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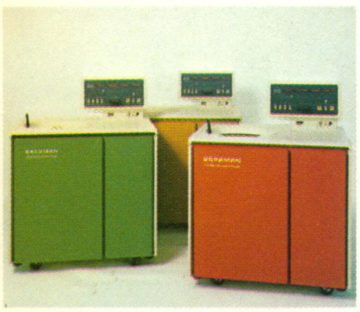

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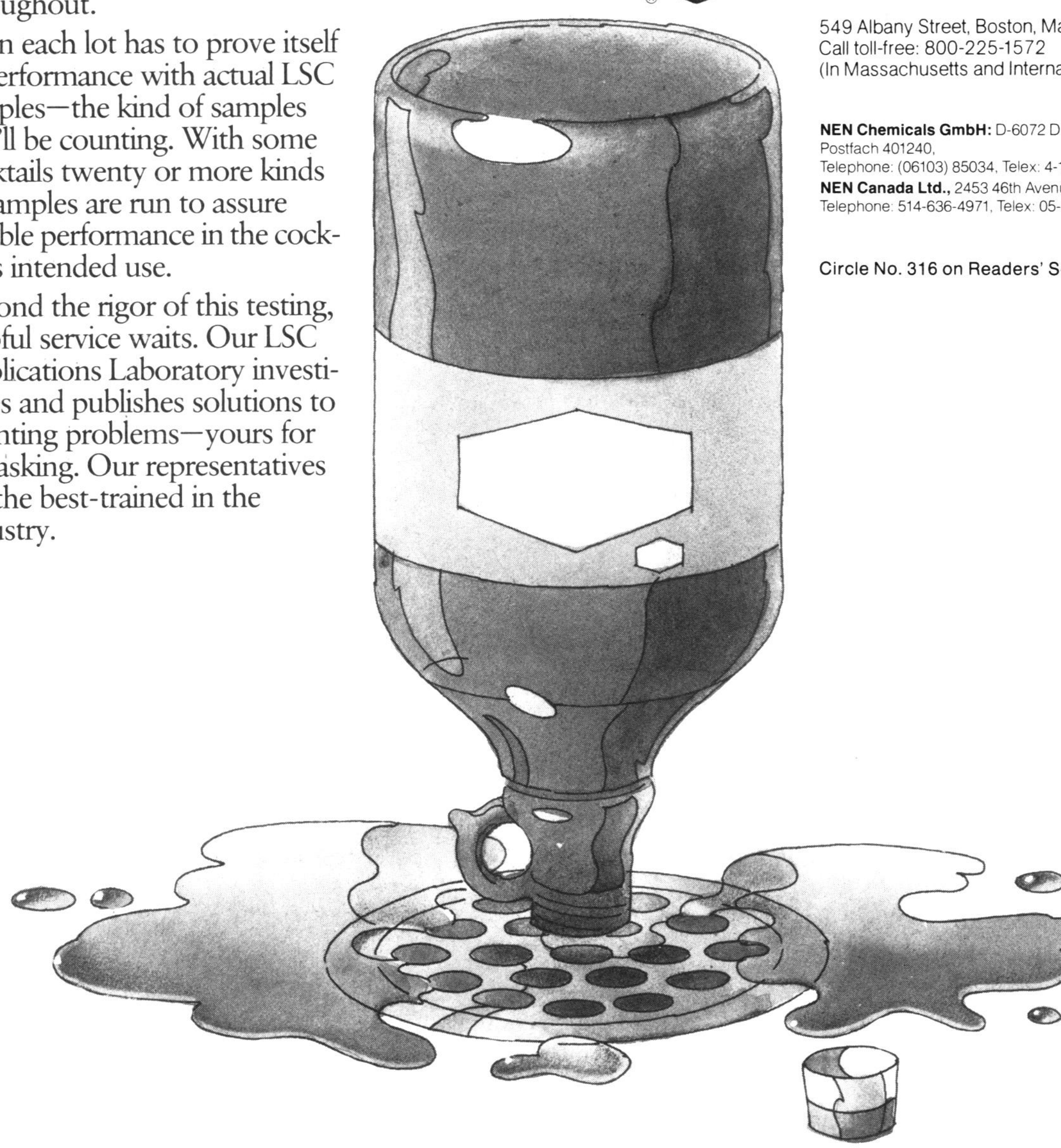

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21 December 1979

Volume 206, No. 4425

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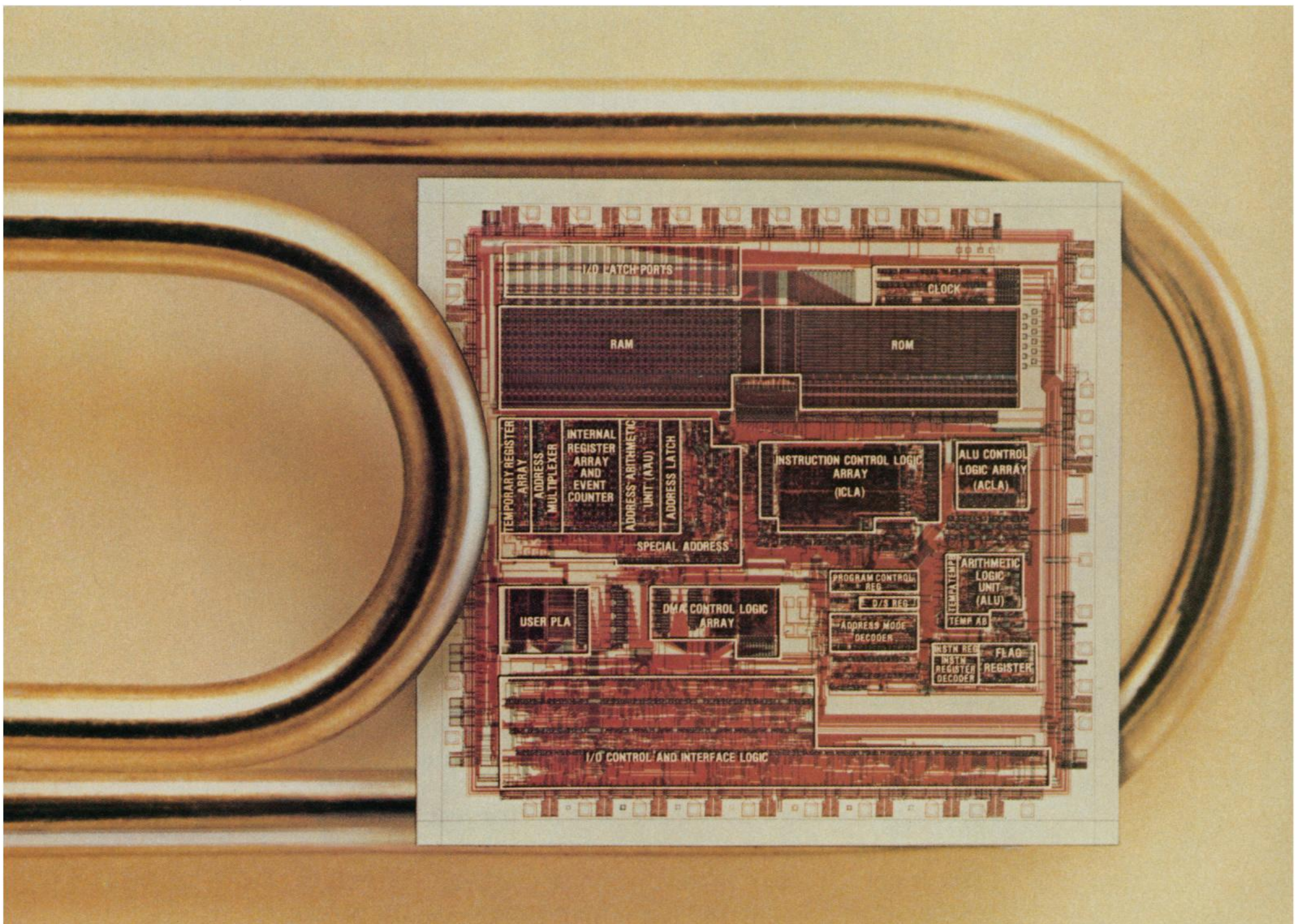
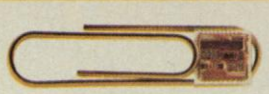
COVER

High-resolution transmission electron micrograph of combination planar and roll structures in the mineral serpentine. These features were produced by solid-state hydration reaction of chain silicates. The lattice fringe spacing in the serpentine is 7.3 angstroms. See page 1398. [David R. Veblen and Peter R. Buseck, Arizona State University, Tempe]

The one-chip computer: offspring of the transistor





The MAC-4 one-chip computer, developed for a variety of telecommunications applications, is compared to a standard-sized paper clip. The chip's numerous functional areas are labeled.

One of the transistor's latest descendants is the Bell System's 30,000-element MAC-4 "computer-on-a-chip." It's another in a long line of microelectronic developments that have come from Bell Laboratories.

The MAC-4 is so efficient that a program written on it takes 25 percent less storage space than that required by most other microcomputers. Its assembler language, C, also developed at Bell Labs, has features that make MAC-4 easier to program, debug and maintain. And the MAC-4 can handle anything from nibbles to bytes to words with its 4-, 8-, 12-, and 16-bit operations capacity.

Like other one-chip computers, the MAC-4 has sufficient memory to support its varied tasks—3000 nibbles of read-only memory and 200 nibbles of random access memory coupled to 34 input/output ports.

Fabricated with the latest CMOS technology, the MAC-4 needs little power. Thus it is well matched to a variety of telecommunications applications.

It started with the transistor

MAC-4 is just one current example of the many microelectronic devices to come from Bell Labs since we started the solid-state revolution with the invention of the transistor in 1947.

Over the past three decades, our advances in materials, processing, and devices have been vital to solid-state technology. These include:

- The Junction Transistor
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- Magnetic Bubble Memory
- Charge-Coupled Device
- Semiconductor Heterostructure Laser Used in Lightwave Communications
- Electron-Beam Exposure System

Today and tomorrow

Today, we continue to make important contributions to solid-state technology. For example, we've developed a rugged 65,536-bit RAM that can tolerate processing faults. Corrections can be made on the chip itself, so we can get more usable chips out of each manufacturing batch—and thus lower unit costs.

In materials processing, we've developed a technique for precisely controlling the growth of successive atomic layers of single crystal materials. This "molecular beam epitaxy" process is finding increasing use within Bell Labs and elsewhere in the electronics industry. We've used it to fabricate a device that permits us to double the speed of electrons by channeling them into crystal layers where they meet less resistance.

Other advances, in X-ray lithography and new resist materials, for example, promise to help place more elements on microelectronic devices and thus enhance their ability to perform important tasks.

As the solid-state revolution continues, these and other developments from Bell Labs will play an important part in it. What's important to us is the promise these advances offer for new telecommunications products and services. Like the transistor, MAC-4 and its solid-state relatives will find more and more applications in the nationwide telecommunications network.

For further information, or to inquire about employment opportunities, write: Bell Laboratories, Room 3C-303, 600 Mountain Avenue, Murray Hill, N.J. 07974.

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COMPARISON OF TIAA WITH THE 10 LARGEST U.S. INSURANCE COMPANIES
20 Year Average Annual Costs* for $50,000 5-Year Renewable Term Policies

	Policies Issued to Men			Policies Issued to Women		
	Aged 25	Aged 35	Aged 45	Aged 25	Aged 35	Aged 45
TIAA	**$ 91.00**	**$189.50**	**$445.00**	**$ 73.00**	**$126.00**	**$281.50**
Aetna Life	214.50	344.00	793.50	209.00	295.50	629.50
Conn. General	NOT ISSUED				NOT ISSUED	
Equitable	183.00	334.00	747.00	154.50	275.50	585.00
John Hancock	203.50	326.00	723.50	193.50	291.50	637.50
Mass. Mutual	182.50	310.50	732.50	171.50	286.50	697.00
Metropolitan	119.00	225.50	584.50	103.50	177.50	469.00
New York Life	171.50	290.00	624.00	156.00	236.50	465.00
Northwestern Mutual	154.00	277.00	628.50	137.00	242.50	545.00
Prudential	150.50	239.00	552.00	130.00	179.50	336.00
Travelers	198.50	352.50	801.00	181.50	275.50	589.50
Mean Cost, Largest Companies	**$175.22**	**$299.83**	**$687.39**	**$159.61**	**$251.17**	**$550.39**
% Greater than TIAA	93%	58%	54%	119%	99%	96%

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The figures speak for themselves: For example, the mean cost for $50,000 5-Year Renewable Term policies issued by these insurers to men aged 35 is 58% higher than the same coverage with TIAA; and for 35 year old women it's 99% higher. Whether you choose 5-Year Renewable Term or some other plan, TIAA insurance is the best buy for you because you are a member of the academic and research community. To learn how you can give your family the most new protection for the least money just get in touch with TIAA!

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A Photomicrograph of a Newt Triturus Viridescens taken with the new Olympus Series BH System Microscope and automatic camera, Model PM-10-A.

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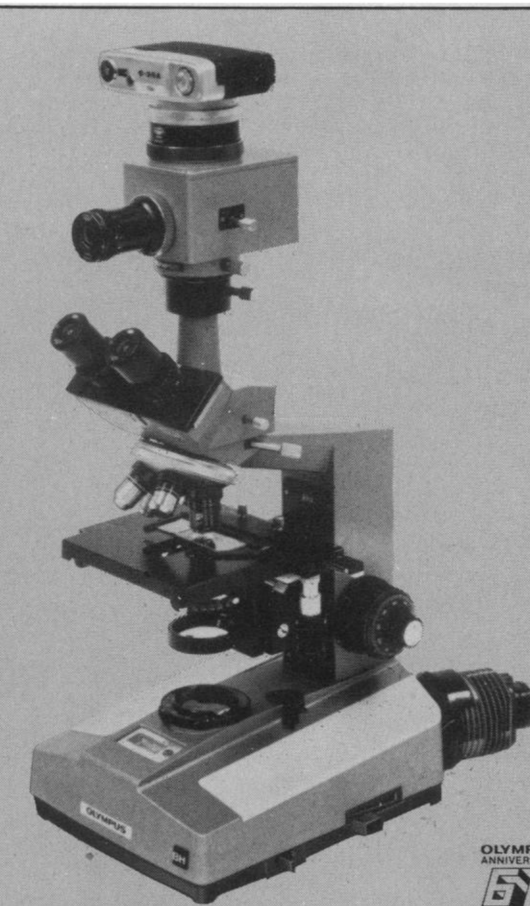

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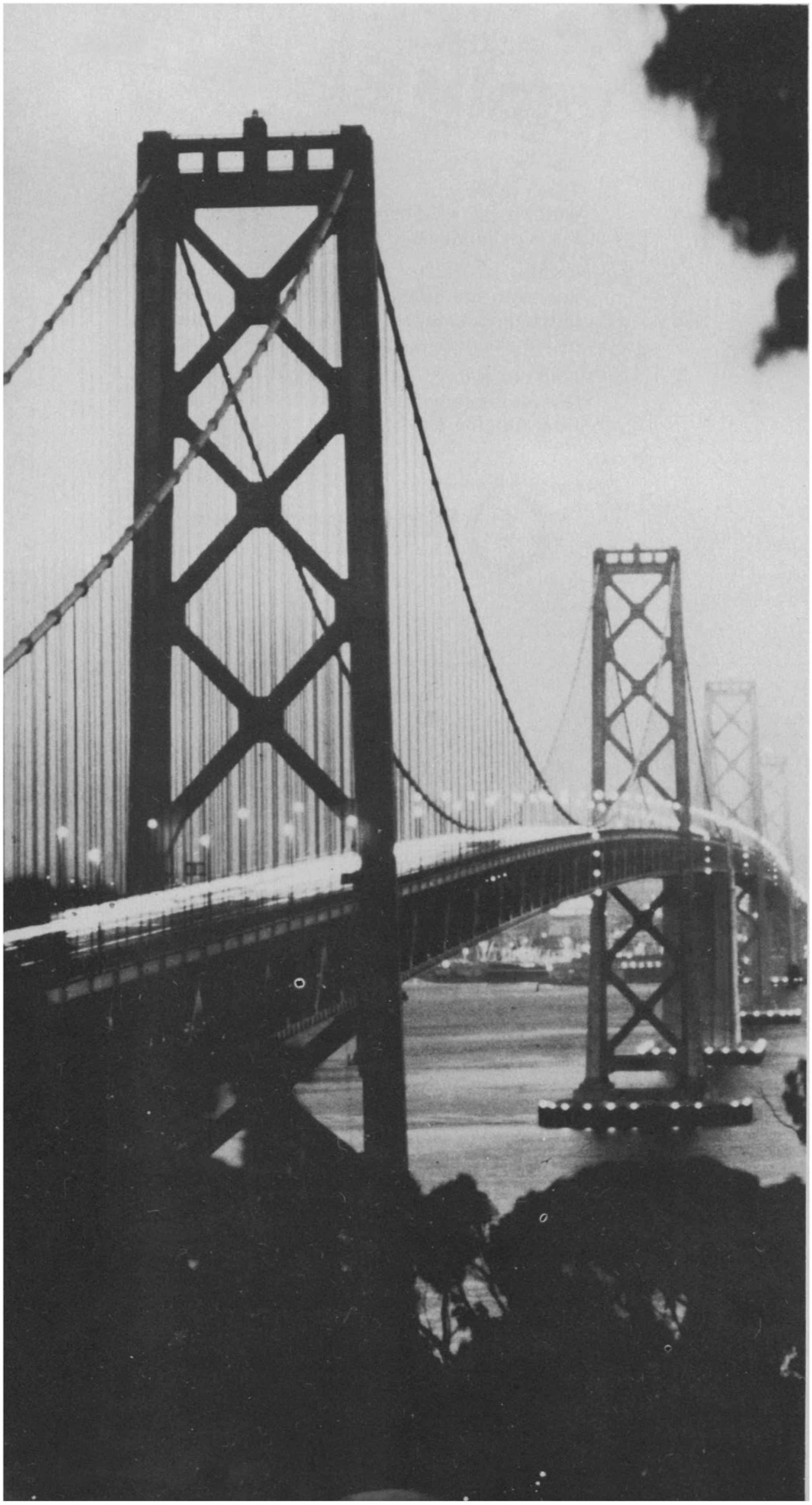

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Environmental Health Research

Most Americans celebrated Thanksgiving and Christmas of 1959 without cranberries. On 9 November of that year, the Secretary of Health, Education, and Welfare reported traces of the weed-killer aminotriazole in cranberries headed for the commercial market. The substance was known to cause thyroid cancer in rats and its use had been restricted by the Food and Drug Administration. After a 5-month struggle between the cranberry industry and the agency, the contaminated berries were isolated, cranberry sauce was returned to the market, and the government paid the industry $10 million to compensate for its loss in sales.

This episode reflected the difficulties that, 20 years ago, confronted decision-makers charged with resolving complex environmental health questions. Gaps existed in epidemiologic information and methods for correlating patterns of disease with exposure to chemicals. Our understanding of carcinogenesis, our ability to test rapidly for health hazards, and our methods for relating the results of animal tests to humans were inadequate. So, too, were methods for decision-making under conditions of uncertainty and for translating reliable information into terms of enlightened personal and organizational behavior.

Since 1959 we have seen some progress. Better epidemiologic techniques, growing attention to decision analysis, greater concern with behavioral science, and the enlightened involvement of the public—all represent significant steps. Developments in basic biology have provided applied scientists with valuable new insights. For example, the development of the Ames test and other sensitive and rapid testing procedures for suspected carcinogens was followed by the demonstration of a correlation between mutagenicity in bacteria and carcinogenicity. This established the significance for mammalian toxicology of much fundamental DNA research in primitive organisms.

Progress has been limited, however, when considered in the context of how far we are from consensus on such questions as those presented by saccharin and benzene. It has also been limited when compared with developments in the biomedical area. During the third quarter of this century, the National Institutes of Health played a critical role in nurturing that area of science and in developing a generation of research-oriented physicians and basic biomedical scientists. As a result, advances in biological knowledge have been applied to medical problems with a great increase in our understanding of disease.

The environmental health issues now confronting society are perhaps even more complex than those in the biomedical sciences. Laboratory scientists, statisticians, epidemiologists, engineers, economists, decision analysts, behavioral scientists, and others must be recruited. In applying their discipline to the environmental area, they must learn the language and problems of colleagues in other disciplines concerned with related questions. Recruitment efforts may be facilitated by the desire of many of today's gifted young scientists to apply their discipline to important social problems.

If we are to enter the 21st century as well prepared in the environmental health sciences as in the biomedical, some government agency must seize the initiative now. It must support efforts to attract, train, and help fund the work of many able scientists prepared to commit themselves to fundamental and applied environmental health research. The challenge facing universities is also great, for the complexities of interdisciplinary research and training do not respect the traditional barriers that separate departments and faculties. Universities and other research organizations must provide the milieu for environmental health research and recognition for success in such activities.

There is no time to waste. The public is increasingly concerned about the environment and health. The year 2000 is only a few days more distant than the cranberry-less holidays of 1959.—HOWARD H. HIATT, *Dean, Harvard School of Public Health, Cambridge, Massachusetts 02115*

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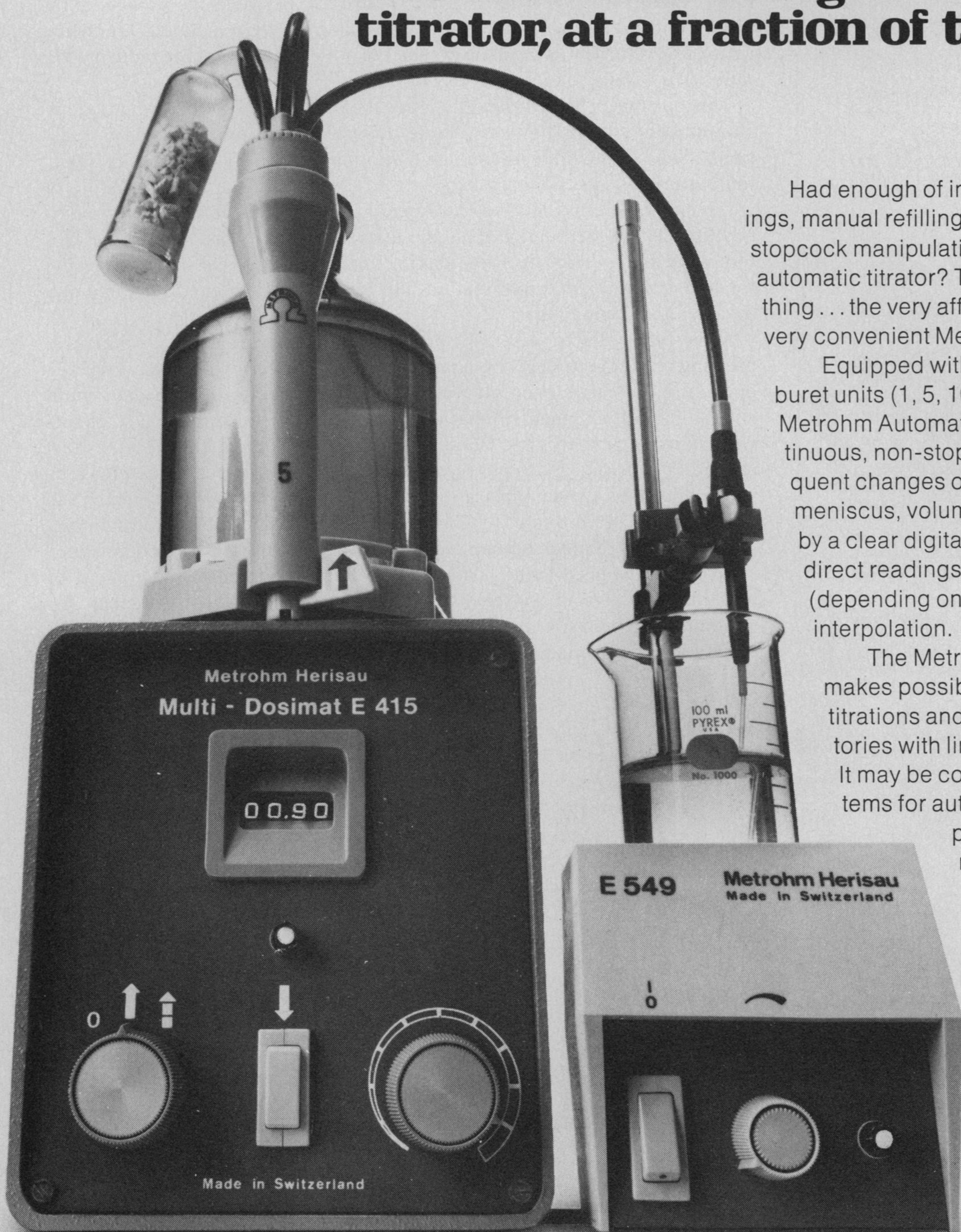

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Submit an original and two duplicates of each manuscript. With the manuscript send a letter of transmittal giving (i) the name(s) of the author(s); (ii) the title of the paper and a one- or two-sentence statement of its main point; (iii) the name, address, and field of interest of four to six persons in North America but outside your institution who you think are qualified to act as referees for your paper; (iv) the names of colleagues who have reviewed your paper for you; and (v) the field or fields of interest of readers who you anticipate will wish to read your paper.

Editorial Policies

All papers submitted are considered for publication. The author's membership or lack of membership in the AAAS is not a factor in selection. Papers are accepted with the understanding that they have not been published, submitted, or accepted for publication elsewhere. Authors will usually be notified of acceptance, rejection, or need for revision in 4 to 6 weeks (Reports) or 6 to 10 weeks (Articles).

Types of papers. Five types of signed papers are published: Articles, Reports, Letters, Technical Comments, and Book Reviews. Familiarize yourself with the general form of the type of paper you wish to submit by looking over a recent issue of the journal, and then follow the instructions for that type of paper.

Reviews. Almost all Articles, Reports, and Technical Comments, whether solicited or not, are sent to two or more outside referees for evaluation of their significance and soundness. Papers that depend on statistical references for their conclusions are sent to statisticians (in addition to other referees) for review. Forms showing some of the criteria reviewers are expected to consider are available on request.

Editing. Papers are edited to improve the effectiveness of communication between the author and his readers. The most important goal is to eliminate ambiguities. In addition, improvement of sentence structure often permits readers to absorb salient ideas quickly. When editing is extensive, with consequent danger of altered meanings, papers are returned to the author for correction and approval before type is set. Authors are free to make additional changes at this stage.

Proofs. One set of galley proofs or an equivalent is provided for each paper. Keep alterations to a minimum, and mark them only on the galley, not on the manuscript. Extensive alterations may delay publication by 2 to 4 weeks.

Reprints. An order blank for reprints accompanies proofs.

Writing Papers

Organize your material carefully, putting the news of your finding or a statement of the problem first, supporting details and arguments second. Make sure that the significance of your work will be apparent to readers outside your field, even if you feel you are explaining too much to your colleagues. Present each step in terms of the purpose it serves in supporting your finding or solving the problem. Avoid chronological steps, for the purpose of the steps may not be clear to the reader until he finishes reading the paper.

Provide enough details of method and equipment so that another worker can repeat your work, but omit minute and comprehensive details which are generally known or which can be covered by citation of another paper. Use metric units of measure. If measurements were made in English units, give metric equivalents.

Avoid specialized laboratory jargon and abbreviations, but use technical terms as necessary, defining those likely to be known only in your field. Readers will skip a paper they do not understand. They should not be expected to consult a technical dictionary.

Choose the active voice more often than you choose the passive, for the passive voice usually requires more words and often obscures the agent of action. Use first person, not third; do not use first person plural when singular is appropriate. Use a good general style manual, not a specialty style manual. The University of Chicago style manual, the style manual of the American Institute of Physics, and the *Style Manual for Biological Journals*, among others, are appropriate.

Manuscripts

Prepare your manuscript in the form used by *Science*. Use bond paper for the first copy. Submit two duplicates. Double-space title, abstracts, text, signature, address, references (including the lines of a single reference), figure legends, and tables (including titles, column headings, body, and footnotes). Do not use single spacing anywhere. Put the name of the first author and the page number in the upper right-hand corner of every page.

Paging. Use a separate page for the title; number it page 1. Begin each major section—text, references and notes, and figure legends—on a new sheet. Put each table on a separate sheet. Place figure legends and tables after the references.

Title. Begin the title with a word useful in indexing and information retrieval (not "Effect" or "New").

References and Notes. Number all references to the literature, footnotes, and acknowledgments in a single sequence in the order in which they are cited in the text. Gather all acknowledgments into a single citation, and keep them short ("I thank," not "I wish to thank"). Cite all references and notes but do not cite them in titles or abstracts. Cite several under one number when feasible. Use *Bibliographic Guide for Editors & Authors* with the few suggested revisions in *International List of Periodical Title Word Abbreviations* for abbreviations of journal names. If the journal is not listed there, provide the full name. Use the following forms:

Journal: H. Smith, *Am. J. Physiol.* **98**, 279 (1931).
Book: F. Dachille and R. Roy, *Modern Very High Pressure Techniques* (Butterworth, London, 1961), pp. 163–180.
Chapter: F. Dachille and R. Roy, in *Reactivity of Solids*, J. H. de Boer, Ed. (Elsevier, Amsterdam, 1960), p. 502.

Illustrations. Submit three copies of each diagram, graph, map, or photograph. Cite all illustrations in the text and provide a brief legend, to be set in type, for each. Do not combine line drawings and photographs in one illustration. Do not incorporate the legend in the figure itself. Use India ink and heavy white paper or blue-lined coordinate paper for line drawings and graphs. Use heavier lines for curves than you use for axes. Place labels parallel to the axes, using initial capital and lowercase letters; put units of measurement in parentheses after the label—for example, Length (m). Plan your figures for the smallest possible printed size consistent with clarity.

Photographs should have a glossy finish, with sharp contrast between black and white areas. Indicate magnification with a scale line on the photograph.

Tables. Type each table on a separate sheet, number it with an Arabic numeral, give it a title, and cite it in the text. Double-space throughout. Give each column a heading. Indicate units of measure in parentheses in the heading for each column. Do not change the unit of measure within a column. Do not use vertical rules. Do not use horizontal rules other than those in the heading and at the bottom. A column containing data readily calculated from data given in other columns can usually be omitted; if such a column provides essential data, the columns containing the other data can usually be omitted.

Plan your table for small size. A one-column table may be up to 42 characters wide. Count characters by counting the widest entry in each table column (whether in the body or the heading) and allow three characters for spaces between table columns. A two-column table may be 90 characters wide.

Equations and formulas. Use quadruple spacing around all equations and formulas that are to be set off from the text. Most should be set off. Start them at the left margin. Use the solidus for simple fractions, adding the necessary parentheses. But if braces and brackets are required, use built-up fractions. Identify handwritten symbols in the margin, and give the meaning of all symbols and variables in the text immediately after the equation.

Articles

Articles, both solicited and unsolicited, may range in length from 2000 to 5000 words (up to 20 manuscript pages). Write them clearly in reasonably nontechnical language. Provide a title of one or two lines of up to 26 characters per line and an objective summary of 50 to 100 words indicating the scope and main finding. Do not break words at the ends of lines. Write a brief author note, giving your position and address. Do not include acknowledgments. Place title, subtitle, and author note on page 1. Begin the text on page 2.

Insert subheads at appropriate places in the text to mark your main ideas. The set of subheads should show that your ideas are presented in a logical order. Keep subheads short—up to 35 characters and spaces.

Do not submit more than one illustration (table or figure) for each four manuscript pages unless you have planned carefully for grouping. With such planning many illustrations can be accommodated in the article. Consult the editorial office for help in planning.

Reports

Short reports of new research results may vary in length from one to seven double-spaced manuscript pages of text, including the bibliography. Long papers are subject to delays in reviewing and editorial consideration. Short papers receive preferred treatment. Limit illustrative material (both tables and figures) to two items, occupying a total area of no more than half of a published page (30 square inches). A research report should have news value for the scientific community or be of unusual interest to the specialist or of broad interest because of its interdisciplinary nature. It should contain solid research results or reliable theoretical calculations. Speculation should be limited and is permissible only when accompanied by solid work.

Title. Begin the title with an important word (preferably a noun) that identifies your subject. The title may be a conventional one (composed primarily of nouns and adjectives), a sentence (containing a verb), or a structure with a colon (Jupiter: Its Captured Satellites). Limit it to two lines of complete words of no more than 55 characters per line (spaces between words count as one character each). Do not use abbreviations. Type the title in the middle of page 1.

Abstract. Provide an abstract of 45 to 55 words on page 2. The abstract should amplify the title but should not repeat it or phrases in it. Qualifying words for terms used in the title may be used. Tell the results of the work, but not in terms such as "____ was found," "is described," or "is presented."

Text. Begin the text on page 3. Put the news first. Do not refer to unpublished work or discuss your plans for further work. If your paper is a short report of work covered in a longer paper to be published in a specialty journal, you may refer to this paper if it has been accepted. Name the journal. If the manuscript has not been accepted, refer to it as "in preparation." Do not use subheads.

Signature. List the authors on the last page of the text and give a simple mailing address.

Received dates. Each report will be dated the day an acceptable version is received in the editorial office.

Letters

The Letters section provides a forum for discussion of matters of general interest to scientists. Letters are judged only on clarity of expression and interest. Keep them short and to the point; the preferred length is 250 words. The editors frequently shorten letters.

Technical Comments

Letters concerning technical papers in *Science* are published as Technical Comments at the end of the Reports section. They may add information or point out deficiencies. Reviews are obtained before acceptance.

Book Reviews

The selection of books to be reviewed is made by the editors with the help of advisers in the various specialties; arrangements are then made with reviewers. A sheet of instructions accompanies each book when it is sent to the reviewer.

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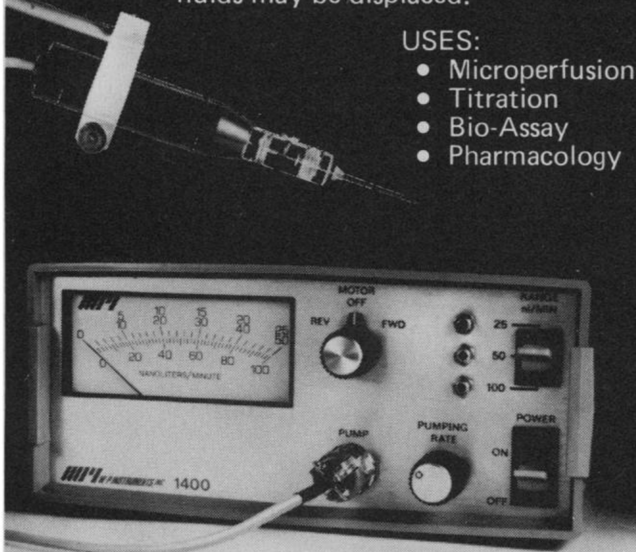

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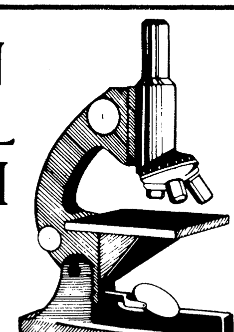

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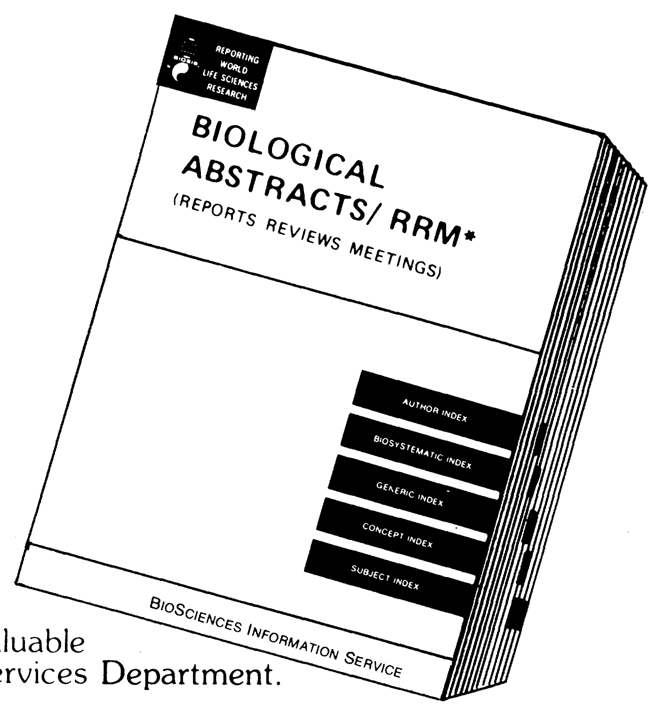

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"Perspectives and
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Speaker: Ivan A. Getting

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WHEN: Saturday, 5 January 1980. Dinner at 7:30 p.m. No-host bar at 6:30 p.m.

WHERE: San Francisco Hilton/Continental Ballrooms 1 and 2

COST: $15. Tickets are available only at AAAS Meeting registration area in East Lounge of the San Francisco Hilton through 2:00 p.m., Saturday, 5 January.

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Open Meeting

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- Major Future Science and Technology Issues
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- Higher Education in the 1980's

Bring Your Own Issues

WHEN: Friday, 4 January 1980, 6:00 p.m.-7:30 p.m. WHERE: San Francisco Hilton/Embarcadero Room

BOOKS RECEIVED

(Continued from page 1396)

Geometric Principles and Procedures for Computer Graphic Applications. Sylvan H. Chasen. Prentice-Hall, Englewood Cliffs, N.J., 1978. xiv, 242 pp., illus. $14.95.

Global Challenges. A World at Risk. Harry Clay Blaney III. New Viewpoints (Franklin Watts), New York, 1979. xiv, 270 pp. Cloth, $12.95; paper, $6.95.

Group Theory Made Easy for Scientists and Engineers. Nyayapathi V. V. J. Swamy and Mark A. Samuel. Wiley-Interscience, New York, 1979. x, 174 pp. $14.50.

Integral Transforms in Science and Engineering. Kurt Bernardo Wolf. Plenum, New York, 1979. xiv, 490 pp., illus. $32.50. Mathematical Concepts and Methods in Science and Engineering, vol. 11.

Location on Networks. Theory and Algorithms. Gabriel Y. Handler and Pitu B. Mirchandani. MIT Press, Cambridge, Mass., 1979. xx, 234 pp., illus. $25. MIT Press Series in Signal Processing, Optimization, and Control.

Methods in Enzymology. Sidney P. Colowick and Nathan O. Kaplan, Eds. Vol. 59, Nucleic Acids and Protein Synthesis. Kivie Moldave and Lawrence Grossman, Eds. Academic Press, New York, 1979. xxvi, 940 pp., illus. $49.50.

Methods in Membrane Biology. Vol. 10. Edward D. Korn, Ed. Plenum, New York, 1979. xiv, 228 pp., illus. $29.50.

Methods in Microbiology. Vol. 11. T. Bergan and J. R. Norris, Eds. Academic Press, New York, 1978. xvi, 312 pp. $28.25.

Mind and Nature. A Necessary Unity. Gregory Bateson. Dutton, New York, 1979. xvi, 238 pp. $11.95.

Population Pressure and Cultural Adjustment. Virginia Abernethy. Human Sciences Press, New York, 1979. 190 pp. $12.95.

Principles of Biomedical Ethics. Tom L. Beauchamp and James F. Childress. Oxford University Press, New York, 1979. xvi, 314 pp. Cloth, $13.95; paper, $7.95.

A Programming Logic. With an Introduction to the PL/CV Verifier. Robert L. Constable and Michael J. O'Donnel with contributions by Scott D. Johnson. Winthrop (Prentice-Hall), Cambridge, Mass., 1978. x, 390 pp. $15.95.

Progress in Anterior Eye Segment Research and Practice. Volume in Honour of Prof. John E. Harris, Ph.D., M.D. O. Hockwin and W. B. Rathbun, Eds. Junk, the Hague, 1979 (U.S. distributor, Kluwer Boston, Hingham, Mass.). x, 370 pp., illus. $75. Documenta Ophthalmologia Proceedings Series, vol. 18.

Solid Surface Physics. Contributions by J. Hölzl, F. K. Schulte, and H. Wagner. Springer-Verlag, New York, 1979. viii, 222 pp., illus. $37.80. Springer Tracts in Modern Physics, vol. 85.

Tooth Enamel III. Its Development, Structure, and Composition. Proceedings of a symposium, Washington, D.C., Mar. 1978. Marie U. Nylen and John D. Termine, Eds. American Association for Dental Research, Washington, D.C., 1979. pp. 673-1032, illus. Paper, $10. *Journal of Dental Research*, vol. 58, Special Issue B.

Toxic Chemical and Explosives Facilities. Safety and Engineering Design. Papers from a symposium, Miami Beach, Sept. 1978. Ralph A. Scott, Jr., Ed. American Chemical Society, Washington, D.C., 1979. x, 352 pp., illus. $32. ACS Symposium Series, 96.

Personnel Placement

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