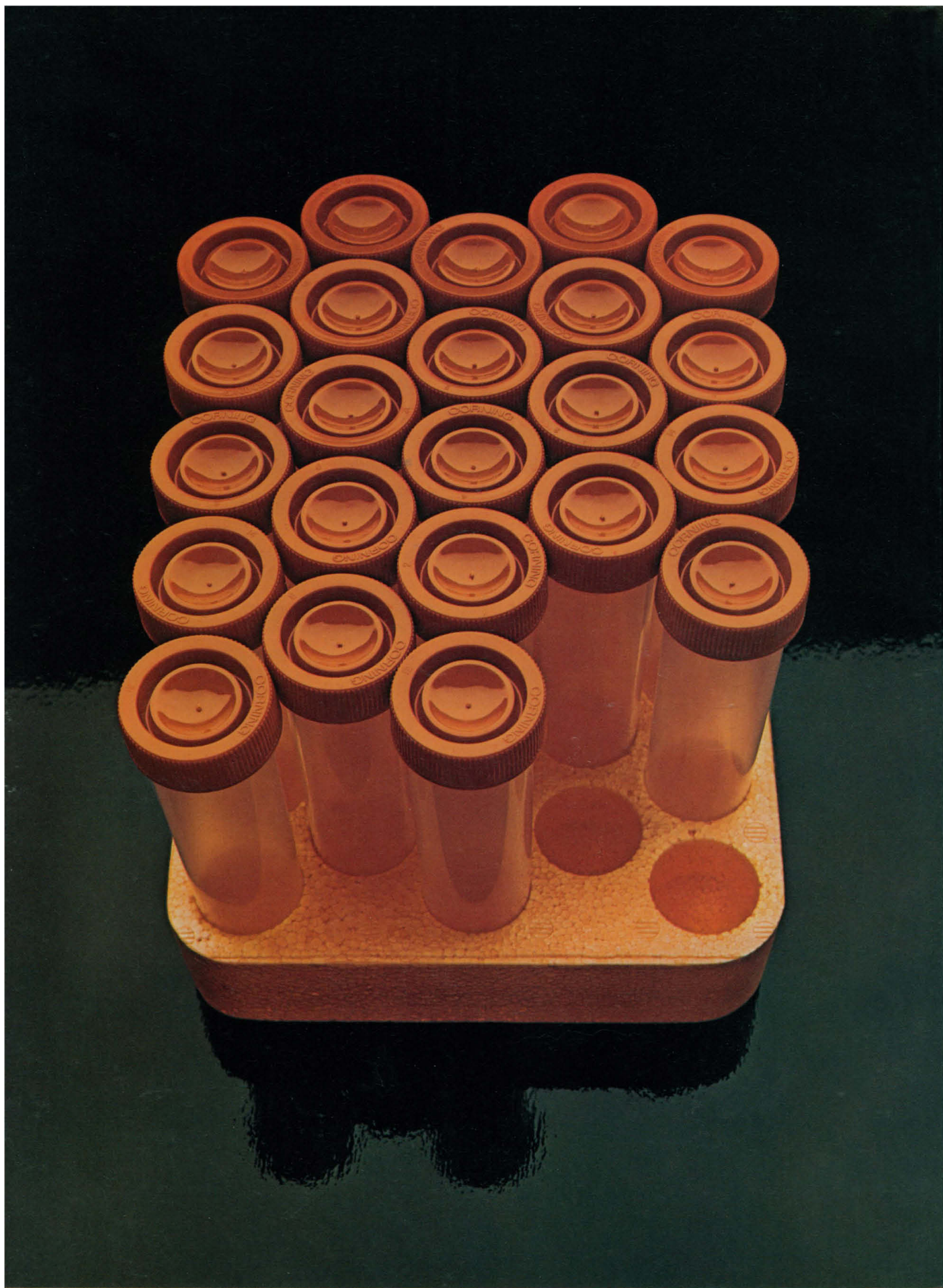
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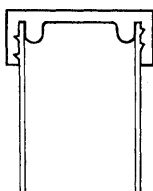




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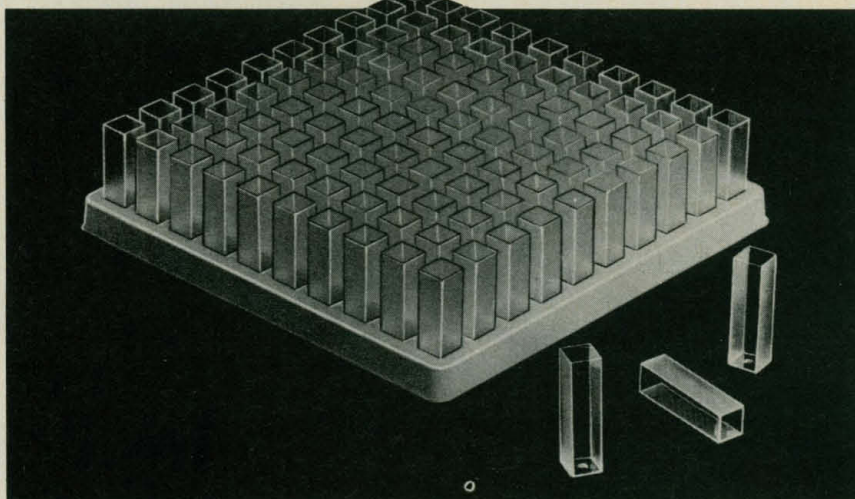
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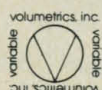


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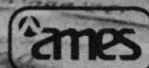


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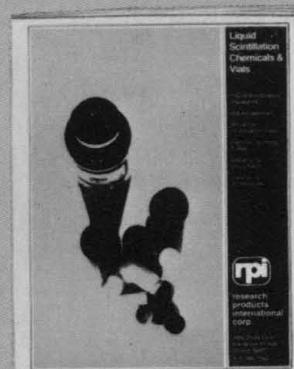
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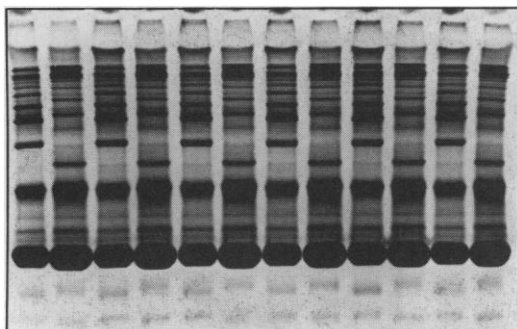


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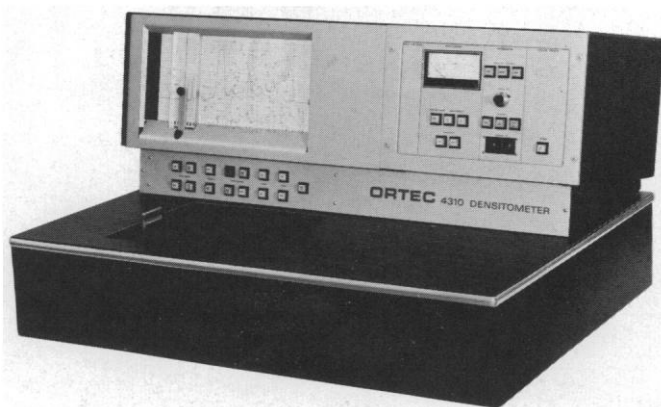
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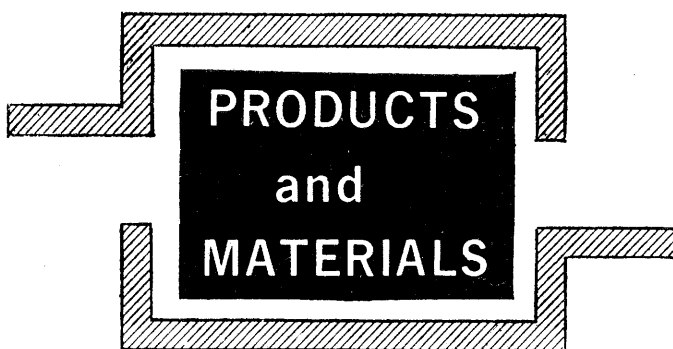
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### Pipette for Platelet-Rich Plasma

The PRP micropipette eliminates mouth pipetting of plasma. Pipetting may be accomplished without changing tips. The device is calibrated for 3.3 and 6.6 microliters and may be used for any volume up to 10 microliters. A spring-loaded adjustable piston fits snugly within a precisely bored capillary. The piston cleanly loads and completely empties the capillary when depressed and released by one finger. Streck Laboratories. Circle 647.

### Anaerobic Workbench

The 75A workbench consists of a Plexiglas isolator equipped with a vacuum airlock, an incubator, a filtration-catalyst system, glove port inserts, and with optional accessories such as lighting, additional glove ports, and others. The workbench is constructed for maximum visibility and even the incubator is made of

Plexiglas. Thus, conventional techniques may be used to grow anaerobic organisms within the workbench. Even organisms that require environments with less than 5 parts of oxygen per million in the atmosphere may be cultured, observed, and manipulated. Electric outlets are provided within the isolator for centrifuges, mixers, and other bench-top apparatus. Germfree Laboratories. Circle 649.

### Immunofluorometric System

The FIAX system features a sampling device called a StiQ Sampler. StiQ is an acronym for surface technique for immuno-quantitation. Each sampler has a specially prepared surface with affinity for a given serum constituent located at one end. When the sampler is inserted in a diluted sample, the surface captures the desired constituent in proportion to its presence in the sample. Two incubations in which the sampler is moved from tube to tube complete the preparation for counting. Counting is done in the FIAX fluorometer. Determination of immunoglobulins G, A, and M may be made in 1 hour including the 5-second readout of the results. International Diagnostic Technology. Circle 650.

### Refrigerated Low-Speed Centrifuge

The J-6 operates at speeds up to 6000 revolutions per minute and can process up to 6 liters of sample in a single operation. It also features Multi-Disc adapters to permit the use of virtually any popular size of centrifuge tube. For example, up to 222 5-milliliter tubes may be accommodated by stacking the adapters. There is a rotor-imbalance detector that shuts the instrument off in case of an imbalance that could damage either the rotor or the drive. Five rotors are offered including 4- and 6-liter swinging-bucket models and a special rotor for radioimmunoassay racks. Beckman Instruments, Spinco Division. Circle 651.

### Yeast Identification System

The UNI-YEAST-TEK system is designed to identify 18 common clinically significant yeasts. The system consists of incubation plates, sucrose assimilation tubes, glucose beef extract media tubes, and an identification logic wheel. The plates consist of 11 sealed peripheral wells with solid media for urea, carbohydrate, and nitrate tests and a center well for morphological examination of the specimen. Based on the specimen's appearance and behavior in the various tests, the logic wheel is used to identify the specimen. Corning Glass Works, Medical Division. Circle 652.

### Literature

*Diffu-Gen Immunology Systems* are now augmented by a set of reference tables designed to accompany each production lot and simplify calibration and standardization. Oxford Laboratories. Circle 653.

*microNOVA*, a minicomputer for medical and instrumentation applications, is the subject of an illustrated brochure. Data General. Circle 654.

*Cardiac Output Trend Monitor* describes an instrument for continuous indication of cardiac output. Dynatech R & D. Circle 655.

*Digiglobin Hemoglobinometer* is characterized in an 8-page brochure. The device is designed for use in hematology, pulmonary, intensive care, and other laboratories. Fisher Scientific. Circle 656.

*Clinti-Chem* is a unit-dose technetium dispenser for radiodiagnostic organ scans. Union Carbide, Clinical Diagnostics. Circle 657.

*Clinical Diagnostics* are covered in an extensive price list catalog. Calbiochem. Circle 658.

*Muscle Re-education System* is a bio-feedback device for physical therapy and behavioral research. Cyborg. Circle 659.

*CO<sub>2</sub> Laser Scalpel* is the subject of a 4-page data sheet. This surgical laser has many medical and research applications. Coherent Radiation. Circle 660.

*Cardiotherm 500 Thermo Dilution Computer* measures blood temperature and other cardiac output parameters. Columbus Instruments. Circle 661.

*Space-Stat 30 Sodium-Potassium Analyzer* makes these determinations on a whole blood sample in 1 minute. The analyzer is described in an illustrated brochure. Orion Research. Circle 662.

*Human Platelet Reference Control* is the subject of a product bulletin. Diagnostic Aids. Circle 663.

Newly offered instrumentation, apparatus, and laboratory materials of interest to researchers in all disciplines in academic, industrial, and government organizations are featured in this space. Emphasis is given to purpose, chief characteristics, and availability of products and materials. Endorsement by *Science* or AAAS is not implied. Additional information may be obtained from the manufacturers or suppliers named by circling the appropriate number on the Readers' Service Card (on pages 326A and 398A) and placing it in the mailbox. Postage is free.

—RICHARD G. SOMMER

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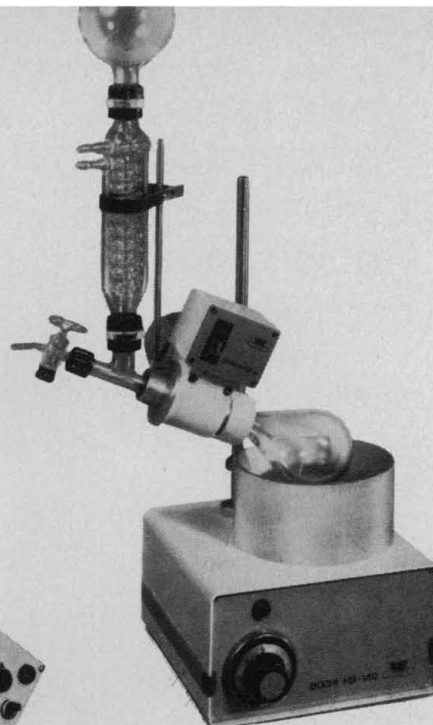
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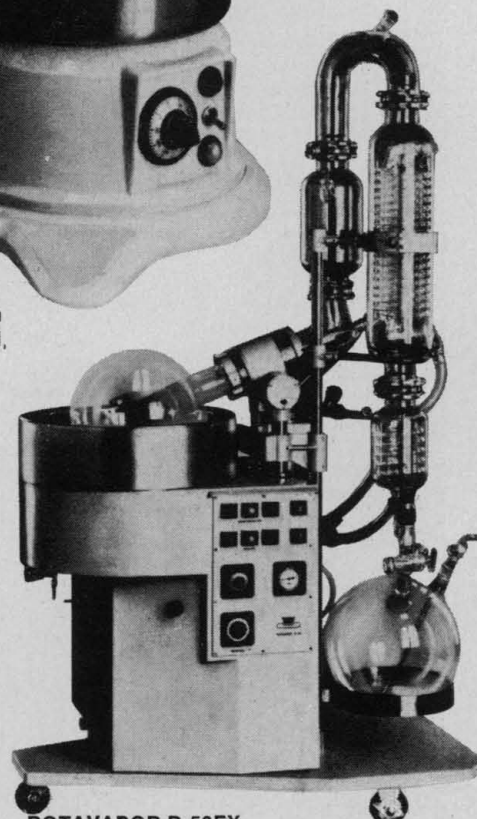
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## RESEARCH NEWS

(Continued from page 362)

x-ray diffraction and electron microscopy to determine the structure of glutamine synthetase, are among the few who have reported results with this technique. Groups at Brandeis, the University of California, Berkeley, and the University of Wisconsin-Madison also have research under way. Outside the United States, there are active groups at the Biozentrum of the University of Basel, the Institute of Crystallography in Moscow, and the Max Planck Institute for Biochemistry in Munich.

Reasons cited for this state of affairs do not include the expense of equipment. A good quality electron microscope, a scanning microdensitometer, and computation facilities are neither cheaper nor more expensive than much equipment common in other types of experiments in structural biology, such as protein crystallography and nuclear magnetic resonance spectroscopy. But, three-dimensional image reconstruction is not a trivial technique. Rather, a group of researchers willing to forego the possibility of quicker results from other types of experiments must spend considerable time mastering the various aspects of the method (especially finding and preparing suitable specimens) before they will have publishable results.

Seen in this light, the spectacular results of Unwin and Henderson may be just as important for the boost they may give to others to take up image reconstruction as for their scientific value. There is, however, one outstanding question mark, namely, how generally applicable is their method?

Besides the glucose fixation method of the MRC investigators, there are at least two other ways to prepare hydrated, unstained specimens for electron microscopy. Donald Parsons and S. W. Hui of the Roswell Park Memorial Institute in Buffalo have devised an environmental chamber in which it is possible to maintain a specimen in its natural hydrated state by differential pumping; that is, near the sample, the vacuum is poor, but elsewhere the vacuum is typical of all electron microscopes. And at the University of California, Berkeley, Kenneth Taylor and Robert Glaeser carefully freeze specimens in liquid nitrogen. The frozen samples do not dehydrate when under vacuum. Electron diffraction patterns of catalase crystals prepared by both methods indicate that structural details with dimensions of 2 to 3 angstroms are preserved. In addition, there is accumulating evidence that radiation ef-

fects are much less severe at cryogenic temperatures than at room temperature.

But how many biological molecules are there that naturally align themselves into two-dimensional periodic structures or that crystallize into such a form? Glaeser and Donald Caspar of Brandeis think there may ultimately be quite a few. Besides membrane proteins which would seem to be natural candidates for crystallization into two-dimensional forms, Caspar is enthusiastic about the possibility of imaging large animal viruses. Such viruses may be too formidable for x-ray crystallography to tackle, in part because of the phase problem, but would be easier subjects for image reconstruction because both amplitude and phase information are available. Robert Horne at the John Innes Institute, Norwich, England, has recently reported on a method for preparing highly ordered two-dimensional arrays of viruses that may be applicable to image reconstruction.

Glaeser points out that, within cell membranes, many apparently crystalline materials exist, but as yet no one has been able to crystallize them outside the cell in a form suitable for electron microscopy. Glaeser also feels that, because image reconstruction from electron micrographs is a faster and less arduous technique than x-ray diffraction, it may be the method of choice in cases where both two- and three-dimensional crystals are available, provided that the resolution of electron microscopy can be increased to that of x-ray diffraction.

To this end, Glaeser and Ivy Kuo at Berkeley have been experimenting with image intensifiers and with nuclear track photographic emulsions in order to increase the sensitivity of the electron recording process. In Unwin and Henderson's experiments, perhaps six or seven electrons struck one picture element in the digitized micrograph. The Berkeley researchers want to decrease this to one electron, and foresee that by so doing, they may achieve a spatial resolution of 3 angstroms.

Some scientists think it may be possible to prepare two-dimensional arrays of molecules (for example, elongated molecules could be tied to a substrate at one end), but each molecule could be oriented slightly differently at its binding site. Joachim Frank of the State of New York Department of Health, Albany, has been exploring theoretical methods for averaging data from arrays of identical objects that are not periodic. If such methods were to be perfected, then, in the words of one scientist, the sky would be the limit.—ARTHUR L. ROBINSON

# Chromatographic compatibles from Bio-Rad

## Three new best buys in chromatographic instruments

To monitor, record and collect chromatographic separations Bio-Rad introduces three sensibly priced instruments—UV Monitor, Strip Chart Recorder and Fraction Collector—all loaded with convenience features you have come to expect from Bio-Rad products.

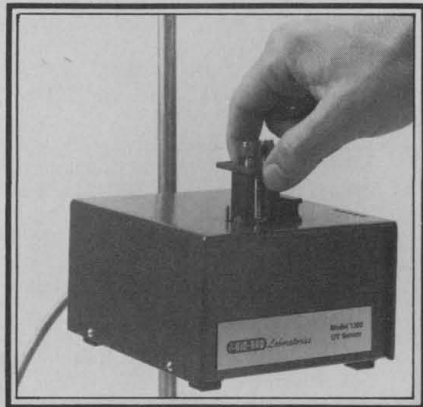
### Model 1300 UV Monitor

Here's a UV monitor with all the features you always wanted, at a price you can afford—\$1,395.

- 1. Double wavelength.** Just pull the knob on the sensor to switch from 254 to 280 nm.
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- 3. Six interchangeable flow cells.** Standard: (as equipped) high sensitivity with 1.5 mm bore arms.

Optional: Microcell, Density Gradient, High Absorbance (0.05 to 20 OD), Dual Path Flow and Quantitative.

Cell changing is easy, positive positioning pin insures correct alignment.



- 4. Cold room operation.** All components are stabilized for continuous cold room operation. (All these compatibles are designed for cold room use if desired.)

- 5. Event marker.** For peak delineation.
- 6. Convenient mounting.** Sensor can easily be located near separation source, or wall mounted if desired. Mounting bar at rear of sensor simplifies this operation.

- 7. Range.** A 7 position range selector gives the Model 1300 tremendous flexibility.

- 8. No high voltage in connecting cables.**

Reader service no. 426

### Model 1320 Fraction Collector

The Model 1320 has all the features Bio-Rad has looked for in fraction collectors, but never found before in one instrument. Look what \$795 can buy.

- 1. Indexing.** (Includes automatic digital counting.)

Timed (standard)

1 to 199 seconds

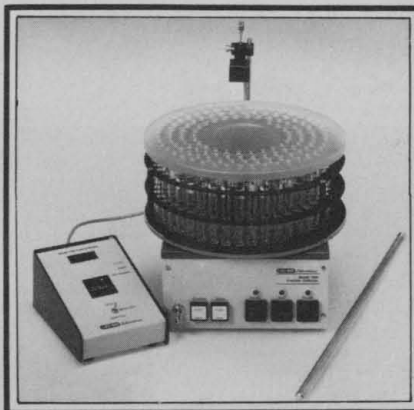
1 to 999 minutes

Volume (optional)

1 to 999 drops

- 2. Turntables.** With the standard and optional turntables you can run one, two or three columns simultaneously, run a preparative column or collect directly into scintillation vials.

Standard (shown in photo)  
Single 136 x 10 ml test tubes



Optional

Double 136 x 10 ml

Preparative — 50 x 75 ml test tubes

Spot Collection

Single 160 x 1 ml

Double 160 x 1 ml

Triple 160 x 1 ml

Scintillation Vial Turntable

50 x 20 ml vials

- 3. Dual event marker.**

Switch closure

5-volt pulse

- 4. Three powered outlets.** For use with accessories such as pumps, recorders, etc.

Power — activated whenever master switch is on.

Run — activated only while collection is in progress. Turns off at conclusion of run.

Finish — activated after last collection.

- 5. Overflow protection.**

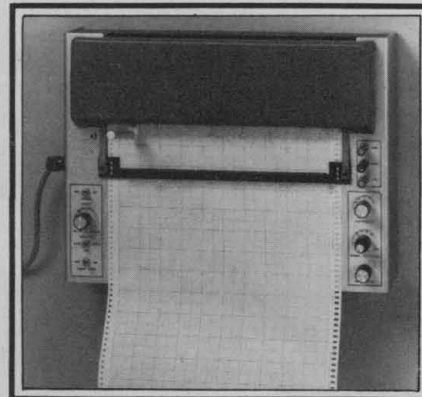
- 6. Manual advance button.**

- 7. Cold room compatible.**

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### Model 1310 Strip Chart Recorder

The Model 1310 has strip chart features rarely found at \$695. It can be wall mounted or bench mounted and has all the other attractions shown below.



- 1. Accuracy:**  $\pm 0.25\%$

- 2. Repeatability:** 0.1 %

- 3. Linearity:**  $\pm 0.5\%$  full scale

- 4. 12 chart speeds**

0.5, 1.0, 2.0, 5.0, 10.0 and 20.0 inches/minute

0.5, 1.0, 2.0, 5.0, 10.0 and 20.0 inches/hour

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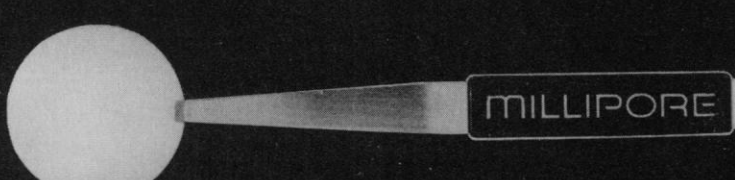
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## BOOKS RECEIVED

(Continued from page 366)

lumbus, Ohio, Sept. 1974. C. William Birky, Jr., Philip S. Perlman, and Thomas J. Byers, Eds. Ohio State University Press, Columbus, 1976. x, 362 pp., illus. \$15. Ohio State University Biosciences Colloquia.

**Geology.** Our Physical Environment. Stanley N. Davis, Paul H. Reitan, and Raymond Pestrong. McGraw-Hill, New York, 1976. viii, 470 pp., illus. \$14.95.

**Geoscience and Man.** Vol. 12, Coastal Resources. Papers from a symposium, Atlanta, 1973. H. J. Walker, Ed. Louisiana State University School of Geoscience, Baton Rouge, 1975. xii, 116 pp., illus. Paper, \$6.

**Global Climate.** Keith Boucher. Halsted (Wiley), New York, 1976. x, 326 pp., illus. \$11.75.

**Global Simulation Models.** A Comparative Study. John Clark and Sam Cole with Ray Curnow and Mike Hopkins. Wiley-Interscience, New York, 1976. x, 136 pp. \$14.50.

**The Green Bay Watershed.** Past/Present/Future. Gerard Bertrand, Jean Lang, and John Ross. University of Wisconsin Sea Grant College Program, Madison, 1976. xviii, 300 pp., illus. Paper, \$3. Technical Report No. 229.

**A Guide to Bird-Watching in Europe.** James Ferguson-Lees, Quentin Hockliffe, and Ko Zweeres, Eds. Scribner, New York, 1976. 298 pp., illus. + tables. \$9.95.

**Guiding the Psychological and Educational Growth of Children.** Jerry W. Willis, Jeane Crowder, and Joan Willis. Thomas, Springfield, Ill., 1975. xii, 216 pp. Cloth, \$11.50; paper, \$6.95.

**Handbook of Genetics.** Vol. 3, Invertebrates of General Interest. Robert C. King, Ed. Plenum, New York, 1975. xiv, 874 pp., illus. + plates. \$45.50.

**Heat Pipes.** P. Dunn and D. A. Reay. Pergamon, New York, 1975. viii, 300 pp., illus. \$18.

**The Helium Liquids.** Proceedings of a NATO Advanced Study Institute, St. Andrews, Scotland, July 1974. Jonathan G. M. Armitage and Ian E. Farquhar, Eds. Academic Press, New York, 1975. xii, 512 pp., illus. \$41.50.

**Helping Families to Change.** Virginia Satir, James Stachowiak, and Harvey A. Taschman. Donald W. Tiffany, Julius I. Cohen, Analee M. Robinson, and Keith C. Ogburn, Eds. Illustrations by Marilyn Ybarra. Aronson, New York, 1976. 296 pp. \$15.

**History of Life.** Richard Cowen. McGraw-Hill, New York, 1975. xii, 146 pp., illus. Paper, \$3.95. McGraw-Hill Earth Science Paperback Series.

**Human Judgment and Decision Processes.** Papers from a conference, DeKalb, Ill., Oct. 1974. Martin F. Kaplan and Steven Schwartz, Eds. Academic Press, New York, 1975. xiv, 326 pp., illus. \$14.50. Academic Press Series in Cognition and Perception.

**Human Stereopsis.** A Psychophysical Analysis. W. Lawrence Gulick and Robert B. Lawson. Oxford University Press, New York, 1976. xii, 292 pp., illus. \$15.

**Hydrocarbon Fuels.** Production, Properties and Performance of Liquids and Gases. E. M. Goodger. Halsted (Wiley), New York, 1975. xviii, 270 pp., illus. \$11.95.

**IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man.** Vol. 8, Some Aromatic Azo Compounds. World Health Organization, Geneva, 1975 (U.S. dis-

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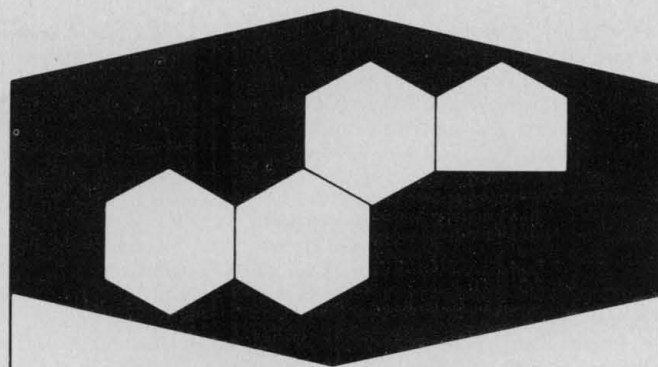
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tributor, Q Corp., Albany, N.Y.). 358 pp. Paper, \$15.40.

**Images and Enterprise.** Technology and the American Photographic Industry, 1839-1925. Reese V. Jenkins. Johns Hopkins University Press, Baltimore, 1975. xviii, 372 pp., illus. \$20. Johns Hopkins Studies in the History of Technology.

**Immunologic and Infectious Reactions in the Lung.** Charles H. Kirkpatrick and Herbert Y. Reynolds, Eds. Dekker, New York, 1976. xviii, 596 pp., illus. \$49.50. Lung Biology in Health and Disease, vol. 1.

**Intermediate Algebra.** Ronald J. Harshbarger. Harper and Row, New York, 1976. viii, 408 pp., illus. \$10.95.

**An Introduction to Embryology.** B. I. Balinsky. Saunders, Philadelphia, ed. 4, 1975. xviii, 648 pp., illus. \$13.50.

**Introduction to Quantum Electronics.** P. A. Lindsay. Halsted (Wiley), New York, 1976. xii, 202 pp., illus. \$19.75.

**Introductory Algebra.** Ronald J. Harshbarger. Harper and Row, New York, 1976. x, 294 pp. \$10.95.

**Introductory Group Theory and Its Application to Molecular Structure.** John R. Ferraro and Joseph S. Ziomek. Plenum, New York, ed. 2, 1975. xvi, 292 pp., illus. \$19.95.

**The Job Corps.** A Social Experiment That Works. Sar A. Levitan and Benjamin H. Johnston. Johns Hopkins University Press, Balti-

more, 1976. x, 118 pp., illus. Cloth, \$8; paper, \$2.95. Policy Studies in Employment and Welfare, No. 22.

**Junkies and Straights.** The Camarillo Experience. Robert H. Coombs, Ed. Lexington Books (Heath), Lexington, Mass., 1975. xxiv, 260 pp. \$16.

**Lasers in Physical Chemistry and Biophysics.** Proceedings of a meeting, Thiais, France, June 1975. Jacques Jousot-Dubien, Ed. Elsevier, New York, 1975. xvi, 522 pp., illus. \$51.95.

**Media Impact.** Vol. 2, Science, Mass Media and the Public. A Research Study on Science Communication. Orest Dubas and Lisa Martel. Ministry of State for Science and Technology, Ottawa, Canada, 1975 (available from Information Canada, Ottawa). xxvi, 394 pp., illus. Paper, C\$6.

**The Metabolism of Contraction.** Proceedings of a meeting. Quebec, June 1974. Paul-Emile Roy and George Rona, Eds. University Park Press, Baltimore, 1975. xii, 788 pp., illus. \$39.50. Recent Advances in Studies on Cardiac Structure and Metabolism, vol. 10.

**Méthodes en Syntaxe.** Régime des Constructions Complétives. Maurice Gross. Hermann, Paris, 1975. 414 pp. Paper, 96 F.

**Methods of Numerical Mathematics.** G. I. Marchuk. Translated from the Russian edition (Novosibirsk, 1973) by Jiri Ružička. Springer-Verlag, New York, 1975. xii, 316 pp. \$29.80. Applications of Mathematics, 2.

**Modern Concepts of Cerebrovascular Disease.** John Stirling Meyer, Ed. Spectrum, New York, 1975 (distributor, Halsted [Wiley], New York). xiv, 182 pp., illus. \$16.50.

**Molecular Dynamics in Biological Membranes.** Milton H. Saier, Jr., and Charles D. Stiles. Springer-Verlag, New York, 1975. xiv, 130 pp., illus. Paper, \$5.90. Heidelberg Science Library.

**Multidimensional Speech Perception by the Hearing Impaired.** A Treatise on Distinctive Features. Jeffrey L. Danhauer and Sadanand Singh. University Park Press, Baltimore, 1975. x, 130 pp., illus. Paper, \$9.50.

**My Father Bertrand Russell.** Katharine Tait. Harcourt Brace Jovanovich, New York, 1975. xii, 212 pp. + plates. \$8.95.

**The New Guide to the Stars.** Patrick Moore. Norton, New York, 1976. 250 pp., illus. + plates. \$9.95.

**Non-Nuclear Futures.** The Case for an Ethical Energy Strategy. Amory B. Lovins and John H. Price. Friends of the Earth International, San Francisco, and Ballinger (Lippincott), Cambridge, Mass., 1975. xxxii, 224 pp. Cloth, \$11.95; paper, \$5.95. Friends of the Earth Energy Papers.

**Nonverbal Communication of Aggression.** Proceedings of a symposium, Mississauga, Ontario, Canada, 1975. Patricia Pliner, Lester Krames, and Thomas Alloway, Eds. Plenum, New York, 1975. x, 196 pp., illus. \$17.50. Advances in the Study of Communication and Affect, vol. 2.

**The Ocean Basins and Margins.** Vol. 3, The Gulf of Mexico and the Caribbean. Alan E. M. Nairn and Francis G. Stehli, Eds. Plenum, New York, 1975. xvi, 706 pp., illus. \$49.50.

**On the Origins of Language.** An Introduction to the Evolution of Human Speech. Philip Lieberman. Macmillan, New York, 1975. viii, 196 pp., illus. Paper, \$4.95. Macmillan Series in Physical Anthropology.

**Ondes Electromagnétiques Relativité.** Cours. Julien Bok and Nicole Hulin-Jung. Hermann, Paris, 1975. xii, 234 pp., illus. Paper, 58 F. Collection Méthodes.

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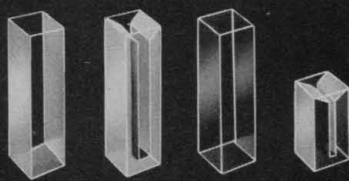


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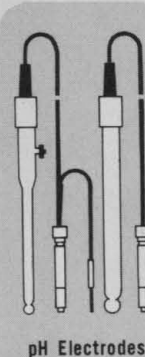


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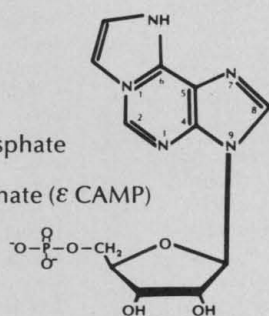
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$\epsilon$  Coenzyme A

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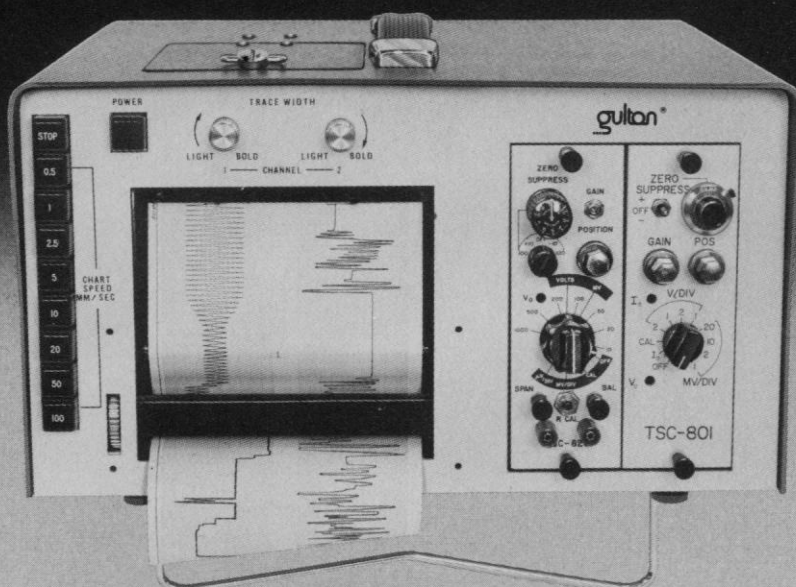
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**Optical Communications.** Robert M. Gagliardi and Sherman Karp. Wiley-Interscience, New York, 1976. xvi, 432 pp., illus. \$24.95.

**Organic Electronic Spectral Data.** Vol. 11, 1969. John P. Phillips, Henry Feuer, P. M. Laughton, and B. S. Thyagarajan, Eds. Interscience (Wiley), New York, 1975. xiv, 1058 pp. \$42.

**Oxford Regional Economic Atlas.** The United States and Canada. John D. Chapman and John C. Sherman, Eds. Oxford University Press, New York, ed. 2, 1975. xii, 128 pp. + gazetteer. Cloth, \$21.95; paper, \$7.95.

**Palaeobiology of Angiosperm Origins.** Problems of Mesozoic Seed-Plant Evolution. Norman F. Hughes. Cambridge University Press, New York, 1976. viii, 242 pp., illus. \$21.50. Cambridge Earth Science Series.

**Phylogeny of the Primates.** A Multidisciplinary Approach. Proceedings of a symposium, Burg Wartenstein, Austria, July 1974. W. Patrick Luckett and Frederick S. Szalay, Eds. Plenum, New York, 1975. xiv, 484 pp., illus. \$39.50.

**Physical and Chemical Bases of Biological Information Transfer.** Proceedings of a colloquium, Varna, Bulgaria, Oct. 1974. Julia G. Vassileva-Popova, Ed. Plenum, New York, 1975. xii, 464 pp., illus. \$35.

**The Physics of Metals. 2, Defects.** P. B. Hirsch, Ed. Cambridge University Press, New York, 1976. xx, 302 pp., illus. \$37.50.

**Physics of the Hot Plasma in the Magnetosphere.** Proceedings of a symposium, Kiruna, Sweden, Apr. 1975. Bengt Hultqvist and Lennart Stenflo, Eds. Plenum, New York, 1975. x, 370 pp., illus. \$25. Nobel Symposium No. 30.

**Plants.** An Introduction to Modern Botany. Victor A. Gruelach and J. Edison Adams. Wiley, New York, ed. 3, 1976. xiv, 586 pp., illus. \$13.95.

**Polymers in Medicine and Surgery.** Proceedings of a symposium, Morristown, N.J., July 1974. Richard L. Kronenthal, Zale Oser, and E. Martin, Eds. Plenum, New York, 1975. x, 336 pp., illus. \$27.50. Polymer Science and Technology, vol. 8.

**Progress in Allergy.** Vol. 19. Paul Kallós, Byron H. Waksman, and Alain de Weck, Eds. Karger, Basel, 1975. xx, 312 pp., illus. \$51.75.

**Progress in Medical Virology.** Vol. 20. Joseph L. Melnick, Ed. Karger, Basel, 1975. xiv, 214 pp., illus. \$40.

**Proiskhozhdenie Kamennyke Lesov.** (Genesis of Stone Forests). L. Š. Davitašvili and Krasimira Zaharieva-Kovacheva. Metsnier-e-ba, Tbilisi, Soviet Union, 1975. 196 pp., illus. 1 Ruble 79 Kopeks.

**Le Psychisme des Primates.** Introduction a l'Etude Biologique du Comportement des Vertébrés Supérieurs. M. Goustard. Masson, Paris, 1975. viii, 172 pp., illus. Paper, 78 F. Les Grands Problèmes de la Biologie, 12.

**Reactivity of Flavins.** Proceedings of a symposium, Nagoya, Japan, Sept. 1973. Kunio Yagi, Ed. University Park Press, Baltimore, 1975. xiv, 186 pp., illus. \$19.50.

**Research Methods in Neurochemistry.** Vol. 3. Neville Marks and Richard Rodnight, Eds. Plenum, New York, 1975. xx, 468 pp., illus. \$35.

**The Role of Vitamin C in Cholesterol Catabolism and Atherogenesis.** Emil Ginter. Veda, Vydavatelstvo Slovenskej Akadémie Vied, Bratislava, Czechoslovakia, 1975. 108 pp., illus. Paper, Kcs 17. Biologické Práce, XXI/1.

**Sedum of North America North of the Mexican Plateau.** Robert T. Clausen. Drawings by Elfriede Abbe. Cornell University Press, Ithaca, 1975. xiv, 128 pp., illus. \$12.50.

aca, N.Y., 1975. 742 pp. \$65. A Comstock Book.

**Stress Response Syndromes.** Mardi Jon Horowitz. Aronson, New York, 1976. xviii, 366 pp. \$15.

**Stress Transients in Solids.** John S. Rinehart. HyperDynamics, Sante Fe, N.M., 1975. vi, 230 pp., illus. Paper, \$8.95.

**Sublethal Effects of Toxic Chemicals on Aquatic Animals.** Proceedings of a symposium, Wageningen, The Netherlands, Sept. 1975. J. H. Koeman and J. J. T. W. A. Strik, Eds. Elsevier, New York, 1975. vi, 234 pp., illus. \$24.95.

**Suspensory Behavior, Locomotion, and Other Behaviors of Captive Gibbons: Cognition.** Duane M. Rumbaugh, Ed. Karger, Basel, 1976. x, 316 pp., illus. \$95. Gibbon and Siamang, vol. 4.

**Teaching the Future.** A Guide to Future-Oriented Education. Draper L. Kauffman, Jr. ETC Publications, Palm Springs, Calif., 1976. vi, 298 pp., illus. Cloth, \$12.95; paper, \$5.95.

**Technical Assistance and Innovation in Science Education.** Robert H. Maybury. Interscience (Wiley), New York, 1975. x, 214 pp. \$12.95.

**Techniques of Program Structure and Design.** Edward Yourdon. Prentice-Hall, Englewood Cliffs, N.J., 1975. xviii, 364 pp., illus. \$16.95.

**Theoretical Mechanics.** G. S. Light and J. B. Higham. Longman, New York, 1975. xii, 360 pp., illus. \$12.50.

**Thin Plate Design for Transverse Loading.** B. Aalami and D. G. Williams. Halsted (Wiley), New York, 1975. xviii, 194 pp., illus. \$19.50. Constrado Monographs.

**Tobacco.** The Ants and the Elephants. Charles Kellogg Mann. Photographs by Billy E. Barnes. Olympus, Salt Lake City, 1976. 176 pp. \$8.95.

**Topics in Numerical Analysis II.** Proceedings of a conference, Dublin, July 1974. John J. H. Miller, Ed. Published for the Royal Irish Academy by Academic Press, New York, 1975. xiv, 266 pp., illus. \$22.75.

**A Treatise on Limnology.** Vol. 3, Limnological Botany. G. Evelyn Hutchinson. Wiley-Interscience, New York, 1975. xii, 660 pp., illus. \$30.

**Who Pays for Clean Air.** The Cost and Benefit Distribution of Federal Automobile Emission Controls. David Harrison, Jr. Ballinger (Lippincott), Cambridge, Mass., 1975. xx, 170 pp., illus. \$14.

**Wild and Tame.** A View of Animals. Erik Sletholt. Translated from the Norwegian by Oliver Stallybrass. Drawings by Egil Torin Naesheim. Scribner, New York, 1976. viii, 160 pp. \$8.95.

**Women Cross-Culturally.** Change and Challenge. Papers from a congress, Chicago, Sept. 1973. Ruby Rohrlich-Leavitt, Ed. Mouton, The Hague, 1975 (U.S. distributor, Aldine, Chicago). xiv, 670 pp. \$27.50. World Anthropology.

**A World Destroyed.** The Atomic Bomb and the Grand Alliance. Martin J. Sherwin. Knopf, New York, 1975. xvi, 316 pp. + index. \$10.

**World Review of Nutrition and Dietetics.** Vol. 23. Geoffrey H. Bourne, Ed. Karger, Basel, 1975. xii, 316 pp. \$72.

**The World's Cats.** Vol. 3. No. 1, Contributions to Status, Management and Conservation. Proceedings of a symposium, Seattle, Apr. 1974. Randall L. Eaton, Ed. University of Washington Department of Zoology. Seattle, 1976. xii, 94 pp., illus. Paper, \$4.25.

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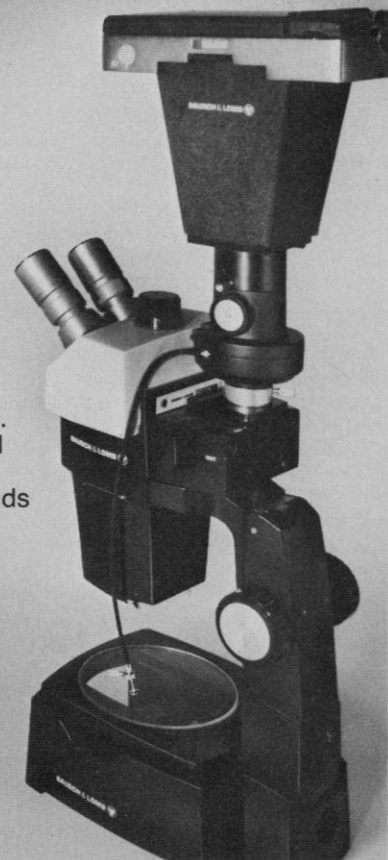
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