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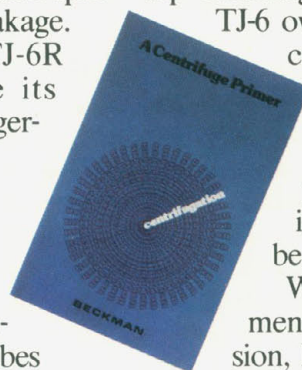
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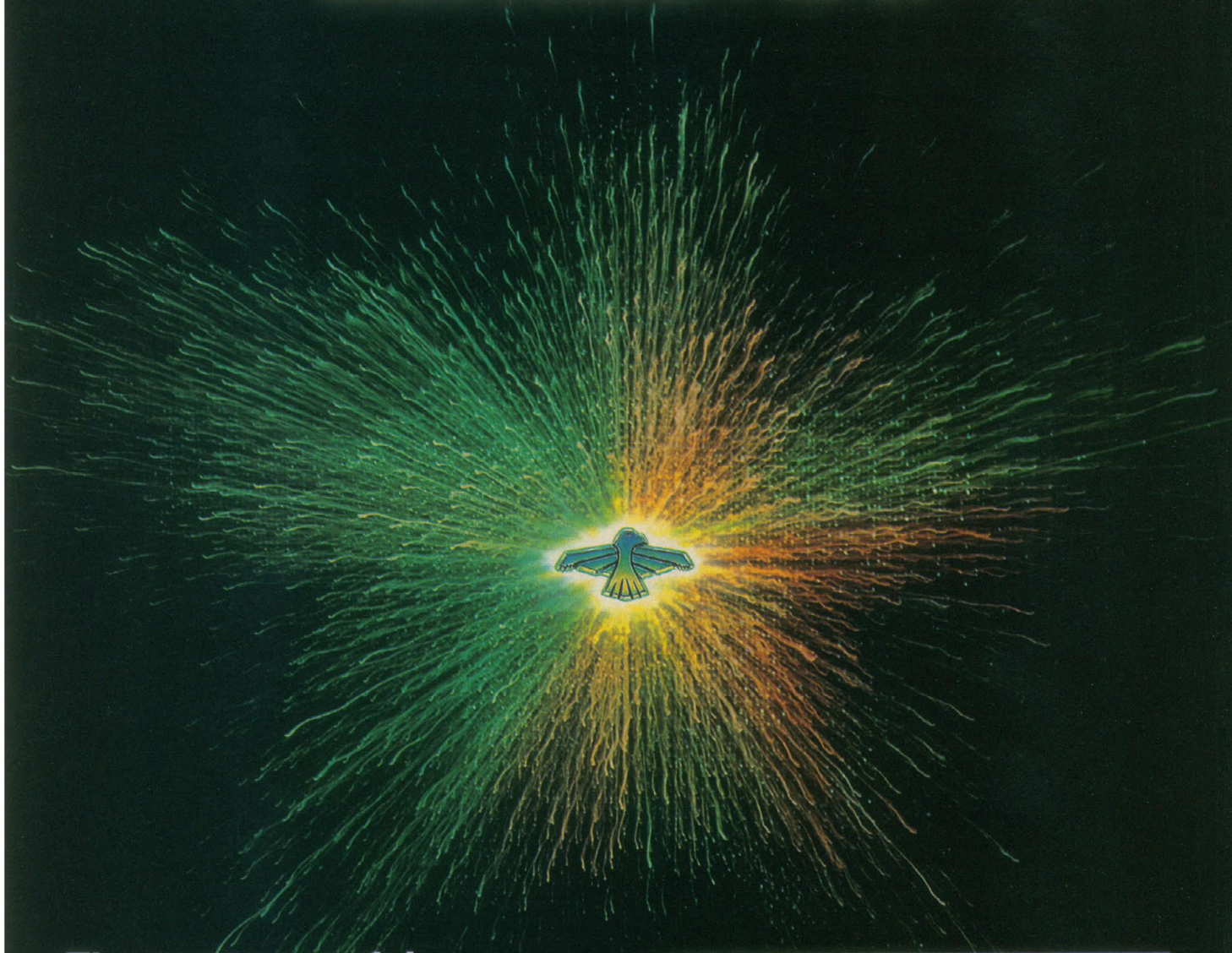
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COVER

Fractal surface shown in this image has statistical properties that approximate those of natural terrain. See page 767. [Loren Carpenter, Lucasfilm Ltd., San Rafael, California]

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

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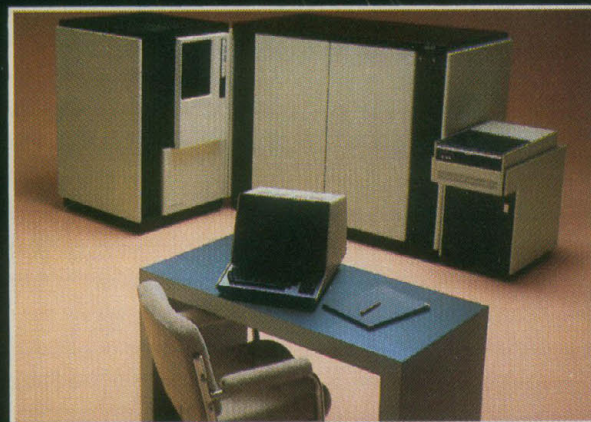
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The cause of these problems is easily explained. Soon after DEC announced the VAX, several companies noticed a great opportunity and rushed to market with their DBMS software. Some of them quickly converted their products to the VAX from other hardware. A few others took their academic research projects and tried to make them viable commercial products. If only good data-base software could be created so easily!

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SCIENCE/SCOPE

The first carbon-dioxide laser rangefinder developed in the U.S. for tactical military use offers several advantages over existing solid-state lasers to improve the first-round accuracy of tank gunners. The new laser, being developed at Hughes for the Army's M1 main battle tank, will penetrate battlefield smoke and dust much better. Because the laser is harmless to the human eye and requires minimal safety restrictions to be operated, gunners will have more training time than they do with the solid-state unit and will become more proficient. The Army is evaluating an advanced development model.

A new adaptive radar, using technology that could be applied in the future to many different weapon control systems, has completed feasibility tests. The radar, called FLEXAR (Flexible Adaptive Radar), uses a multimode transmitter and a programmable signal processor that are now in production, plus a new lightweight, low-cost electronically-scanned antenna. The antenna rotates once each second while the beam electronically scans up and down and back and forth. Waveforms are selected automatically to match the environment. Such flexibility enables the radar to adapt its waveform beamwidth and scan rate as needed to acquire and track targets. Hughes developed FLEXAR for the U.S. Navy.

Besides taking pictures of clouds every 30 minutes, a new satellite provides meteorologists with other important information. The GOES-5 spacecraft relays data from more than 1,500 stations that monitor sea ice conditions and water and snow distribution in remote areas, providing flood warning, among other services. It also measures solar winds and detects solar flares and fluctuations in the earth's magnetic field. This data, besides being useful in weather predictions, is used in communications and electrical power distribution. GOES-5 is the second of three Geostationary Operational Environmental Satellites built by Hughes for the National Oceanic and Atmospheric Administration.

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Better and timelier weather forecasts will be possible when a microwave sensor is launched aboard a military satellite in the mid-1980s. The instrument will tell how hard rain is falling in a specific area rather than simply how much has fallen over a wide area within 24 hours. It also will determine wind speed, atmospheric water content, soil moisture, and sea ice conditions. Because the satellite will follow a low polar orbit, the sensor will gather important data on the little-studied polar regions and oceans. Hughes will soon deliver the prototype Special Sensor Microwave/Imager to the U.S. Air Force.

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Dr. Melitta Schachner; Universitat Heidelberg, Heidelberg, Federal German Republic

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Speakers:

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Dr. Walter Gerhard; The Wistar Institute, Philadelphia, Pennsylvania, USA

Dr. Michael J. Buchmeier; Scripps Clinic and Research Foundation, La Jolla, California, USA

Dr. Dwight Lopes; The Wistar Institute, Philadelphia, Pennsylvania, USA

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Speakers:

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Dr. Zenon Steplewski; The Wistar Institute, Philadelphia, Pennsylvania, USA

Dr. Barton Haynes; Duke University, Durham, North Carolina, USA

Dr. Jean-Pierre Mach; Ludwig Institute for Cancer Research, Lausanne, Switzerland

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Speakers:

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Dr. Carlo Croce; The Wistar Institute, Philadelphia, Pennsylvania, USA

Dr. Tadimitsu Kishimoto; Osaka University Hospital, Osaka, Japan

Dr. Steven Gillis; University of Washington, Seattle, Washington, USA

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64K	64K	64K	128K
Maximum Memory when fully configured*			
64K	64K	192K	256K
Expandability			
No expansion slots	No expansion slots	No extra expansion slots in fully configured* 192K system	4 extra expansion slots in fully configured 256K system*
Diskette Storage (per drive)			
92K	256K	160K	140K
Mass Storage (per drive)			
—	1.16 megabyte Floppy Disk	—	5 megabyte Hard Disk
Display Graphics Capability			
High resolution B/W	High resolution B/W	High resolution B/W or 4-color (color requires additional card)	High resolution B/W or 16-color
Software Available			
Word Processing Super Calc®	Word Processing VisiCalc® 125	Word Processing VisiCalc®	Word Processing VisiCalc® III
—	Business Graphics	—	Business Graphics
Communications	Communications	Communications	Communications
—	—	—	Apple II software library
CP/M® library	CP/M® library	CP/M® 86 programs	CP/M® library (available Spring, 1982)

*"Fully configured" means system includes, at minimum, monitor, printer, 2-disk drives and RS-232C communicator. NOTE: Chart based on manufacturer's information available as of December, 1981.

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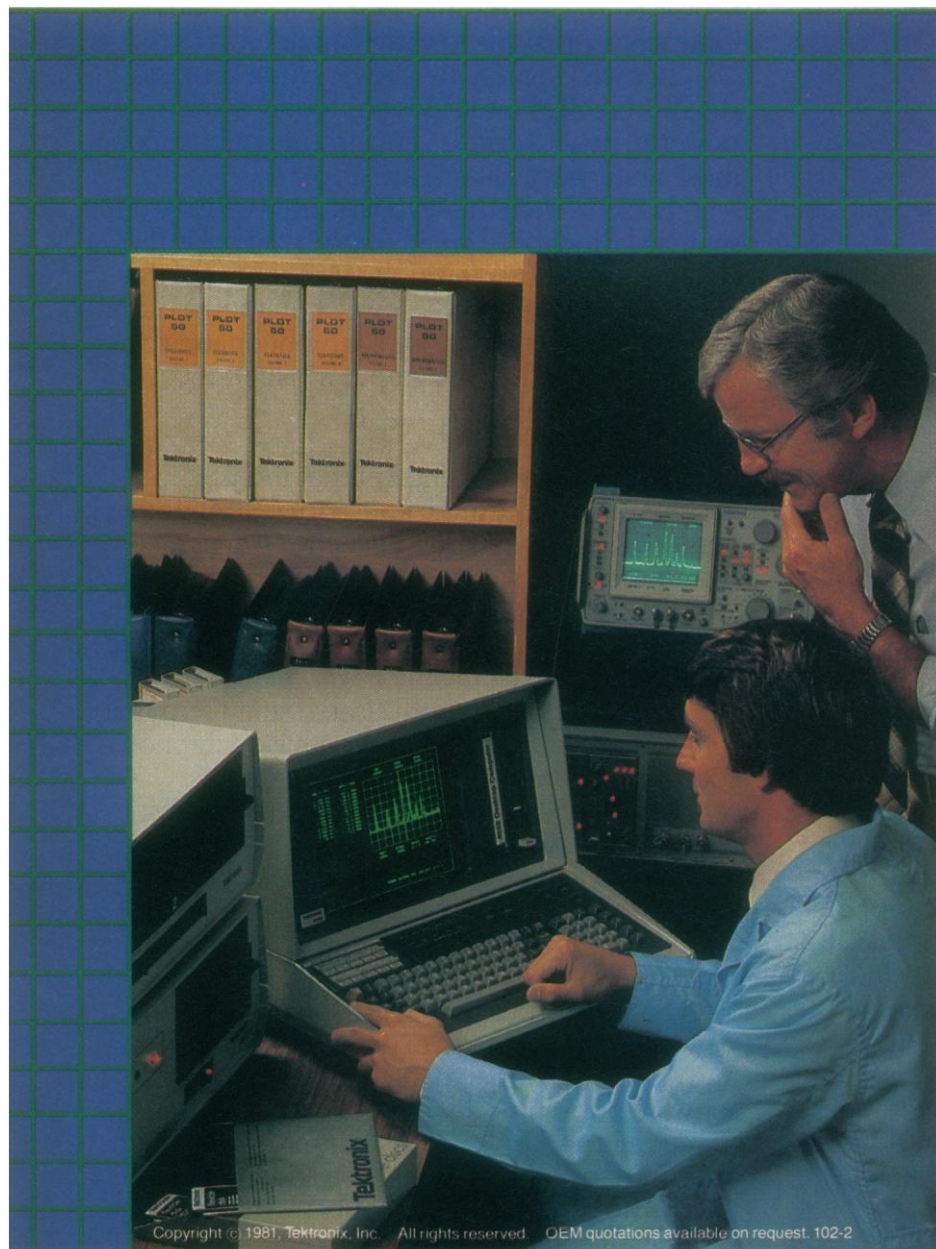
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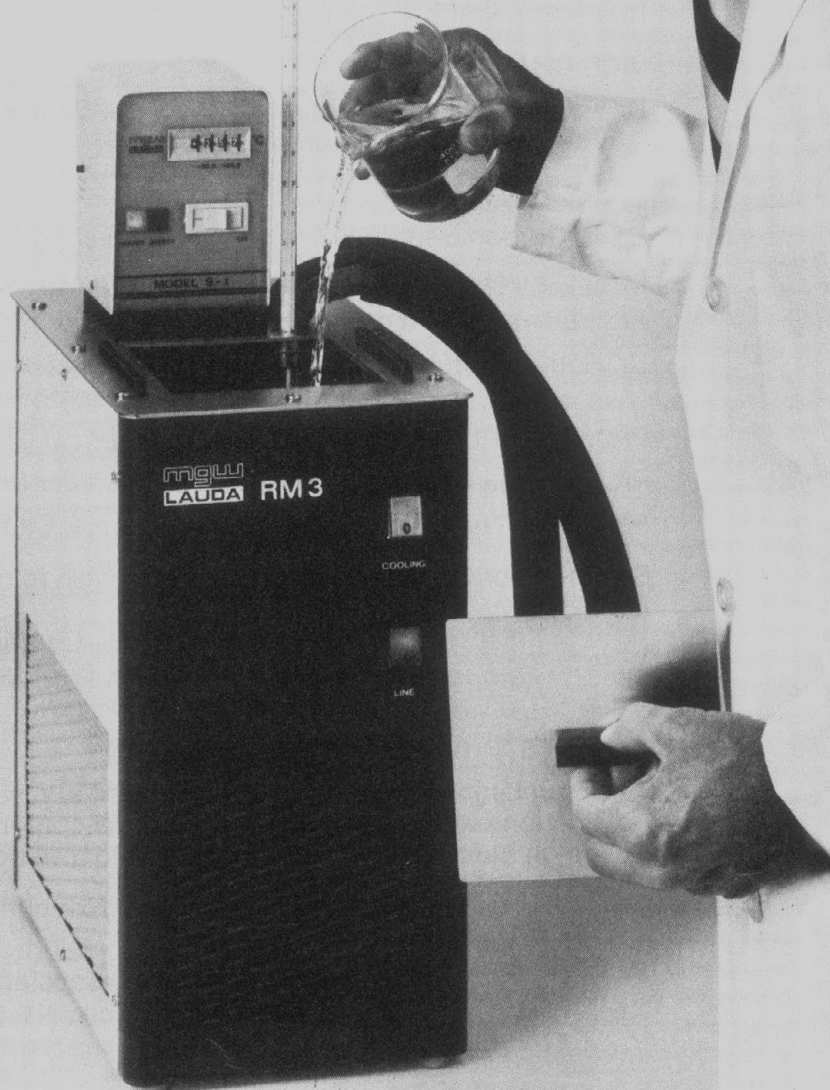
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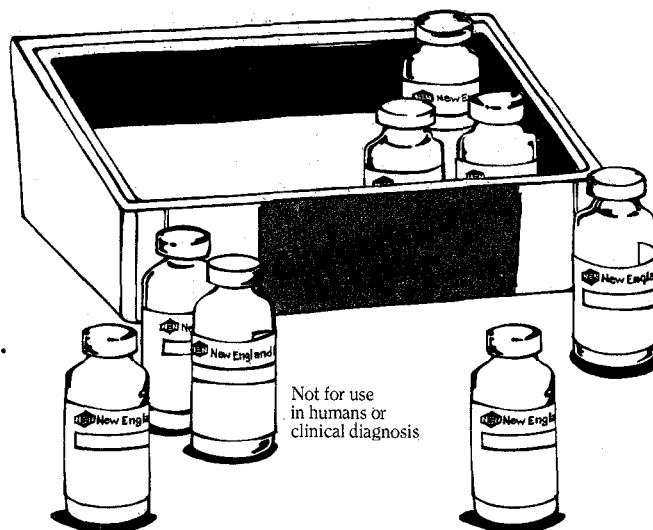
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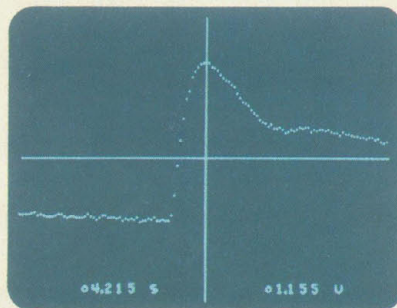


Fig. 2—Expansion of selected area for detailed analysis (up to X 256)

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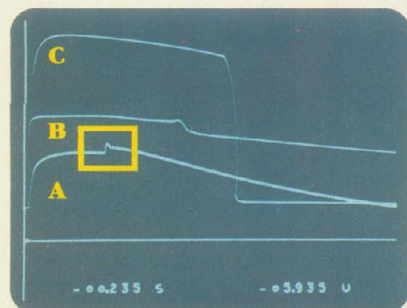
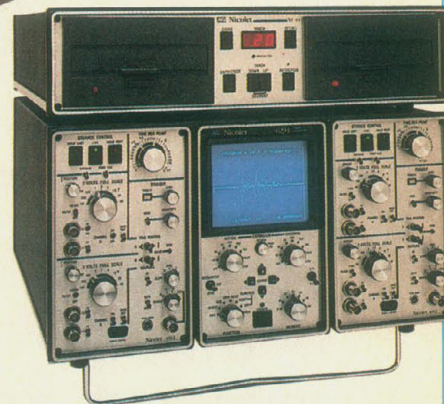


Fig. 1—Tetanic response in avian embryonic muscle after 15 days (A), 17 days (B), and 19 days (C) *in ovo*.

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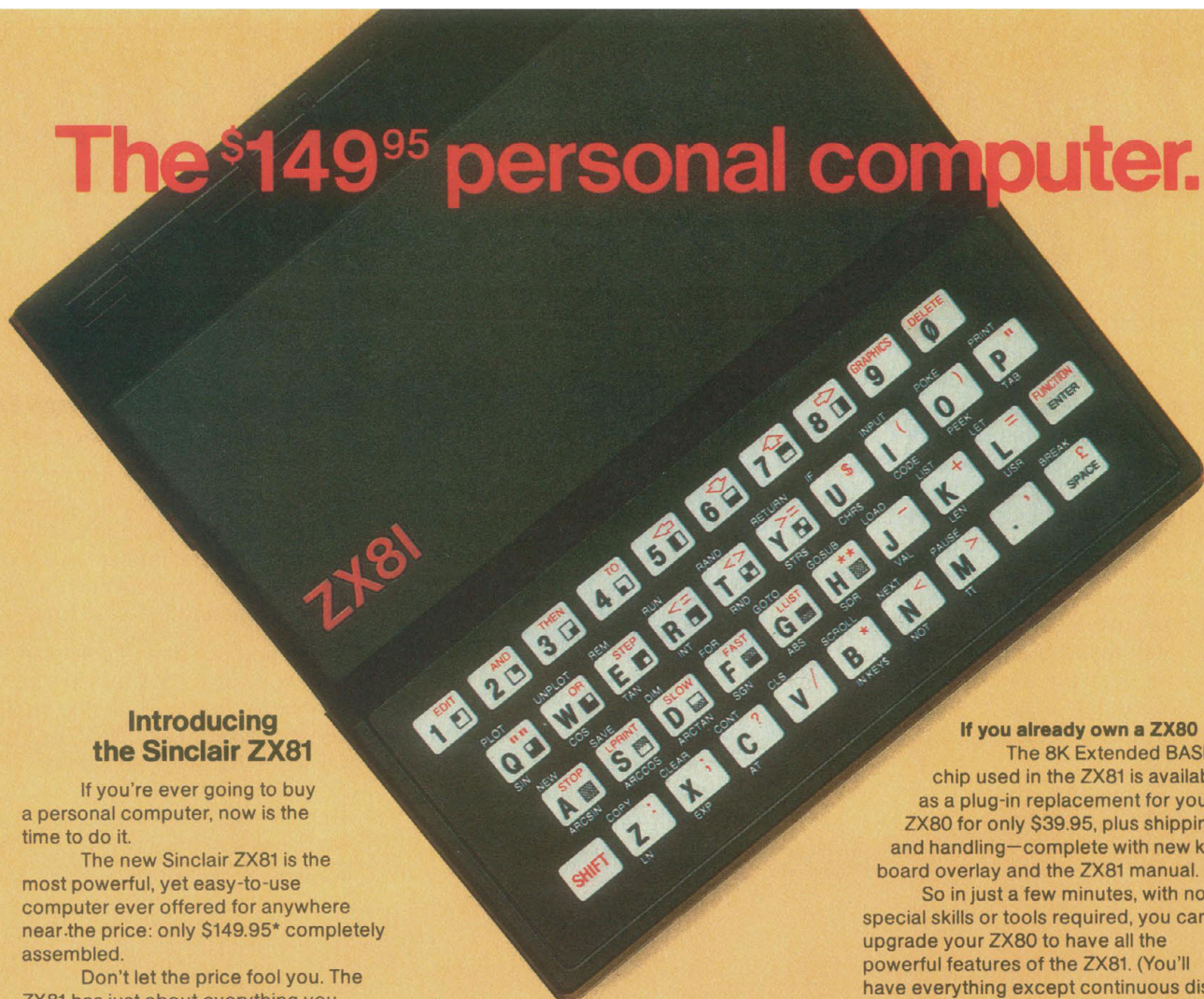
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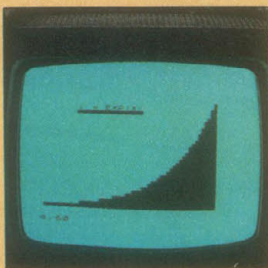
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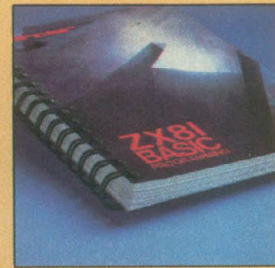
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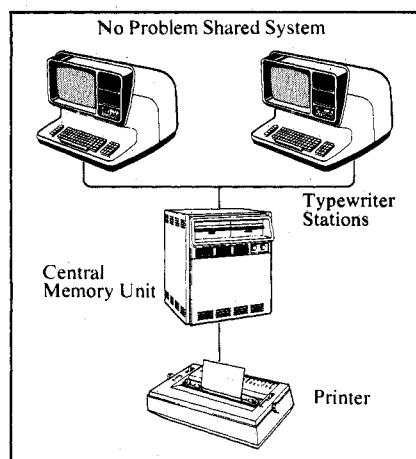


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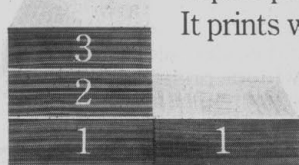
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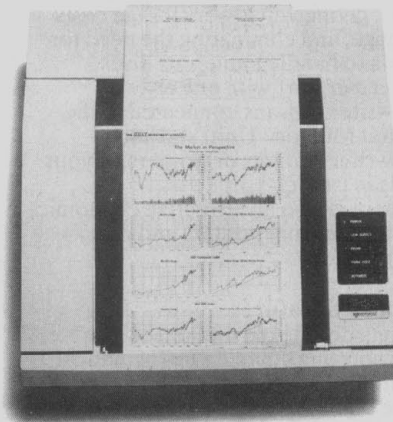
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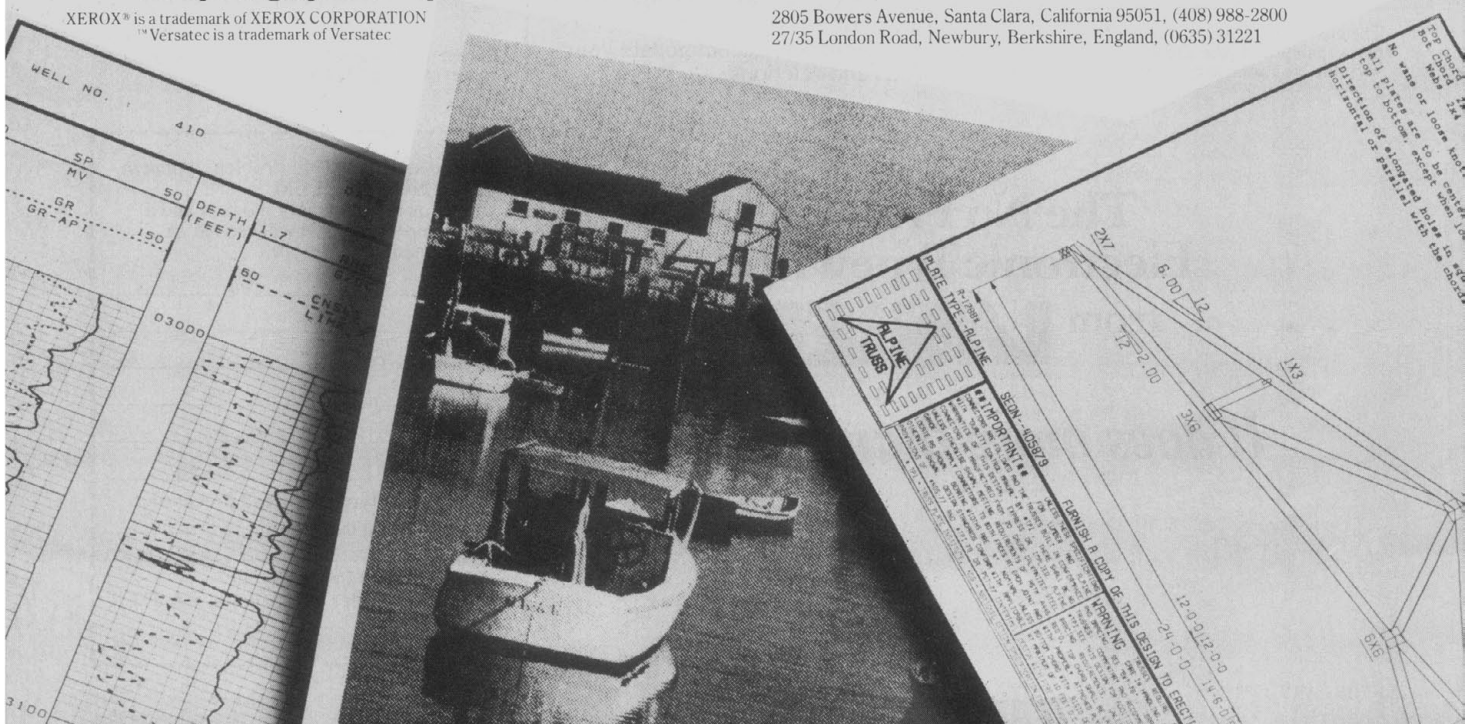
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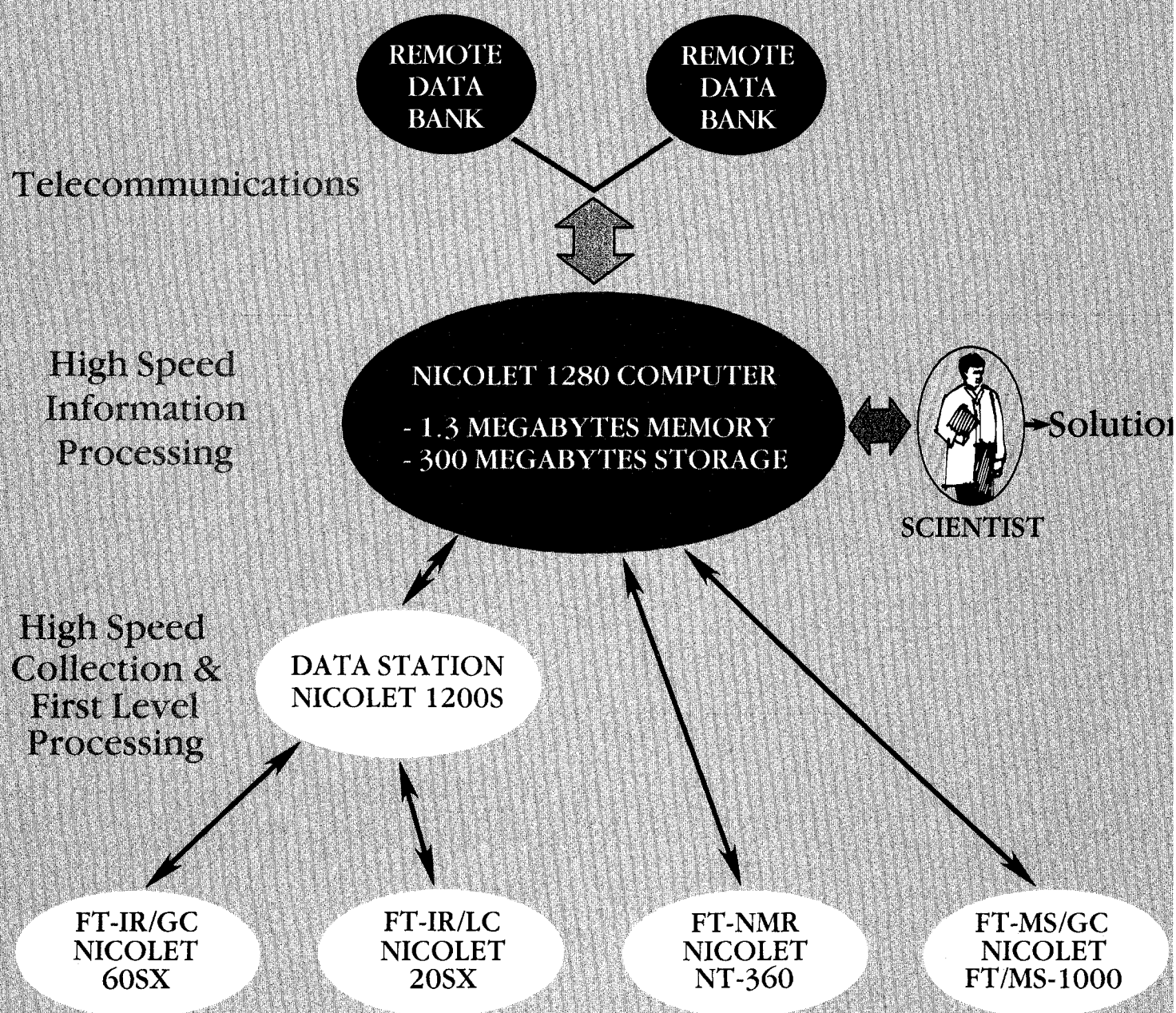
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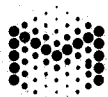
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concern for the monkeys under Taub's care and unconnected with efforts to disrupt biomedical research on animals, even though "the issues in the trial all had to do with animal care."

ADRIAN R. MORRISON
PETER J. HAND

*Department of Animal Biology,
School of Veterinary Medicine,
University of Pennsylvania,
Philadelphia 19104*

A number of recent events have focused on welfare concerns for experimental animals. Holden's excellent account "Scientist convicted for monkey neglect" describes the lack of veterinary care provided to 17 surgically treated monkeys that led to the suspension of funds from the National Institutes of Health (NIH) and a court conviction under the state anticruelty laws. At the 13 and 14 October congressional hearings of the subcommittee on science, research, and technology, this monkey case was discussed in some detail. Subcommittee chairman Douglas Walgren called for suggestions for measures that would improve humane standards for laboratory animals. The conference of the Scientists Center for Animal Welfare, held from 11 to 13 November, addressed the responsibilities of scientists toward experimental animals and analyzed the review procedure currently used.

The following ten recommendations are proposed. They are based, in part, on recommendations from the conference of the Scientists Center for Animal Welfare and, in part, on my personal convictions.

Inasmuch as there is general agreement that proper care and use of experimental animals is desirable, it is recommended:

- 1) That public and private funding agencies use consultants with expertise in animal issues to review selected grant proposals that pose special concerns;
- 2) That funding agencies require investigators applying for grants to specifically address animal issues;
- 3) That accreditation of institutions by the American Association for the Accreditation of Laboratory Animal Care be fostered;
- 4) That more funds be allocated by public and private sources for upgrading animal facilities;
- 5) That training courses be provided to scientists to increase their sensitivity and knowledge about animal care policies;
- 6) That institutional animal care committees be composed of members with

broad representation of viewpoints and who have no conflict of interest;

7) That inspection and review procedures by the federal government be improved;

8) That a central office be established within the federal government to coordinate federal activities affecting proper use and care of experimental animals;

9) That current policies be reassessed to see if additional requirements would be beneficial to ensuring high standards of humane animal care; and

10) That on a prospective basis, an evaluation be made of the peer review system for animal welfare concerns.

Given appropriate leadership and resources, I believe that support for most, if not all, of the above-listed recommendations would be forthcoming from the biomedical community. As a result, the quality of animal research would be enhanced and the accountability of scientists to the public would benefit.

F. BARBARA ORLANS
*Scientists Center for Animal Welfare,
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Aspartame in Canadian Soft Drinks

Imagine my surprise, while swilling down a can of an aspartame-sweetened Tab, to read the following statement in R. Jeffrey Smith's article "Aspartame approved despite risks" (News and Comment, 28 Aug., p. 986). "The additive . . . will not be used in soft drinks because Searle has yet to find a way of keeping it stable for the duration of a soda's shelf life." How was the trick pulled off (one assumes) in Canada, where drinks sweetened with aspartame have already hit the market? Smith's interesting article could have been improved by consideration of such regulatory decisions in countries other than the United States.

HENRY L. ROEDIGER, III
*Department of Psychology,
University of Toronto,
Toronto, Canada M5S 1A1*

The impetus for putting aspartame in soft drinks was much greater in Canada, where saccharin is banned for such uses. A spokesman for Searle says that the shelf life issue requires additional study before aspartame can be introduced into sodas in the United States. Canadian soft drink manufacturers, who studied the issue independently, say no further study is needed and no problem exists.

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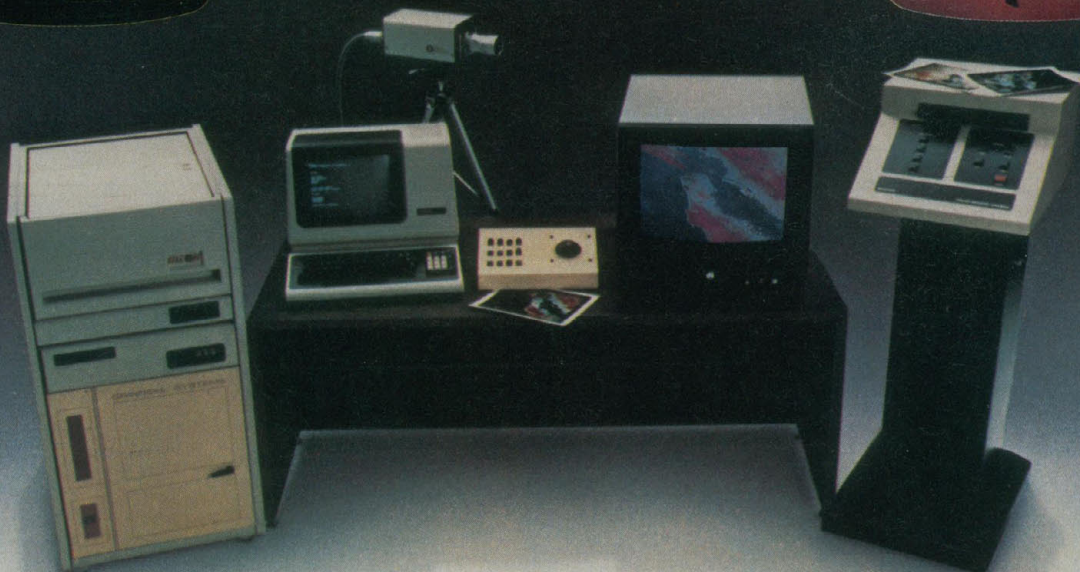
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Computers and Electronics

This special issue of *Science* is devoted to an assessment of the revolution in computers and electronics. Essays on topics of special relevance to the scientific, technical, and medical communities are included. The computer revolution has had profound effects on instrumentation and on the collection, analysis, and storage of data. Changes in modes of communication among scientists are occurring and more are in prospect.

Scientific instrumentation evolved rapidly during the past two decades. In many instances, sensitivities increased by several orders of magnitude. It became possible to make new kinds of measurements, for example, in studies of phenomena that occur in 10^{-12} second or less. Instruments containing dedicated microcomputers became common. In this issue Enke points to potential avenues for further improvement. He discusses the use of the computer to free us from the limitations imposed when we must attempt to hold all variables except one constant during a measurement. The computer also frees us from the necessity of finding sensors that are linear in the quantity measured. Another example is the use of the computer to extend by a factor of 100 to 1000 the already great sensitivity of mass spectrometry. The mass spectrometer can be set by the computer to monitor a parent-daughter mass combination and disregard potentially interfering substances.

Present-day instrumentation can obtain and record enormous amounts of data. The volume of these data is so great that computers and associated memory devices have become essential in data management. There is a need for both on-line and archival storage. At present, wide use is made of magnetic disk storage systems. However, optical and video disk technologies that are under development promise enormous storage capabilities at extremely low costs per bit. Already video disks 12 inches in diameter are available that contain 54,000 frames. In this issue Goldstein tells of activities of many companies in developing optical disks, one of which is designed to store 200 billion bits of information or the equivalent of about 500,000 pages of text. Video and optical disks will have an important role in storage of scientific information, and they may provide a new publication mechanism.

A large fraction of the total number of scientists active in research or development have ready access to computers. Many have terminals near their desks, and increasing numbers have them at home. By using telephone or other linkage, it is possible for them to send electronic mail to distant colleagues and to tap into a very large number of databases. For the transfer of large amounts of data, special links are needed. Most of the databases available are bibliographic and nonscientific. An important example of one that is useful in biomedical research is the base maintained by the National Library of Medicine, which provides coverage of the world's medical literature. The development of scientific numerical databases has been slow, but they are being formed and they will be valuable.

A decade ago, the telephone was the crucial link between members of invisible colleges. Among those who are familiar with computers, there is the beginning of an evolution toward using computer networks as the crucial linkage. In this issue Newell and Sproull discuss conditions necessary for a successful computer network. The pioneering example was the ARPANET, which has served needs of computer scientists and given rise to electronic mail and valuable interaction among the participants. The network links a number of universities, national laboratories, and other installations. Another network is SUMEX-AIM (Stanford University Medical Experimental Computer-Artificial Intelligence in Medicine). It links a group of medical scientists distributed around the country who are concerned with computer applications in medicine. Recently, a group of geneticists formed a network (GENET) to make use of computers in work related to recombinant DNA. Other networks have been authorized or are being planned.

—PHILIP H. ABELSON



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Captions for Divider Pages, Computers and Electronics

Computers and Electronics

Page 754—Portion of computer memory chip that can store 288,000 bits of information [IBM, Armonk, New York]

Graphics and Software

Page 766—Robot ant, an example of the high image quality needed in computer-generated effects for feature films. The ant, designed by Dick Lundin, is a 41st-century construction machine in "The Works," a feature-length computer-animated film in production at the New York Institute of Technology. [Dick Lundin and Lance Williams, New York Institute of Technology, New York]

Scientific Research and Medicine

Page 784—Positron emission tomograph depicting glucose metabolism (red), disruption of the blood-brain barrier (yellow), and normal scalp uptake of rubidium-82 in a patient with a brain tumor (green). [Donner Laboratory, University of California, Berkeley]

Business and Industry

Page 807—Two robots working in coordination to assemble relay. [Westinghouse Electric Corporation, Pittsburgh, Pennsylvania]

Communications and Personal Services

Page 830—Two microcomputers (at top, a packaged four-bit device and at right an unpackaged 32-bit device) and a wafer containing more than 100 microcomputer chips. The background suggests pulses of digital information. [Bell Laboratories, Short Hills, New Jersey]

Information Storage and Retrieval

Page 856—Pits in tellurium film used in preparing optical digital disks. [Philips Laboratories, North American Philips Corporation, Briarcliff Manor, New York]