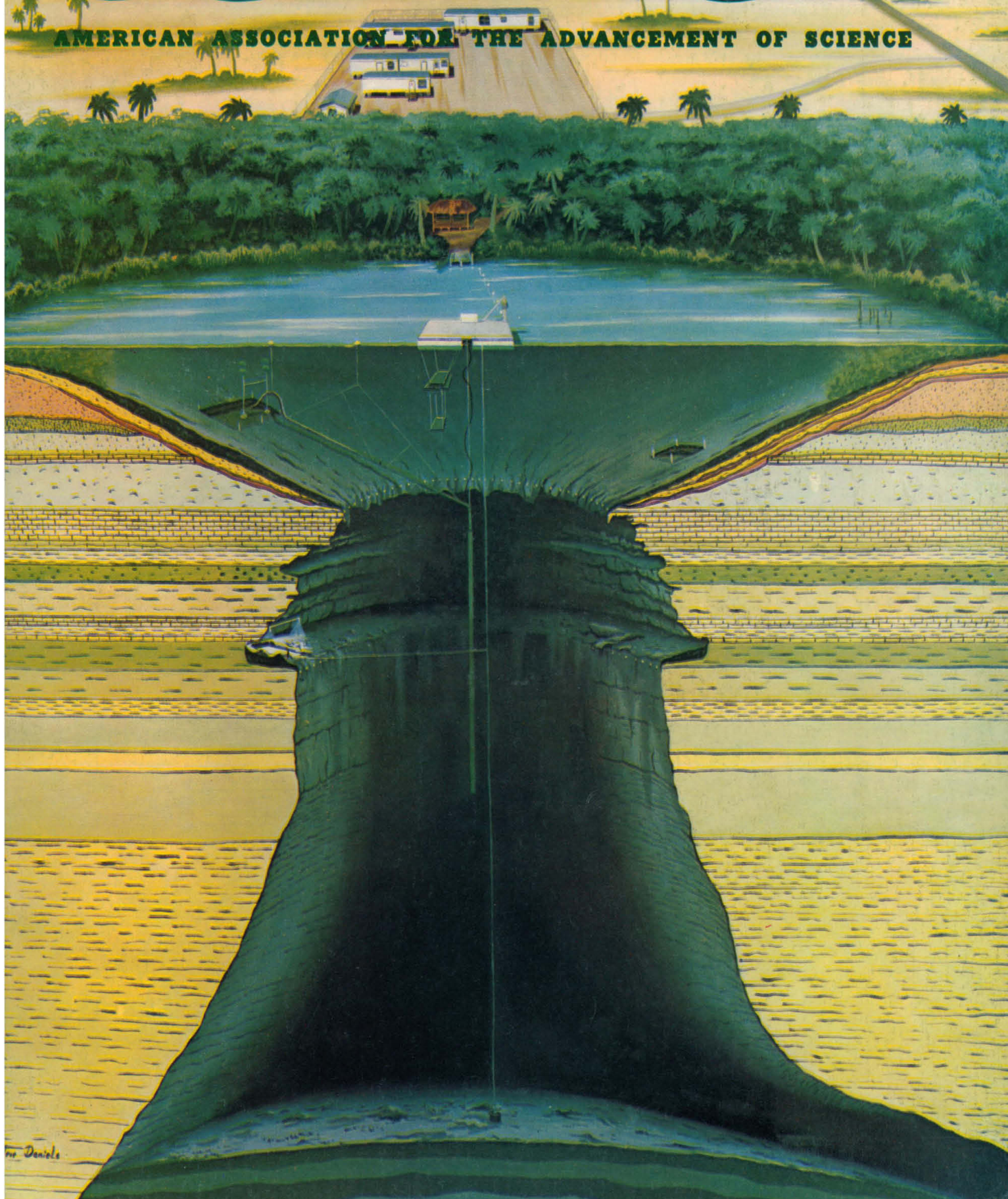


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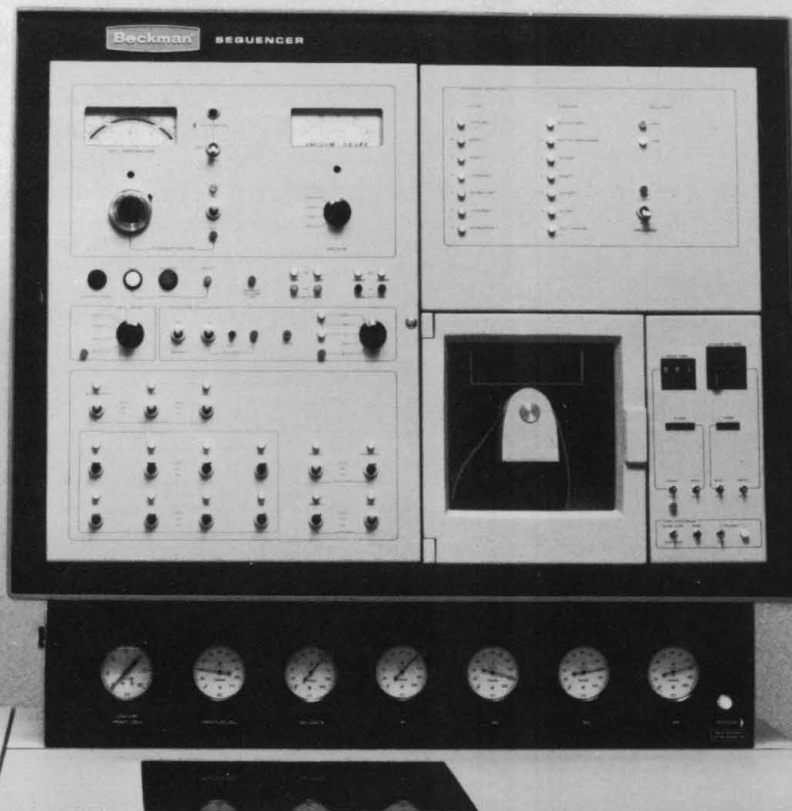
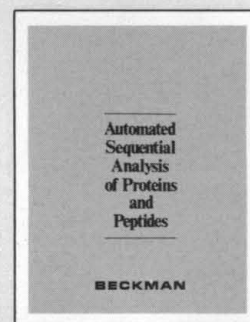
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1. Bradford, M., *Anal. Biochem.*, 72, 248 (1976).

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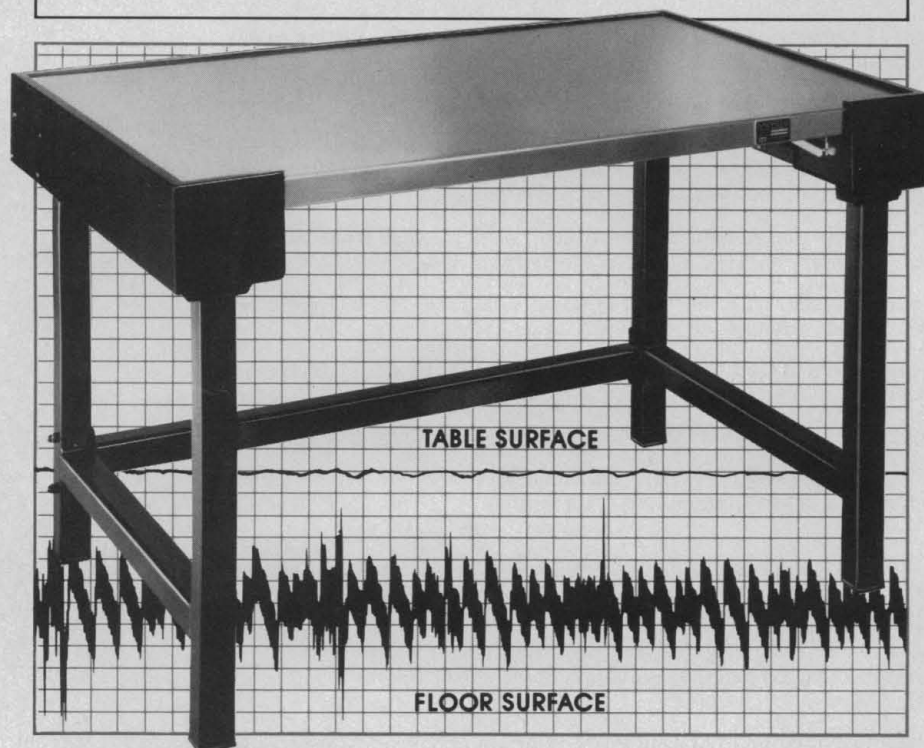
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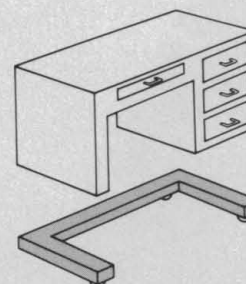
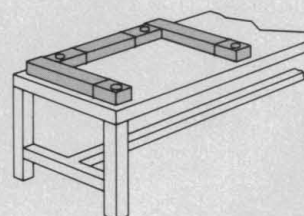
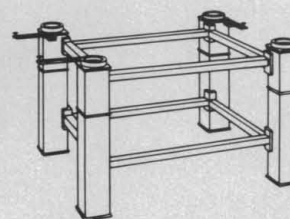
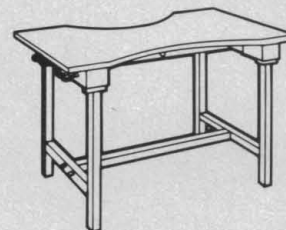
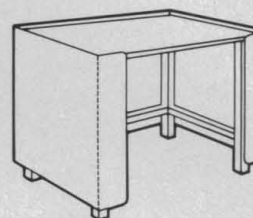
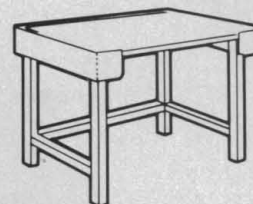
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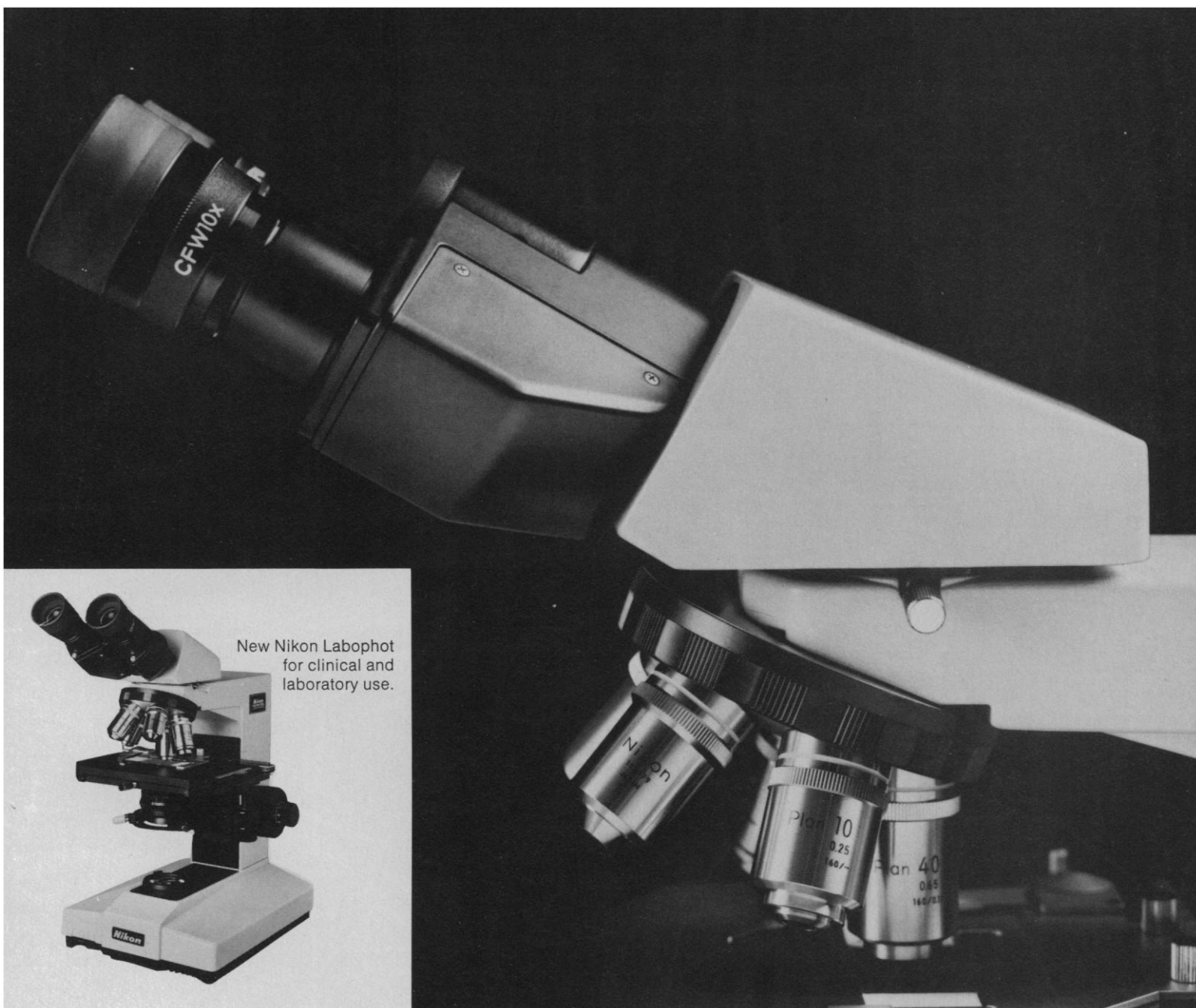
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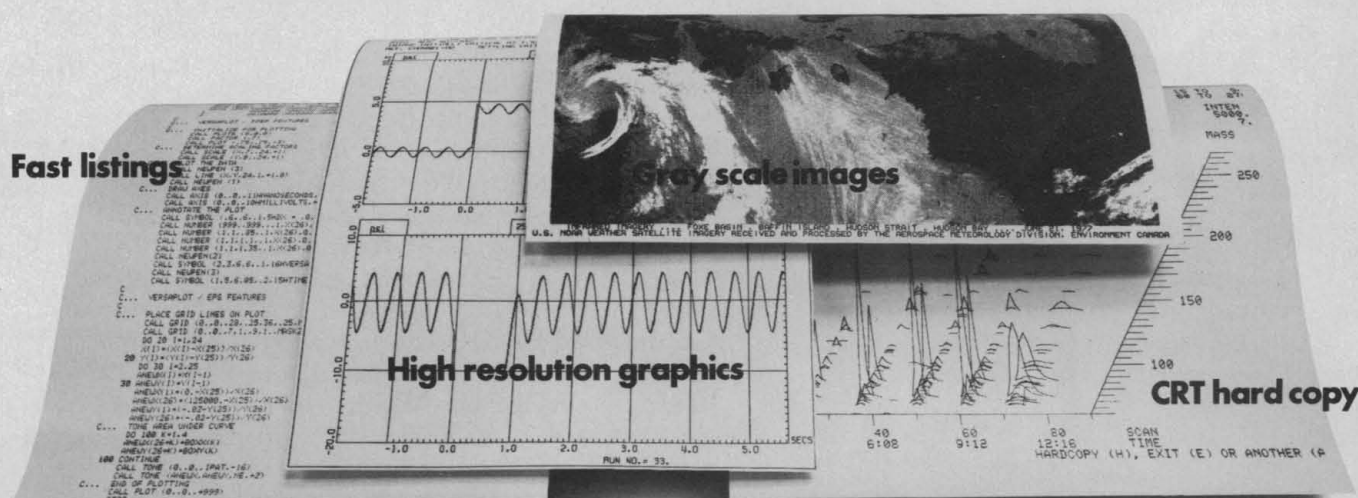
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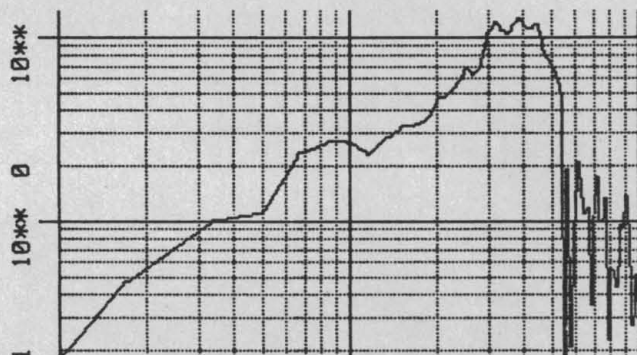
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Cancer prevention is one of the most discussed subjects of our age because it is one of the best weapons, in the long run, in the war on cancer. Scientific, *practical* advances have been made in understanding the multiple factors that increase the risk of developing cancers, thus opening the door to more effective prevention, for more people. Despite this progress there is a gap between scientific knowledge and public understanding—a gap that appears to have grown deeper in recent times.

This symposium will attempt to correct this unfortunate situation. It will present national and international experts in medical science offering objective, authoritative assessments of:

- What we really know about the causes of the major lethal cancers.
- What we *don't* know but can learn with a reasonable commitment to research.
- What individuals and society can do *now* to help prevent cancers.

Who should attend? The planners of the symposium have developed it for four primary audiences: Federal and state legislators and members of regulatory agencies; editors and reporters who cover cancer and other public health issues; scientists studying cancer causation; and business and labor executives who must deal with this problem.

All of these audiences have important roles in the formation of public policy on cancer prevention. All will find this symposium a needed review, a "scientific pause," as it were, on a vital subject.

The proceedings of the symposium will be published shortly after the meeting and will include summaries in non-scientific terminology.

*This Symposium is being held in cooperation with the
AMERICAN CANCER SOCIETY, INC.*

February 28, 1979 Wednesday Morning *The Speaker's time includes 5-10 minutes of Specific Discussion*

7:00 a.m.	Distribution of Symposium Materials and Late Registration, continued from Tuesday evening.	
Time	Session Topic/Specific Presentations	Participants
8:15- 8:30	Introduction	Joseph Cimino, President, New York Medical College, Valhalla, NY; Past Commissioner of Health, New York City
	Session I: A Review of Some Chemical Mechanisms Involved in Molecular Damage by Carcinogens in the General and Personal Environment	Chairperson and Moderator: Elizabeth Miller, McCardle Laboratories, University of Wisconsin, Madison, Wisconsin
8:30- 9:00	Prediction of Carcinogenicity Based on Structure, Reactivity and Possible Metabolic Pathways	Benjamin Van Duuren, NYU Medical Center, New York, NY
9:00- 9:30	Inhibitors of Chemical Carcinogens	Lee Wattenberg, University of Minnesota, Minneapolis, Minn.
9:30-10:00	Mechanisms of DNA Damage and DNA Repair Systems	James Cleaver, Laboratory of Radiobiology, University of California, San Francisco, CA
10:00-10:20	Coffee Break	
10:20-10:50	Mammalian Cell Transformation and Mammalian Cell Mutagenesis (in vitro)	Charles Heidelberger, USC Cancer Center, Los Angeles, CA
10:50-11:20	Evaluating Substances for Promotion, Co-Carcinogenesis and Synergy	Bernard Weinstein, Columbia University, College of Physicians and Surgeons, New York, NY
11:20-11:35	Summary and Comment	Elizabeth Miller, <i>Chairperson and Moderator</i>
11:35-12:30	General Discussion	Participants and Audience
12:30- 1:30	Luncheon	
	Session II: Clues to Cancer Causation and Prevention, from Existing Epidemiologic Data in Humans	Chairman and Moderator: Rulon Rawson, University of Utah Research Institute, Salt Lake City, Utah
1:30- 2:00	The Epidemiology of Health: Its Relevance to Cancer Prevention	Rulon Rawson, University of Utah Research Institute, Salt Lake City, Utah
2:00- 2:45	Multiplicity of Factors Involved in Cancer Patterns and Trends	John Higginson, International Agency for Research on Cancer, Lyons, France

AN ACADEMIC REVIEW OF THE ENVIRONMENTAL DETERMINANTS OF CANCER

2:45- 3:05	Coffee Break
3:05- 3:35	Trends in the Incidence and Mortality in the United States
3:35- 4:05	Cancer Among the Seventh Day Adventists
4:05- 4:20	Summary and Comment
4:20- 5:30	General Discussion

Susan Devesa,
National Cancer Institute, Bethesda, Md.
Roland Phillips,
Loma Linda University, Loma Linda, Calif.
Rulon Rawson,
Chairman and Moderator
Participants and Audience

March 1, 1979 Thursday Morning *The Speaker's time includes 5-10 minutes of Specific Discussion.*

Time	Session Topic/Specific Presentations	Participants
	Session III: Cancer Causation: Cigarettes, Urban Factors and Life Style	Chairman and Moderator: Merril Eisenbud , NYU Medical Center, New York, NY Ernst Wynder , Naylor Dana Preventive Medicine Institute, Valhalla, NY Gio Gori , National Cancer Institute, Bethesda, Md. John Goldsmith , Calif. Dept. of Health Services, Berkeley, and Faculty of Health Sciences, Ben Gurion University of the Negev, Beer Sheva, Israel
8:30- 9:00	The Environment and Cancer Prevention	
9:00- 9:30	Threshold and Dose Responses in Filtered Cigarettes	
9:30-10:00	The Urban Factor and Air Pollution	
10:00-10:20	Coffee Break	
10:20-10:50	Cancer in New Jersey and Other Complex Urban/Industrial Areas	Harry Demopoulos , NYU Medical Center, New York, NY
10:50-11:20	Carcinogenicity of Hair Dye Components	Benjamin Van Duuren , NYU Medical Center, New York, NY
11:20-11:35	Summary and Comment	Merril Eisenbud , Chairman and Moderator
11:35-12:30	General Discussion	Participants and Audience
12:30- 1:30	Luncheon	
	Session IV: Cancer Causation: Disordered Nutrition	Chairman and Moderator: Vernon Young , M.I.T., Cambridge, Mass. Kenneth Carroll , University of Western Ontario, London, Ontario
1:30- 2:00	Lipids and Carcinogenesis	
2:00- 2:30	The Possible Role of Pathologic Free Radical Reactions	Harry Demopoulos , NYU Medical Center, New York, NY
2:30- 3:00	Steroids, Fibre, and Related Factors in Carcinogenesis	David Kritchevsky , Wistar Institute, Philadelphia, Penn.
3:00- 3:20	Coffee Break	
3:20- 3:50	Determinants in the Control of Lipid Transport and Metabolism	Herbert Kayden , NYU Medical Center, New York, NY
3:50- 4:20	Nutritional Deficiencies	Paul Newberne , M.I.T., Cambridge, Mass.
4:20- 4:35	Summary and Comment	Vernon Young , Chairman and Moderator
4:35- 5:30	General Discussion	Participants and Audience

March 2, 1979 Friday Morning *Please Note the 8:00 a.m. Start, and Combined Discussion Periods.*

Time	Session Topic/Specific Presentations	Participants
	Session V: Cancer Causation: Major Additives in Food and Beverages	Chairman and Moderator: Vernon Young , M.I.T., Cambridge, Mass. Steve Tannenbaum , M.I.T., Cambridge, Mass.
8:00- 8:25	Nitrites and Nitrosamines	Panel Review
8:25- 8:50	Saccharin and Cyclamates, In Perspective	Vernon Young , Chairman and Moderator
8:50- 9:00	Summary and Comment	Participants and Audience
9:00- 9:30	Discussion, Specific and General	
9:30- 9:50	Coffee Break	

Session VI: Cancer Causation: Medical and Occupational

- 9:50-10:15 Administration of Therapeutic Agents
10:15-10:40 Pre-Existing, Non-Malignant Disorders Associated with Increased Cancer Risk
10:40-11:05 A Review of Occupational Exposures, Past and Present
11:05-11:20 Summary and Comment
11:20-12:00 Discussion, Specific and General
12:00- 1:00 Luncheon

Session VII: Risk Assessment

- 1:00- 1:25 A Review of Past Risk Assessments and Extrapolation Problems with Radiation
1:25- 1:55 The Relationship of Bio-Assay of Chemicals to Human Risk
1:55- 2:05 Summary and Comment
2:05- 2:35 Discussion, Specific and General
2:35- 2:55 Coffee Break

Session VIII: New Potentials for Prevention, and Conference Conclusions

- 2:55- 3:20 Chemical Prevention of Carcinogenesis
3:20- 3:45 Retinoids in Cancer Prevention
3:45- 4:15 Conference Conclusions Relevant to Comprehensive Prevention of Cancer
4:15- 4:45 Discussion, Specific and General

Chairman and Moderator:

Bernard Wagner,
Columbia University, College of Physicians and Surgeons, New York, NY

Richard Adamson,
National Cancer Institute, Bethesda, Md.

Alexander Templeton,
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Chairman and Moderator:

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SUNY, Stony Brook, NY

Panel Review

Henry Pitot,
McCardle Laboratories, University of Wisconsin, Madison, Wisc.

Marvin Kuschner,
Chairman and Moderator

Participants and Audience

Chairman and Moderator:

Joseph Cimino,
New York Medical College, Valhalla, NY

Paul McCay,
Oklahoma Medical Research Foundation, Oklahoma City, Okla.

Michael Sporn,
National Cancer Institute, Bethesda, Md.

Panel Review

Participants and Audience

CANCER SYMPOSIUM

An Academic Review of the Environmental Determinants of Cancer Relevant to Prevention

Symposium Committee:

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Dr. Benjamin Van Duuren, New York University Medical Center

Dr. Vernon Young, Massachusetts Institute of Technology

Dr. Marvin Kuschner, Dean, Health Sciences Center, State University of New York, Stony Brook

Dr. John Higginson, International Agency for Research on Cancer, Lyons, France

Dr. Joseph Cimino, President, New York Medical College; Former Commissioner of Health, New York City

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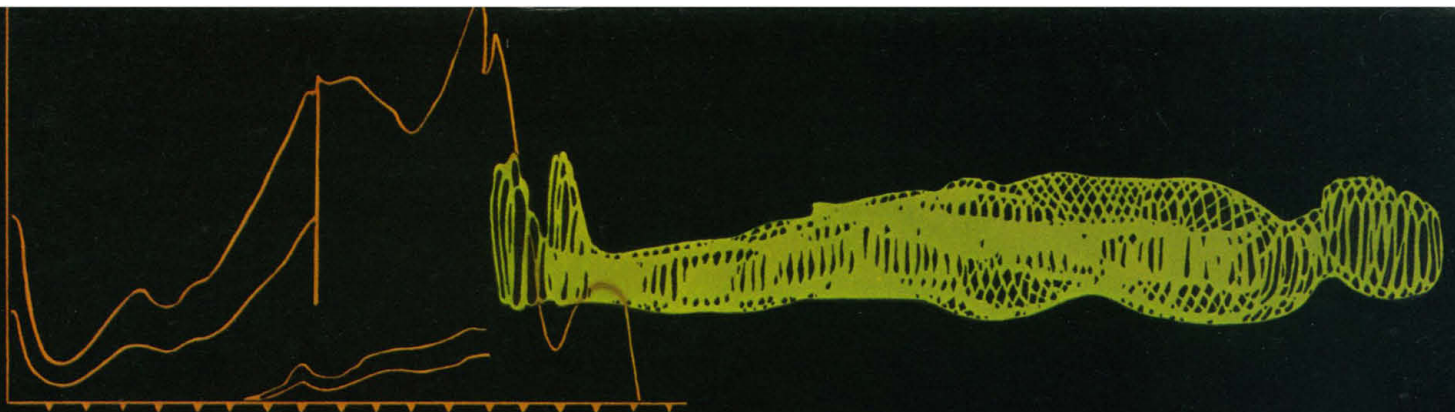
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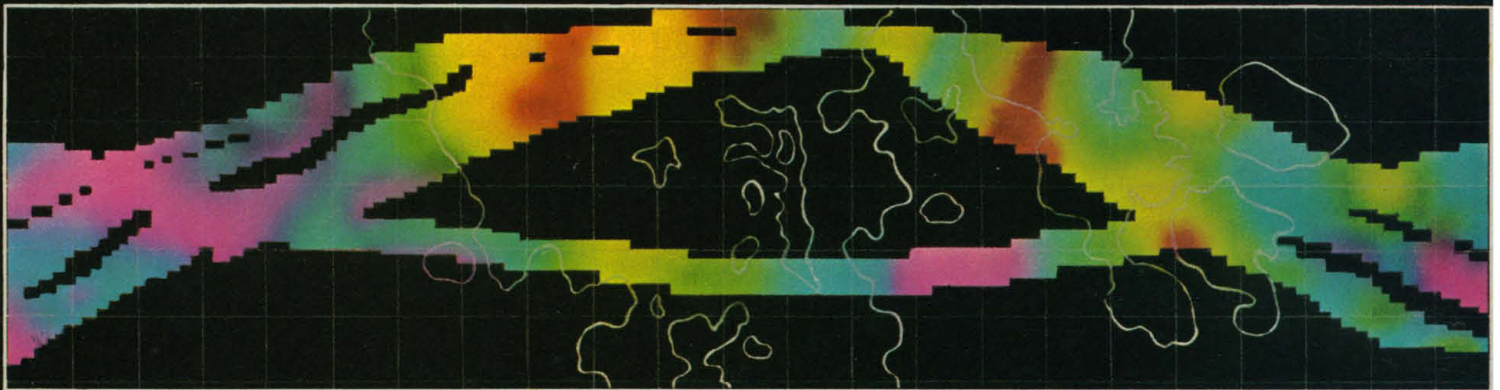
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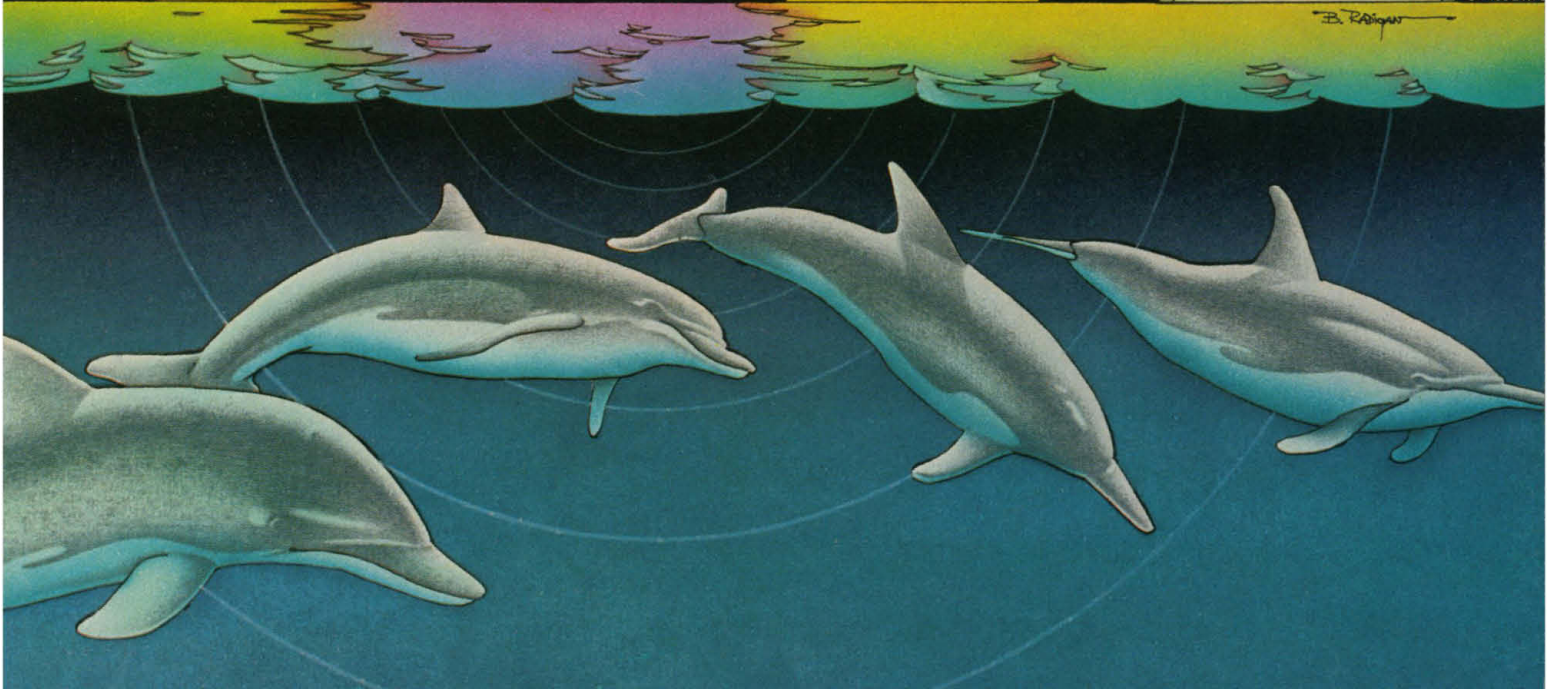
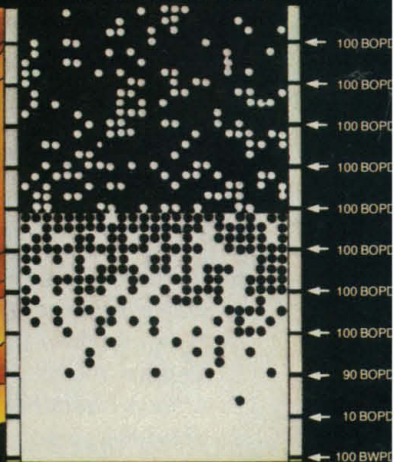


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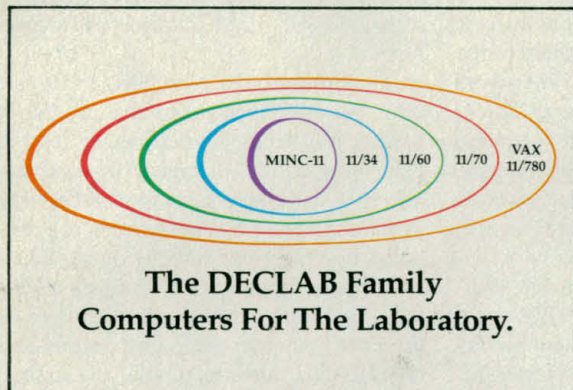
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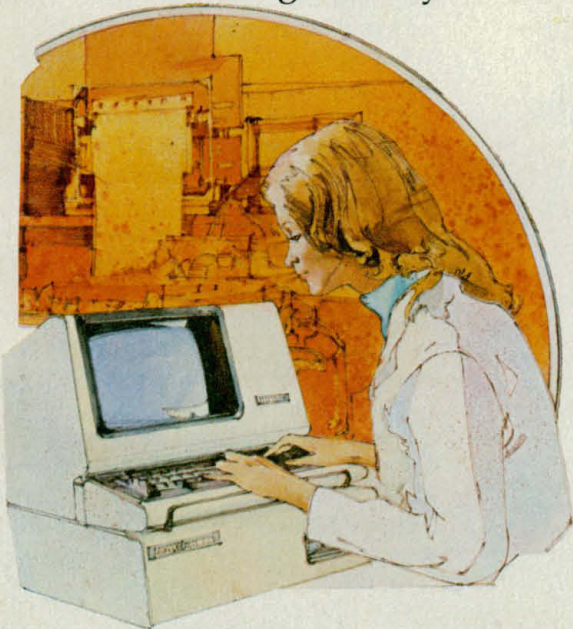
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ner. However, for the record, some points need clarification or correction.

I am a former consultant to Petróleos Mexicanos (Pemex) and have been involved with the Chiapas-Tabasco (Reforma)-Gulf of Campeche discoveries since 1972. The data from these discoveries have been released to Francisco Viniegra Osorio, former exploration manager of Pemex (now retired) and the discoverer of Mexico's new giant fields. They will be published in an article by Viniegra to appear during 1979 in the *Journal of Petroleum Geology*. Viniegra and I will present a summary of the Pemex discoveries at the forthcoming American Association of Petroleum Geologists annual meeting in Houston, 1 to 4 April 1979.

On 14 September 1978, Jorge Díaz Serrano (president of Pemex) and I were among those who presented a review of the new discoveries on "The MacNeil/Lehrer Report." We reported that, in the approximately 35 structures then drilled, 57 billion barrels of oil had been found—20 billion *proved* and 37 billion *probable*. The 200-billion-barrel estimate cited in Metz's article is a projected (that is, *potential* or *speculative*) volume for the drilled and undrilled structures together—35 drilled and 100 to 150 undrilled. It is undesirable at this time to project reserve volumes beyond actual knowledge. In addition, on the basis of reservoir performances and production records, Viniegra and I have since downgraded the 57-billion-barrel figure to 47 billion barrels—still a giant reserve by any standard.

I also wish to correct the statement that Pemex's Ixchel-1 well was a "gusher." As of 22 December 1978, the date of this letter, Ixchel-1 has *not* been drilled, despite recurrent reports in trade journals that it has been. My statement that the well has not been drilled is based on letters received today from (i) the Pemex office in Mexico City and (ii) my coauthor Viniegra, who joins me in asking that the official record be set straight.

ARTHUR A. MEYERHOFF
Post Office Box 4602,
Tulsa, Oklahoma 74104

On 31 December, Pemex doubled its figure for proved reserves and raised its figure for probable reserves, so that the total for both categories is now 84 billion barrels—up considerably from the 57 billion figure quoted by Meyerhoff. The status of drilling in the Ixchel area is an important indicator of the oil potential in far-offshore areas that have been little explored. Successful drilling in the Ixchel area was first reported on 5 July

Congressional Science Fellowships

The American Association for the Advancement of Science (AAAS), which coordinates the Congressional Science and Engineering Fellow Program, is pleased to announce that the American Society of Zoologists (ASZ) and the Biophysical Society (BS) [in conjunction with the American Society for Photobiology (ASP)] have joined 17 other professional societies seeking applications for a Congressional Science Fellow for 1979–1980. The AAAS will also select and sponsor one Congressional Science Fellow; persons in all fields of science and engineering are invited to apply.

Fellows spend 1 year working as special legislative assistants on the staffs of various members of Congress or congressional committees. Stipends for the AAAS, ASZ, and BS/ASP Fellowships are approximately \$18,000 per annum plus a nominal sum for travel and relocation expenses. The \$18,000 stipend is in addition to any other source of support available to the Fellow, such as sabbatical salary.

Applicants should write directly to the appropriate society listed below. Deadlines for the three Fellowships range from mid-March to March 31. Information about the entire program and the addresses of all 21 participating societies are available from AAAS.

Dr. E. L. Hess, The Biophysical Society, 9650 Rockville Pike, Bethesda, Maryland 20014.

Dr. Robert Higgins, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560.

Mr. Charles A. Mosher, Congressional Science Fellow Program, AAAS, 8th Floor, 1776 Massachusetts Ave., NW, Washington, D.C. 20036.

1978 in the *Wall Street Journal*. At a press breakfast the next day in Mexico City, Pemex president Diaz Serrano discussed the new well, going over its spelling and location several times with reporters. According to Charles Green of the Associated Press, who attended the breakfast and based an AP story on it, Diaz Serrano left no doubt the Ixchel well had been drilled and said that it "indicates a considerable platform" of oil. Whether Pemex designated that well Ixchel-1 could not be determined. More detail was given in the September 1978 newsletter of the international oil reporting service Petroconsultants, S.A., in Geneva. Specifying a discovery well with the surname Ixchel drilled by May 1978, Petroconsultants issued a field record giving the well's location (92°22' west; 21°47' north), geological features, gravity, and sulfur content. Petroconsultants president J. Dixon told *Science* he had no doubt at all that oil had been discovered at the site—that a field record was authoritative. Not only does Petroconsultants stand by its original report, but the firm reported another discovery in late 1978 made in the same vicinity.

—WILLIAM D. METZ

Editorial Writers

Concerning Rochelle Semmel Albin's letter (19 Jan., p. 228) on the selection of *Science* editorial writers, I hope that the uses to which the editorial page is put will continue to be based on (i) the appropriateness of the subject and (ii) the credentials of the author to handle the subject in a competent and readable manner. This does not lend itself to quotas based on the sex of the author.

I prefer to believe that it is only coincidence that the 19 January editorial is signed by Lucy W. Sells.

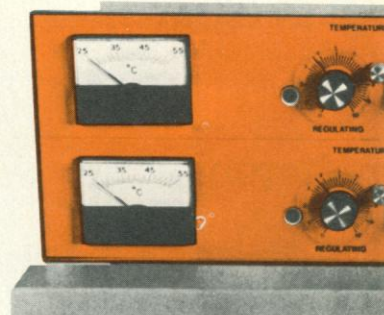
BURTON C. BELDEN
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As an occasional author of *Science* editorials, I would like to share my experience with Rochelle Semmel Albin; it may sound too simple, but nothing more was involved than writing an editorial and sending it to the editor. While I have no idea how many editorials are received, I suggest that Albin give the same procedure a try—as I assume was the case with the editorial by Lucy W. Sells, published in the same issue of *Science*.

JURGAN SCHMANDT
Lyndon B. Johnson School of Public Affairs, University of Texas, Austin

16 FEBRUARY 1979

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The Burden of Competitive Grants

In 1960, when U.S. science was beginning to depend heavily on grants and contracts for research support, Leo Szilard wrote a fanciful story.* In it he suggested that if some person or some group should ever want to bring research progress to a standstill, they could do so by establishing a competitive grants system under which all researchers would be required to prepare written proposals describing what they wished to work on. The commitment of time by the research community in writing, reviewing, and supervising such a universal grant system would effectively halt research progress. It may be that now, in the late 1970's, we should ask ourselves whether the load of the competitive grant and contract system is becoming excessive and whether it is time to seek alternatives.

The numbers of research proposals submitted to the principal federal granting agencies in 1978 were as follows: 28,000 to the National Science Foundation, 13,000 to the National Institutes of Health, 3,500 to the Department of Energy, 1,000 to the Environmental Protection Agency, and 2,000 to the Department of Agriculture. This makes a rough total of 47,500 proposals in 1 year.

Calculating the amount of time it takes to write a proposal is not easy, but 3 weeks would be a conservative estimate for the average time invested in each proposal. Thus last year, on the order of 2700 man-years were invested in proposal writing. This is probably a low estimate, since it often takes 3 months to write a proposal, and proposals by groups can take as much as 3 man-years.

Any estimate of the time investment must include those involved in the reviewing process. Allowing 3 man-days for review adds another 575 man-years, making a total estimated investment by the research community of approximately 3300 man-years during 1978. Since most research scientists are in the academic community, where perhaps half their time is available for research, the figure of 3300 man-years of research time may, in fact, represent the entire research time of 6600 academic persons during 1978.

The preparation and even the review of research proposals does have an educational effect. An essential part of the preparation of the research proposal is the examination of the literature and consideration of research directions that might be most profitable. But the cost in time to the research community is nevertheless a very heavy burden.

The problem is exacerbated by the fact that in every competitive program the majority of the proposals are rejected. The rejection rate can vary from 60 percent in some programs to 95 percent in others, but in general, it ranges between 70 percent and 85 percent. Thus roughly three of every four proposals fail to obtain funding for the researchers.

In the early days of federal support of research, when support was increasing year by year, distribution of grants on the basis of competition was an effective means of getting money to competent and productive persons. In the late 1960's, however, the amount of money (corrected for inflation) available for the support of research began to level off, and the growth period has now ended. Competition has become increasingly keen and the proportion of proposals that can be funded has declined. The investment of research time in the proposal system, however, may continue to increase.

With the investment of an estimated 6600 persons' research time in writing and reviewing proposals, perhaps it is now appropriate to ask whether Szilard's fanciful story is turning into a serious matter. Should consideration be given to ways of providing research support without adding to the heavy burden of our present grants and contracts system?—A. CARL LEOPOLD, *Boyce Thompson Institute for Plant Research, Ithaca, New York 14853*

*L. Szilard, *The Voice of the Dolphins, and Other Stories* (Simon & Schuster, New York, 1961), p. 100.

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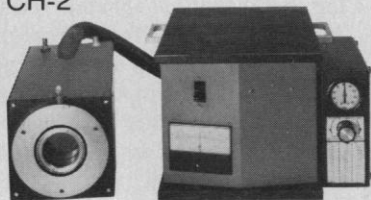
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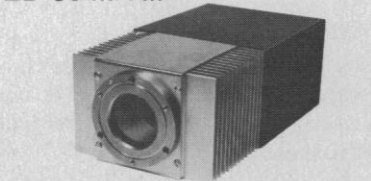
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Green Algae and Asymbiotic Bacteria. Proceedings of a symposium, Uppsala, Sweden, Sept. 1976. U. Granhall, Ed. Swedish Natural Science Research Council, Stockholm, 1978. 392 pp., illus. Paper, 100 SwCr. Ecological Bulletins, NFR 26.

Essays in Microbiology. J. R. Norris and M. H. Richmond, Eds. Wiley, New York, 1978. Various pages, illus. \$33.

Excited States. Vol. 3. Edward C. Lim, Ed. Academic Press, New York, 1977. x, 352 pp., illus. \$32.

Exobiology. A Research Guide. Martin H. Sable. Green Oak Press, Brighton, Mich., 1978. xii, 324 pp. \$17.95.

Farewell to Darwin. The Unified Field Theory of Physics, the Genetic Process, and Psychology. George M. Hall. Warren H. Green, Inc., St. Louis, 1977. xxxvi, 500 pp., illus. \$19.75.

The Fat-Soluble Vitamins. Hector F. DeLuca, Ed. Plenum, New York, 1978. xii, 288 pp., illus. \$27.50. Handbook of Lipid Research, vol. 2.

Figuring. The Joy of Numbers. Shakuntala Devi. Harper and Row, New York, 1978. 158 pp. \$6.95.

Form and Function. An Organic Chemistry Module. Bruce Jarvis and Paul Mazzocchi. Harper and Row, New York, ed. 2, 1978. viii, 136 pp., illus. Paper, \$2.49. Interdisciplinary Approaches to Chemistry.

Formal Theories of Visual Perception. E. L. J. Leeuwenberg and H. F. J. M. Buffart, Eds. Wiley, New York, 1978. xii, 346 pp., illus. \$37.50.

Frequency and Time. P. Kartaschoff. Academic Press, New York, 1978. xvi, 260 pp., illus. \$24.50. Monographs in Physical Measurement.

Fundamentals of Oncology. Henry C. Pitot. Dekker, New York, 1978. viii, 192 pp., illus. Paper, \$9.95.

A Host-Parasite Catalog of North American Tachinidae (Diptera). Paul H. Arnaud, Jr. U.S.D.A. Science and Education Administration, Washington, D.C., 1978. iv, 860 pp. Paper. Miscellaneous Publication No. 1319.

How to Dissect. Exploring with Probe and Scalpel. William Berman. Arco Publishing Company, New York, ed. 3, 1978. 128 pp., illus. Cloth, \$6.95; paper, \$3.25.

Human Genetics. J. H. Edwards. Chapman and Hall, London, and Halsted (Wiley), New York, 1978. 80 pp., illus. Paper, \$3.95. Outline Studies in Biology.

The Human Mind Revisited. Essays in Honor of Karl A. Menninger. Sydney Smith, Ed. International Universities Press, New York, 1978. xiv, 504 pp. \$22.50.

Human Response to Crowding. Andrew Baum and Yakov M. Epstein, Eds. Erlbaum, Hillsdale, N.J., 1978 (distributor, Halsted [Wiley], New York). xiv, 418 pp. \$19.95.

Infants, Mothers, and Doctors. Eugene B. Gallagher. Lexington (Heath), Lexington, Mass., 1978. xvi, 220 pp. \$18.

Informal Groups. An Introduction. Stephen Wilson. Prentice-Hall, Englewood Cliffs, N.J., 1978. xiv, 306 pp., illus. \$13.95.

Intermolecular Forces. T. Kihara. Translated from the Japanese edition (Tokyo, 1976) by S. Ichimaru. Wiley, New York, 1978. x, 182 pp., illus. \$23.

International Review of Cytology. Supplement 7, Neuronal Cells and Hormones. G. H. Bourne, J. F. Danielli, and K. W. Jeon, Eds.

Academic Press, New York, 1978. x, 442 pp., illus. \$42.

Interpersonal Psychoanalysis. New Directions. Earl G. Witenberg, Ed. Gardner Press, New York, 1978 (distributor, Halsted [Wiley], New York). xii, 156 pp. \$16.95.

Introduction à l'Arriération Mentale. Jean-Luc Lambert. Mardaga, Brussels, 1978. 328 pp. Paper, 430 BF. Psychologie et Sciences Humaines.

Introduction to Marine Micropaleontology. Bilal U. Haq and Anne Boersma, Eds. Elsevier, New York, 1978. viii, 376 pp., illus. \$24.

Isolation of Plant Growth Substances. Papers from a symposium, Birmingham, England, Jan. 1977. J. R. Hillman, Ed. Cambridge University Press, New York, 1978. x, 158 pp., illus. Cloth, \$23.50; paper, \$8.95. Society for Experimental Biology Seminar Series, 4.

Joint WHO/IABS Symposium on the Standardization of Rabies Vaccines for Human Use Produced in Tissue Culture (Rabies III). Marburg/Lahn, West Germany, Nov. 1977. W. Hennessen and R. H. Regamey, Eds. Karger, Basel, 1978. x, 292 pp., illus. \$41. Developments in Biological Standardization, vol. 40.

Lakes of New York State. Vol. 1, Ecology of the Finger Lakes. Jay A. Bloomfield, Ed. Academic Press, New York, 1978. xvi, 500 pp., illus. \$23.50.

Language of Autistic Children. Don W. Churchill. Winston, Washington, D.C., and Halsted (Wiley), New York, 1978. viii, 140 pp., illus. \$12.95.

The Lectins. Molecular Probes in Cell Biology and Membrane Research. Jürgen Roth. Gustav Fischer Verlag, Jena, East Germany, 1978. 186 pp., illus. Paper, 59 M. Experimentelle Pathologie, Supplement 3.

The Lingering Crisis of Youth Unemployment. Arvil V. Adams and Garth L. Mangum with Wayne Stevenson, Stephen F. Seninger, and Stephen L. Mangum. W. E. Upton Institute for Employment Research, Kalamazoo, Mich., 1978. xx, 152 pp. \$4.

The Lipoprotein Molecule. Proceedings of a NATO Advanced Study Institute, Bruges, Belgium, May 1977. Hubert Peeters, Ed. Plenum, New York, 1978. x, 302 pp., illus. \$32.50. NATO Advanced Study Institutes Series A, vol. 15.

The Listening Process. Robert Langs. Aronson, New York, 1978. xx, 662 pp. \$30.

The Making of Psychological Anthropology. George D. Spindler, Ed. University of California Press, Berkeley, 1978. xiv, 666 pp., illus. \$27.50.

Maturation of Neurotransmission. Biochemical Aspects. Papers from a symposium, Saint-Vincent, Aosta, Italy, Aug. 1977. A. Vernadakis, E. Giacobini, and G. Filogamo, Eds. Karger, Basel, 1978. viii, 236 pp., illus. \$42.50.

Megawatt Infrared Laser Chemistry. Ernest Grunwald, David F. Dever, and Philip M. Keehn. Wiley-Interscience, New York, 1978. xiv, 108 pp., illus. \$15.

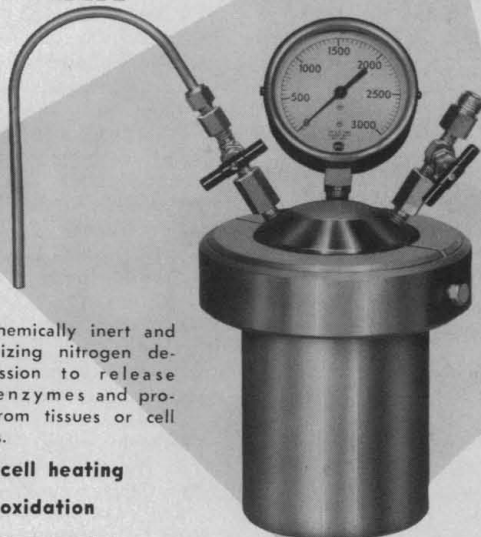
Metal Toxicity in Mammals. Vol. 2, Chemical Toxicity of Metals and Metalloids. B. Venugopal and T. D. Luckey. Plenum, New York, 1978. x, 410 pp. \$35.

Methods in Enzymology. Sidney P. Colowick and Nathan O. Kaplan, Eds. Vol. 51, Purine and Pyrimidine Nucleotide Metabolism. Patricia A. Hoffee and Mary Ellen Jones, Eds. Academic Press, New York, 1978. xxvi, 654 pp., illus. \$44.50.

Microbiology for Health Students. C. Thomas Settlemire and William T. Hughes. Reston (Prentice-Hall), Reston, Va., 1978. x, 244 pp., illus. Paper, \$12.95.

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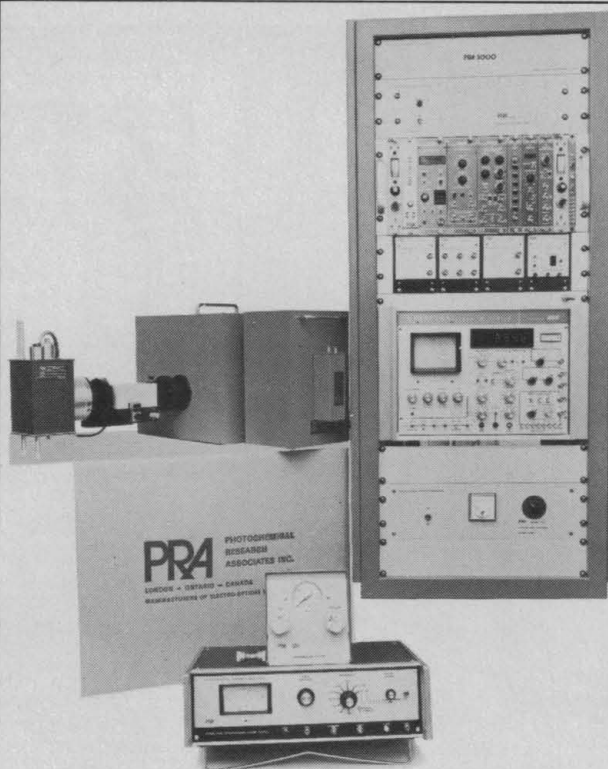


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Modern Electronic Communication. Gary M. Miller. Prentice-Hall, Englewood Cliffs, N.J., 1978. xvi, 510 pp., illus. \$19.95.

Motivation. Theories and Principles. Robert C. Beck. Prentice-Hall, Englewood Cliffs, N.J., 1978. x, 470 pp. \$12.95.

Multimedia Management of Municipal Sludge. National Academy of Sciences, Washington, D.C., 1978. xvi, 188 pp. Paper, \$8. Analytical Studies for the U.S. Environmental Protection Agency, vol. 9.

The Mystifying Mathephysics of Micro-reality. James D. Edmonds, Jr. Published by the author, Department of Physics, Bucknell University, Lewisburg, Pa., 1978. Variously paged. Spiral bound, \$10.

Neurological Pathophysiology. Sven G. Eliasson, Arthur L. Pinsky, and William B. Hardin, Jr. Oxford University Press, New York, ed. 2, 1978. x, 454 pp., illus. Cloth, \$16.95; paper, \$9.95.

Outliers in Statistical Data. Vic Barnett and Toby Lewis. Wiley, New York, 1978. xii, 366 pp. \$39.95. Wiley Series in Probability and Mathematical Statistics.

Particles and Fields. Proceedings of an institute, Banff, Canada, Aug. 1977. David H. Boal and Abdul N. Kamal, Eds. Plenum, New York, 1978. viii, 462 pp., illus. \$42.50.

Passive and Active Microwave Circuits. J. Helszajn. Wiley-Interscience, New York, 1978. x, 274 pp., illus. \$27.50.

Perspectives on Energy. Issues, Ideas, and Environmental Dilemmas. Lon C. Ruedisili and Morris W. Firebaugh, Eds. Oxford University Press, New York, ed. 2, 1978. xii, 592 pp., illus. Cloth, \$15.95; paper, \$8.95.

The Phanerozoic Geology of the World. Vol. 2, The Mesozoic, A. M. Moullade and A. E. M. Nairn, Eds. Elsevier, New York, 1978. viii, 530 pp., illus. \$75.

Physical Science for Technicians. R. McMullan. Butterworths, Boston, 1978. xii, 78 pp., illus. Paper, \$5.95. Newnes-Butterworths Technician Series.

Physicochemical Anthropology. Part 1, Human Behavioral Structure. Norman R. Joseph. Karger, Basel, 1978. x, 160 pp. \$42.50.

Physiology of Annelids. P. J. Mills, Ed. Academic Press, New York, 1978. xvi, 684 pp., illus. \$58.

Plantcraft. A Guide to the Everyday Use of Wild Plants. Richard Mabey. Illustrated by Marjorie Blamey. Universe Books, New York, 1978. 176 pp. + plates. \$10.

Police Deployment. New Tools for Planners. Richard C. Larson, Ed. Lexington (Heath), Lexington, Mass., 1978. xxxii, 330 pp., illus. \$21. Urban Public Safety Systems, vol. 1.

Prehistoric Coastal Adaptations. The Economy and Ecology of Maritime Middle America. Papers from a symposium, St. Louis, May 1976. Barbara L. Stark and Barbara Voorhies, Eds. Academic Press, New York, 1978. xx, 316 pp., illus. \$21. Studies in Archeology.

Preparation and Characterisation of Mammalian Plasma Membranes. W. Howard Evans. North-Holland, Amsterdam, 1978 (U.S. distributor, Elsevier, New York). 266 pp., illus. Paper, \$26. Laboratory Techniques in Biochemistry and Molecular Biology.

Principles of Applied Clinical Chemistry. Chemical Background and Medical Applications. Vol. 2, The Erythrocyte: Chemical

Composition and Metabolism. Samuel Natelson and Ethan A. Natelson. Plenum, New York, 1978. xxiv, 560 pp., illus. \$39.50.

Probability, Statistics, and Queueing Theory. With Computer Science Applications. Arnold O. Allen. Academic Press, New York, 1978. xviii, 390 pp., illus. \$29.50. Computer Science and Applied Mathematics.

Psychological Perspectives in Youth Sports. Papers from a symposium, Seattle, Mar. 1977. Frank L. Smoll and Ronald E. Smith, Eds. Hemisphere, Washington, D.C., and Halsted (Wiley), New York, 1978. xvi, 288 pp., illus. \$22.50. The Series in Clinical and Community Psychology.

Reflector Antennas. A. W. Love, Ed. IEEE Press, New York, 1978 (distributor, Wiley, New York). viii, 428 pp., illus. Cloth, \$26; paper, \$14.95. IEEE Press Selected Reprint Series.

Regulation and the Quality of Dental Care. Peter Milgrom. Aspen Systems Corporation, Germantown, Md., 1978. xvi, 254 pp. \$17.50.

Research Advances in Alcohol and Drug Problems. Vol. 4. Yedy Israel and five others, Eds. Plenum, New York, 1978. xiv, 498 pp. \$39.50.

Research and the Health of Americans. Improving the Policy Process. Stephen P. Strickland. Lexington (Heath), Lexington, Mass., 1978. xxiv, 164 pp. \$16.

Research Methods in Neurochemistry. Vol. 4. Neville Marks and Richard Rodnight, Eds. Plenum, New York, 1978. xx, 442 pp., illus. \$35.

Resonance Raman Spectroscopy as an Analytical Tool. Papers from a symposium, New York, Dec. 1977. A. J. Melveger, Ed. Franklin Institute Press, Philadelphia, 1978. viii, 84 pp., illus. Paper, \$10.50.

River Plants. The Macrophytic Vegetation of Watercourses. S. M. Haslam. Illustrated by P. A. Wolseley. Cambridge University Press, New York, 1978. xii, 396 pp. Cloth, \$62.50; paper, \$14.95.

Sociocultural Roots of Mental Illness. An Epidemiologic Survey. John J. Schwab and Mary E. Schwab. Plenum, New York, 1978. xiv, 338 pp. \$27.50. Topics in General Psychiatry.

The Spatial Organisation of Culture. Ian Hodder, Ed. University of Pittsburgh Press, Pittsburgh, 1978. x, 310 pp., illus. \$25.95. New Approaches in Archaeology.

Stable Isotopes in the Life Sciences. Proceedings of a meeting, Leipzig, Feb. 1977. International Atomic Energy Agency, Vienna, 1977 (U.S. distributor, Unipub, New York). 458 pp., illus. Paper, \$34. Panel Proceedings Series.

Staff Working Papers of the Drug Law Evaluation Project. A Companion Volume to the Final Report of the Joint Committee on New York Drug Law Evaluation. National Institute of Law Enforcement and Criminal Justice, Washington, D.C., 1978 (available from the Superintendent of Documents, Washington, D.C.). vi, 322 pp., illus. Paper, \$5.

State Flowers. Anne Ophelia Dowden. Illustrated by the author. Crowell, New York, 1978. x, 86 pp. \$7.95.

Stress and Anxiety. Vol. 5. Papers from a meeting, Urbino, Italy, July 1976. Charles D. Spielberger and Irwin G. Sarason, Eds. Hemisphere, Washington, D.C., and Halsted (Wiley), New York, 1978. xiv, 422 pp., illus. \$18.95. The Series in Clinical and Community Psychology.

Subcellular Biochemistry. Vol. 5. Donald B. Roodyn, Ed. Plenum, New York, 1978. xx, 390 pp., illus. \$37.50.

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A Systems Approach to Alcohol Treatment. Frederick B. Glaser, Stephanie W. Greenberg, and Morris Barrett. Addiction Research Foundation, Toronto, 1978. xxii, 304 pp., illus. Paper, \$14.95.

Techniques of Chemistry. Vol. 12, Separation and Purification. Edmond S. Perry and Arnold Weissberger, Eds. Wiley-Interscience, New York, ed. 3, 1978. xiv, 438 pp., illus. \$30.

Theoretical Chemistry. Periodicities in Chemistry and Biology. Vol. 4. Henry Eyring and Douglas Henderson, Eds. Academic Press, New York, 1978. xvi, 294 pp., illus. \$31.

Thermal Storage. Thomas Scott Dean. Franklin Institute Press, Philadelphia, 1978. 62 pp., illus. Paper, \$6.50. Solar Energy Series.

Thermodynamic Derivatives for Water and Steam. Solomon L. Rivkin, Aleksey A. Aleksandrov, and Elena A. Kremenevskaya. Translated from the Russian and introduced by Joseph Kestin. Winston, Washington, D.C., and Halsted (Wiley), New York, 1978. vi, 264 pp. \$25.

Thermodynamics of Irreversible Processes. Bernard H. Lavenda. Halsted (Wiley), New York, 1978. xvi, 182 pp. \$27.50.

Topics in Enzyme and Fermentation Biotechnology 2. Alan Wiseman, Ed. Horwood, Chichester, England, and Halsted (Wiley), New York, 1978. 308 pp., illus. \$30.

Toward One Science. The Convergence of Traditions. Paul Snyder. St. Martin's, New York, 1978. xvi, 224 pp. Cloth, \$10; paper, \$5.95.

Trace Fossil Concepts. Paul B. Basan, Ed. Society of Economic Paleontologists and Mineralogists, Tulsa, Okla., 1978. iv, 202 pp., illus. Paper, \$6. SEPM Short Course No. 5.

Trance and Treatment. Clinical Uses of Hypnosis. Herbert Spiegel and David Spiegel. Basic, New York, 1978. xiv, 382 pp. \$18.50.

Ultrasound in Medicine. Vol. 4. Proceedings of a meeting, Dallas, Oct. 1977. Denis White and E. A. Lyons, Eds. Plenum, New York, 1978. xxvi, 668 pp., illus. \$59.50.

Values and Choices in the Development of the Colorado River Basin. Papers from a symposium, San Francisco, Feb. and Mar. 1974. Dean F. Peterson and A. Berry Crawford, Eds. University of Arizona Press, Tucson, 1978. xvi, 338 pp., illus. Cloth, \$14.50; paper, \$7.50.

Vergleichende Untersuchung zur Lautgebung einiger Feliden (Mallalia, Felidae). Gustav Peters. Zoologische Staatssammlung München, Munich, 1978 (available from Max-Planck-Institut für Verhaltensphysiologie, Wuppertal, Germany). iv, 206 pp. + plates. Paper, \$15. *Spixiana*, Supplement 1.

Violence and Responsibility. The Individual, the Family and Society. Papers from two conferences, Philadelphia, Mar. and Sept., 1976. Robert L. Sadoff. Spectrum, New York, 1978 (distributor, Halsted [Wiley], New York). xii, 140 pp. \$14.95.

Water-in-Plants Bibliography. Vol. 2, 1976. J. Pospíšilová and J. Solárová, Eds. Junk, The Hague, 1978 (U.S. distributor, Kluwer Boston, Hingham, Mass.). vi, 130 pp. Paper, \$24.

World Communication. Threat or Promise? A Socio-Technical Approach. Colin Cherry. Wiley-Interscience, New York, ed. 2, 1978. xiv, 230 pp., illus. Cloth, \$26.50; paper, \$10.95.

The Year of the Ant. George Ordish. Illustrated by Clarke Hutton. Scribner, New York, 1978. xii, 140 pp. \$9.95.



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