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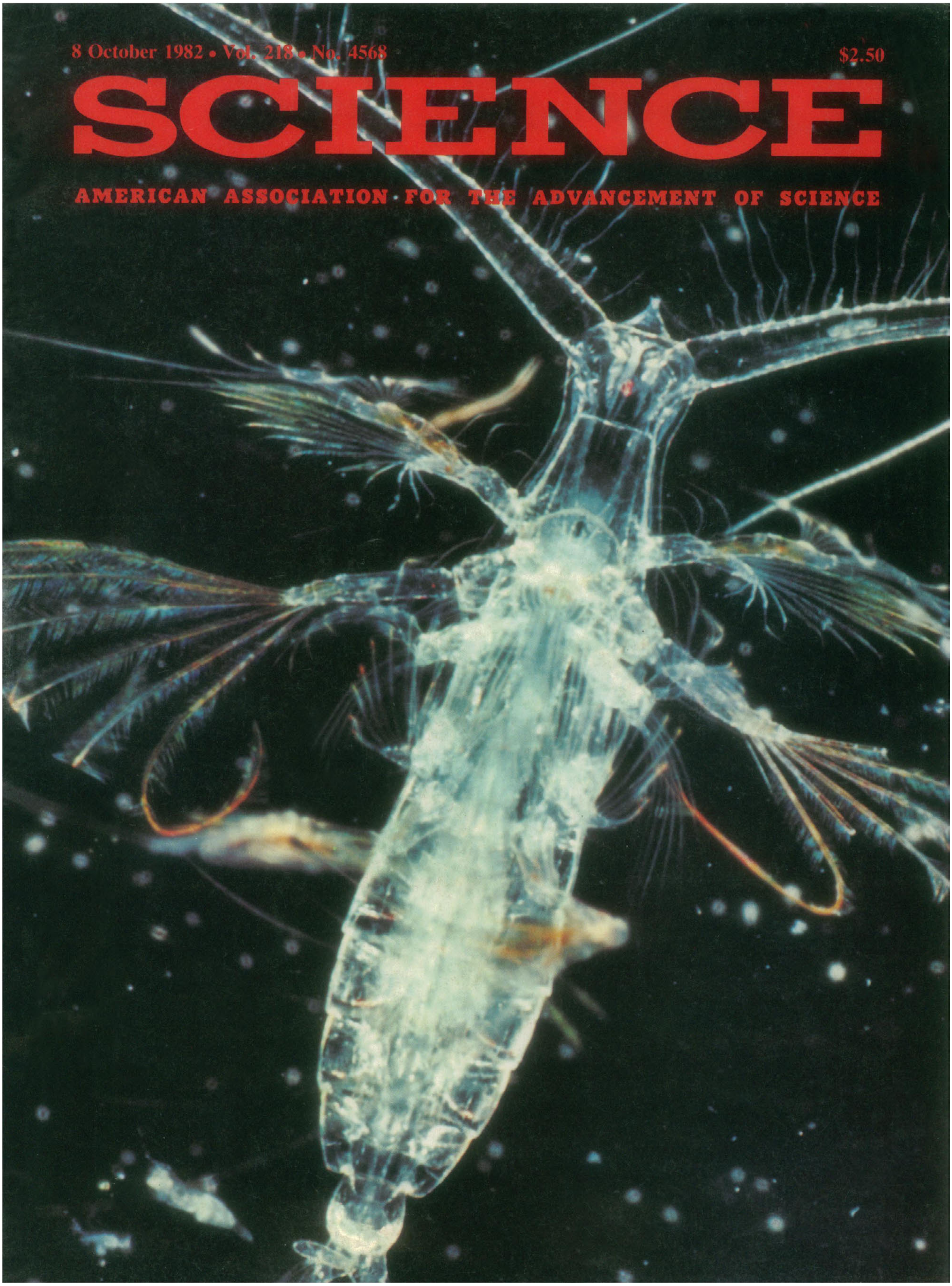

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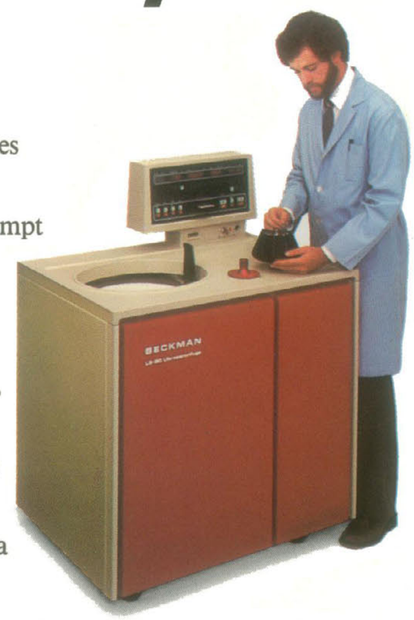

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Female calanoid copepod (*Eucalanus attenuatus*) from the Coral Sea, Australia. This herbivorous planktonic microcrustacean lives in a nutritionally dilute environment. Note the sensor arrays on the outstretched first antennae and the elaborate mouthparts. These animals create feeding currents that help them detect algae. See page 158. [Paul Dixon, Australian Institute of Marine Science, Townsville, Australia]

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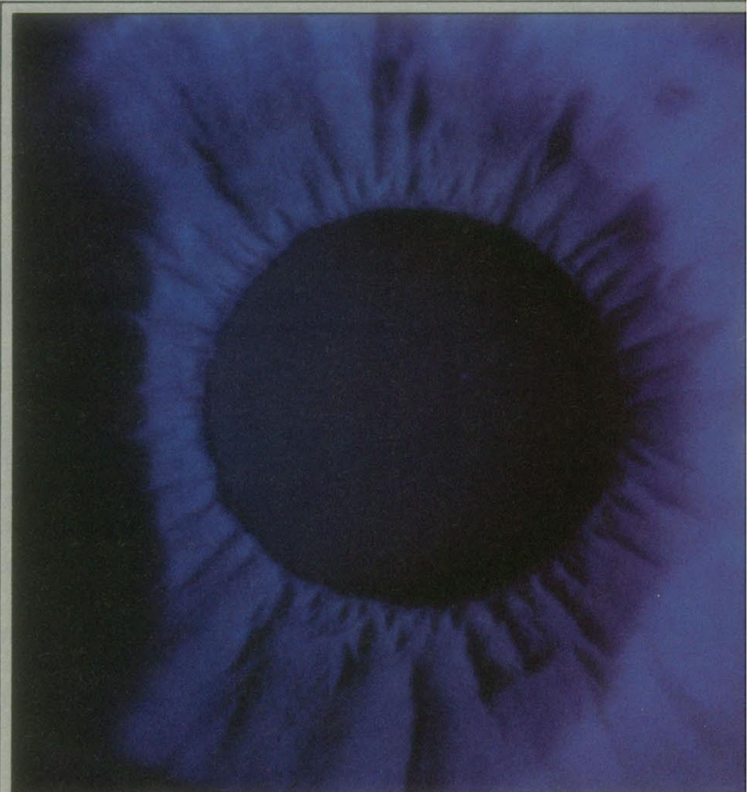

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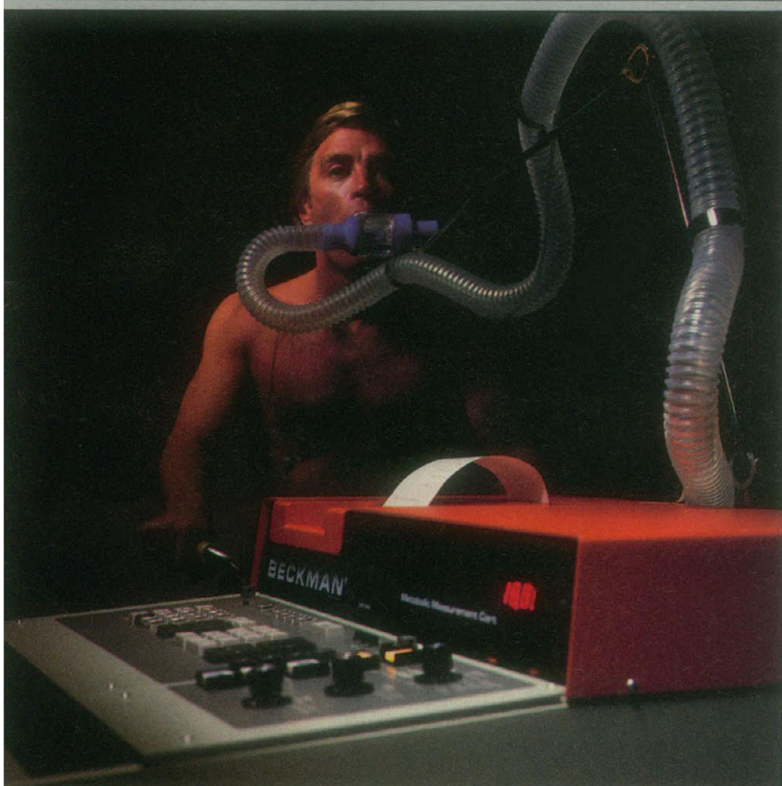

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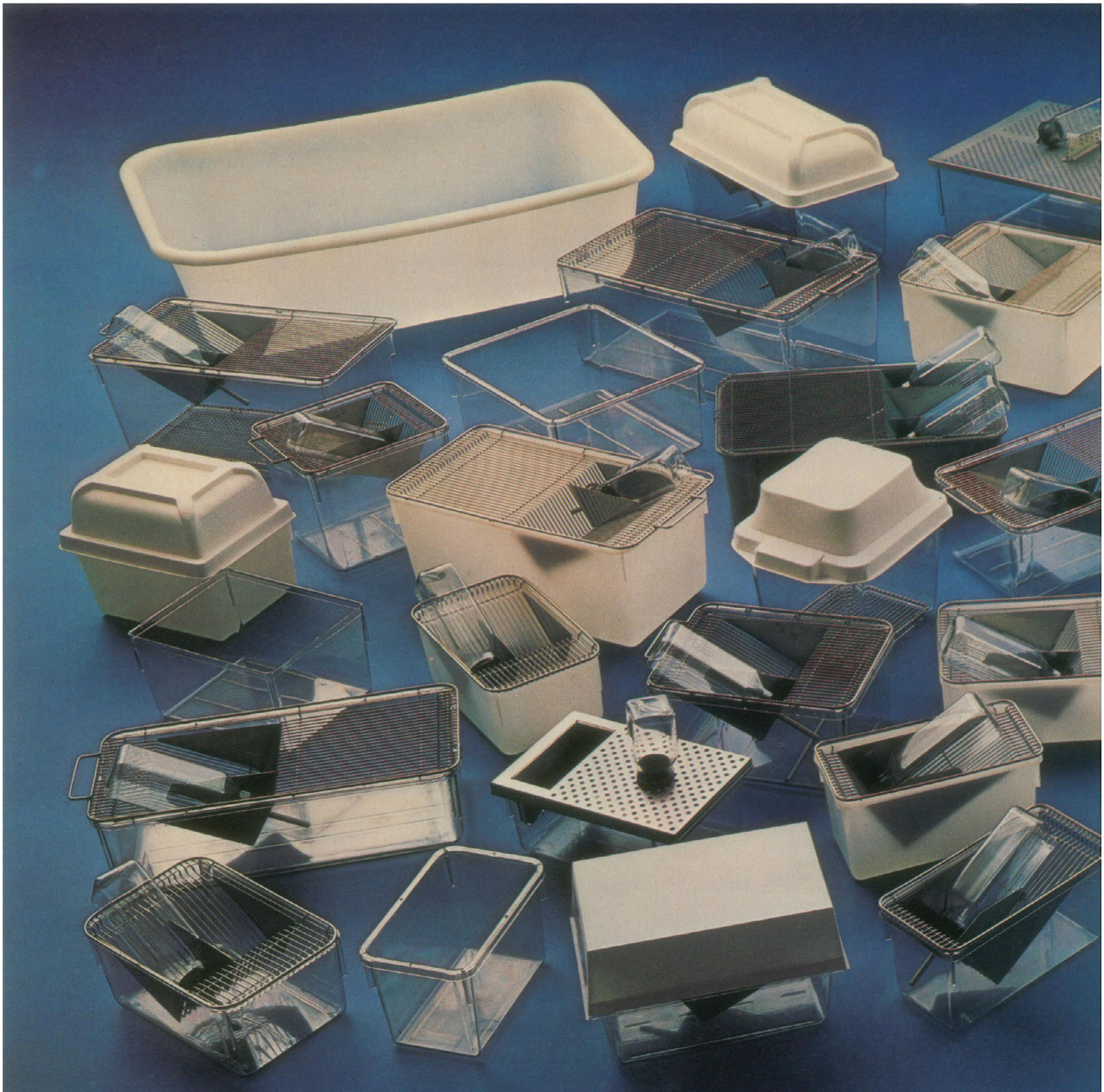

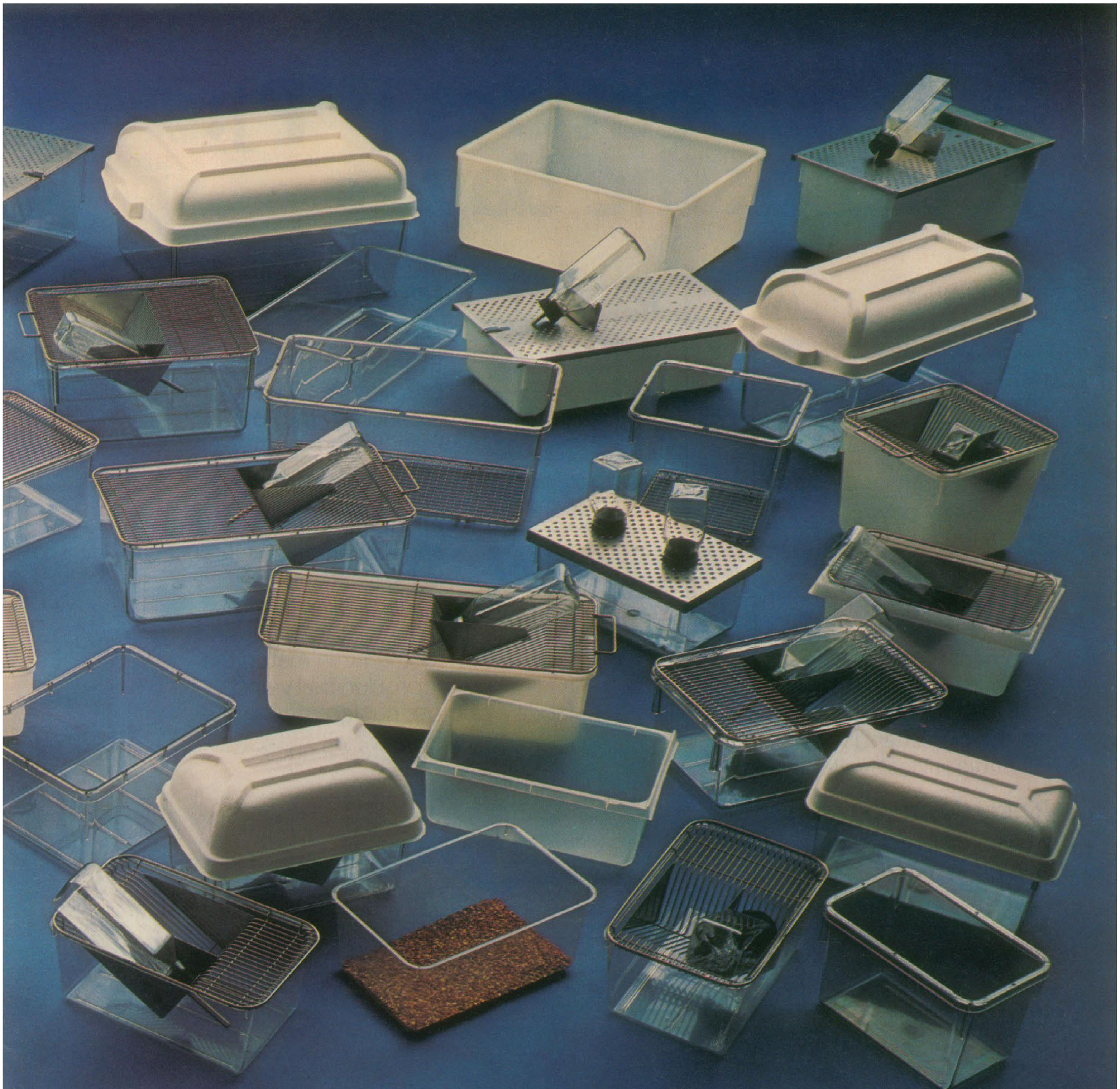

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December 6-9, 1982

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Vice Chairman: Dr. Peter Friedland, Research Associate, Dept. of Computer Science, Stanford University

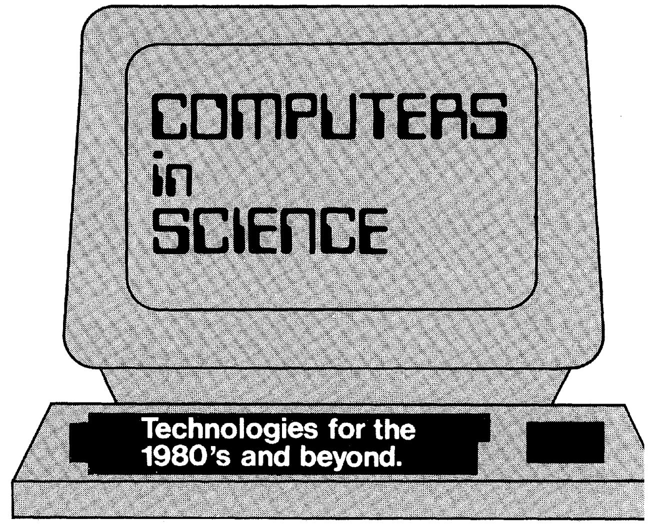
The conference's primary objective is to provide information on how changing computational technologies will influence future scientific research. Sessions will examine state of the art applications of existing technologies to specific areas of research as well as the impact of new developments on scientific research in the decades ahead.

Each conference day is devoted to a specific topic with lectures and presentations providing in-depth coverage of the subject:

- **Tuesday, December 7th — Products of the Technological Revolution: Building Blocks of Future Computer Systems.** A look at the underlying technology of future computer systems, emphasizing hardware developments and their role in providing powerful, distributed systems.
- **Wednesday, December 8th — Computational Systems: Man/Machine Synergism and the Conduct of Scientific Research.** Discussion on building useful research and development systems, focusing on the interaction of scientists with computers.
- **Thursday, December 9th — Scientific Communication and Collaboration: Conducting Research in the New Computational Environment.** An examination of the influence of computers, on how research is conducted, covering scientific collaboration, communication, resource sharing and the sociology of research in a new computational environment.

On Monday, December 6th, the day immediately preceding the main conference three Tutorials will be presented on the subjects of hardware, software, and communication technology. The Tutorials will provide intensive instruction on these subjects to provide a background for the main conference sessions to follow.

In addition, comprehensive exposition of equipment and software used in scientific computer applications will run concurrently with the conference. Company technical personnel will be on hand to assist attendees and to give demonstrations. Contributed papers in the form of posters or demonstrations are invited. Please check registration form to receive Tutorial information and/or Abstract forms where indicated.



Tuesday, December 7th — Morning lectures:

Microelectronics — Dr. Gordon Moore, Chairman of the Board/CEO, Intel Corp.

Personal Computers — Dr. Adele Goldberg, Principal Scientist/Area Manager, Software Concepts Group, Xerox Palo Alto Research Center

Local Area Networks — Dr. Robert M. Metcalfe, Chairman of the Board, 3COM Corp.

Shared Resources — Dr. C. Gordon Bell, Vice President of Engineering, Digital Equipment Corp.

Wednesday, December 8th — Morning Lectures:

Symbols and Software for Science — Prof. Edward A. Feigenbaum, Dept. of Computer Science, Stanford University

Methodology of Programming — Dr. Ira Goldstein, Manager, Application Technology Dept., Computer Research Center, Hewlett-Packard

Expert Systems/Artificial Intelligence — Prof. Bruce G. Buchanan, Dept. of Computer Science, Stanford University

Computer Graphics — Prof. Robert Langridge, Dept. of Pharmaceutical Chemistry, University of California, San Francisco

Thursday, December 9th — Morning Lectures:

General Perspectives — Dr. Ralph E. Gomory, IBM Vice President and Director of Research

Evolution of Computer Networks — Dr. Robert Kahn, Director, Information Processing Techniques, Defense Advance Research Projects Agency

Scientific Collaborations — Lynn Conway, Research Fellow/Manager, VLSI System Design Area, Xerox Palo Alto Research Center

Sociological Impact of Computing — Prof. J.C.R. Licklider, Laboratory for Computer Science, MIT

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8 October 1982, Volume 218, Number 4568

SCIENCE

Engineering Education and National Policy

We are witnessing a significant transfer of sources of support from the federal government to private industry. But the objectives of industry may differ radically from our previous national policy. Industry is often primarily interested in quick practical applications, and accordingly focuses resources on schools where the research quality is very high and the existing research parallels industrial interests. We need only note the sequence of industrial commitments to major universities such as Massachusetts Institute of Technology or Stanford to envision a narrow concentration of support for excellent engineering education on a few schools by the end of this decade.

The growth of industrial support for engineering education occurs just after the abolition of the National Science Foundation's (NSF's) Directorate for Science and Engineering Education. Since the mission-oriented federal agencies have responsibilities analogous to those of industry, the NSF change means that we cannot anticipate future programs giving support to average or just-above-average institutions.

Possibly this change in national policy is desirable. It may well be true that, with limited resources, we must concentrate on a few institutions and educate a small number of excellent students to the fullest degree possible: the country's economic and social problems may demand relatively few, truly outstanding engineers in the future. But the policy change may lead to a serious national shortage of solidly educated engineers. There may also be less obvious impacts: second-echelon colleges have frequently been the strongest contributors to improving precollege mathematics and science education, to opening engineering careers to minorities and women, and to contributing technological capability to local and state governments and citizen groups. Moreover, the second-echelon institutions frequently carry on research that fills critical gaps. For example, during the 1950's and 1960's, electrical energy research and education remained in a low priority position at the most prestigious schools, where Department of Defense and NASA interests were strong driving forces. When energy problems became a national priority in the early 1970's, a history of strong emphasis existed only at a few schools and state universities.

If the trend toward concentration of excellence in a few schools continues, we anticipate the emergence by the 1990's of distinct groups of engineering schools: perhaps 25 superb schools, 150 schools offering weak programs, and 75 schools which really should not be offering engineering at all. We also anticipate that there will be a large difference between the superb schools and the weaker ones. What are the conditions for future excellence?

Three factors guide us in predicting which engineering colleges will be outstanding: (i) Quality and visibility of present research. These criteria depend on the level of research activity, available facilities, quality of graduate students, and, especially, quality of faculty. To some extent, areas of research are important simply because of strong national interest. (ii) Sources of support. Certain institutions have unusually strong sources of support. Some are located in cities with exceptional civic pride and have developed rapidly with help from local industrial and financial communities. Others are able to capitalize on remarkable state political commitments to the importance of quality engineering education. (iii) Leadership. Occasionally an engineering college has such exceptional leadership that it is rapidly improving research quality and obtaining long-term sources of support. The leadership understands national priorities, has contacts with industrial and political decision-makers, and is able to allocate resources.

There has been no open discussion of the existence, let alone the desirability, of the changes that are occurring. Are the national trends reversible? Certainly, but only if there is open discussion and formulation of an overt national policy on engineering education.—J. G. TRUXAL *and* M. VISICH, JR., *College of Engineering and Applied Sciences, State University of New York, Stony Brook 11794*

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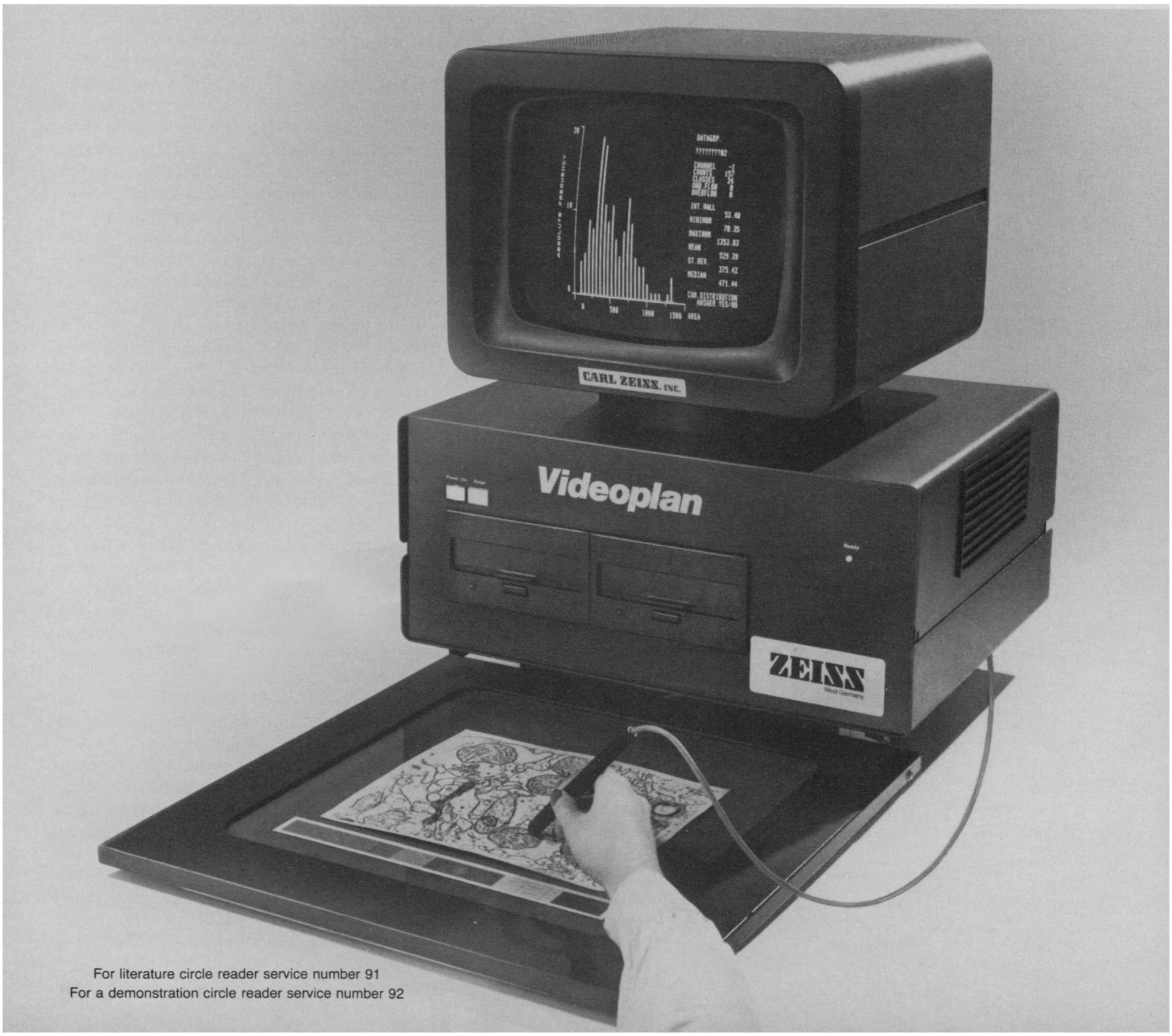

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