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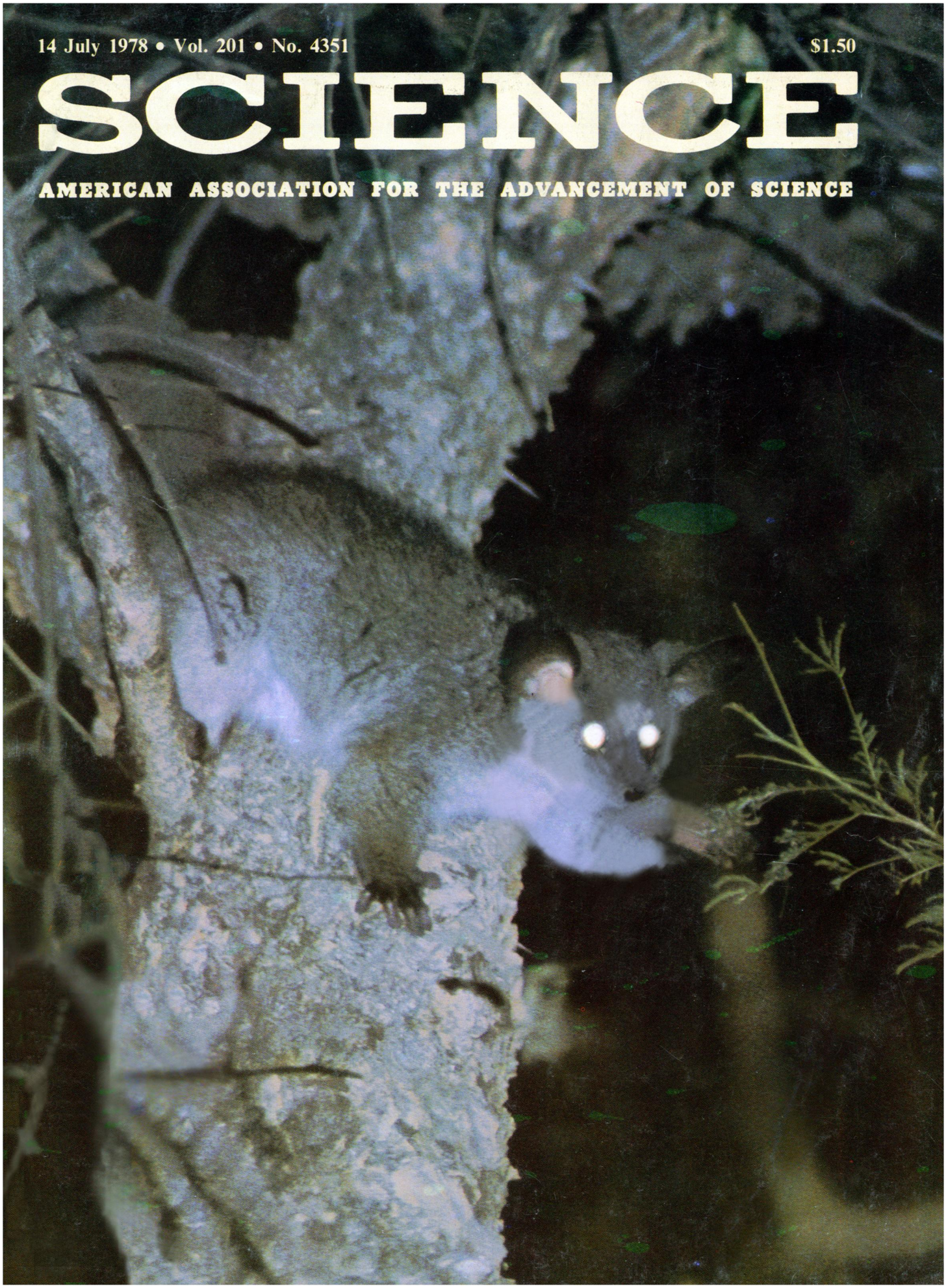

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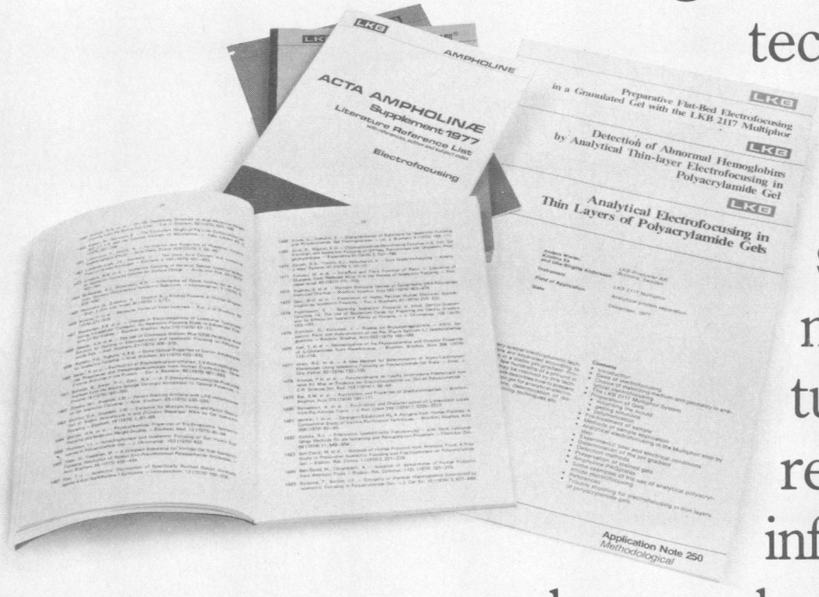

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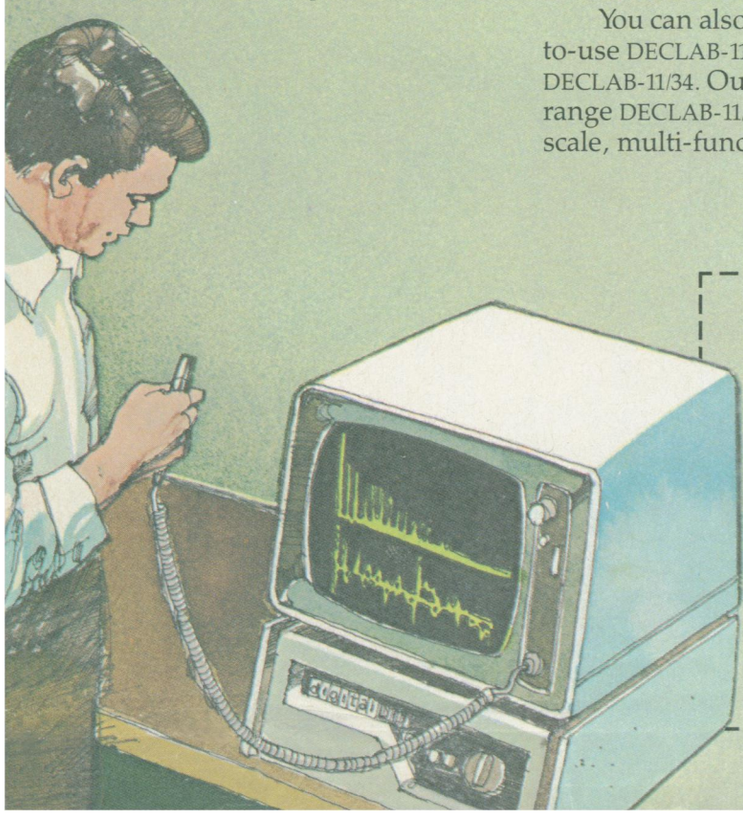

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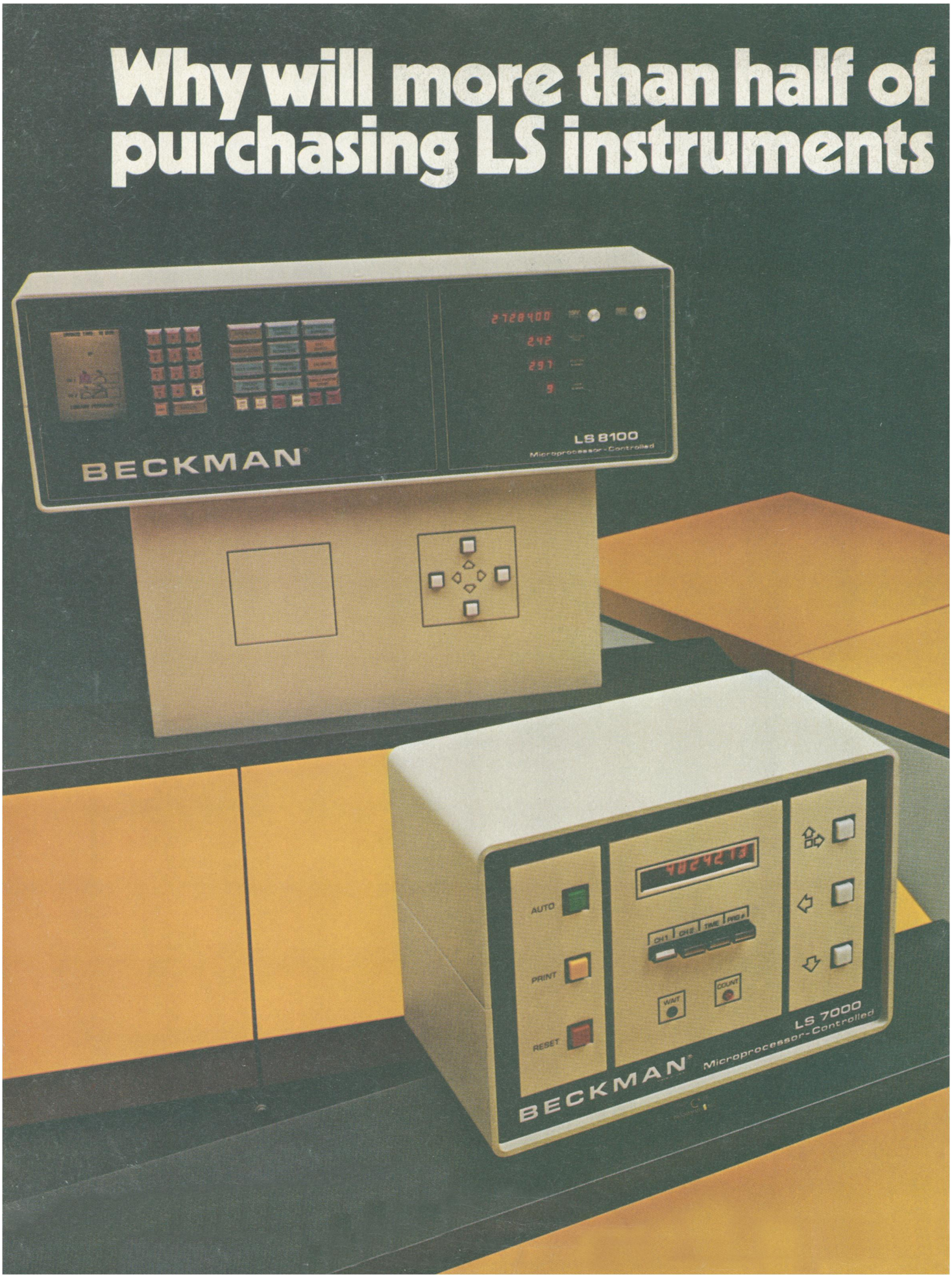

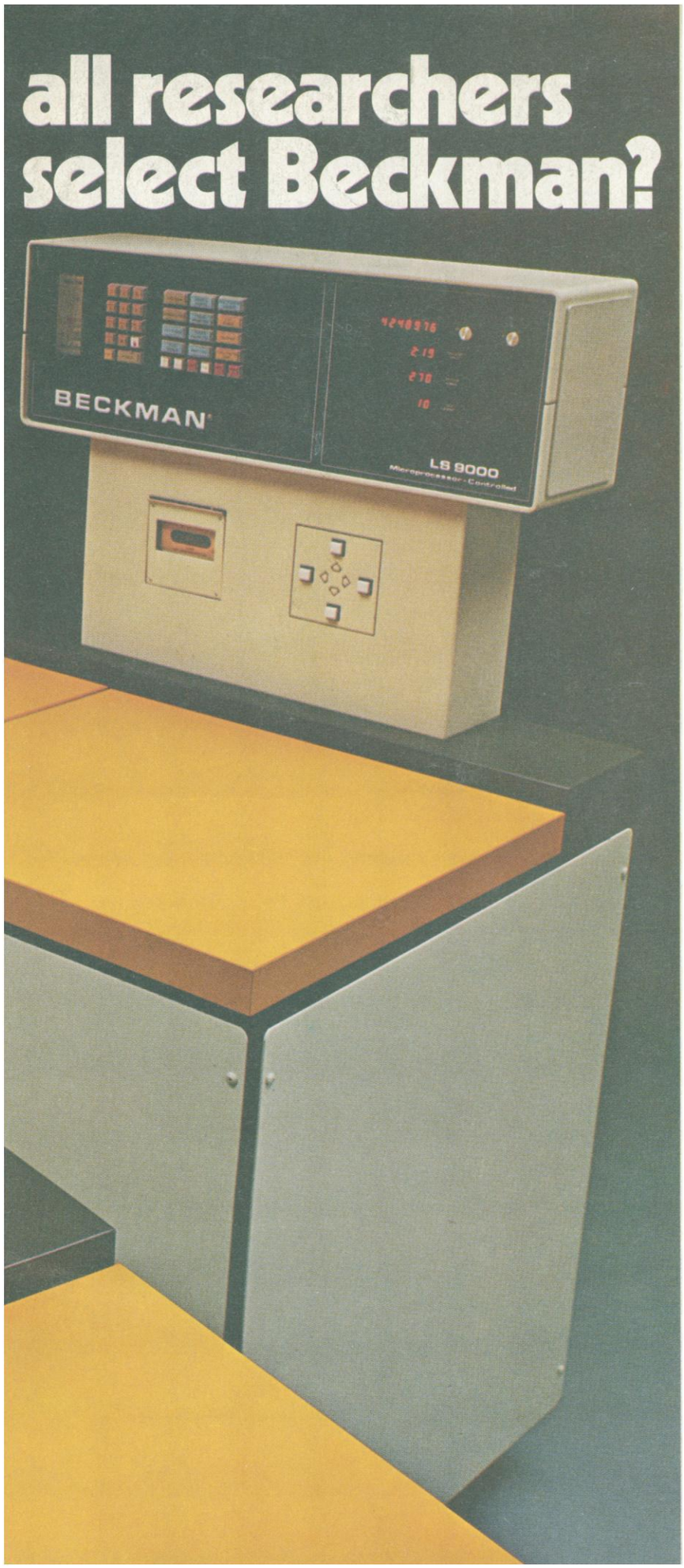

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LETTERS

A Scientist-Senator on Recombinant DNA Research

I wish to express great concern about the broad implications for scientific research in this country if the regulation of recombinant DNA research is expanded in the manner proposed by Senator Edward Kennedy and others (News and Comment, 23 June, p. 1368). As a scientist as well as a Senator, I feel obligated to offer views on the desirability of legislative or executive action which would restrict recombinant DNA research activities more severely than do the current National Institutes of Health (NIH) guidelines.

For the past 2 years Congress has debated the need for and ramifications of the regulation of recombinant DNA activities. This has been an enlightening and worthwhile experience which has assisted Congress and the public in understanding the nature of scientific research and the benefits of a new field of scientific inquiry. After Senator Stevenson and I took the procedural steps necessary to postpone Senate consideration of hastily conceived DNA legislation, we jointly agreed to hold 3 days of oversight hearings on this issue by the science, technology, and space subcommittee during November 1977. These hearings were particularly useful in establishing the scientific basis for calculating the conjectured risk of recombinant DNA research.

The use of recombinant techniques to modify genetic codes in DNA offers great promise for all of mankind through improved understanding of biological processes and varied applications in such fields as medicine, industry, and agriculture. Nevertheless, as with any new field of scientific research, it is impossible at this stage to say with absolute certainty that there is no future hazard from such research. On the other hand, our understanding of natural recombinant processes, evolutionary processes, bacterial genetics and ecology, and pathogenicity all indicate very strongly that there is little to fear. The situation is very similar to the extremely remote possibility of pathogenic organisms being returned to Earth by the Apollo missions. Reasonable safeguards were imposed then without regulatory or legislative action.

There have been recombinant processes occurring in nature since life began, and nature has built-in defenses against

aberrant DNA strains. There have been no illnesses or any other harm associated with recombinant DNA research. However, we cannot ignore the theoretical risks, nor can we ignore the necessity to assure the public that its health and safety and that of the environment are not reduced from that which exists naturally.

The general thrust of testimony from the more than 20 witnesses who appeared at the subcommittee hearings was that, if there is determined to be a need for legislation, it should be directed toward extending the NIH guidelines to nonfederally funded research on recombinant DNA. I generally agree with that conclusion. However, I am concerned that any action more restrictive than the NIH guidelines might initiate unnecessary and unreasonable restrictions on the conduct of basic scientific research in this country.

The initial fears of potential harm raised by concerned scientists led to what many consider to be premature legislative proposals which would, if enacted into law, unduly restrict the conduct of this valuable research. Subsequently, more broadly based analysis and review of advancements in knowledge about recombinant techniques led to a reassessment of the need for formal government regulation. Many of the scientists who originally raised concerns about the safety of such research have since modified their position in light of more complete information and have concluded that there is little, if any, hazard resulting from recombinant DNA research, particularly when performed under the NIH guidelines. Their assessments of the practical benefits from such research continue to be more and more favorable.

Faced with the continuing controversy over the need for legislation regulating recombinant DNA research, Senator Kennedy and others have suggested that it might be preferable to encourage action by the Executive Branch under the presumption that statutory authority exists, specifically Section 361 of the Public Health Service Act (42 U.S. Code 264). This section authorized the Secretary of Health, Education, and Welfare (HEW) to regulate activities related to the spread of "communicable disease." While the delegation of authority to the Secretary under this section is admittedly broad, there are numerous legal uncertainties and scientific inadequacies associated with its application to recombinant DNA research.

HEW Secretary Joseph Califano has

indicated on several occasions that he feels the use of Section 361 to regulate recombinant DNA research is inappropriate and inadequate. On 4 May, I wrote to Secretary Califano asking for his specific legal views on the application of Section 361 to recombinant DNA activities. Although I have yet to receive a response from him, I have acquired information from HEW which strongly suggests that application of Section 361 to recombinant DNA research would be inappropriate and ill-advised.

Some of my personal concerns with Section 361 are as follows:

• Application of Section 361 would serve as a bad precedent for Congress by encouraging unilateral and unauthorized action by the Executive Branch to regulate an area of basic scientific research.

• Section 361 would give the Secretary unbridled discretion to promulgate and enforce regulations controlling basic research without adequate safeguards against regulations which would be unnecessarily restrictive. In an 18 May letter replying to my request for his views on the use of Section 361 for regulating DNA research, Frank Press, director of the Office of Science and Technology Policy, said, "Section 361, of course, was not written to regulate research. Its use in this regard may provide precedent for broad intrusions into the research environment. . . ."

• The Congressional Research Service, responding to my request for an analysis of Section 361, agreed with the conclusions of the Federal Interagency Committee on Recombinant DNA Research that ". . . no single legal authority or combination of authorities currently exist that would clearly reach all research and other uses of recombinant DNA techniques. . . ."

• Under Section 361, there would be no preemption of local law regulating recombinant DNA research, a condition thought to be necessary by many researchers; I am personally uncertain whether preemption is a critical factor.

• Use of Section 361 is likely to lead to much litigation and delay in U.S. research and applications in the recombinant DNA area.

• Section 361 would authorize the Secretary to impose sanctions of up to $1000 in fines and 1 year's imprisonment, which is wholly unreasonable in view of the purely hypothetical nature of the suggested risks of recombinant DNA research.

Precipitous action such as that proposed by my Senate colleagues could seriously damage basic scientific research in this country at a time when the rest of the world is moving rapidly to reap its benefits. Premature regulation of scientific research based on hypothetical risk assessments would have vast implications for all of science and technology. We must move cautiously and, at the same time, fully explore all of the alternatives to and ramifications of such regulation before embarking on this course.

Until we fully understand the implications of stretching Section 361 to include recombinant DNA activities, it would be imprudent to recommend or allow its application. If we are not more far-seeing and more cautious in our use of regulatory authority, we may find the United States becoming irrelevant, first in the advance of science, then in the advance of technology, and, finally, in the advance of the best of human civilization and freedom.

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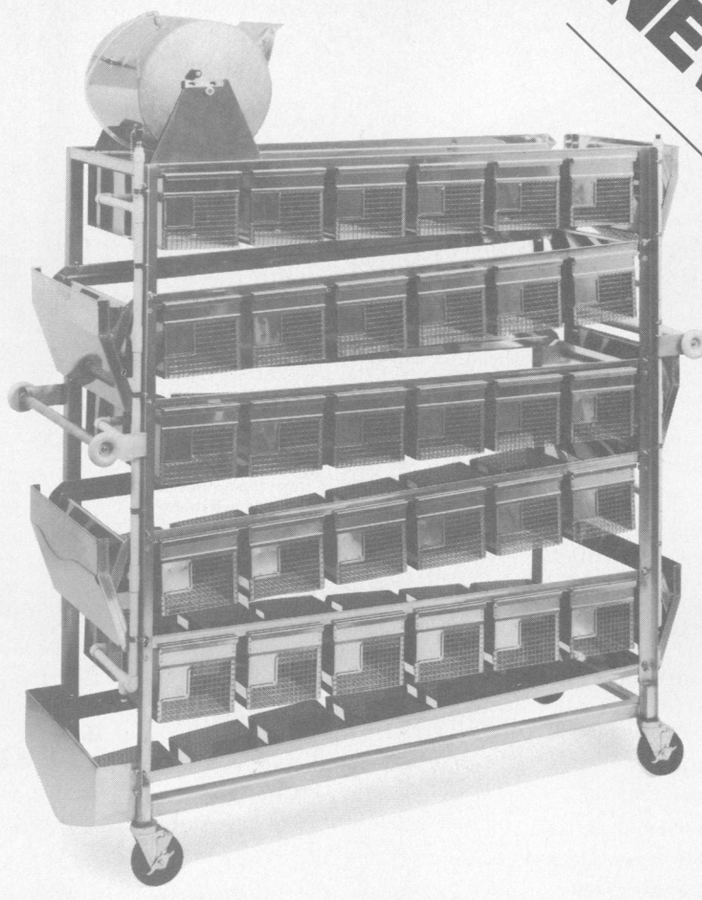

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14 July 1978, Volume 201, Number 4351 **SCIENCE**

Public and Private Policies for R & D

AAAS held its third annual R & D Policy Colloquium in Washington in late June. Once again, the academic and industrial sectors mingled and debated with key spokespersons from the White House, the Office of Management and Budget (OMB), and Congress. This was no public rally to wring more money out of the government's hard-pressed purse. On the contrary, the colloquium struggled with large and vexing uncertainties which pervade the many-sided structure of U.S. research and development, and the give-and-take was refreshingly frank.

The framework for the colloquium was set by the special AAAS "R & D Report" prepared by Willis Shapley and Don Phillips, analyzing President Carter's budget decisions on research and development and exploring the indicative evidence concerning industrial research and the connections between R & D and the performance of the national economy. Aside from its merits in sizing the current government mind-set toward R & D, the report provides a unified view of the disordered terrain that we like to call "science and technology policy." It is important reading.

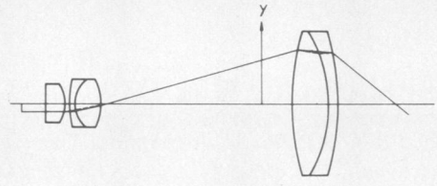
The colloquium made several things clear. Government is now reaching for consensus approaches to national science and technology policies. There is still some life left in the system of checks and balances in the relations between politics and science. It is up to the scientific and technological communities to get into the act and help to construct the terms on which the United States will both pursue the search for knowledge and reach a less ambiguous view of the contributions of R & D to the technology base of the nation's economy. Equally clear are the risks associated with underinvestment in basic research, the confusion among public policies that promote science and others that discourage innovation, and the vulnerability of R & D as discretionary outlays in the emerging national distemper toward the high price of government.

But the colloquium suggests something else that is on the cheerful side. As we look at the federal government, in a number of ways the quality of policy management for R & D begins to be impressive. There is, at this point, an unmistakable search for a better architecture of science and technology policy, on the part of the Executive as well as Congress. We begin to see a blending of science policy with economic and budget policies, together with a definite tilt toward multiyear fiscal strategies, starting with the 1980 budget. Even in the area of science and technology indicators there is evidence not only of lively development but also of intentions to link such indicators directly to policy management. None of this signifies that public policy for science and technology has done more than turn the corner, much less that it is settled or complete. What it does indicate is that public policymakers, few of whom are at home with science, are trying very hard to cope. The White House study of the problems afflicting industrial risk-taking, in an environment of public policy uncertainty, is sufficient evidence of this.

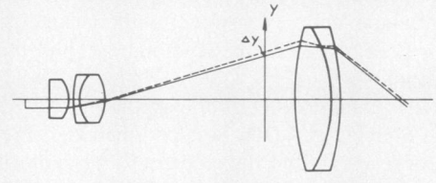
One example of the candor displayed at the AAAS colloquium was OMB's revelation that the 1980 budget, now being scripted, will be exceedingly tight because of inflationary danger signals. Research and Development may well feel the pinch, barely 1 year after experiencing a growth budget. This exemplifies the predicament assailing the whole process of public policy-making: an itch for durable science policies on the one hand, and the mischief created by near-term discontinuities on the other. But if there is bad news, there is good news too, and it is the new awareness by government of research and development as necessary public and private investment and as very good economics. That constitutes high ground for science and technology in the long run, and it is ground that can be held.

—WILLIAM D. CAREY

Nikon CF Optics



Correction of the chromatic difference of magnification by the new Nikon CF system.



Correction of the chromatic difference of magnification by the conventional compensation system.

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CF Optics Story. For the past one hundred years, the standard design for microscope optics has been a compensation system in which the eyepiece was designed to offset chromatic aberration in the objective. This system usually performed well in the center of the field of view but exhibited increasing chromatic aberration near the periphery.

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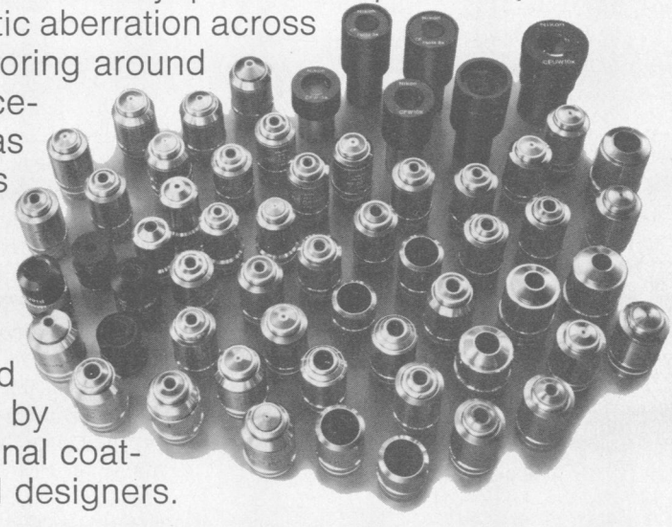

CF optics are the result of advanced computer technology, the total control by Nikon of its optical glass from sand to final coating, and the innovation of Nikon optical designers.

For more information on Nikon CF optics, contact Nikon Incorporated, Instrument Division, a subsidiary of Ehrenreich Photo-Optical Industries, Inc., 623 Stewart Avenue, Garden City, N.Y. 11530; (516) 222-0200.

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PRODUCTS and MATERIALS

Instrumentation Recorder

Model D offers eight tracks and five speeds from 15/16 to 15 inches per second. When the tape is stopped, electronics to electronics monitoring occurs in which the signal passes through all the record and playback electronics but bypasses the heads thus allowing simultaneous display on an external oscilloscope. In the record mode, this EE monitoring occurs in both direct and FM plug-ins. Voice electronics and a speaker are also built-in to allow recording and playback on channel 8. The voice channel may be used as an override on a time-shared basis. A. R. Vetter. Circle 667.

High-Performance Liquid Chromatograph

System I is a modular system comprising a sample injector, a column, a pumping unit, and a detector. Features include a pulse-free liquid delivery system and an injection valve that offers pressures up to 7000 pounds per square inch. The modular design allows the user to develop the best system for a given application. The sample loop-filling syringe operates with a variety of interchangeable components. Glenco Scientific. Circle 665.

Image Analyzer

The Magiscan image analysis system offers control by key pad and light pen. The software-based system will accept images from any television camera, electron microscope, or computerized axial tomograph scanner. A high-speed analog-digital converter digitizes an image and displays it. The image is then processed and amended and features are measured and analyzed. Data may then be extracted relative to such parameters as area, count, perimeter, height, density, maximum chord length, orientation, and so forth. Output is then made available. Joyce, Loebl. Circle 666.

Automatic Clinical Analyzer

The aca II is a 60-channel device suitable for large-scale applications. The new unit uses the 35 current aca methods presently available and can be adapted as more become available. New features include the low-temperature accessory that provides an alternative (30°C) to the usual 37°C operating temperature and an interface to link the analyzer with an on-line laboratory information system. DuPont Instruments. Circle 671.

Nephelometer

The LSA 290 employs a light-scattering technique to measure serum proteins. It includes a pipettor-diluter, a nephelometer and a data processor. Twelve assays may be performed: immunoglobulins G, A, and M, complement components 3 and 4, haptoglobin, alpha-1-antitrypsin, albumin, transferrin, alpha-2-macroglobulin, ceruloplasmin, and hemopexin. Reagents consist of antiserum, buffer, and five diluted reference serums. Kallestad Laboratories. Circle 668.

Thermal Analysis and Mass Spectrometry

An apparatus is available for the study of decomposition processes under atmospheric pressure simultaneously by thermogravimetric differential thermal analysis and mass spectrometry to 1550°C. For measurements under high vacuum, the pressure-reduction systems are removed and by direct view between test body and ion source a high sensitivity is achieved. The system is suitable for a variety of organic and inorganic chemistry applications. Netzsch Brothers. Circle 670.

Tissue Freeze Dryer

The Tis-U-Dry series comprises three mechanically refrigerated bench models that offer drying temperatures between − 45°C and − 110°C with vapor-condensing temperatures to −130°C to permit extra-low-temperature studies. All histological techniques including formaldehyde fluorescence and resin or paraffin embedding are carried out within the 4-liter chamber without sample transfer. A proportionally controlled heat source is provided to control formaldehyde fixation temperature to within 0.5°C between ambient and 100°C. The specimen holder accepts specimens up to 92 square centimeters. Up to 3 liters of vapor may be collected before defrosting the self-contained condenser. FTS Systems. Circle 669.

Literature

Radioimmunoassay Instrumentation describes the RackGamma counting instrument for analysis of double-labeled samples, enabling the operator to count gamma emitting isotopes of cobalt, selenium, chromium, iodine, and iron in addition to iodine-125. LKB Instruments. Circle 672.

HPLC Detectors are listed on separate data sheets that include design specifications and individual features. Micromeritics Instrument. Circle 673.

Camera Microscope is devoted to the Ultraphot IIIb which is suitable for all biological and metallographic applications. Carl Zeiss. Circle 674.

Absorption Spectrophotometry reports dual-element determinations with the IL 751 atomic absorption spectrophotometer in 25 analytical laboratories. References are included. Instrumentation Laboratory. Circle 675.

Instrumentation Laboratory. Circle 675.

Biological Stains also lists indicators, embedding and mounting media, buffers, fixatives, and reagents. Atomergic Chemetals. Circle 676.

Scientific Apparatus includes a full line of tissue homogenizers, stirrers, temperature controllers, concentrators, mills, and many other laboratory devices. Tekmar. Circle 677.

Fittings describes flangeless miniature fluid fittings of Teflon and other materials. Omnifit. Circle 678.

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 102A and 190A) and placing it in the mailbox. Postage is free.

—RICHARD G. SOMMER

BOOKS RECEIVED AND BOOK ORDER SERVICE

(Continued from page 149)

of a symposium, London, Oct. 1975. R. I. C. Spearman, Ed. Published for the Zoological Society of London by Academic Press, New York, 1977. xviii, 428 pp., illus. $29. Symposia of the Zoological Society of London, No. 39.

The Concept of Energy. An Inquiry into Origins and Applications. E. J. Hoffman. Ann Arbor Science, Ann Arbor, Mich., 1977. x, 574 pp. $29.50.

Corn and Corn Improvement. G. F. Sprague, Ed. American Society of Agronomy, Madison, Wis., ed. 2, 1977. xvi, 774 pp., illus. $20. Agronomy, 18.

Cosmology. Michael Rowan-Robinson. Clarendon (Oxford University Press), New York, 1977. xii, 160 pp., illus. $13.25. Oxford Physics Series, 15.

The Craniofacial Morphology of the Sulawesi Macaques. Multivariate Approaches to Biological Problems. Gene H. Albrecht. Karger, Basel, 1978. viii, 152 pp., illus. Paper, $35.75. Contributions to Primatology, vol. 13.

Decompression Sickness. Vol. 1, The Biophysical Basis of Prevention and Treatment. B. A. Hills. Wiley-Interscience, New York, 1977. x, 322 pp., illus. $31.50.

Dengue Viruses. R. W. Schlesinger. Springer-Verlag, New York, 1977. iv, 132 pp., illus. $33.20. Virology Monographs, 16. *To order this book circle No. 389 on Readers' Service Card*

Denotational Semantics. The Scott-Strachey Approach to Programming Language Theory. Joseph E. Stoy. MIT Press, Cambridge, Mass., 1977. xxxii, 414 pp., illus. $19.95. MIT Press Series in Computer Science, 1.

Desk Reference for Neuroanatomy. A Guide to Essential Terms. Isabel Lockard. Springer-Verlag, New York, 1977. viii, 158 pp. $12.80. *To order this book circle No. 390 on Readers' Service Card*

Diffraction from Materials. L. H. Schwartz and J. B. Cohen. Academic Press, New York, 1977. xvi, 558 pp., illus. $27.50. Materials Science and Technology.

Directory of Electronic Circuits with a Glossary of Terms. Matthew Mandl. Prentice-Hall, Englewood Cliffs, N.J., ed. 2, 1978. xiv, 322 pp., illus. $16.95.

Directory of On-Going Research in Cancer Epidemiology 1977. International Agency for Research on Cancer, Lyon, 1977 (U.S. distributor, WHO Publications Centre USA, Albany, N.Y.). xiv, 600 pp. Paper, $10. IARC Scientific Publications No. 17.

The DNA Molecule. Structure and Properties. Original Papers, Analyses, and Problems. David Freifelder. Freeman, San Francisco, 1977. xii, 498 pp., illus. Cloth, $20; paper, $12. A Series of Books in Biology.

Dynamical and Chemical Coupling between the Neutral and Ionized Atmosphere. Proceedings of a NATO Advanced Study Institute, Spåtind, Norway, Apr. 1977. B. Grandal and J. A. Holtet, Eds. Reidel, Boston, 1977. xx, 392 pp., illus. $36. NATO Advanced Study Institutes Series C, vol. 35.

The Dynamics of the Upper Ocean. O. M. Phillips. Cambridge University Press, New York, ed. 2, 1977. viii, 336 pp., illus. $34. Cambridge Monographs on Mechanics and Applied Mathematics.

Dyserythropoiesis. Papers from a symposium, Leuven, Belgium, Apr. 1976. S. M. Lewis and R. L. Verwilghen, Eds. Academic Press, New York, 1977. xii, 350 pp., illus. $23.

Early Intervention and the Integration of Handicapped and Nonhandicapped Children. Michael J. Guralnick, Ed. University Park Press, Baltimore, 1978. xvi, 302 pp. $16.50.

The Education of Motor and Neurologically Handicapped Children. Simon H. Haskell, Elizabeth K. Barrett, and Helen Taylor. Croom Helm, London, and Halsted (Wiley), New York, 1977. 196 pp., illus. + plates. $17.95.

The Effects of Infant and Child Mortality on Fertility. Papers from a seminar, Bangkok, Thailand, May 1975. Samuel H. Preston, Ed. Academic Press, New York, 1977. x, 262 pp. $19.50.

Electric Circuits. A First Course in Circuit Analysis for Electrical Engineers. By Members of the Staff of the Department of Electrical Engineering, Massachusetts Institute of Technology. MIT Press, Cambridge, Mass., 1977. xxxiv, 782 pp., illus. Paper, $6.95. Principles of Electrical Engineering Series, vol. 1. Reprint of the 1940 edition.

Energy or Extinction? The Case for Nuclear Energy. Fred Hoyle. Heinemann, London, 1977. x, 82 pp., illus. Paper, $5.25.

Energy Use Management. Proceedings of a conference, Tucson, Ariz., Oct. 1977. Rocco A. Fazzolare and Craig B. Smith, Eds. Pergamon, New York, 1977. Two volumes, illus. xxxiv, 1000 pp., and xxxiv, 700 pp. $200. *To order this book circle No. 378 on Readers' Service Card*

Engineering Hemodynamics. Application to Cardiac Assist Devices. Walter Welkowitz. Lexington (Heath), Lexington, Mass., 1977. xxviii, 144 pp., illus. $17.50.

Epidemiologic Studies in Psychosomatic Medicine. Stanislav Kasl and Franz Reichsman, Eds. Karger, Basel, 1977. x, 224 pp., illus. $27.50.

Epistemology and Psychology of Functions. Jean Piaget, Jean-Blaise Grize, Alina Szeminska, and Vinh Bang with the collaboration of Catherine Fot and five others. Translated from the French edition (Paris, 1968). Reidel, Boston, 1977. xiv, 214 pp. $34.

The Essential Tension. Selected Studies in Scientific Tradition and Change. Thomas S. Kuhn. University of Chicago Press, Chicago, 1978. xxiv, 366 pp. $18.50.

The Evolution of Metalloenzymes, Metalloproteins and Related Materials. Proceedings of a symposium, Sussex, July 1977. G. J. Leigh, Ed. Symposium Press, London, 1977. iv, 118 pp., illus. Paper, $7.70.

Experimental Studies in Regeneration of Spinal Neurons. Tat'yana Nesmeyanova. Translated from the Russian edition. Winston, Washington, D.C., and Halsted (Wiley), New York, 1977. xii, 268 pp., illus. $27.50.

The Family Crucible. Augustus Y. Napier and Carl A. Whitaker. Harper and Row, New York. 1978. xvi, 304 pp. $11.95.

Fans. William C. Osborne. Pergamon, New York, ed. 2. 1977. x, 228 pp., illus. $15. International Series in Heating, Ventilation and Refrigeration, Vol. 1. *To order this book circle No. 391 on Readers' Service Card*

Federal Milk Marketing Orders and Price Supports. Paul W. MacAvoy, Ed. American Enterprise Institute for Public Policy Research, Washington, D.C., 1977. xii, 168 pp. Paper, $3.75. American Enterprise Institute Studies in Government Regulation. Ford Administration Papers on Regulatory Reform.

Food, Fertilizer and Agricultural Residues. Proceedings of a conference, Ithaca, N.Y., 1977. Raymond C. Loehr, Ed. Ann Arbor Science, Ann Arbor, Mich., 1977. viii, 728 pp., illus. $32.50.

Food Policy. The Responsibility of the United States in the Life and Death Choices. Peter G. Brown and Henry Shue, Eds. Free Press (Macmillan), New York, and Collier Macmillan, London, 1977. viii, 344 pp. $14.95.

Fortschritte der Chemie organischer Naturstoffe. Progress in the Chemistry of Organic Natural Products. Vol. 34. W. Herz, H. Grisebach, and G. W. Kirby, Eds. Springer-Verlag, New York, 1977. x, 622 pp., illus. $118.70. *To order this book circle No. 392 on Readers' Service Card*

Fourier Transformation and Linear Differential Equations. Zofia Szmydt. Translated from the Polish edition (Warsaw, 1972) by Marcin E. Kuczma. Reidel, Boston, and PWN—Polish Scientific Publishers, Warsaw, 1977. xx, 504 pp. $34.

From Private Vice to Public Virtue. The Birth Control Movement and American Society since 1830. James Reed. Basic, New York, 1978. xvi, 456 pp. + plates. $17.95.

Frontiers in Reproduction and Fertility Control. A Review of the Reproductive Sciences and Contraceptive Development, part 2. MIT Press, Cambridge, Mass., 1977. xvi, 580 pp., illus. $29.95.

Genetics and Physiology of *Aspergillus*. Papers from a symposium, Birmingham, England, Sept. 1976. John E. Smith and John A. Pateman, Eds. Academic Press, New York, 1977. x, 552 pp., illus. $23.50.

Geochemical Exploration 1976. Proceedings of a symposium, Sydney, Australia, Aug. 1976. C. R. M. Butt and I. G. P. Wilding, Eds. Elsevier, New York, 1977. x, 494 pp., illus. $42.50. Developments in Economic Geology, 9. Association of Exploration Geochemists Special Volume No. 6. Reprinted from the *Journal of Geochemical Exploration*, vol. 8, No. 1/2.

Getting the Most out of Your Doctor. Lawrence A. May. Basic, New York, 1978. xxvi, 262 pp. $10.

Handbook of Behavior Therapy with Sexual Problems. Vol. 1, General Procedures. Joel Fischer and Harvey L. Gochros. Pergamon, New York, 1977. liv, 258 pp. + index. $20. Pergamon General Psychology Series, vol. 64. *To order this book circle No. 393 on Readers' Service Card*

Handbook of Environmental Data on Organic Chemicals. Karel Verschueren. Van Nostrand Reinhold, New York, 1977. viii, 660 pp., illus. $37.50. *To order this book circle No. 379 on Readers' Service Card*

The High Frontier. Human Colonies in Space. Gerard K. O'Neill. Illustrated by Donald Davis. Bantam, New York, ed. 2, 1978. viii, 344 pp. Paper, $2.75.

Hosts and Guests. The Anthropology of Tourism. Valene L. Smith, Ed. University of Pennsylvania Press, Philadelphia, 1977. viii, 254 pp., illus. $14.

Immunology of the Gut. Papers from a symposium, London, Apr. 1976. Elsevier/Excerpta Medica/North-Holland, New York, 1977. viii, 376 pp., illus. $27.95. Ciba Foundation Symposium 46 (new series).

Inference, Method and Decision. Towards a Bayesian Philosophy of Science. Roger D. Rosenkrantz. Reidel, Boston, 1977. xvi, 270 pp. Cloth, $26; paper, $11.95. Synthese Library, vol. 115.

International Nonproprietary Names (INN) for Pharmaceutical Substances, 1977. Cumulative List No. 5. World Health Organization, Geneva, 1977 (U.S. distributor, WHO Publications Centre USA, Albany, N.Y.). xviii, 332 pp. Paper, $19.20.

Introduction to Ecological Biochemistry. J. B. Harborne. Academic Press, New York, 1977. xiv, 244 pp., illus. $13.65.

The Journal of William Tully. Medical Stu-