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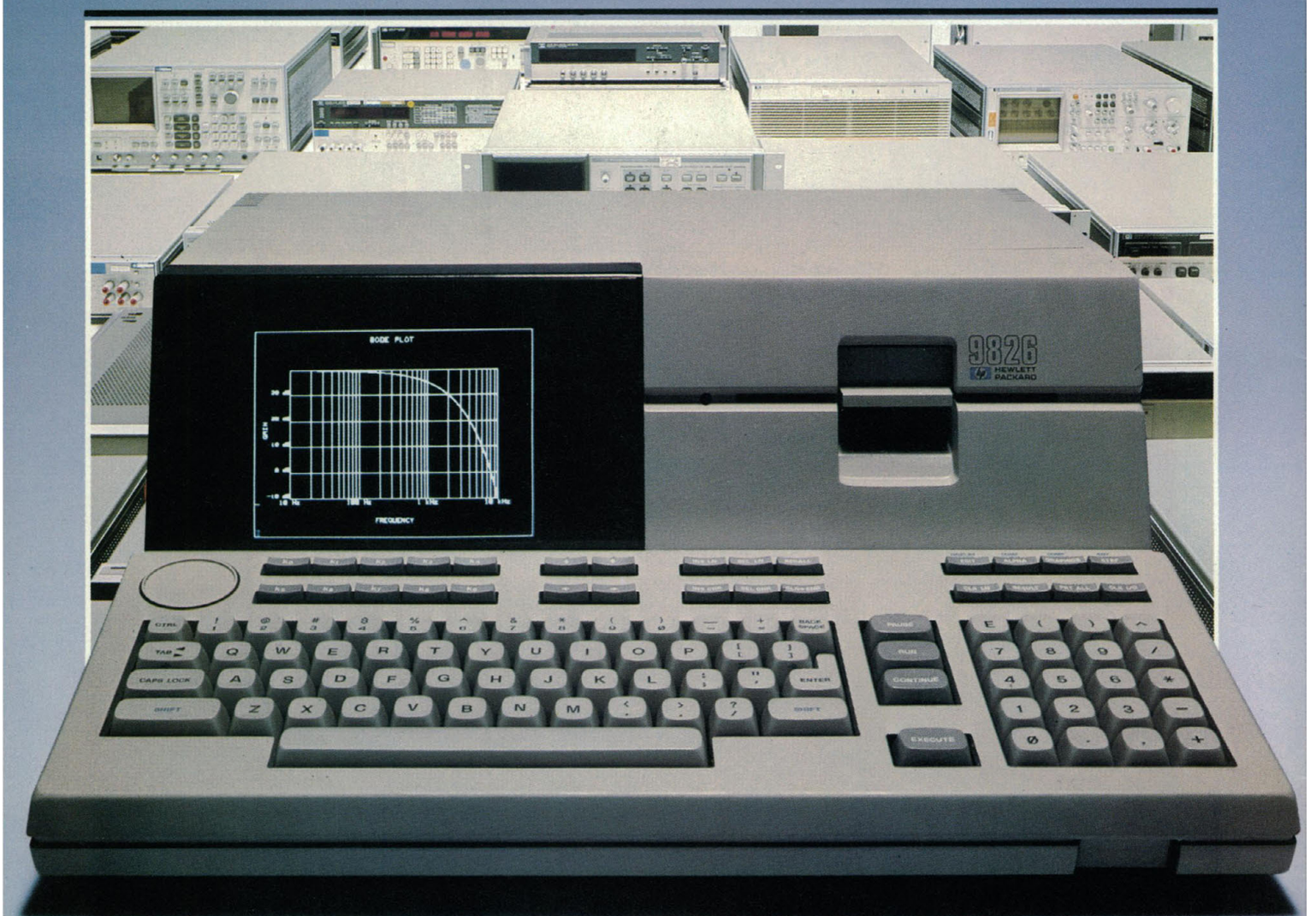

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COVER

Myriad of minerals form on the surface of nuclear waste glass (type SRL-131) during exposure to water vapor. Such hydration reactions can be used to age glass, thereby simulating conditions in a waste repository. Results also add insight to the age dating of natural artifacts (about ×750). See page 51. [J. K. Bates and J. Thallemer, Chemical Engineering Division, Argonne National Laboratory, Argonne, Illinois 60439]

WATCHING THE RED TIDE COULD CURE JET LAG.

In one way, you resemble the small organism that causes red tide.

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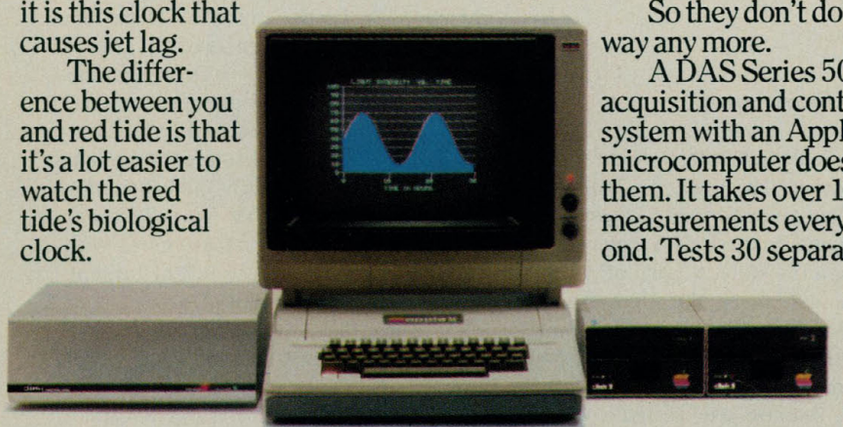

Every twenty-four hours, it glows. Which makes it an ideal subject for finding out what makes the body clock tick. You pop some red tide in a test tube. Do something to it. And see if what you've done changes the time when it glows.

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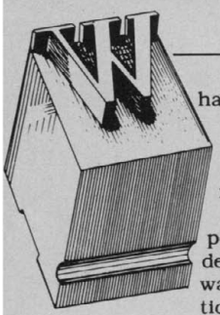

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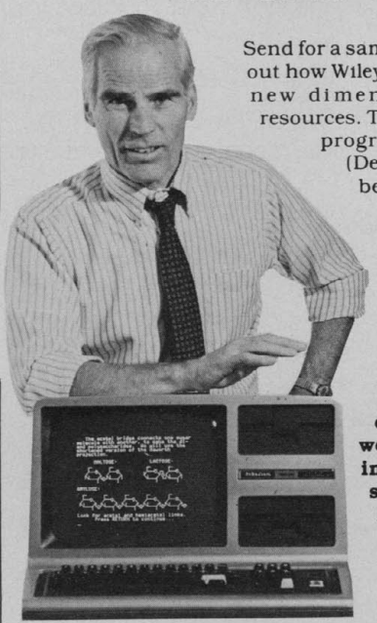

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1 October 1982, Volume 218, Number 4567 **SCIENCE**

Constraints on Surface Science Research

Surface science research offers immense and exciting opportunities. It is fair to say that we have only begun to understand what may be regarded as another state of matter which is just as important as the classical solid-liquid-gas triad. But these promising horizons are constrained in many ways, many of which are common throughout academic research programs.

Scientific advances cannot be made without attracting bright and enthusiastic people into scientific professions and facilitating their work. Loss of a single generation of people actively engaged in scientific inquiry has disastrous consequences. Our highest academic priority should be training students in an atmosphere of free inquiry and stimulating research. Too often we use students to do our research with little regard for their intellectual and professional preparation to function effectively after graduation.

Another factor is the influence of sources of research funds on student education. With the trend toward increasing industrial support of university research has come justifiable concern about the extent to which the "research-for-profit" and "proprietary rights" motives will direct such research support and thereby compromise free inquiry and open dissemination. But we should be equally concerned about the extent to which the involvement of the government in university research has, over the years, influenced the training of students. The lion's share of federal dollars for university research comes in the form of grants or contracts for particular projects, which are judged on the basis of scientific merit or the practical needs of government agencies. In this mode of support, the intellectual and professional training of students plays a secondary role.

Moreover, the number of unrestricted graduate fellowships is now near zero, and thus there is little opportunity for undergraduate students to compete for awards that will give them some measure of acclaim and independence early in their careers. This makes students more dependent on project support and is an indirect, but strong, signal that on the national level we have lost interest in promoting graduate training in the sciences. Such signals reach the high schools, where the natural sciences are seldom highlighted as exciting, worthwhile, and important professions. Reinstituting a sizable National Science Foundation (NSF) fellowship competition would be relatively inexpensive and could help to counteract this trend.

Demographics also has important implications. Enrollments in advanced degree programs have already dropped. It is expected that there will be a decline of approximately 25 percent in the number of 18-year-olds over the next 20 years. These factors are sure to bring pressure on our centers of graduate education and research, and we must develop long-term policies to ensure continuity in student training.

In surface science, which is naturally interdisciplinary, these problems are compounded. A major commitment by several departments is necessary to assemble the faculty. Even when chemists, physicists, and engineers are all in place, university departmental structures and procedures often impede implementation. The formation of an institute solves some of these problems, but divides loyalties and tends to focus on project research while pushing graduate and undergraduate training into the background.

Another constraint for surface science is due to its heavy reliance on instrumentation. It is foolhardy for a new investigator to attempt to begin a program with capital resources of less than $100,000. Funding at the appropriate level is difficult even for senior academic investigators. This point can be illustrated by considering fiscal 1981 data from the NSF. For projects in the surface science—heterogeneous catalysis category the average award size was $66,000 per year, with an average of $9,600 budgeted for permanent equipment. Principal investigators, reviewers, university administrators, and granting agencies must all face these economic requirements squarely and positively if significant numbers of surface science programs are to flourish.—JOHN M. WHITE, *Department of Chemistry, University of Texas, Austin 78712*

Science Magazine in cooperation with Scherago Associates announces The First Annual Conference on

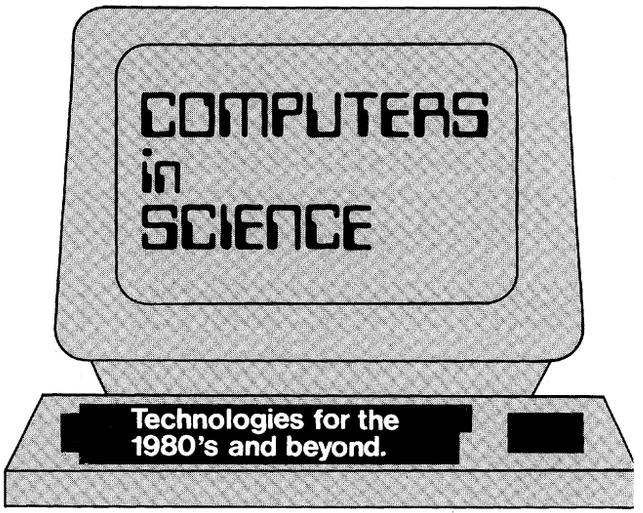
COMPUTERS IN SCIENCE

December 6-9, 1982

Conrad Hilton, Chicago, Illinois

Chairman: Dr. Dennis Smith, Group Leader, Discovery Research Systems, Lederle Laboratories

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

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