

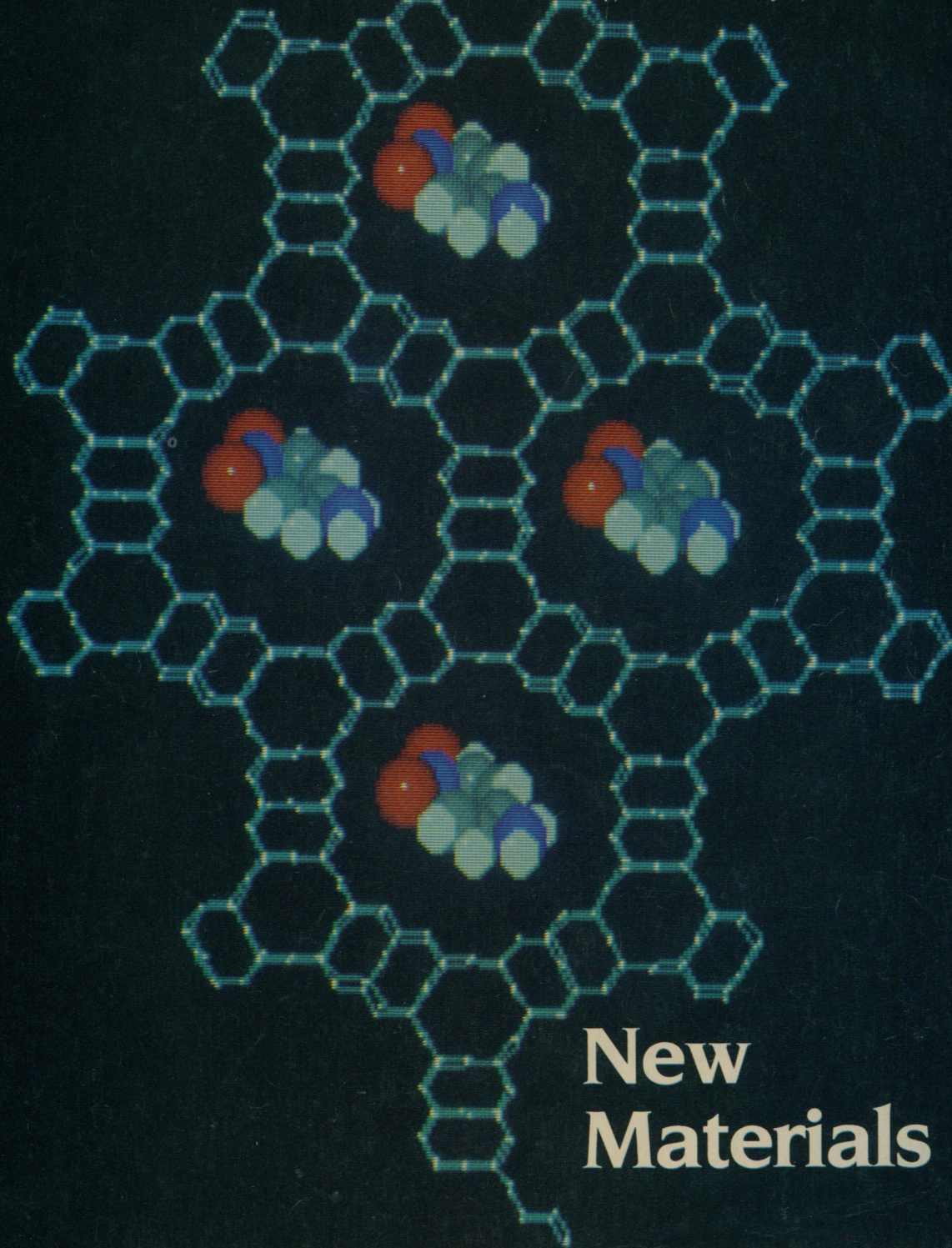
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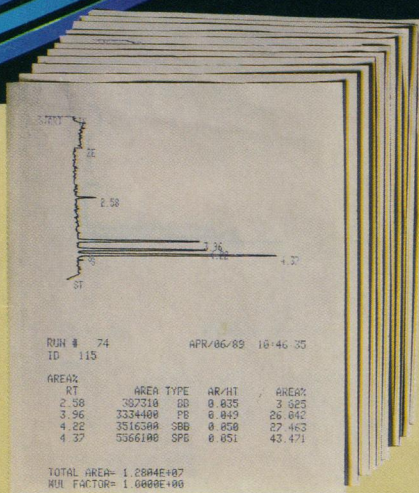
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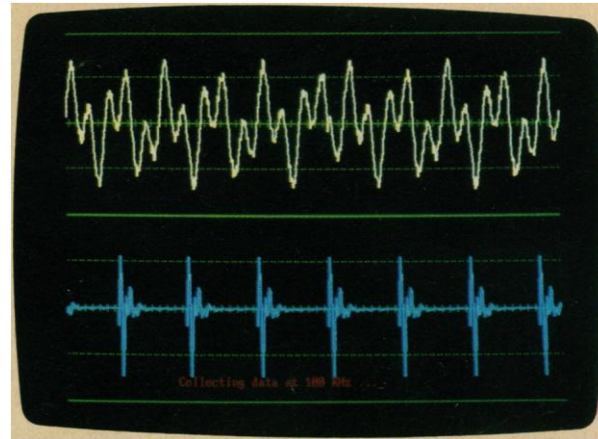
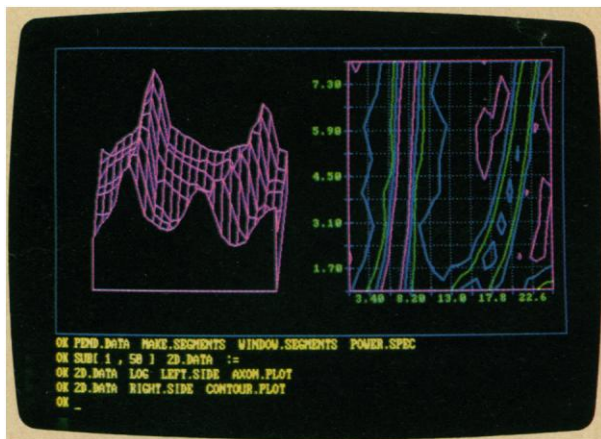
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611 This Week in *Science*

Editorial

613 New Materials: Chemistry and Physics: J. I. BRAUMAN

Letters

620 Global Warming: B. D. SOLOMON AND M. J. ADLER; W. FULKERSON, D. B. REISTER, S. I. AUERBACH, A. M. PERRY, A. T. CRANE, D. E. KASH ■ BEIR V: Implications for the Nuclear Workforce: R. E. LAPP; W. K. SINCLAIR ■ RU 486 Development: D. PHILIBERT AND G. TEUTSCH ■ Waste Site Cleanup: D. F. LUECKE AND M. KASSEN

News & Comment

624 Huntington's Gene: So Near, Yet So Far ■ Three Steps Forward, Two Steps Back
628 NIH Director: The Search Goes On. . . and On
629 Fetal Research Ban on Shaky Ground?
Bush Names Science Committee
630 Stretching the Point
631 Fish, Money, and Science in Puget Sound
632 *Briefings*: New Lease on Life for Dahlem Meetings ■ What's in the Bowl? ■ Layoffs Hit Draper Laboratory ■ Protecting Progress ■ Going Where Nukies Fear to Tread ■ European Weather Forecasters Get One Right ■ U.S.-Soviet Diabetes Project ■ Patent Court Gets First Scientist ■ Room at the Top

Research News

634 The Children of the STM
637 Asking for the Moon ■ The Return of Cold Dark Matter

Articles

Fundamentals of Materials Science

649 Solid-State Chemistry: A Rediscovered Chemical Frontier: F. J. DiSALVO
656 Structural Chemistry and the Local Charge Picture of Copper Oxide Superconductors: R. J. CAVA
663 Electrides: Ionic Salts with Electrons as the Anions: J. L. DYE
669 Quantum Confinement and Host/Guest Chemistry: Probing a New Dimension: G. D. STUCKY AND J. E. MAC DOUGALL
679 All-Optical Nonlinearities in Organics: B. I. GREENE, J. ORENSTEIN, S. SCHMITT-RINK
688 Current Issues and Problems in the Chemical Vapor Deposition of Diamond: W. A. YARBROUGH AND R. MESSIER

Reports

697 Precision Lattice-Parameter Determination of (Mg,Fe)SiO₃ Tetragonal Garnets: R. MATSUBARA, H. TORAYA, S. TANAKA, H. SAWAMOTO

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- 699 Effects on Carbon Storage of Conversion of Old-Growth Forests to Young Forests: M. E. HARMON, W. K. FERRELL, J. F. FRANKLIN
- 702 An Aptian Plant with Attached Leaves and Flowers: Implications for Angiosperm Origin: D. W. TAYLOR AND L. J. HICKEY
- 704 Expression of β -Nerve Growth Factor Receptor mRNA in Sertoli Cells Downregulated by Testosterone: H. PERSSON, C. AYER-LE LIEVRE, O. SÖDER, M. J. VILLAR, M. METSIS, L. OLSON, M. RITZEN, T. HÖKFELT
- 707 Induction of Cellular Senescence in Immortalized Cells by Human Chromosome 1: O. SUGAWARA, M. OSHIMURA, M. KOI, L. A. ANNAB, J. C. BARRETT
- 710 A Potent GAL4 Derivative Activates Transcription at a Distance in Vitro: M. CAREY, J. LEATHERWOOD, M. PTASHNE
- 712 Suppression of Tumorigenicity of Human Prostate Carcinoma Cells by Replacing a Mutated *RB* Gene: R. BOOKSTEIN, J.-Y. SHEW, P.-L. CHEN, P. SCULLY, W.-H. LEE
- 715 Antigen Presentation Requires Transport of MHC Class I Molecules from the Endoplasmic Reticulum: J. H. COX, J. W. YEWDELL, L. C. EISENLOHR, P. R. JOHNSON, J. R. BENNINK
- 718 T Cells Responsive to Myelin Basic Protein in Patients with Multiple Sclerosis: M. ALLEGRETTA, J. A. NICKLAS, S. SRIRAM, R. J. ALBERTINI
- 721 Influence of Scene-Based Properties on Visual Search: J. T. ENNS AND R. A. RENSINK
- 723 Growth Factors Induce Phosphorylation of the Na^+/H^+ Antiporter, a Glycoprotein of 110 kD: C. SARDET, L. COUNILLON, A. FRANCHI, J. POUYSSÉGUR

Technical Comments

- 727 "Subjective Perception": B. LIBET; N. K. LOGOTHETIS

Book Reviews

- 731 The Informal Economy, *reviewed by* N. FONER ■ Dinosaur Tracks and Traces, A. R. FIORILLO ■ Photons and Atoms, G. C. HEGERFELDT ■ Neurobiology of Glycoconjugates, S. HOCKFIELD ■ Books Received

Products & Materials

- 735 Centrifugal-Partition Chromatography ■ Automated DNA Sequencer ■ Cell Adhesion Protein ■ Variable-Intensity Transilluminators ■ Bacteria and Fungus Detector ■ Capillary Electrophoresis Systems ■ Single-Button ICP-MS Control ■ DISCUS Cell for IR/FTIR Gas Analysis ■ Dedicated 2-D Electrophoresis System ■ HPLC Pump ■ Scientific Graphing Software ■ HPLC System ■ Preparative Column Packer ■ Automated Liquid Transfers ■ Molecular Microanalysis System ■ Alkaline-Resistant HPLC Columns

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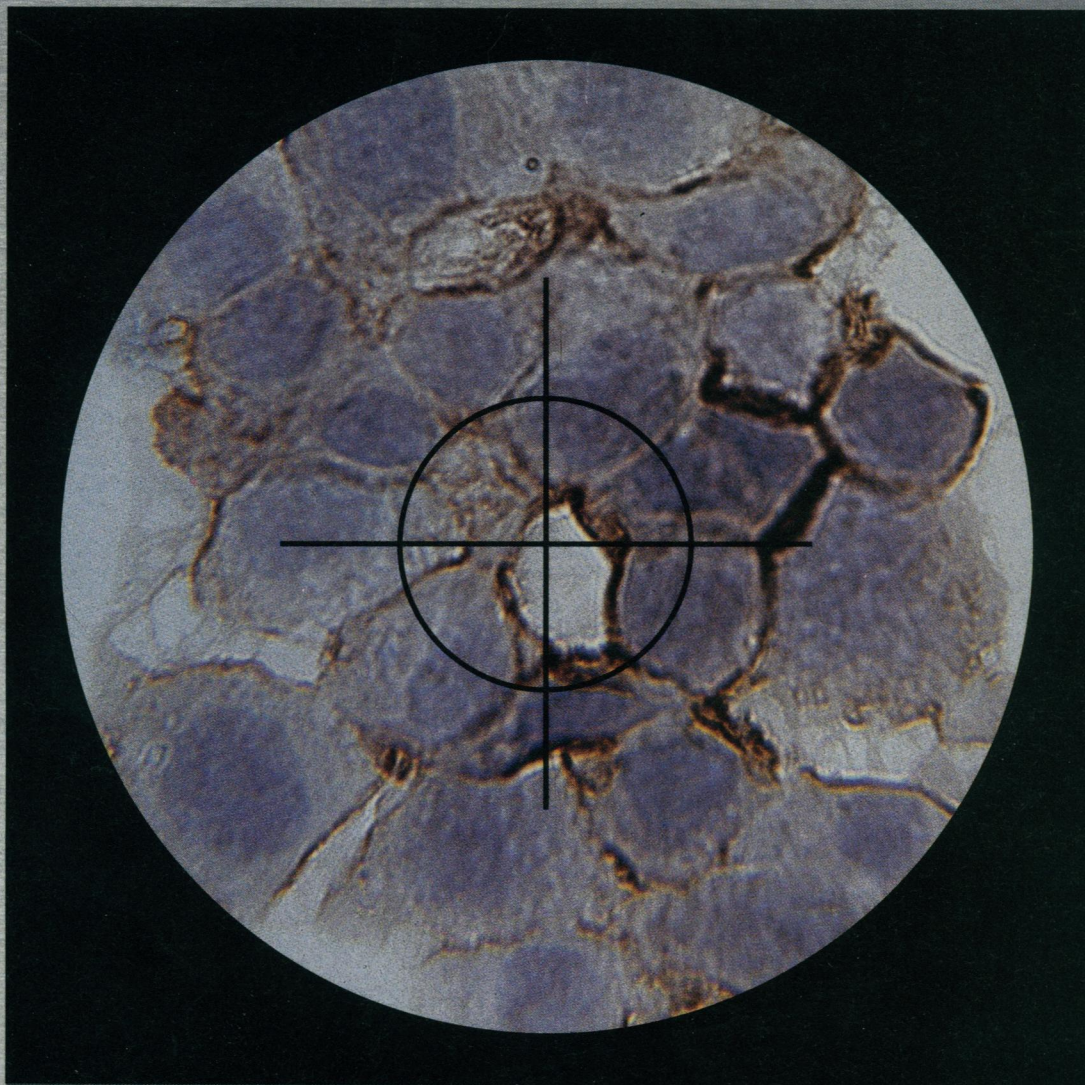
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This Week in SCIENCE

Forests and carbon cycling

VERY old forests store a tremendous amount of carbon. When old-growth forests are cut down, the carbon can either remain in storage (for example, in the timber that is used for constructing buildings) or be released into the atmosphere (during the production of paper, wood burning, decay, and so on). Harmon *et al.* used computer simulations to assess what the impact would be on carbon cycling between the earth and atmosphere of cutting down old forests in the Pacific Northwest of the United States and replacing them with new ones (page 699). Young trees have higher primary productivity and remove carbon more rapidly from the air than do old ones, but the simulations indicate that the net effect of forest replacement is to add carbon dioxide to the atmosphere; release of the stored carbon is what shifts the balance toward this increase. The simulation results do not support recent suggestions that the replacement of old forests with new ones could help to slow the addition of carbon dioxide, a greenhouse gas, to the atmosphere.

Immortal versus senescent cells

MANY tumor cells are immortal: they will go on dividing indefinitely in culture. In contrast, various other cells, such as normal fibroblasts, have only a limited in vitro life span. The aging of cells in culture, cellular senescence, appears to be a genetically controlled process. One of the genes that helps to bring about senescence (but most likely not the only one) is present on human chromosome 1 (page 707). Sugawara *et al.* report that hybrids of immortal Syrian hamster cells and normal human fetal lung fibroblasts are usually senescent: after a short period in culture, they enlarge and flatten and eventually stop proliferating. The small number of hybrids that become immortal share one feature: they have all lost both copies of human chromosome 1. Furthermore, when a

copy of human chromosome 1 is inserted into otherwise immortal hamster cells, these cells begin to show signs of senescence. An understanding of cellular senescence is important because the process of senescence is probably relevant to the aging process, tumor biology, and normal cell growth.

Tumor suppressor in prostate cancer

INACTIVATED *RB* tumor suppressor genes have been found in various types of tumors, including retinoblastomas, breast carcinomas, osteosarcomas, lung carcinomas, and others. Bookstein *et al.* now describe a prostate carcinoma cell line—prostate carcinomas are the most common cancers of men—in which the *RB* gene product, a protein, was abnormally short (page 712). When cells from this line were injected into experimental mice (the nude mouse system), large tumors developed. When normal *RB* genes were then inserted into the tumor-producing cells, the tumorigenic properties were modified and large tumors did not develop in vivo. In this prostate cell line, the loss of expression of the region of the gene called exon 21 was sufficient for curtailing the gene's tumor suppressor activities. Because normal *RB* genes appear to suppress tumor development, gene therapy with such genes could prove to be a powerful antitumor clinical strategy.

Autoimmune cells in multiple sclerosis

IMMUNE reactions to myelin basic protein (MBP), the material that sheaths and thereby protects nerves, have been implicated in the pathology of multiple sclerosis. Studies of demyelinating diseases that can be experimentally induced in animals support this contention, but, until now, MBP-reactive cells could not be identified in diseased humans. Allegretta *et al.* hypothesized that patients with multiple sclerosis, whose T cells are dividing rapidly as part of the autoimmune disease process, should have a greater than

normal number of T cells with mutations; furthermore, among the mutant cells, there might be some that react with MBP (page 718). An assay is described in which T cells that have mutations are selected; the population did contain MBP-reactive cells. If a role for MBP autoimmunity in human disease is confirmed, immunotherapies based on the MBP reactions might prove ameliorative for multiple sclerosis just as they are for a number of animal models.

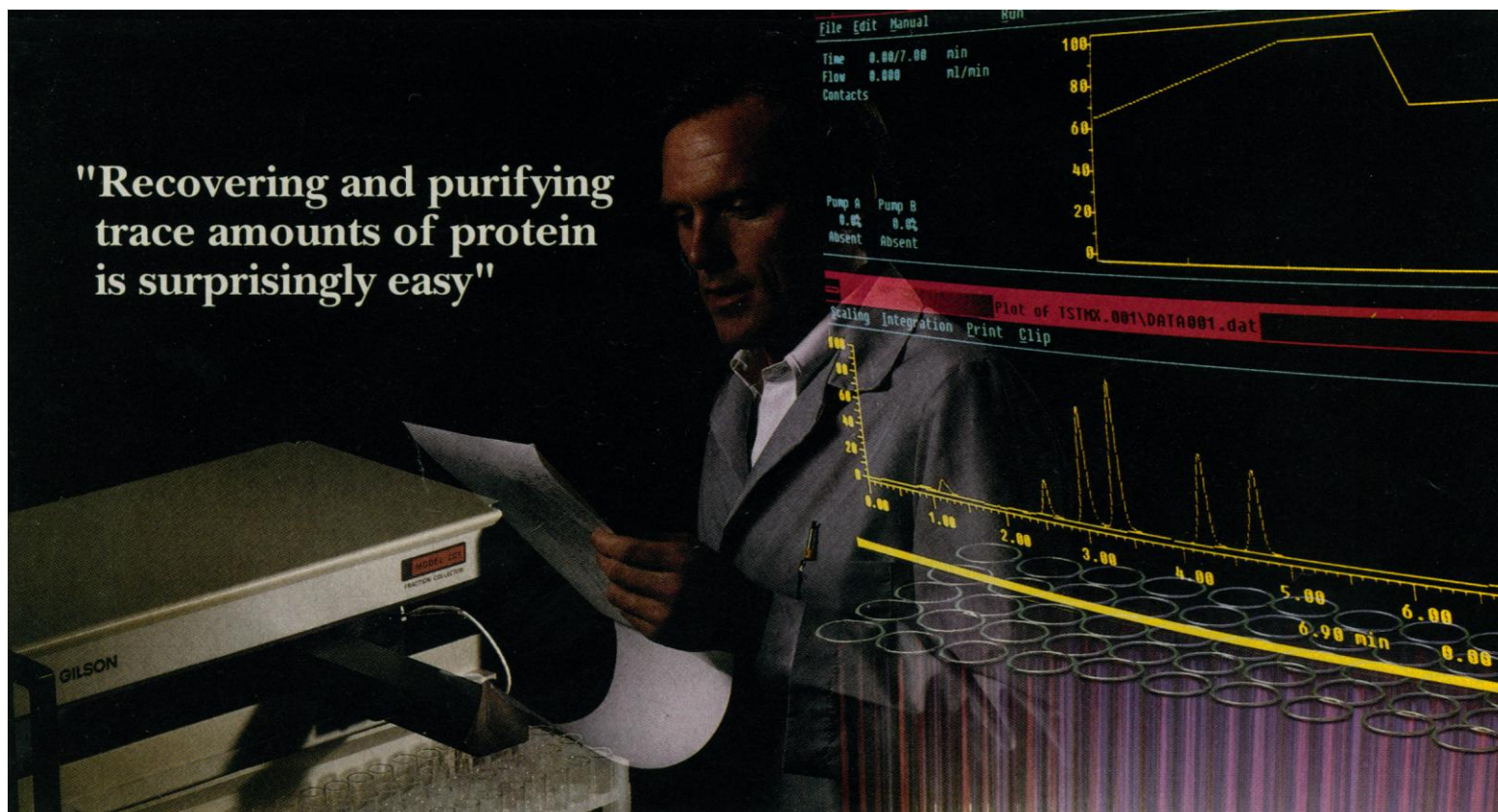
Antiporter activation mechanism

CELL membranes contain antiporters; these are exchange proteins, one type of which affects pH inside the cell by carrying Na⁺ and H⁺ in opposite directions across the membrane. The activity of the Na⁺/H⁺ antiporter is triggered by diverse external signals, including sperm, growth factors, lectins, and hormones; these stimulants bind to different cell surface molecules but ultimately induce a common intracellular effect. Sardet *et al.* show that the Na⁺/H⁺ antiporter molecules on human and hamster cells are phosphorylated when stimulated by several kinds of growth factors and that, concurrently, the cells become alkaline (page 723). The phosphorylation step, which changes the conformation of the antiporter, appears to be pivotal to antiporter activation.

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Materials science

Smaller, faster, stabler, more efficient, stronger. These are some of the many properties and features that chemists, physicists, and engineers would like to "build into" new materials. The accelerating rate of production of such materials is the outgrowth of new insights in chemistry and physics and a new meld of the two disciplines (pages 649, 656, 663, 669, 679, and 688).



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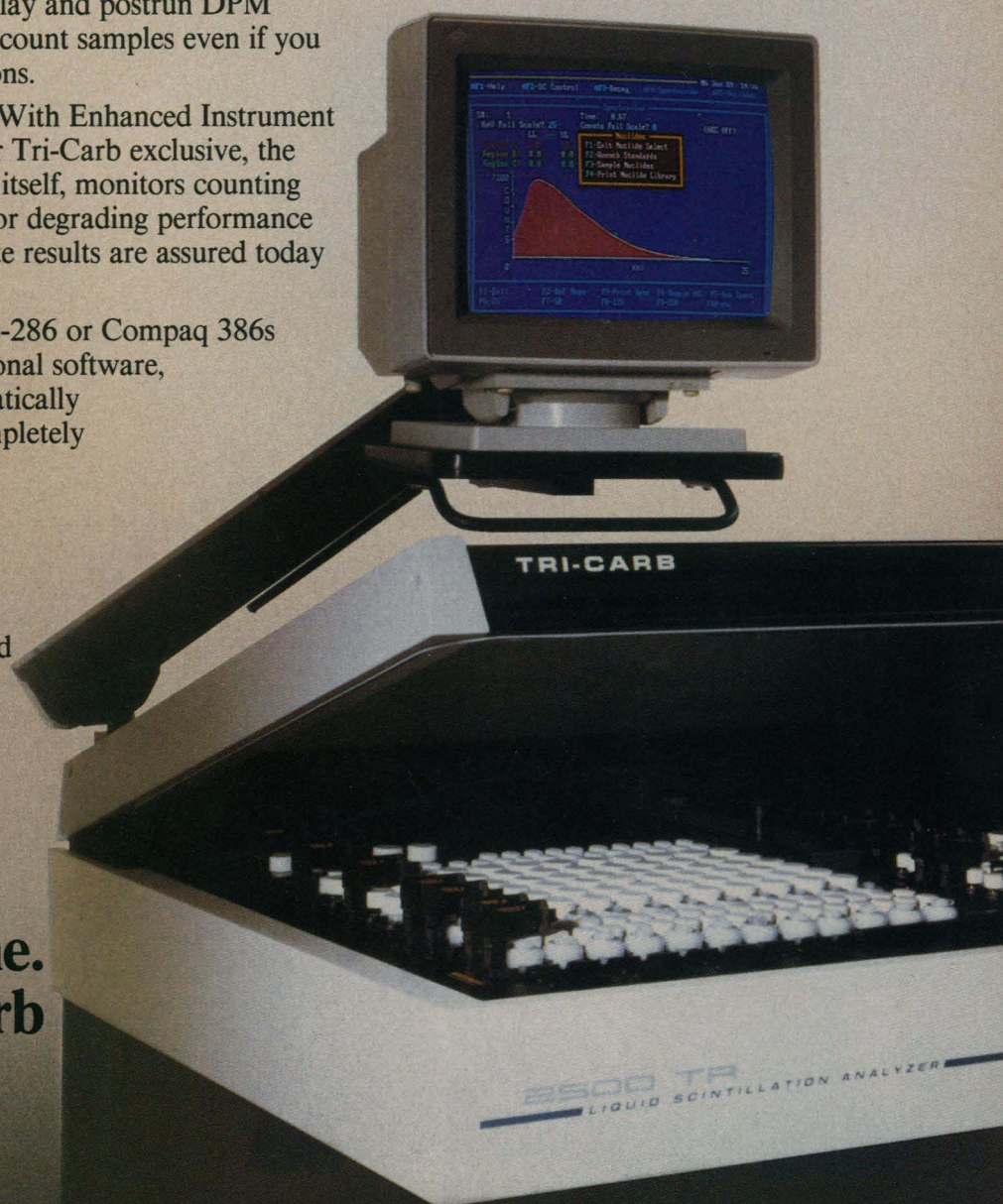
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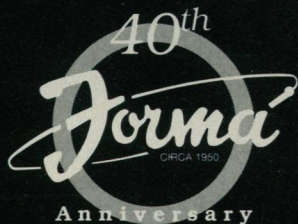
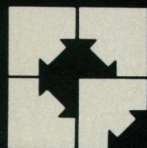
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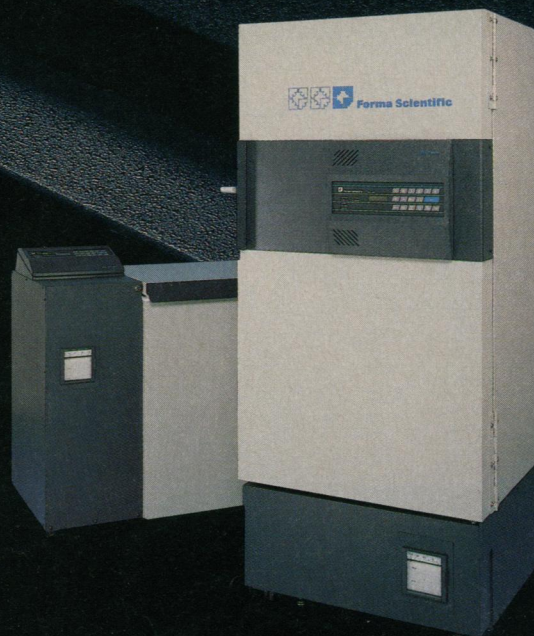


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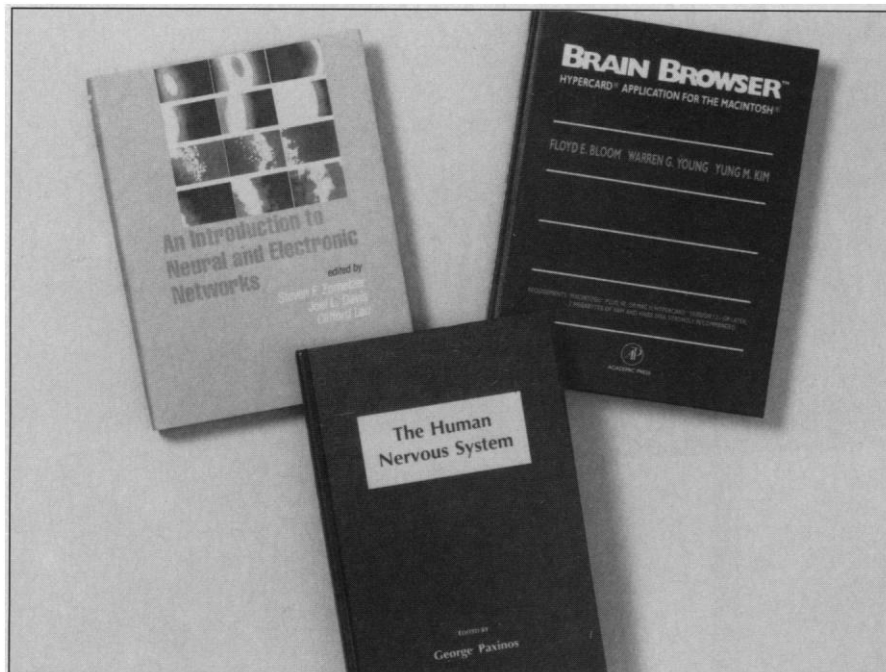
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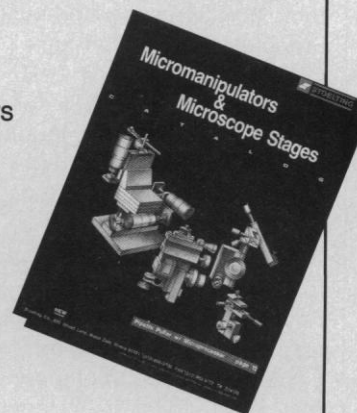
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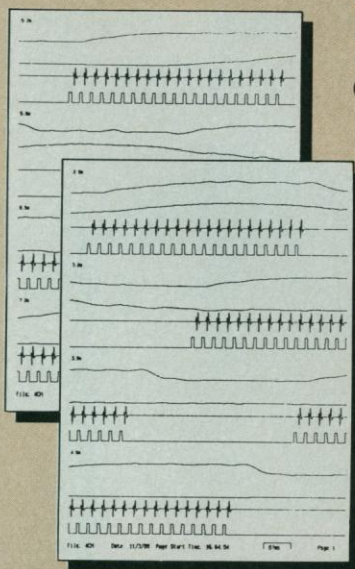


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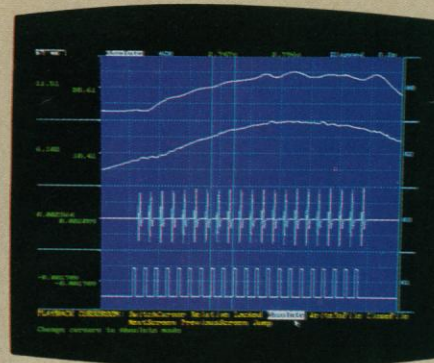
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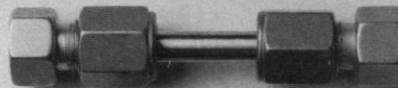
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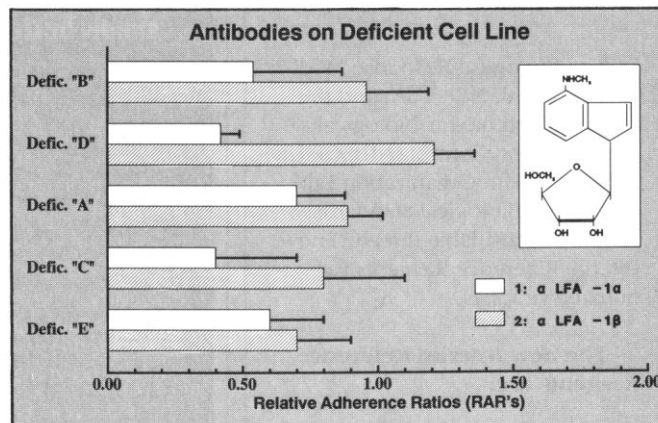
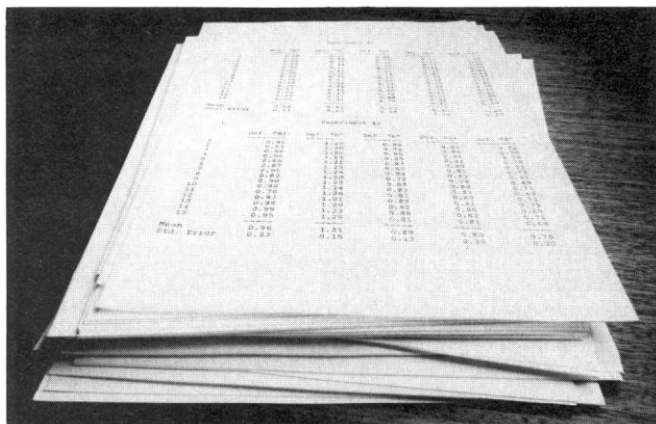
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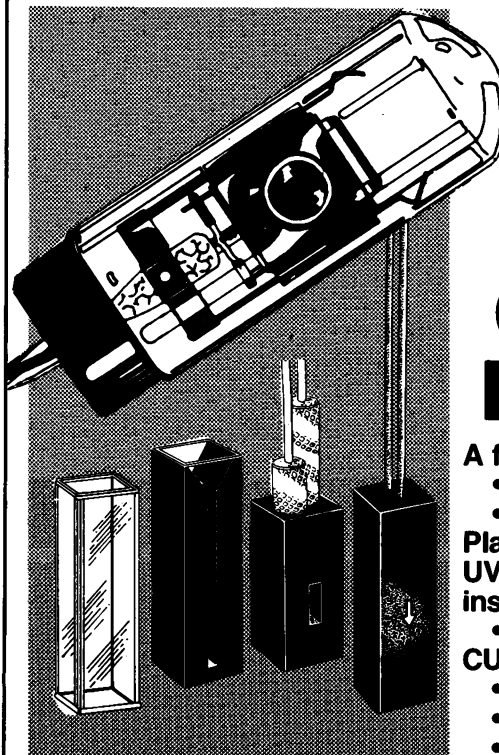
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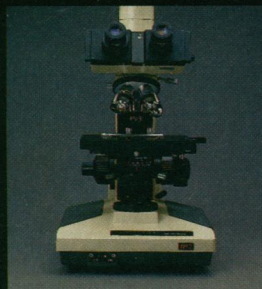
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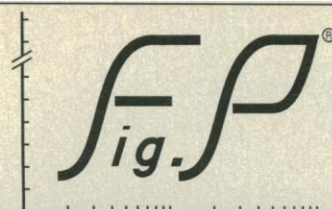
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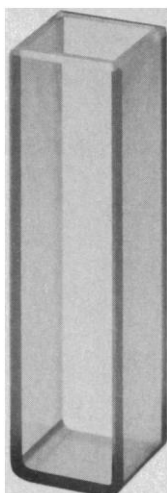
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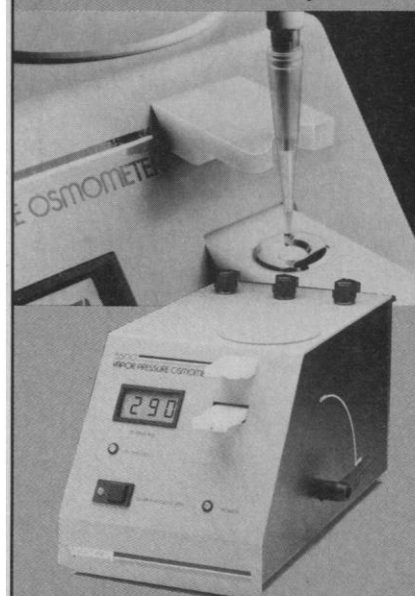
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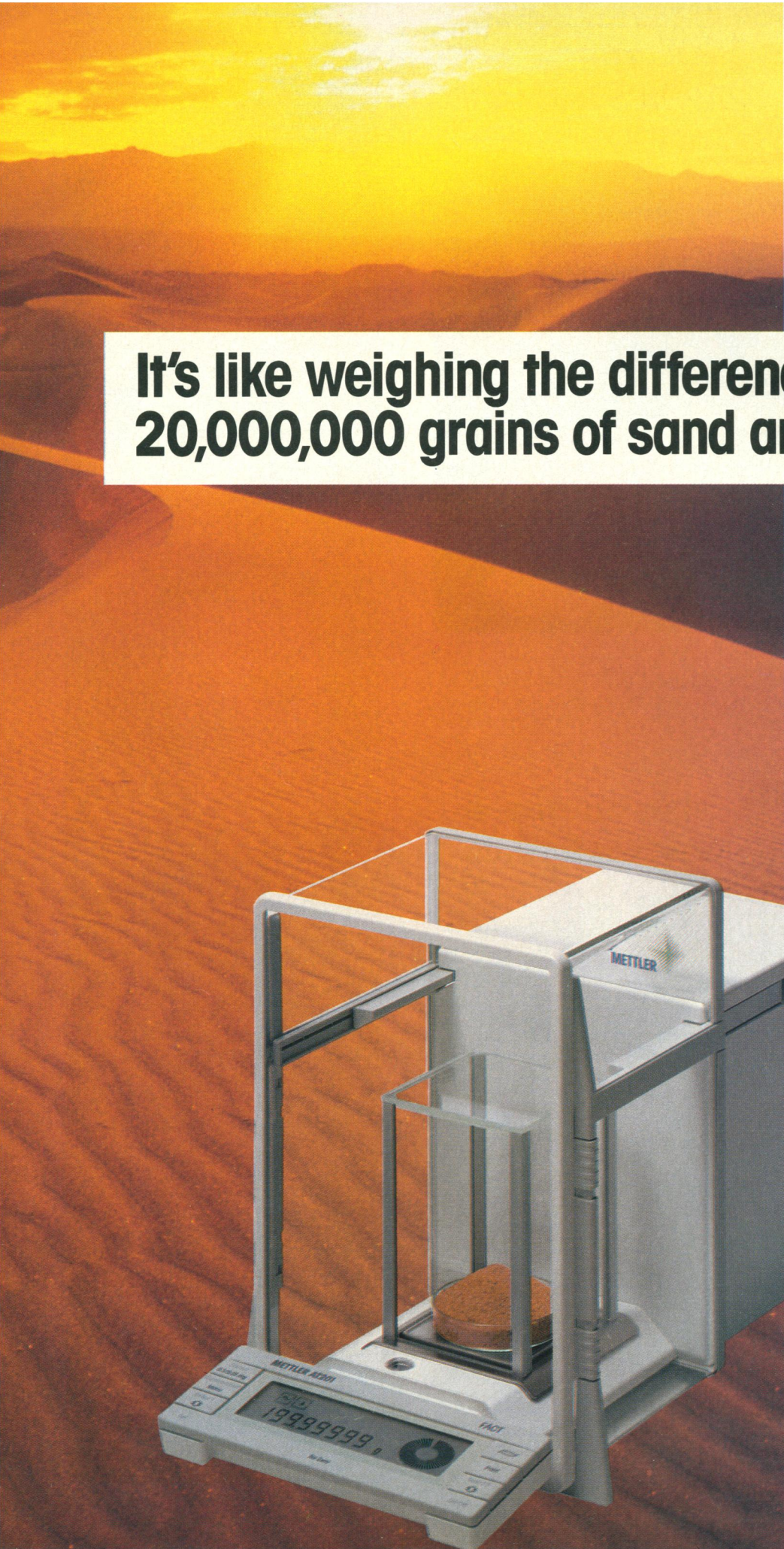
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