

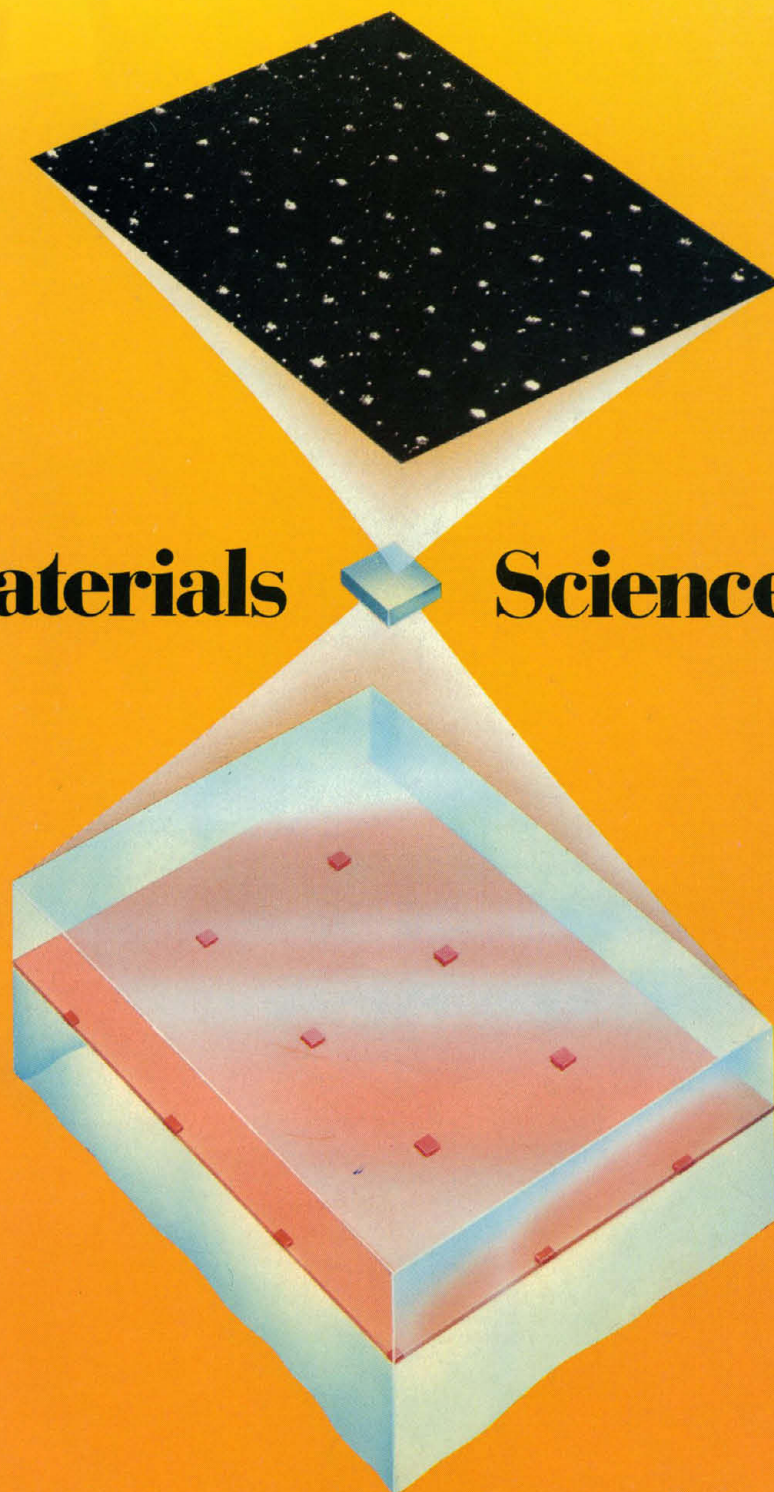
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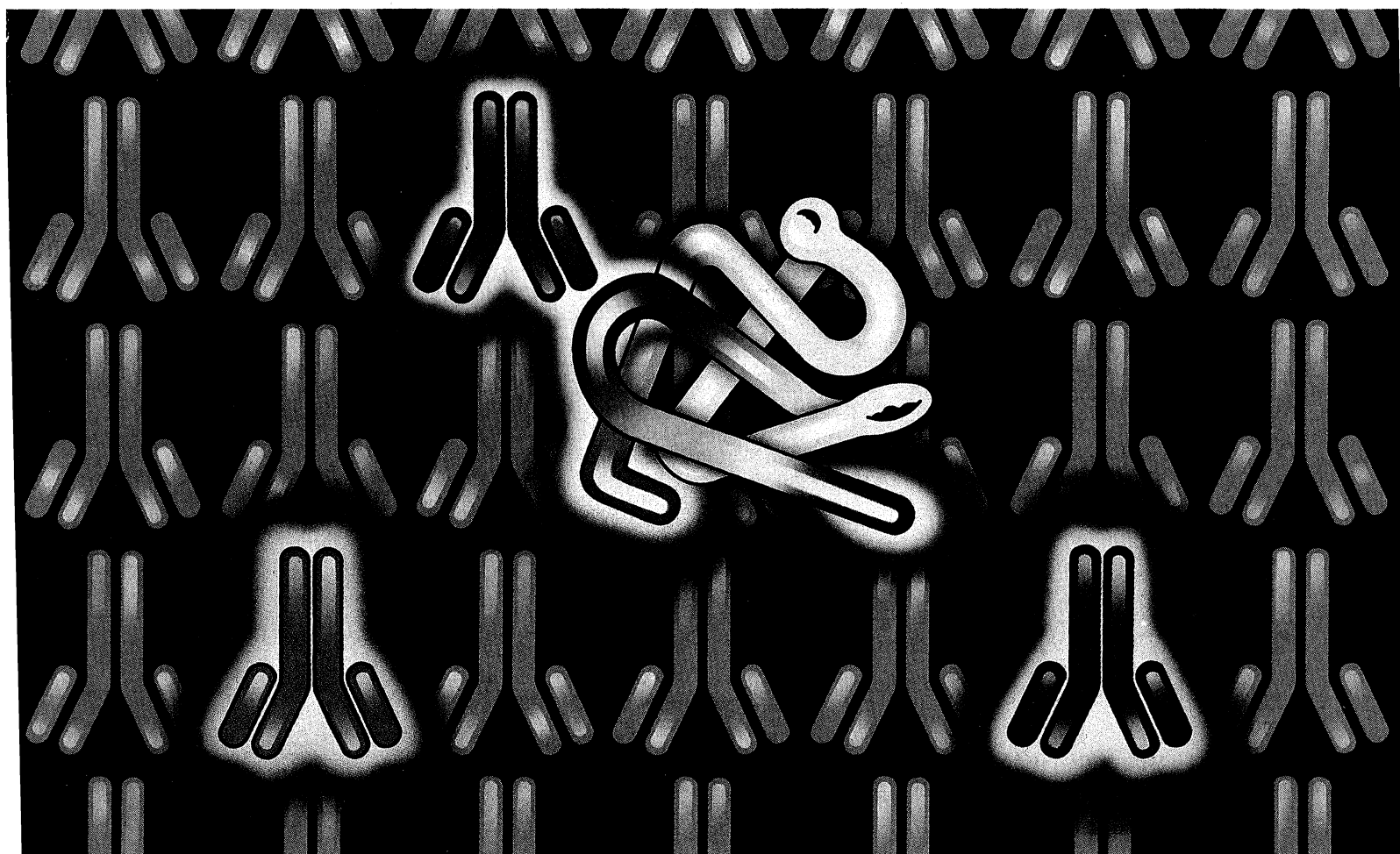
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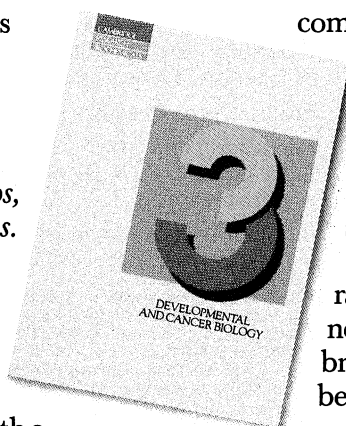


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COVER Artificial quantum box structure. Sketch (below) shows GaAs quantum boxes (in red) formed in molecular-beam-grown crystal by interdiffusion of surrounding layer areas. Photo (above) is image of boxes formed with their own luminescence in an electron microscope. The boxes are 1000 angstroms in size and are spaced 10 micrometers apart. See page 1023. [Figure prepared by A. C. Gossard and P. M. Petroff, AT&T Bell Laboratories, Murray Hill, NJ 07974]

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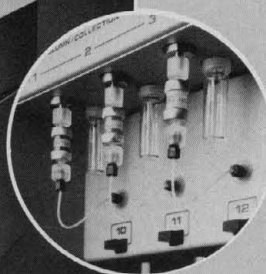
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This Week in SCIENCE

Materials science

PHOENICIANS sailing in the Mediterranean some 7000 years ago may, according to Pliny, have been the first people to have synthesized amorphous or glassy-phase materials; the syntheses resulted when the hot coals from the sailors' beachside fires and blocks of soda supporting the cooking pots sank into the sand, and greenish molten materials formed and then hardened into glass (page 997). Amorphous materials are solids that are completely disordered at the atomic scale. It is difficult to probe and describe their structures because, unlike crystals, even when the structure of a portion of the material is known, the atomic details of the total structure cannot be extrapolated from the past. There is active research interest in making models of amorphous materials; theory has been coupled to new methodologies, and a number of techniques exist for forming metallic amorphous alloys from crystalline solids or from liquids. Cheng and Johnson discuss past and current research pertaining to the synthesis and analysis of amorphous materials. Other articles in this special issue on materials science and Brauman's editorial address various aspects of the nature, behavior, and use of new materials that are being developed for and applied to science and technology (pages 997, 1003, 1010, 1015, 1023, and 1029).

Bilirubin

SKIN that has a yellow hue may be a sign of abnormally high concentrations of circulating bilirubin and signify hepatitis or other liver or blood diseases, or, in babies, neonatal jaundice; bilirubin may, however, also serve a beneficial physiologic role as an antioxidant (page 1043). Bilirubin is an end product in the metabolism of heme in mammals and occurs when red cells are broken down in the liver or spleen and hemoglobin is released. Stocker *et al.* studied the antioxidant properties of bilirubin; in vitro it efficiently scavenged chemically generated peroxy radicals,

preventing lipid peroxidation in a model system. At the physiologic level (2%) of oxygen in tissues, bilirubin is at least as efficient an antioxidant as α -tocopherol (a component of vitamin E) which is considered to be the best antioxidant. Thus, rather than being merely a potentially cytotoxic waste product, bilirubin may be an important scavenger that removes from the circulation highly reactive oxygen radicals that may cause tissue damage in cancer, aging, and heart disease.

Sensing scents

THE mucous layer of the nose links odors in the air to the body's olfactory tissues (page 1053). A protein, called BG, which is a component of mucus, may be involved in solubilizing, concentrating, and shuttling odorants across this layer. This protein is produced in Bowman's glands, the secretory glands of the olfactory mucus, and is not found in other tissues. Bowman's glands or their equivalents are found in humans and other animals. The gene for the BG protein of frogs was cloned and characterized; BG-specific messenger RNA was found only in the neuroepithelial lining of the nose and was there in great abundance. BG's protein sequence was homologous with sequences of a family of serum proteins (α_1 -microglobulin, β -lactoglobulin, and retinol-binding protein) that bind small organic molecules. Lee *et al.* suggest that BG may participate in the transport of airborne hydrophobic odorants across the mucous layer to the olfactory tissues so that they can be smelled.

Growing up in a rain forest

NUTRIENTS can be recycled in a rain forest without entering the soil (page 1062). Sanford describes the unusual cycling process that was observed in an Amazonian rain forest in Venezuela; soil in the forest had among the lowest nutrient contents

reported for tropical rain forests worldwide. Roots grew upward out of the soil and climbed the stems of plants; most stems supported roots of plants of different species, but one (*Eperua purpurea*) was observed to support only its own roots. The roots traveled up and remained on the exposed surfaces; they grew within fissures and beneath mosses, ferns, and vines, but they were not observed to penetrate to the cambium layer of the host plant. As rain ran down the stems, the roots took up nutrients that had leached out of the plant or that were in the rainwater. About one-fifth of the nutrient transfer in the forest involved such stem flow. Plastic pipes baited with mineral nutrients were set up in the forest to test whether root growth up stems occurred in a directed fashion. Growth was indeed fastest and highest on pipes baited with enriched nutrient supplies.

Oncogenes and chromosome deletions

ANOTHER piece of evidence favors a tie between a specific oncogene and tumor development (page 1064). The oncogene *c-myb*, which has been associated with proliferation and differentiation of hematopoietic cells, resides in the q region of human chromosome 6. Chromosome deletions are common in chromosome 7 in several types of human leukemias and lymphomas (acute lymphoblastic leukemias, non-Hodgkin lymphomas, and acute myelogenous leukemias); the heterogeneous group of 6q- deletions occurs in the "long arm" of the chromosome. Barletta *et al.* show, by hybridizing human *c-myb* probes to chromosome preparations from tumor cells, that this oncogene is retained on chromosome 6 in tumors in which a deleted 6q- chromosome is found; the chromosomal breakpoint was always near the oncogene. Messenger RNA levels of *c-myb* are increased in only those tumor cells with the 6q- deletions. This oncogene may promote proliferation while inhibiting further differentiation of affected cells.

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- pTGFβ2 is a structurally distinct second form of TGFβ (sequence homology 70% in the first 50 a.a. to hTGFβ/pTGFβ1). When assayed as above, it gives the same ED₅₀s on NRK and AKR cells. However, some cell lines can distinguish between pTGFβ2 versus pTGFβ1/hTGFβ.
- Human platelet derived growth factor h(PDGF) is assayed on Balb/c-3T3 and NIH-3T3 cells for H³-thymidine incorporation as per Raines and Ross, Meth. in Enz. 109, p749.
- Porcine PDGF is structurally very different from hPDGF (i.e. differs in M.W., subunit composition, N-terminus), its activity is determined as in 3 above.
- Both the acidic and basic forms of bovine fibroblast growth factor are isolated from brain and assayed for H³-thymidine incorporation on NR6-3T3 cells after Gospodarowicz, et al JBC, 253, p3736, 1978.

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Materials Science

Materials science is currently experiencing major advances, both in basic understanding and in applications. Indeed, one of the great strengths of the field has been the close connection between the pure and applied aspects of the science. In this issue we present some exciting developments in materials science. Future issues will bring articles on areas not covered here.

Most of the topics are covered from the viewpoint of physical attributes rather than applications. In each article, however, we see a variety of applications to diverse areas ranging from structure to electronics. And, as the applications are broad, the field encompasses contributions from chemistry, solid-state physics, and electrical engineering, among others.

We start with disordered materials by Cheng and Johnson. Amorphous solids have been shown to have some remarkable properties. Active interests include synthesis of noncrystalline materials, atomic scale structural modeling, electronic structure and properties, transport and kinetic processes, and phase transitions. New conceptual developments deal with interesting aspects of the lack of long-range order. Glass describes new developments in optical materials. Display technologies have been a noteworthy area that has shown remarkable advances, but optics now appear in other areas of technology as well. These include optical devices at higher bandwidths than are possible with traditional methods, and the generation and transmission of very high energy densities (for example, in laser fusion) where spectacular advances are making new technologies viable.

Spaepen discusses recent advances in controlling the microstructure of metallic systems. Rapid solidification technology has revolutionized our ability to synthesize metals with new and important properties. In increasing order of metastability, the solidification product can be one with a finer grain size, a supersaturated solution, a metastable crystalline phase, or, if no crystallization occurs, a glass. One result has been the extraordinary discovery of icosahedral quasicrystals. Both metallic glasses as well as new crystalline materials play an important role. Ultrarapid heating and cooling techniques reveal new aspects of the kinetics of solidification.

Proceeding to more ordered materials, Baer, Hiltner, and Keith discuss hierarchical structure in polymeric materials, describing elegant new methods for controlling macroscopic properties by manipulating the chemical and physical aspects of synthesis. They focus on the molecular, nano-, micro-, and macrolevels and show how interactions at and between these levels affect each other. Semicrystalline, liquid crystalline, and amorphous polymers having flexible chains, rigid macromolecules, and multiphase components, respectively, have very different properties. From studies of biocomposites in natural polymeric systems important lessons can be learned and applied to synthetic materials.

Narayanamurti describes some exceptional examples of artificially structured materials. Molecular beam epitaxy and metal-organic chemical vapor deposition allow one to structure new materials on an atomic scale, resulting in the observation of new physical phenomena. New classes of electronic devices based on band-gap and wave function engineering arise from this work. New instrumentation plays a critical role in characterizing these materials.

Finally, Ehrenreich addresses the issue of theory in materials science. His insights into the role of theory in this strongly experimentally based science help tie together the basic science, its applications, and future developments that we may expect to see.

The diversity of the problems being attacked and solved, and the impressive progress already recorded, augurs well for more advances in this important science and technology. Helped by an also continuing advance in instrumentation and ancillary technologies, we expect continuing revelations.—JOHN I. BRAUMAN, *Department of Chemistry, Stanford University, Stanford, CA 94305*

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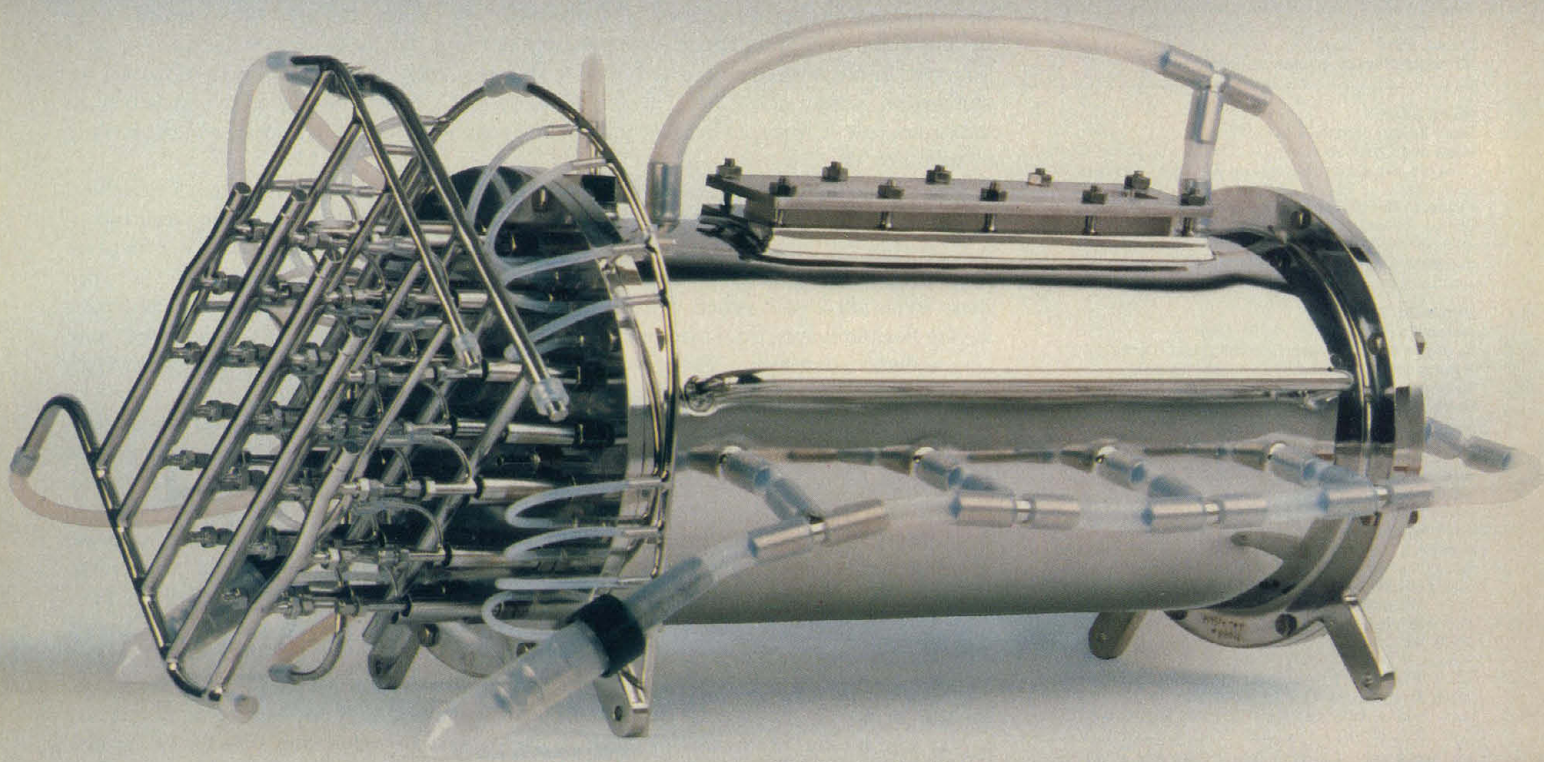
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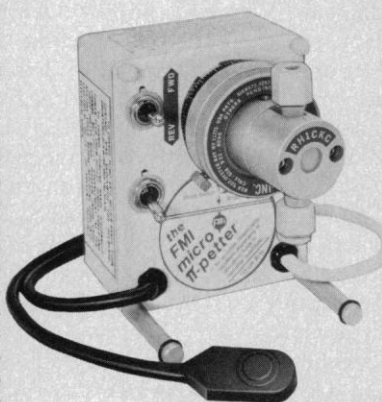


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homelessness. In face-to-face interviews with 979 homeless people in 19 Ohio counties, Roth and Bean (1) found that only 29.9% had ever been hospitalized for mental health problems and only 2.5% gave deinstitutionalization as a major reason for their homelessness. (The leading reasons named were unemployment, problems paying rent, family conflict, and eviction.) Although subjective interviews are not entirely trustworthy indicators of causation, they do suggest that homelessness is a multidimensional socioeconomic problem, not merely a consequence of a misguided psychiatric movement.

PETER B. FIELD
VA Medical Center,
Baltimore, MD 21218

REFERENCES

1. D. Roth and G. J. Bean, Jr., *Hosp. Community Psychiatry* 37, 712 (1986).

Response: To clarify the essence of our editorial, we reiterate our basic point. We must do the best we can with today's homeless mentally ill, but unless we make a long-range investment in systematically studying the problem we are not likely to solve it. Basic questions remain unanswered. Even the magnitude of the problem has not been

resolved. Estimates of the numbers of homeless individuals range widely, from 250,000 to 3 million (News & Comment, 2 May 1986, p. 569). As Field points out, not all homeless are mentally ill; nevertheless, a review of a range of studies done in several large U.S. cities indicates that from one-third to one-half of the homeless are chronically or acutely mentally ill (1). The 30% found by Roth and Bean (2) is thus on the low side.

We agree with Mechanic that patient rejection of treatment, fragmented and inaccessible care, and lack of clear lines of authority are serious problems, but do not believe they are remedied solely by a rush of money, social good will, and political interest. Perhaps the handful of controlled studies demonstrating the effectiveness of well-thought-out community care as an alternative to hospitalization (3) will teach us principles for the care of the homeless mentally ill. It should be realized, however, that these studies may or may not be generalizable across communities and have dealt mostly with small numbers of subjects. Also, the majority of studies have taken place over brief time periods and have not been demonstrated to be successful in a large-scale mental health care system. Finally, what might work as an alternative to hospitalization will not necessarily work for the current homeless mentally ill. In conjunction with our existing and near-term efforts for the homeless mentally ill, we must provide a knowledge base for the future.

RICHARD JED WYATT
Neuropsychiatry Branch,
National Institute of Mental Health, and
Intramural Research Program,
St. Elizabeths Hospital,
Washington, DC 20032
EVAN DERENZO
Collingswood Nursing Center,
Rockville, MD 20850

REFERENCES

1. *The Homeless: Background, Analysis, and Options* (Department of Health and Human Services, Washington, DC, 1984).
2. D. Roth and G. J. Bean, Jr., *Hosp. Community Psychiatry* 37, 712 (1986).
3. L. I. Stein and M. A. Test, *Arch. Gen. Psychiatry* 37, 392 (1980).

Erratum: In the report "Females' choice of 'good genotypes' as mates is promoted by an insect mating system" (12 Sept., p. 1187), W. B. Watt *et al.* do not evaluate the fitness of the progeny of *Colias* butterflies, as suggested in This Week in Science (12 Sept., p. 1131).

Erratum: In Mark Crawford's News & Comment article, "Reagan okays the Supercollider," (6 Feb., p. 625), Alvin W. Trivelpiece was incorrectly identified as director of basic research at the Department of Energy. Trivelpiece actually serves as the director of the Office of Energy Research.

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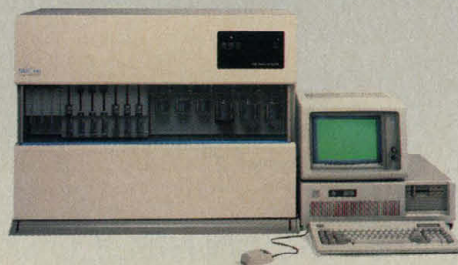
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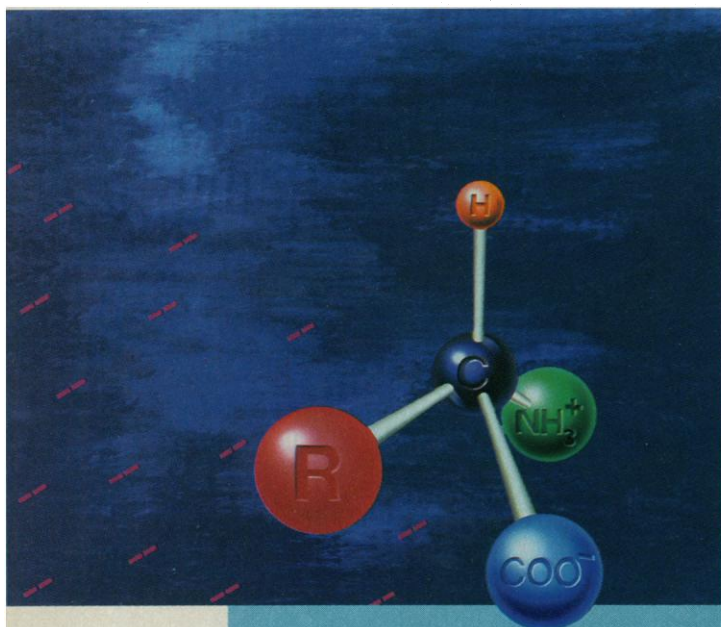
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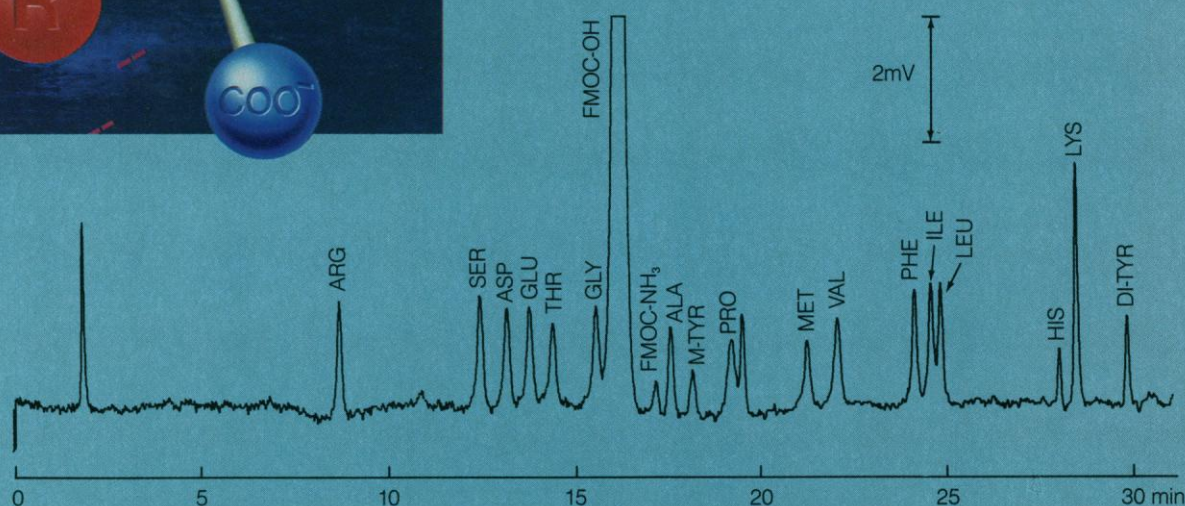
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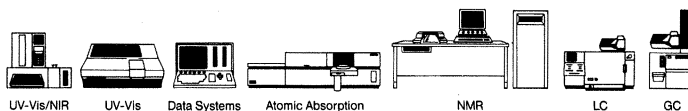


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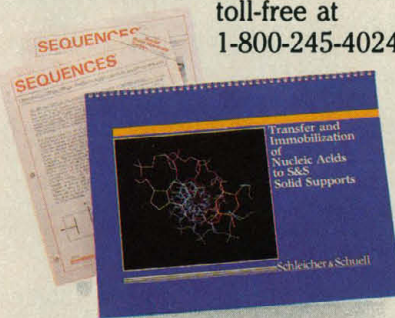
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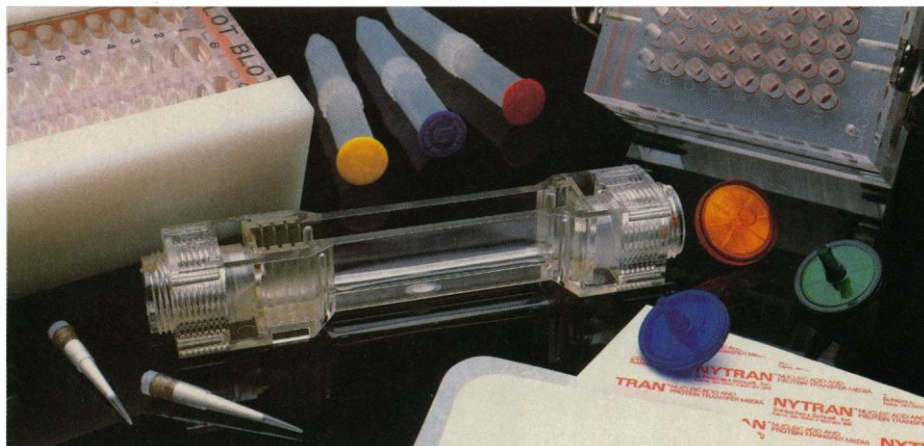
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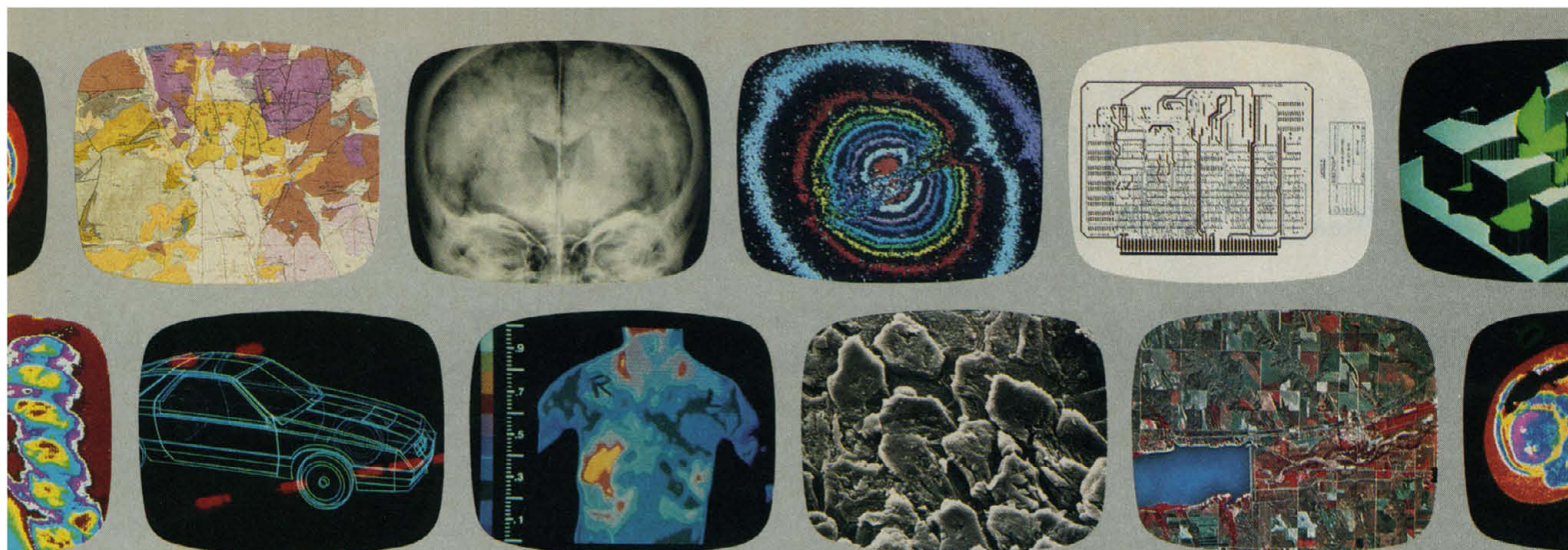
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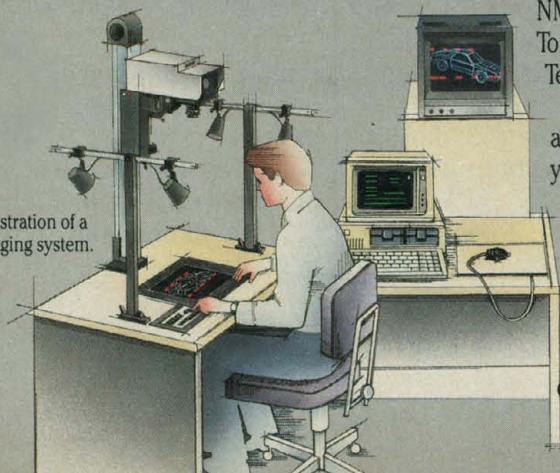


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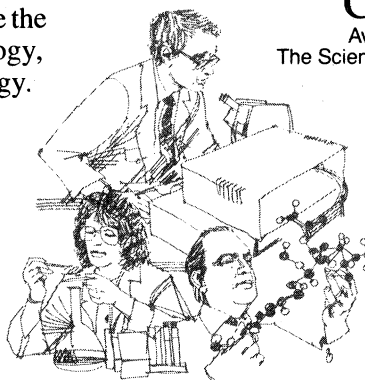
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HTLV-III AND OTHER FACTORS IN THE ORIGIN OF AIDS AND ASSOCIATED MALIGNANCIES

Robert C. Gallo, Bethesda

IMMUNOLOGIC AND MOLECULAR FEATURES OF HIV INFECTION

Jay A. Levy, San Francisco

MOLECULAR BIOLOGY OF IMMUNOSUPPRESSIVE RETROVIRUS

Simon Wain-Hobson, Paris

DEFINING THE VIRAL GENES FOR HTLV-III REPLICATION AND CYTOPATHOGENICITY

Flossie Wong-Staal, Bethesda

(Monday p.m.)

MOLECULAR BIOLOGY OF THE AIDS VIRUS

William Haseltine, Boston

RELATIVE IMMUNOGENICITY OF HTLV-III, HTLV-IV, AND STLV-III PROTEINS

Myron Essex, Boston

ENVELOPE PROPERTIES OF HIV

Robin Weiss, London

TARGETS FOR IMMUNE ATTACK IN RETRO VIRUSES ASSOCIATED WITH AIDS

Dani P. Bolognesi, Durham

USE OF VACCINIA VECTORS TO STUDY EXPRESSION AND IMMUNOGENICITY OF RETROVIRAL PROTEINS

Bernard Moss, Bethesda

DNA SESSIONS

CHROMATIN (Monday p.m.)

Chairman, Gary Felsenfeld

TRANSCRIPTION (Tuesday a.m.)

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INTRACELLULAR PROTEIN TARGETING (Tuesday p.m.)

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Chairman, Davor Solter

ANTI-IDIOTYPE VACCINES (Tuesday p.m.)

Chairman, J. Donald Capra

THE USE OF HYBRIDOMAS IN DETERMINING CYTOKINE STRUCTURES AND FUNCTIONS (Wednesday a.m.)

Chairman, Robert Schreiber

ANTI-CARBOHYDRATE MAB'S IN THE STUDY OF GLYCOLIPID-MEDIATED CELLULAR EFFECTS (Wednesday a.m.)

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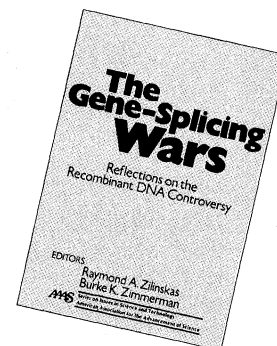
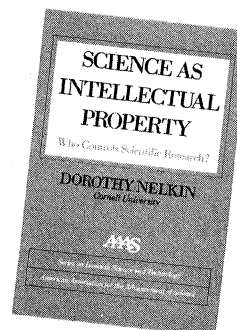
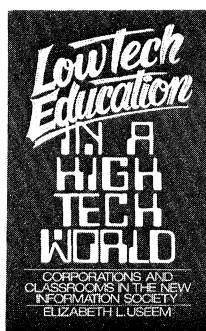
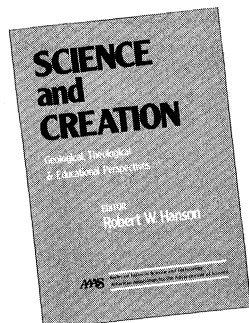
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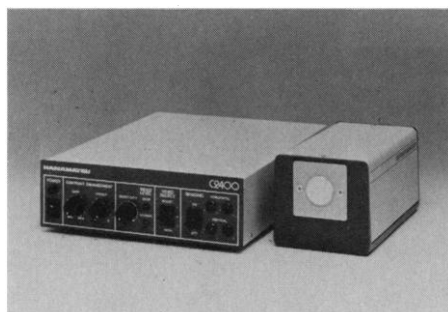
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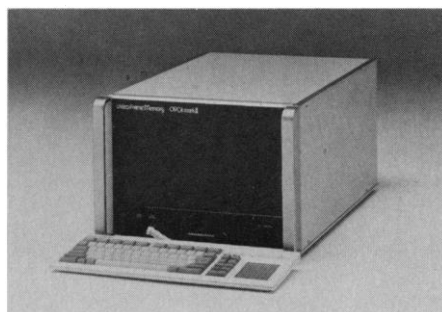
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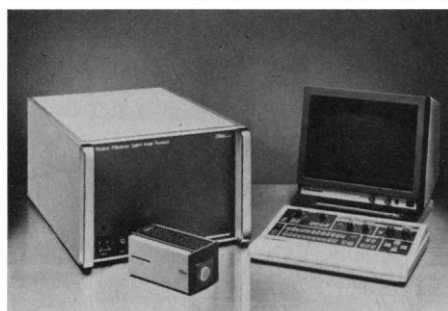


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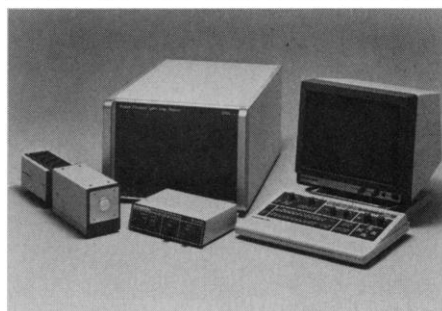


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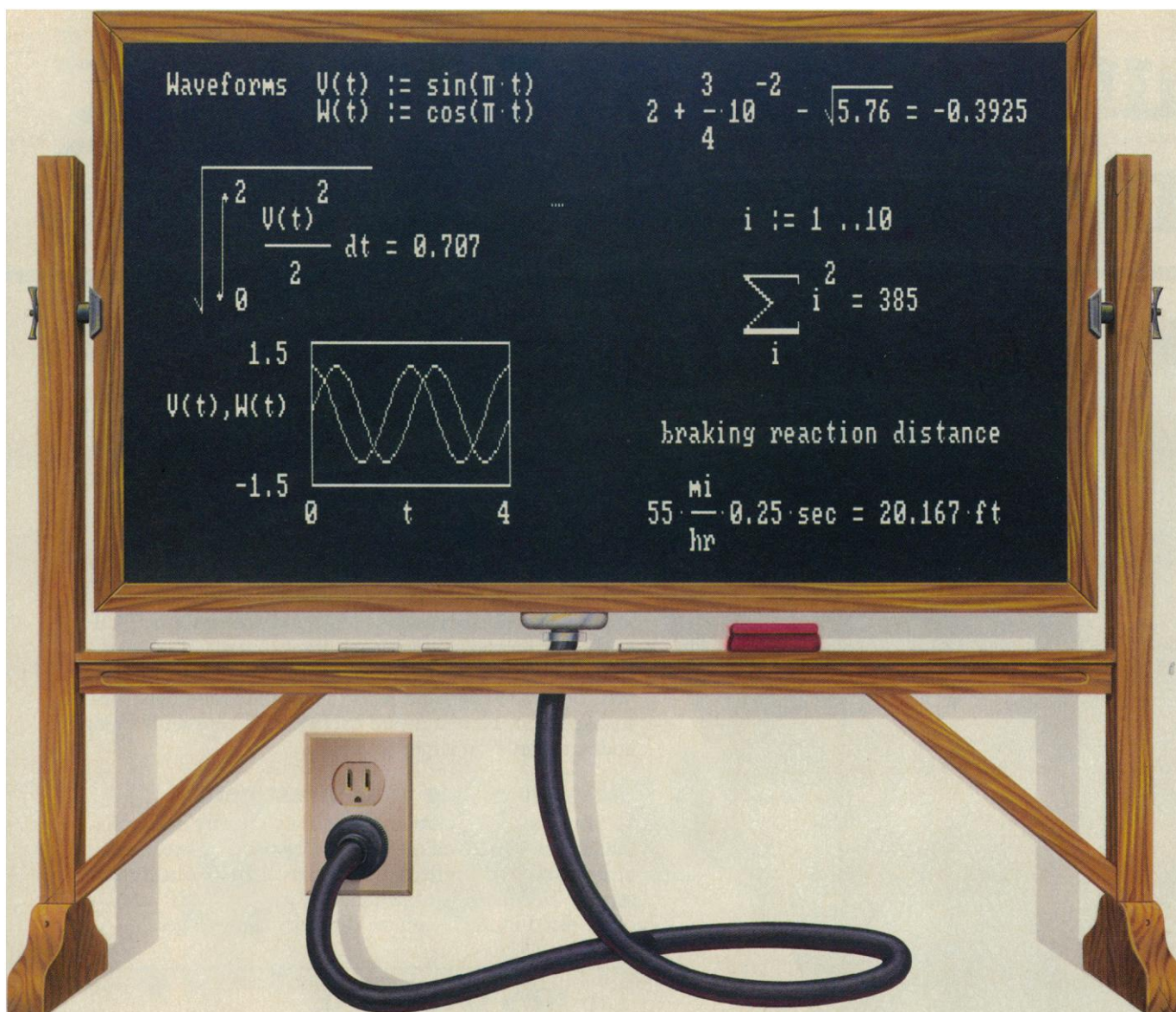
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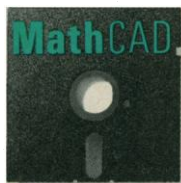
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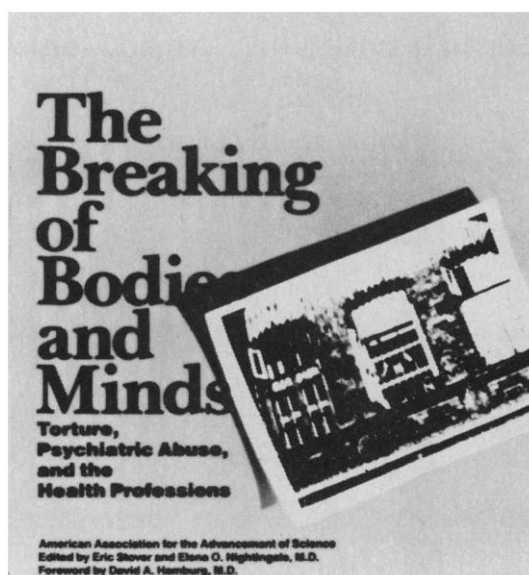
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With a Foreword by
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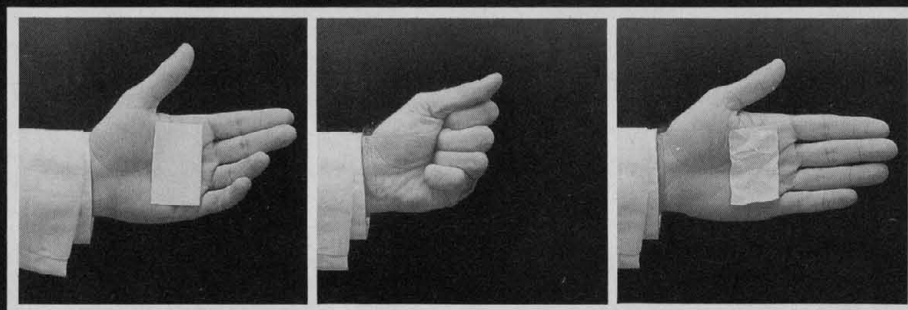
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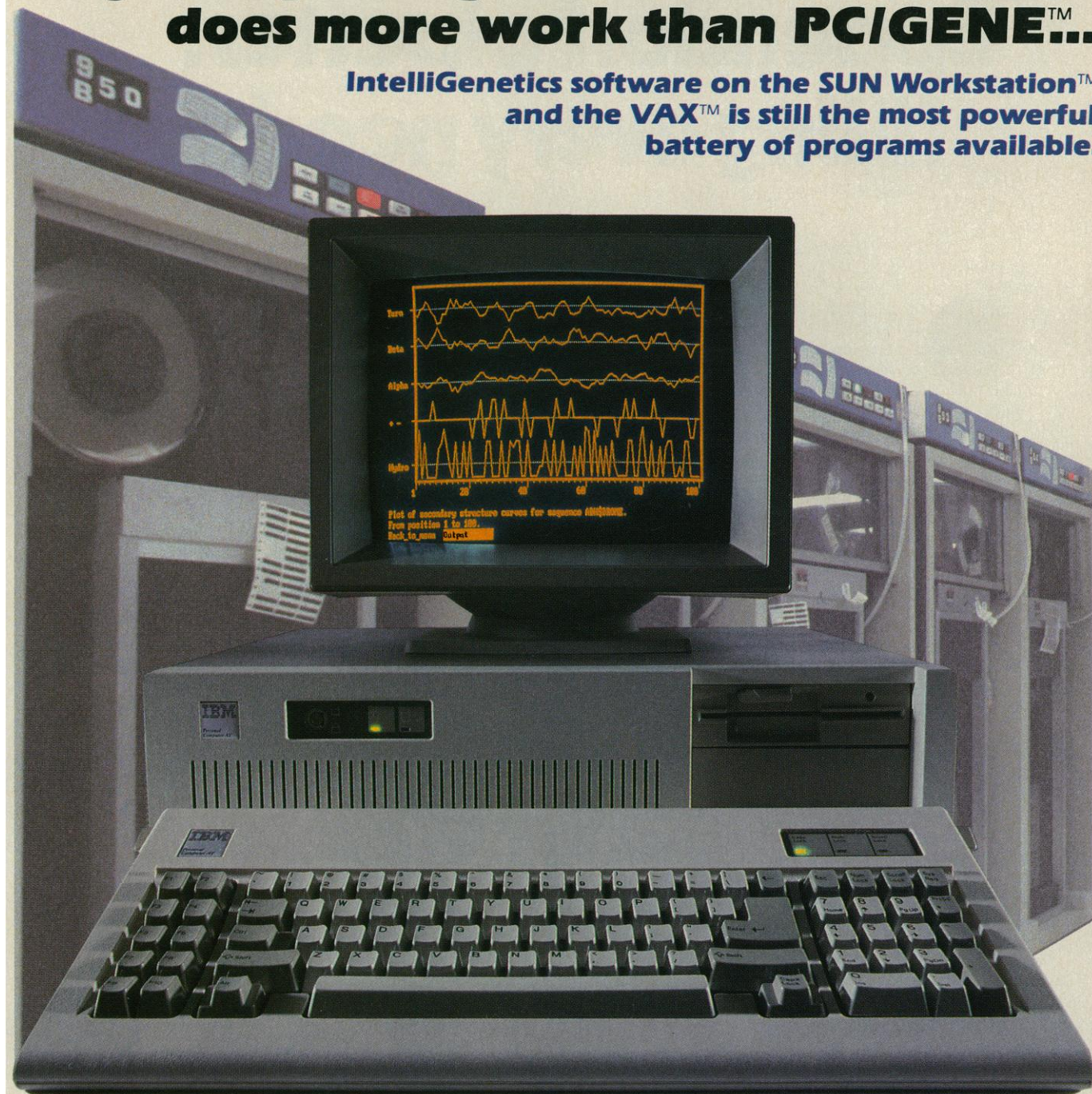
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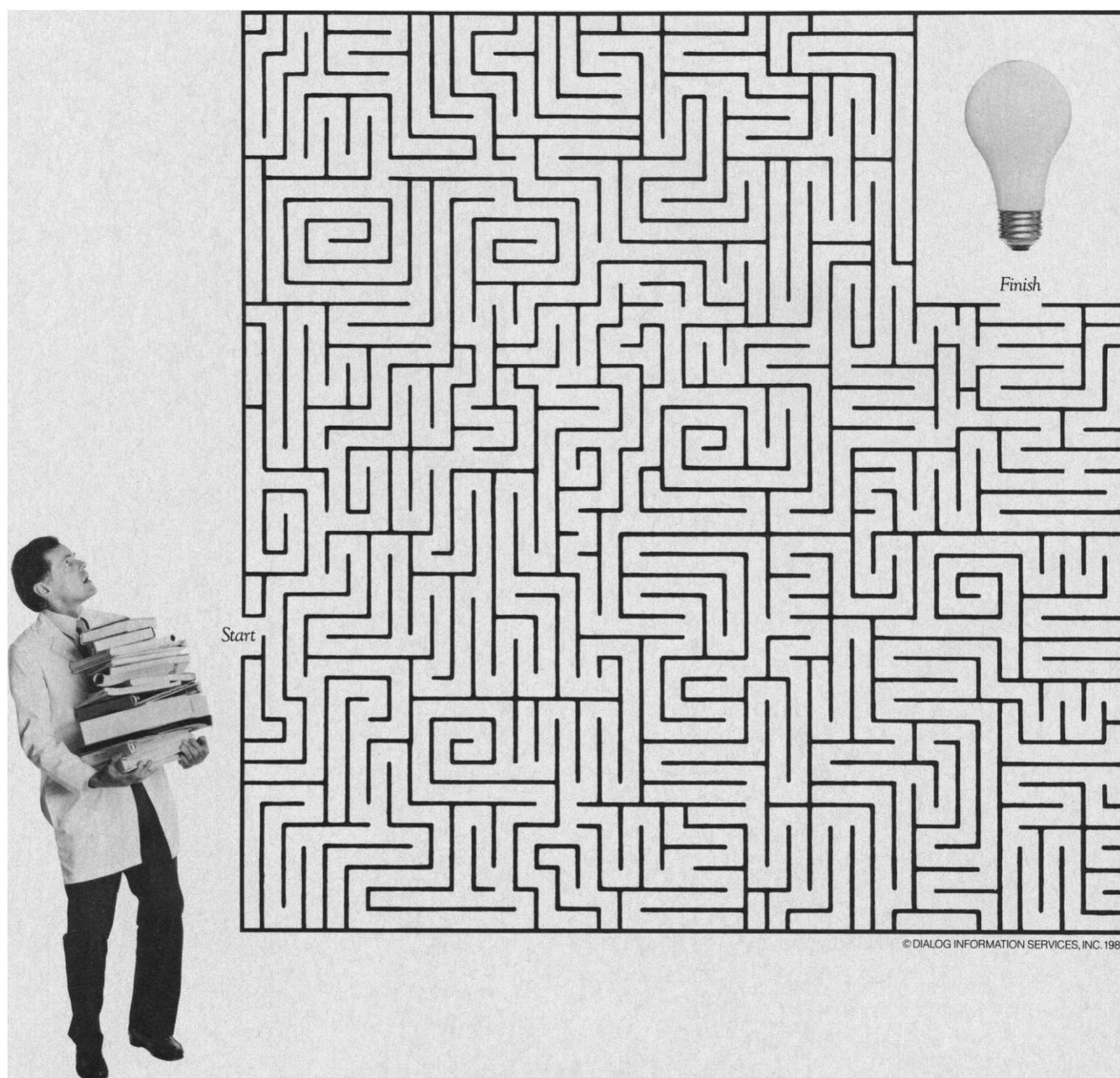
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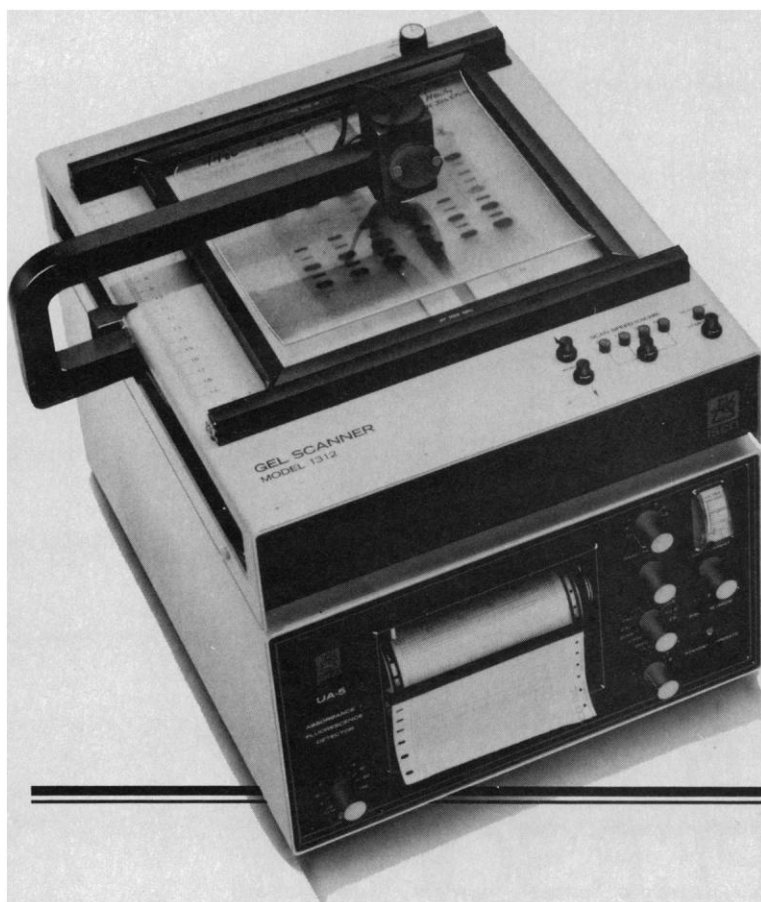
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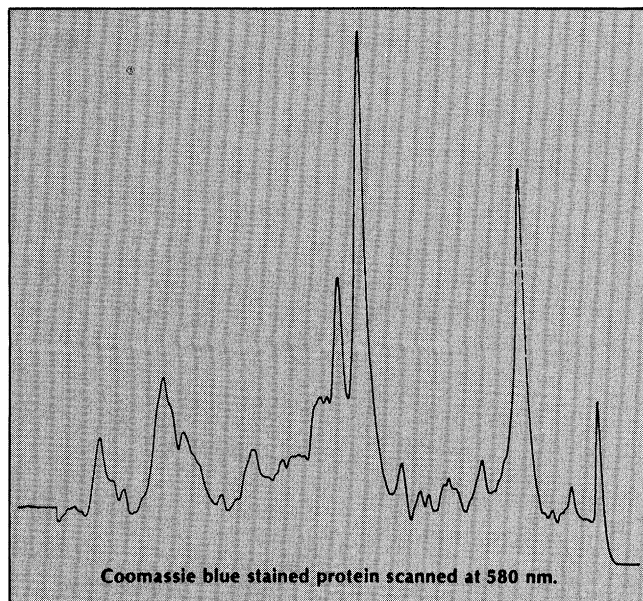




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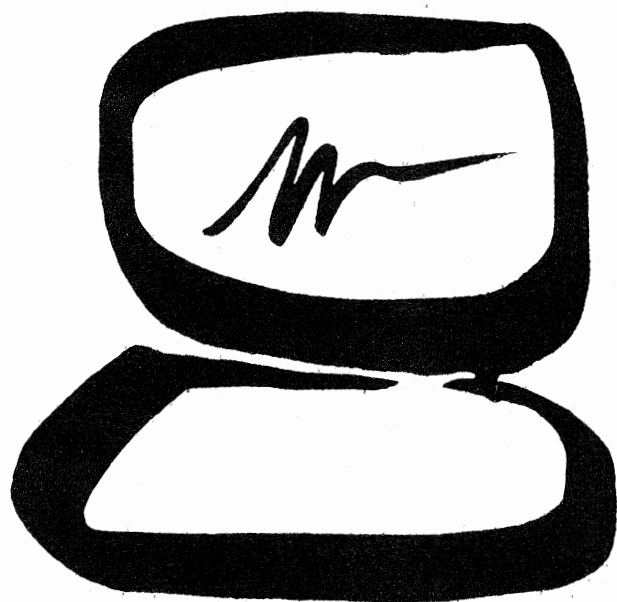
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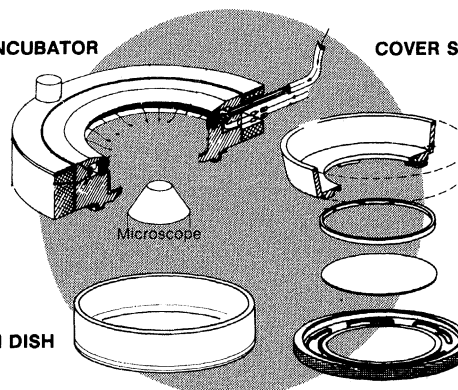
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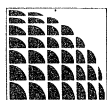
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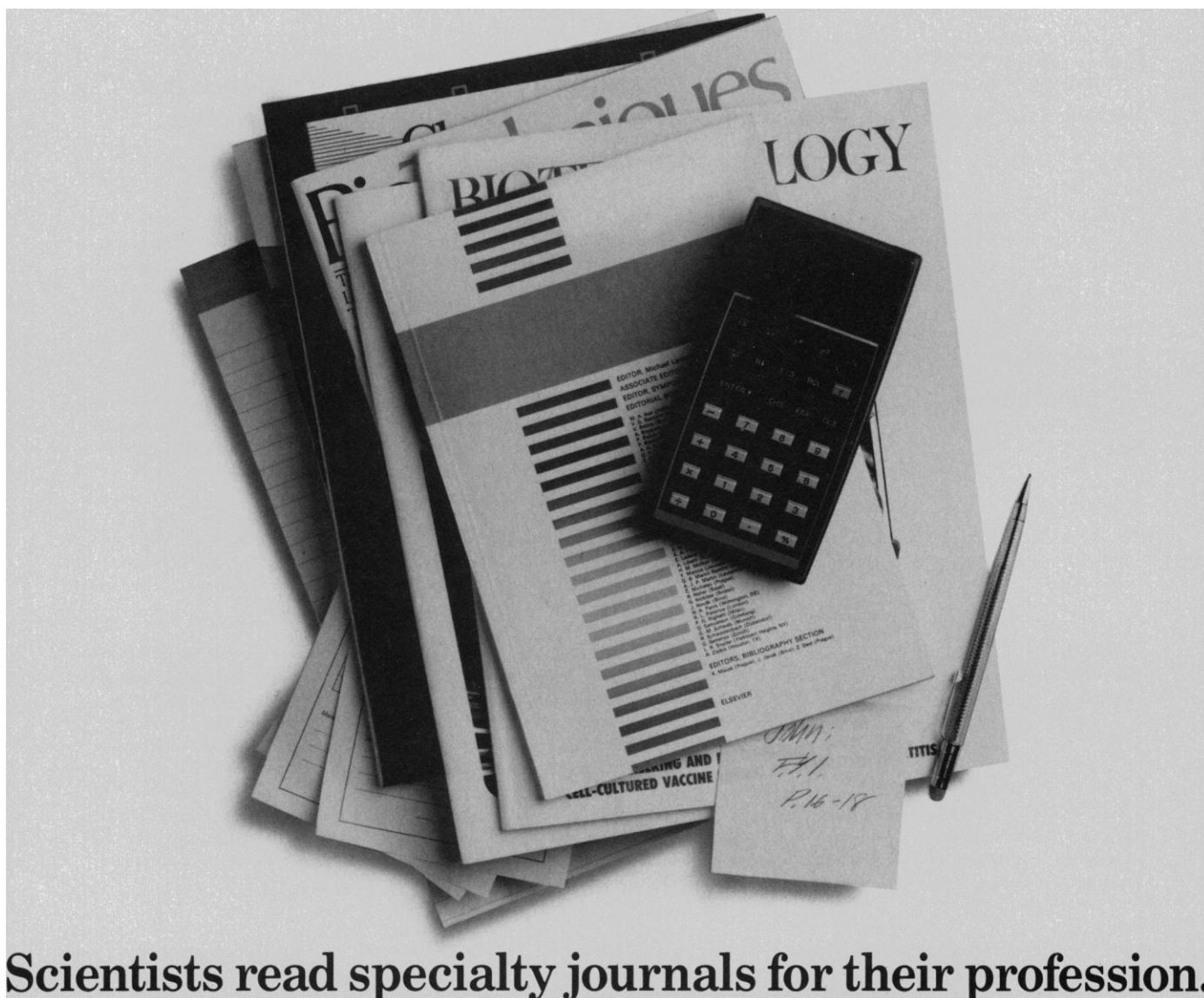


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Source: Scientist Readership Research Update/ISI December 1986

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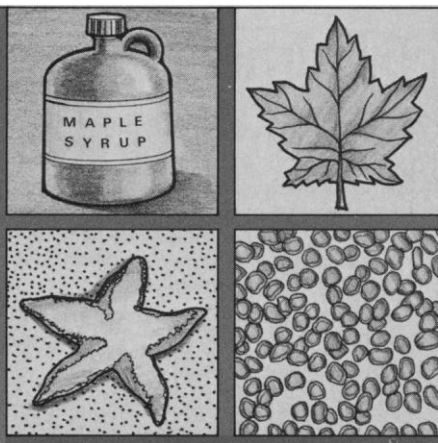
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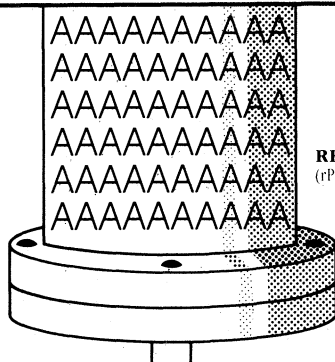
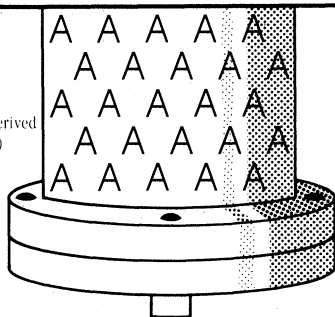
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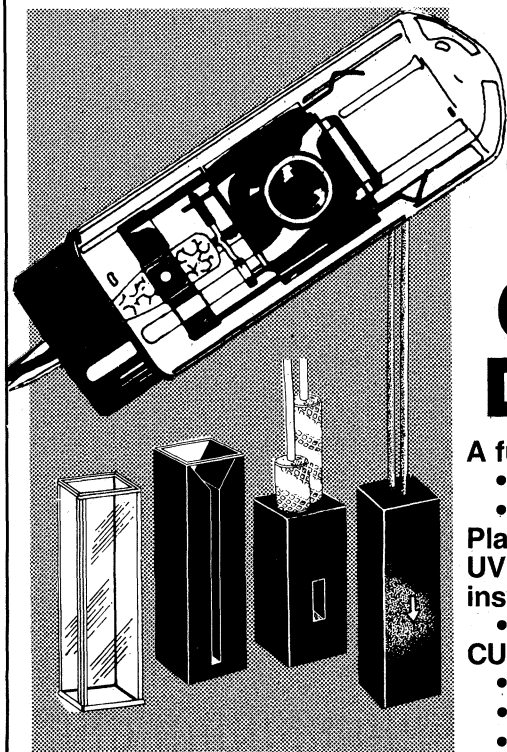
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☐ Check here if you need special services due to a handicap. We will contact you before the meeting.

REGISTRATION FEES

\$170 Full (meals and publications) \$ _____

\$125 Partial (publications only) _____

\$ 60 Student (publications only) _____

SEPARATE MEAL TICKETS

\$ 22 Lunch, Thursday (9 Apr.) _____

\$ 8 Breakfast, Friday (10 Apr.) _____

\$ 22 Lunch, Friday (10 Apr.) _____

TOTAL AMOUNT: \$ _____

Packets will be mailed to preregistrants on about 23 March; registrations received after 23 March will be held at the AAAS Registration Desk in the Capital Hilton. **Refund Policy:** Advance registration fees and meal tickets will be refunded for cancellations received by 3 April; no refunds will be made on cancellations received after this date.

Registration fees include all sessions and publications; meals are included only with payment of full registration fee. All registrants receive *AAAS Report XII: Research and Development, FY 1988* before or at the Colloquium, published *Proceedings* after the meeting, and a supplementary report, *Congressional Action on R&D in the FY 1988 Budget*, in the fall.

Mail registration form to: AAAS Meetings, R&D Forum Registration, 1333 H Street, N.W., Washington, D.C. 20005

Capital Hilton Hotel Reservation
AAAS R&D Colloquium ♦ 9-10 April 1987

(Reservations received after 13 March cannot be guaranteed)

Send confirmation to:

Name _____ Street _____

City _____ State _____ Zip _____ Telephone No. _____

Other occupants of room: Name _____ Name _____

Room: ☐ Single (\$115)* ☐ Double (\$135)* ☐ Twin (\$135)* *Add 10% D.C. sales tax and \$1 occupancy tax.

Arrival: Date _____ Time _____ **Departure:** Date _____ Time _____

Be sure to list definite arrival and departure time. Check-in time is 3:00 p.m.; check-out time is 12 noon.

Special housing needs due to handicap _____

Enclose separate check, made out to **The Capital Hilton**, for first night's room deposit or provide major credit card information:

Credit Card Name _____ Number _____ Expiration Date _____

Cardholder's signature _____

Mail hotel reservation form to: Reservations, The Capital Hilton, 16th & K Streets, N.W., Washington, D.C. 20036