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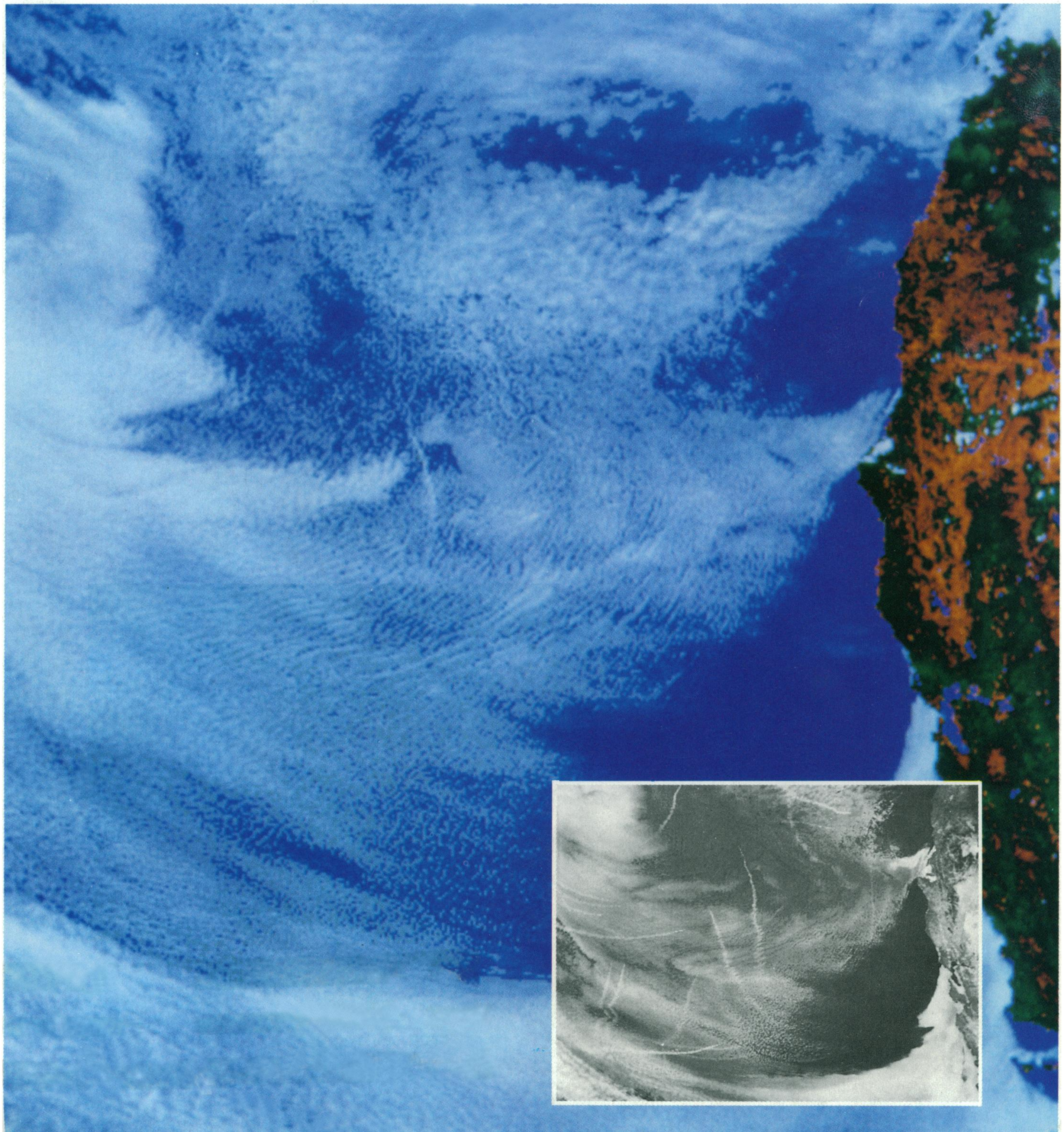

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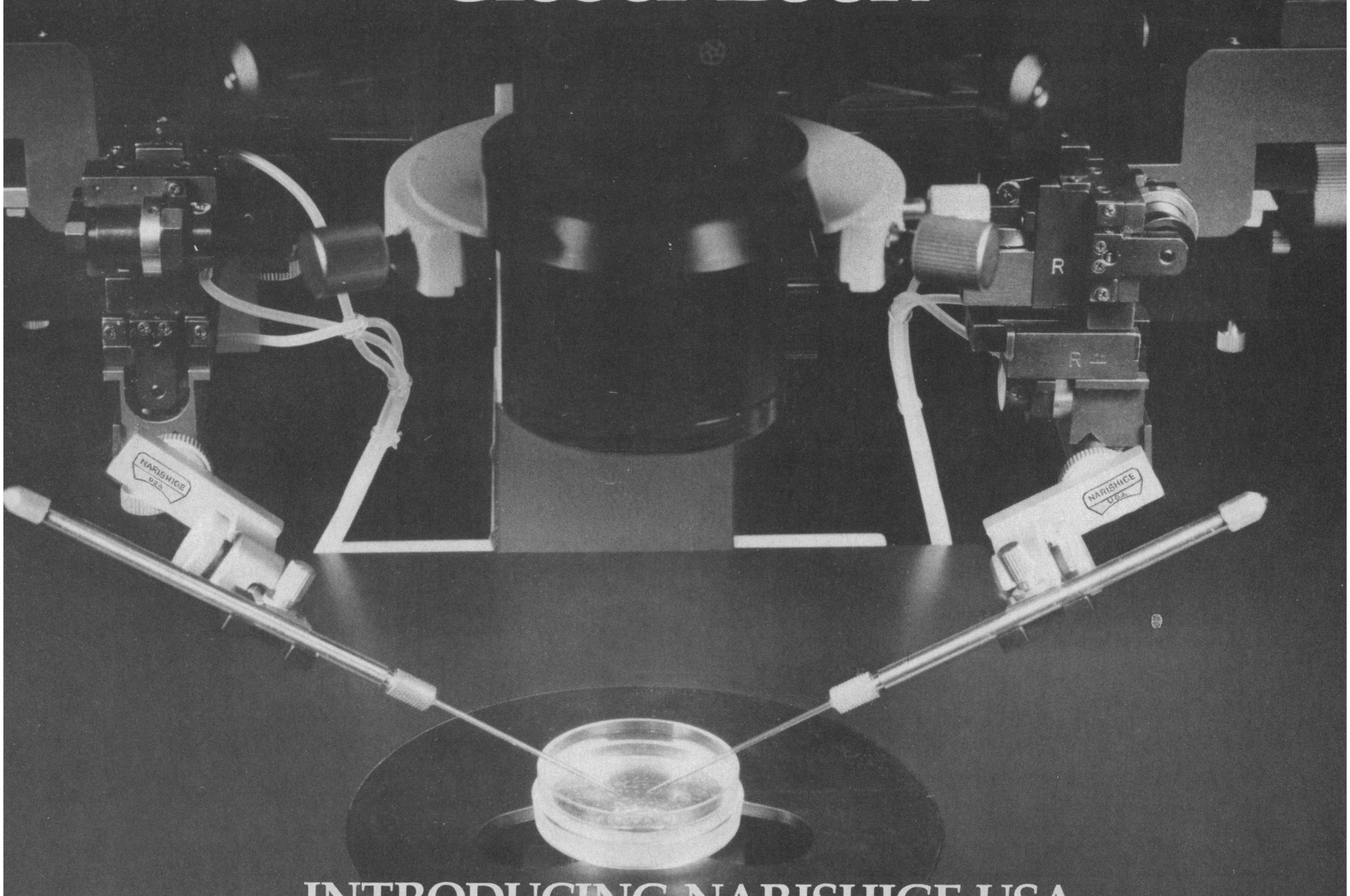

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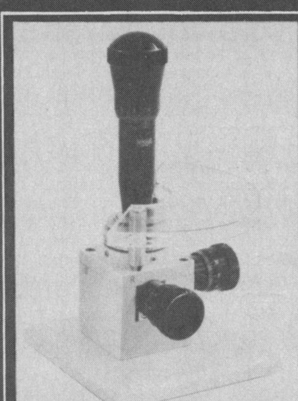

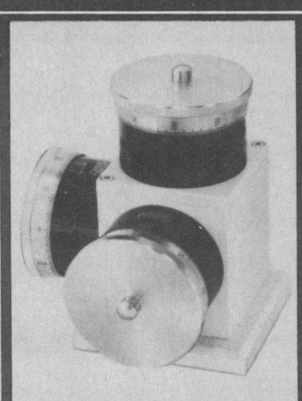

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COVER Satellite images showing an extensive stratocumulus cloud system off the coast of California. The false color image is constructed from visible (0.63 μm) and near infrared (0.89 μm) radiances. The inset is constructed from 3.7 μm radiances. The streaks revealed at 3.7 μm are caused by a decrease in cloud droplet size for clouds that are contaminated by the exhausts of ships. See page 1020. [Images constructed by J. A. Coakley, Jr., and R. A. Bumpas; cover design by M. Shibao, National Center for Atmospheric Research, Boulder, CO 80307]

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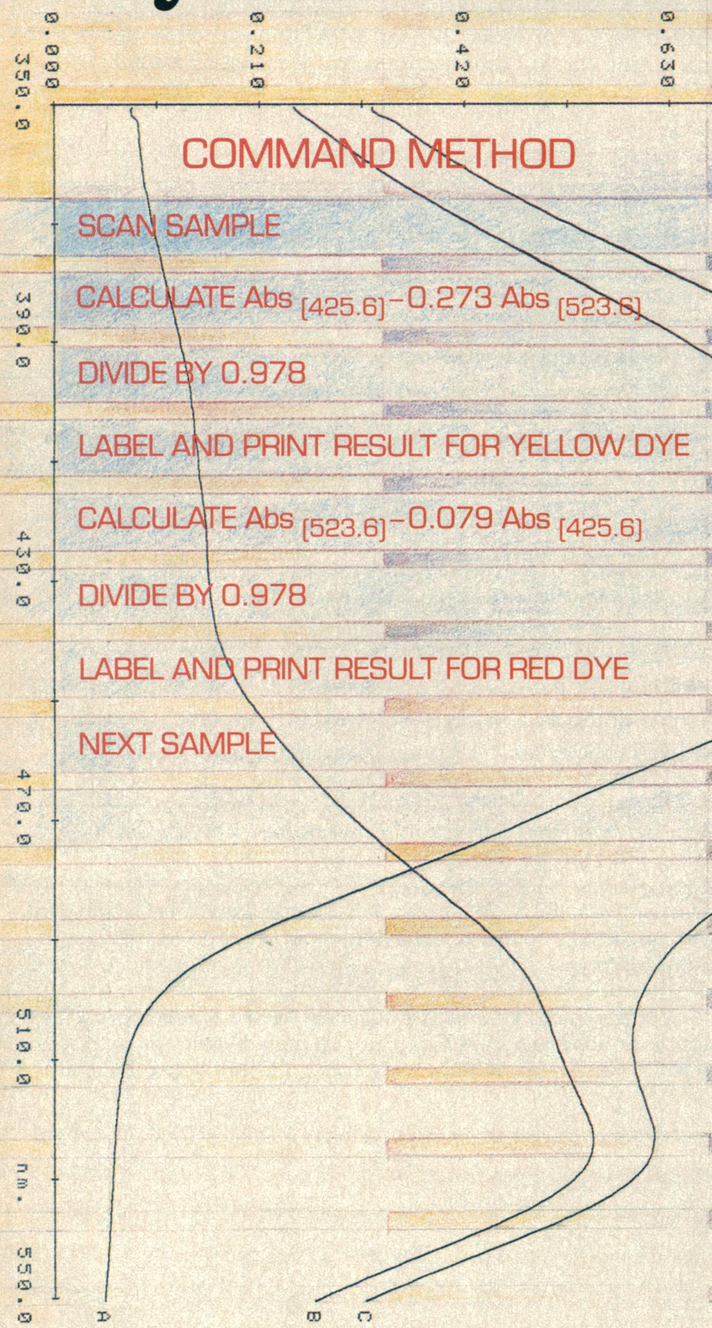


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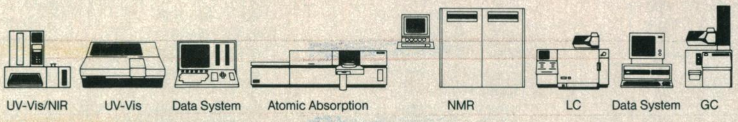

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This Week in SCIENCE

Timing of Cameroon lake disasters

Two disasters involving lethal gases occurred in Cameroon in the past 3 years, both in August (page 1022). In August of 1984, 37 people were killed by carbon dioxide gas from Lake Monoun; in August of 1986, 1700 people died near Lake Nyos. Kling has studied air and water conditions at a third crater lake in Cameroon, Barombi Mbo, in order to understand this unusual late summer phenomenon. Each year around March, the southeast trade wind brings light clouds and light rain to the region. By late August, cloud cover and precipitation are at their heaviest, heat from the sun, air temperature, and evaporation are at their annual minimums, water in the lake is at its coldest, and the water column is at its minimum stability. The instability of the water column at Barombi Mbo allows deep mixing and gradual escape of accumulated gases. In a highly charged lake (evidence exists that gas concentrations were building for years in Lakes Nyos and Monoun), the unfortunate conjunction of a gas-saturated lake, somewhat extreme climate factors (in recent years both lower than average temperatures and heavier than average rainfall have been recorded in August), and some triggering disturbance (something as simple as a strong wind) could result in the sudden release of lethal gas.

Triassic-Jurassic mass extinction

How did the Triassic Period end, gradually or catastrophically (page 1025)? Evidence from a rich assemblage of vertebrate bones (of fishes and of reptiles including dinosaurs) from the Fundy Basin of Nova Scotia indicates that the Triassic-Jurassic boundary 200 million years ago was a time of mass extinction. Dominant Triassic families disappeared over a period of less than 850,000 years (rather abruptly in geologic terms), and few if any new species originated during that time. These new vertebrate data are in accord with marine invertebrate data that earlier pointed to a major extinction at the Triassic-Jurassic boundary. Olsen *et al.* discuss the likelihood that an asteroid impact may have caused the extinction, as has been proposed for the Cretaceous-Tertiary extinction some 130 million years later. Interestingly, similar groups of terrestrial vertebrates survived both the Triassic and the Cretaceous extinctions.

Suppressor cells in autoimmune disease

AUTOIMMUNE uveoretinitis is an experimentally induced disease of rats that can be produced by injections of retinal soluble antigen (page 1029). The eyes become inflamed and the photoreceptor cells—of which this antigen is a major constituent—sustain permanent damage; some damage is mediated by helper T cells that have specific reactivity to the retinal antigen. Caspi *et al.* show that Müller cells—major structural elements of the eye—can suppress specific T cell proliferation; in this way, they might counteract some of the damaging effects of T cells. The suppression, which was measured in an in vitro assay, requires physical contact between Müller and T cells. These cells are two of probably several cells and factors that through cooperation and antagonism maintain normal tissue homeostasis in the eye; because Müller cells can damp inflammatory immune reactions, they may help make the eye an immunologically "privileged" site where certain types of immune reactions simply cannot occur.

Chicks do not quail from foreign wings

CHIMERIC chickens that have one chicken wing and one quail wing do not reject their foreign wing if they also have a chimeric (chicken-quail) thymus (page 1032). In experiments with various combinations of donor and recipient birds, Ohki *et al.* show that the key to maintaining the foreign wing is to remove the host's thymic rudiment and to transplant quail thymic epithelium along with the quail limb bud (out of which the wing grows). Quail limb buds were grafted onto 4-day-old chicken embryos; quail thymic rudiments (containing epithelial tissue but not hematopoietic precursors) were transplanted 1 day later. If donor thymic tissue was not transplanted, foreign wings were rejected within 2 weeks of hatching. However, with quail thymus tissue present, partial or complete tolerance to the quail wing was established. The chimeric thymus had epithelial tissue of both donor and host but lymphocytes, macrophages, and dendritic cells of only the host. Tolerance to the foreign wing depends on the chicken's acceptance of it as a self constituent; the thymus epithelium has now been shown to play an important part in the process by which self and nonself are discriminated.

Stereospecific catalytic antibodies

BECAUSE of the exquisite specificity with which antibodies recognize and react with specific antigens, the feasibility of using antibodies as catalysts to speed up important but slow chemical reactions is being actively investigated (page 1041). Napper *et al.* show that a monoclonal antibody greatly accelerated the cyclization reaction of a δ-hydroxyester to a δ-lactone. The starting solution contained a racemic mixture (both enantiomers—mirror and mirror image) of the compound; the antibody was not specific for these structures but for a structure that mimics a crucial intermediate in the five-step cyclization reaction. The finding that the product δ-lactone was largely one of the enantiomers and not a racemic mixture of the two (as would result in the noncatalyzed reaction) indicates that antibodies are capable of making fine stereospecific distinctions—similar to those made by enzymes—between available reactants and that they can produce a defined reaction product.

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Strengthening U.S. Engineering

The large U.S. deficit in trade has multiple origins. To ameliorate it will require many actions, some of which are outlined in a report just issued by the National Academy of Engineering.* The document emphasizes the need to respond to the growing quality and quantity of engineering activity abroad and to tap the new knowledge and technology being developed at foreign centers of excellence.

The report presents what it terms an illustrative rather than comprehensive list of 34 areas of engineering research in which there is comparable or superior technology abroad. The areas include artificial intelligence, robotics, systems engineering and control, optoelectronics, combustion and engine technology, high speed rail, and nuclear plant safety. As might be expected, a few countries have widespread competence. Out of the 34 items named, the following countries are listed as having comparable or superior technology to the United States: Japan, 25; Federal Republic of Germany, 22; United Kingdom, 20; France, 15; and Sweden, 12. In all, 25 countries are named, four of them behind the Iron Curtain. The list and the activities indicate that the rest of the world can progress without tapping U.S. technology. But can the United States become competitive in global technology if it attempts to follow a policy of technologic isolationism?

U.S. industrial success earlier in this century led to an attitude of superiority and a prejudice against the need to learn what the rest of the world is doing. While many of our competitors became multilingual, we basked in the comfortable assumption that for us command of English was sufficient. We have also been reluctant to recognize that the immediate post–World War II period of U.S. economic dominance has ended. The world in which U.S. engineers and technologists learn and practice is changing more rapidly than our institutions.

The report specifies four areas in which focused and improved U.S. efforts are needed in the United States: (i) promoting international cooperation in engineering research, (ii) making engineering education more responsive to world-wide progress and concerns, (iii) gathering, disseminating, and assimilating information from abroad, and (iv) supporting international organizations and standards. A key item is (iii). If we are to compete, we must be quick to learn about and apply advances being made elsewhere.

In the gathering and dissemination of information, a number of organizations have roles or needs. These include universities, government, professional organizations, small companies, and multinational companies. The multinational companies have a large variety of mechanisms for information gathering. They have facilities abroad; they participate in joint ventures, operate centers to assess competitors' products, maintain listening posts, send their experts on exchange visits abroad, and hire foreign consultants. Once the information is obtained, it is systematically disseminated to relevant personnel within the organization. Small U.S. companies, in sharp contrast, are lacking in ability to be aware of global developments. They need to improve their information flow. In comparison with other countries, the performance of the U.S. government is poor. Other nations have developed better governmental mechanisms for monitoring foreign technological developments and reporting them back to governmental agencies and domestic industries. For example, several nations—including France, the Federal Republic of Germany, Japan, and the People's Republic of China—have notably more effective science and technology attaché systems than the United States. The impression is widespread among U.S. scientists and engineers that if information is gathered, it is not vigorously disseminated.

Insofar as their resources permit, the professional societies perform very useful functions on information gathering and dissemination. Given sufficient funds, they could do more in the way of translation and could assist in exchanges of scholars. The universities, with some exceptions, have not been sufficiently active in accumulating information about engineering developments abroad. Nor have they performed some other aspects of their educational function well in an era of global engineering competition. The report emphasizes the need for more instruction in foreign languages and for more arrangements for study abroad, including postdoctoral fellowships.—PHILIP H. ABELSON

*National Academy of Engineering, *Strengthening U.S. Engineering Through International Cooperation: Some Recommendations for Action* (National Academy Press, Washington, DC, 1987).

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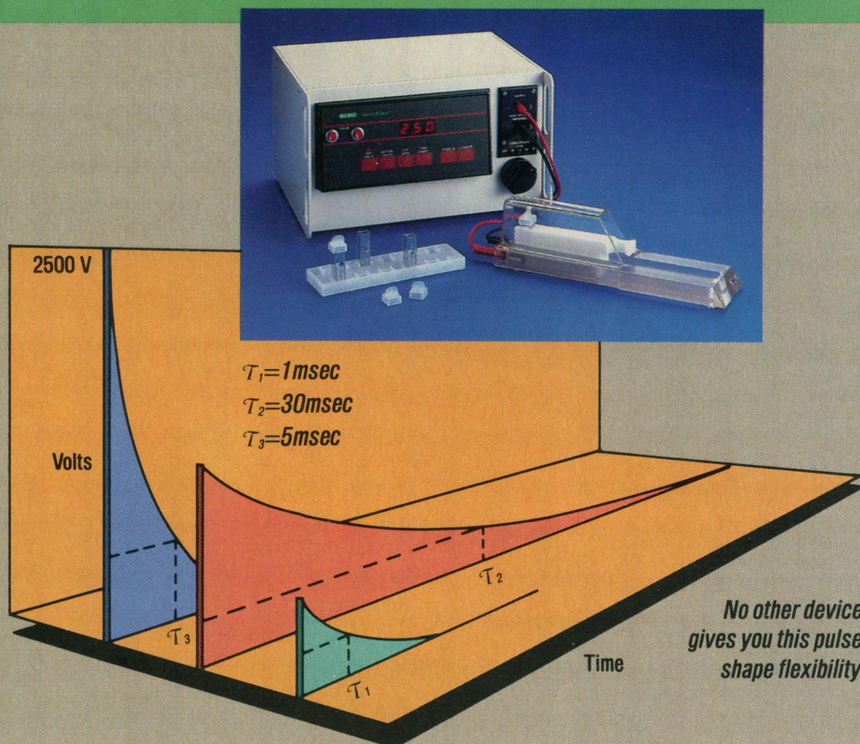

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from the primary process of the collapse and fragmentation of interstellar clouds, producing objects no less massive than about 10 to 20 Jupiter masses (*6*). Planets form as a result of secondary processes in the flattened accretion disks surrounding newly formed stars. Because accretion disk masses are typically a fraction of the mass of the central protostar and a number of planets may form, planetary masses should only be a small fraction of their star's mass.

Unfortunately, brown dwarf stars probably occur primarily in isolation as single stars, or as members of brown dwarf binary systems. Because of the absence of a more massive luminous companion, these stars may well elude discovery until more powerful infrared telescopes (for example, the Space Infrared Telescope Facility) are employed in the uncertain future.

ALAN P. BOSS
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Blocked Ontogeny

I would like to comment on the statement given prominence in an article by Jean L. Marx (Research News, 15 May, p. 778): "The view that cancer results from a block in differentiation is naïve at best." No one can quarrel with the efforts by many investigators to overcome blocks in differentiation in tumor cells by using natural factors or chemotherapeutic agents. It should be made clear, however, that the concept of "oncogeny as blocked ontogeny" (*1*) was from the outset understood as "partially blocked ontogeny" (*2*). Differentiation need not be completely blocked, only blocked *enough*. The blocked ontogeny hypothesis is not naïve; it provides the only framework today for integrating ongoing experiments in developmental biology and carcinogenesis at the molecular level.

Further development of the hypothesis calls for experiments that examine the interaction of three kinds of regulatory genes (*3*). Arbitrary designations for these genes are here given as (i) the *gf*, expressed as a growth factor GF; (ii) the *sr*, expressed as a suppressor receptor SR; and (iii) the *s*, expressed as a growth inhibitor or suppressor S. Moore and his collaborators (*4*) mention a growth factor that can stimulate the cell cycle at low concentrations and stimulate differentiation at higher concentrations, and they refer to qualitative concentration effects observed by Metcalf.

The blocked ontogeny hypothesis suggests that stem cells express *gf* (or receptors for GF from other cells), but not the genes for SR or S. Differentiation leads to expression of *sr*, and *s* and may be promoted by increased levels of GF over and above those needed for growth. Partially blocked ontogeny could result from mutations in *sr* that lower affinity of SR for S or even that lead to total loss of SR. Closure of a feedback loop that would promote normal homeostatic balance between cell reproduction and differentiation might be effected by the production of second signals when S combines with SR, which would lead to decreased expression of *gf*. Recent work by Trosko and his colleagues on the role of gap junctions in intercellular communication (*5*) suggests that the appearance and function of gap junction may be a step in a homeostatic feedback loop that leads from GF to SR to S and back to *gf*.

VAN RENSSELAER POTTER
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2. ———, *Brit. J. Cancer* **38**, 1 (1978).
3. ———, *Environ. Health Perspect.* **50**, 139 (1983); *Prog. Nucl. Acid Res.* **29**, 161 (1983).
4. K. Welte *et al.*, *Proc. Natl. Acad. Sci. U.S.A.* **82**, 1526 (1985).
5. C.-C. Chang *et al.*, *Cancer Res.* **47**, 1634 (1987).

Erratum: In the letter "Cancinogenicity and allergenicity" by Merril Eisenbud (26 June, p. 1613), the first sentence of the second paragraph should have read, "Two metals (Ba and Bi) are reported to be neither allergenic nor carcinogenic."

Erratum: In the article "Splicing of messenger RNA precursors" by Phillip A. Sharp (13 Feb., p. 766), the results of C. Weissmann (*53*) were incorrectly described. As H. Hornig *et al.* show [*Nature (London)* **324**, 589 (1987)], a C at the branch site of a precursor RNA does not arrest splicing at the intermediate stage, while either a U or a G at this position does arrest splicing at this point.

Erratum: The caption for the map accompanying the article "Bolivia swaps debt for conservation" by John Walsh (News & Comment, 7 Aug., p. 596) does not make clear that the land indicated remains in Bolivian ownership and will be a conservation area.

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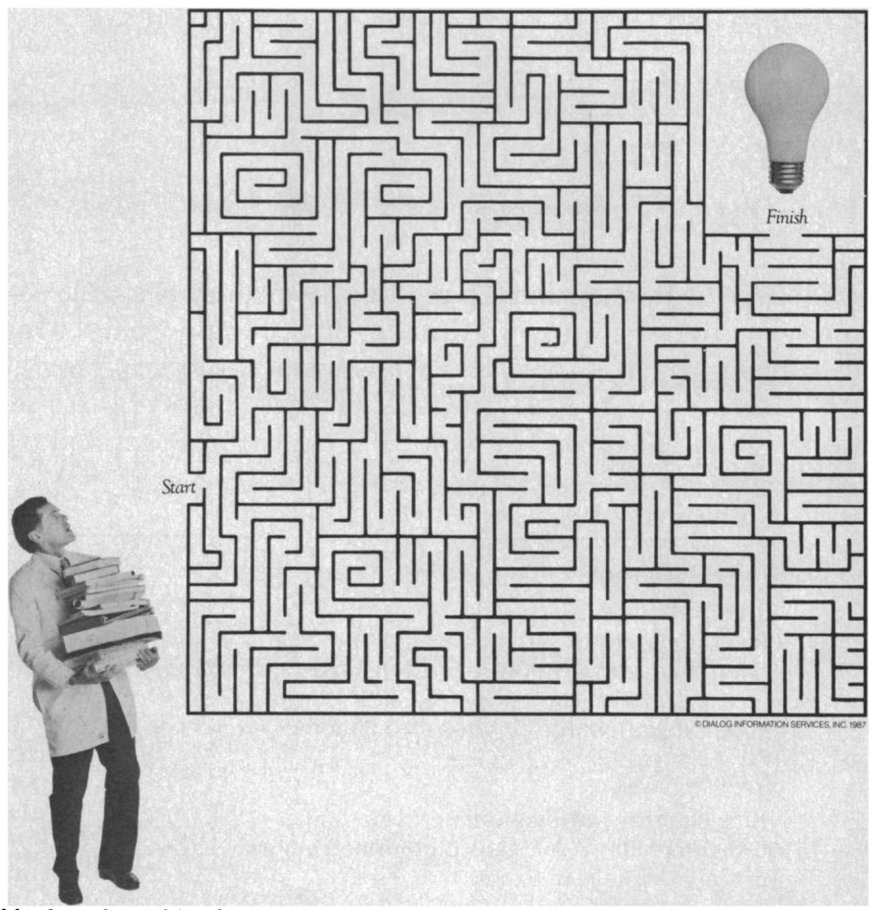

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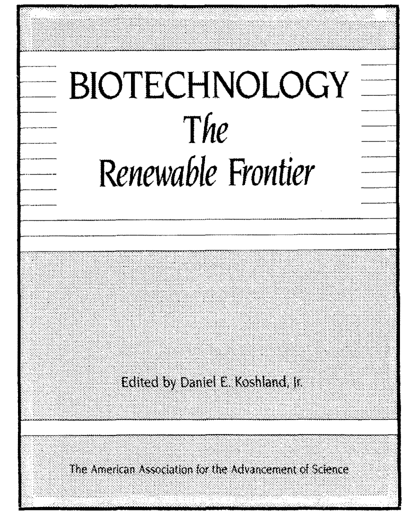

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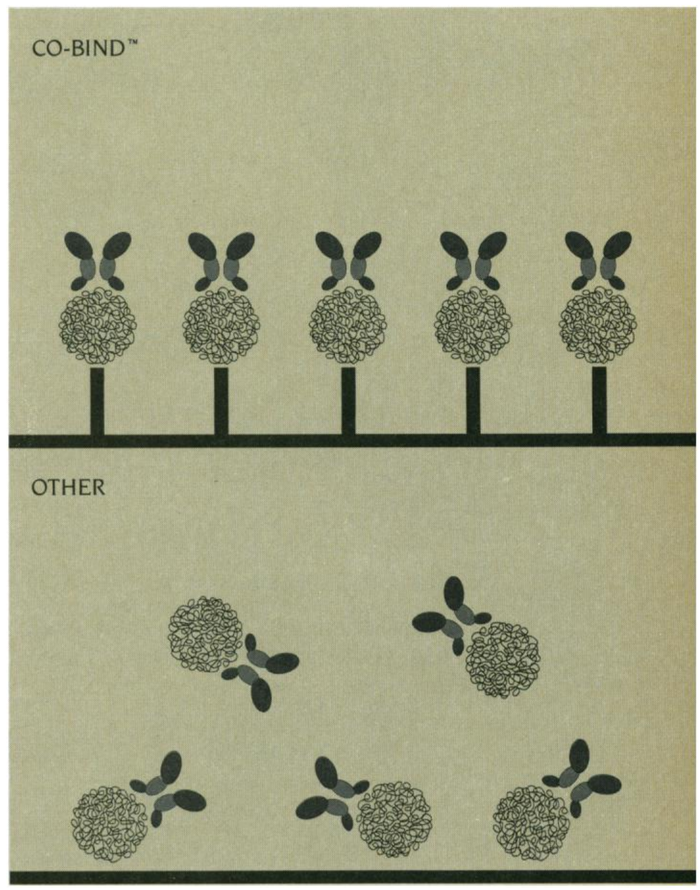

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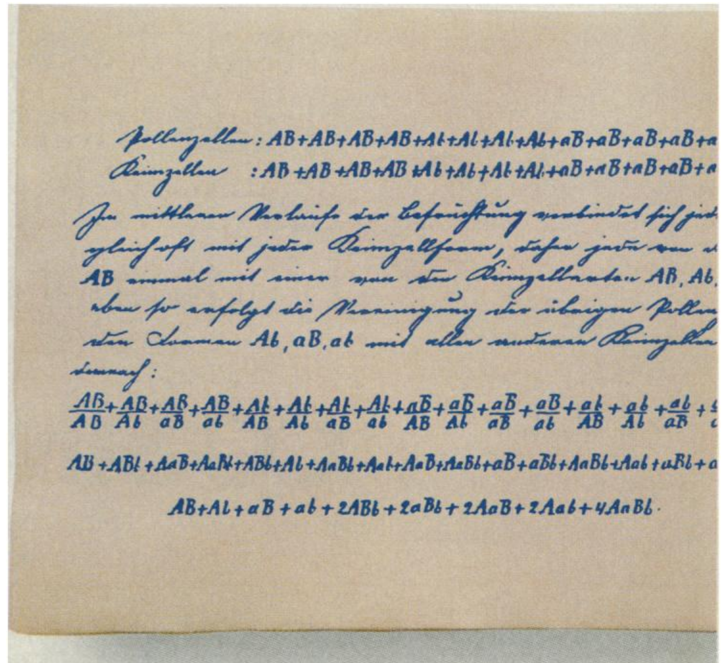
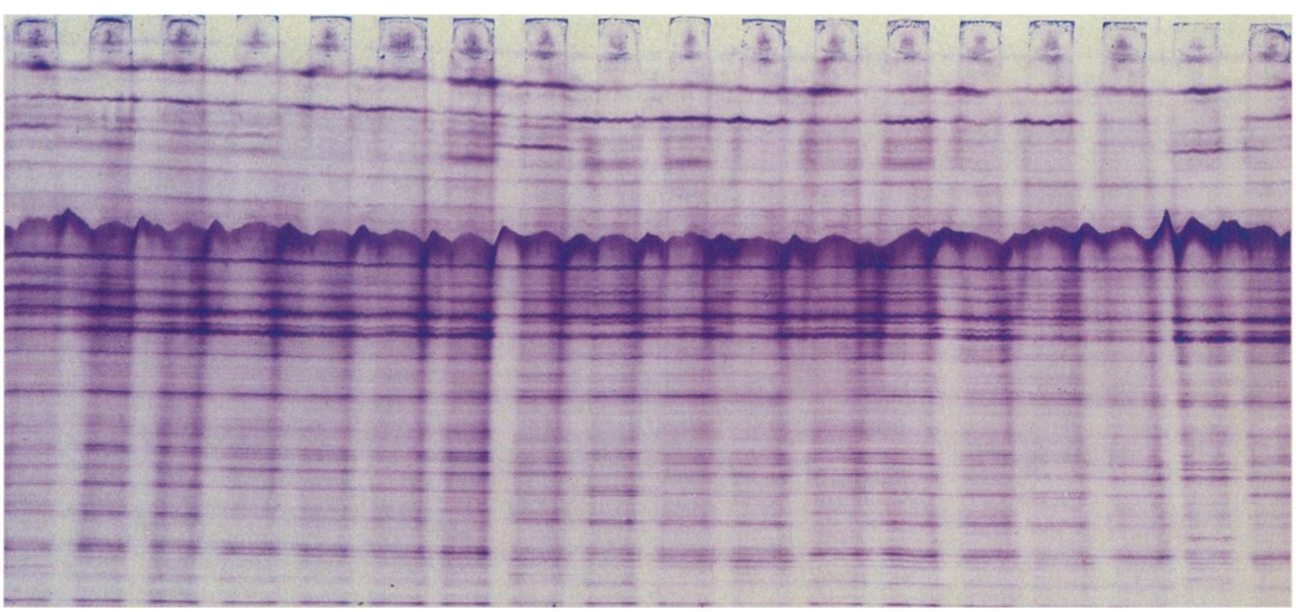


A facsimile from one of Mendel's own handwritten manuscripts, in which he sets forth the Mendelian laws.



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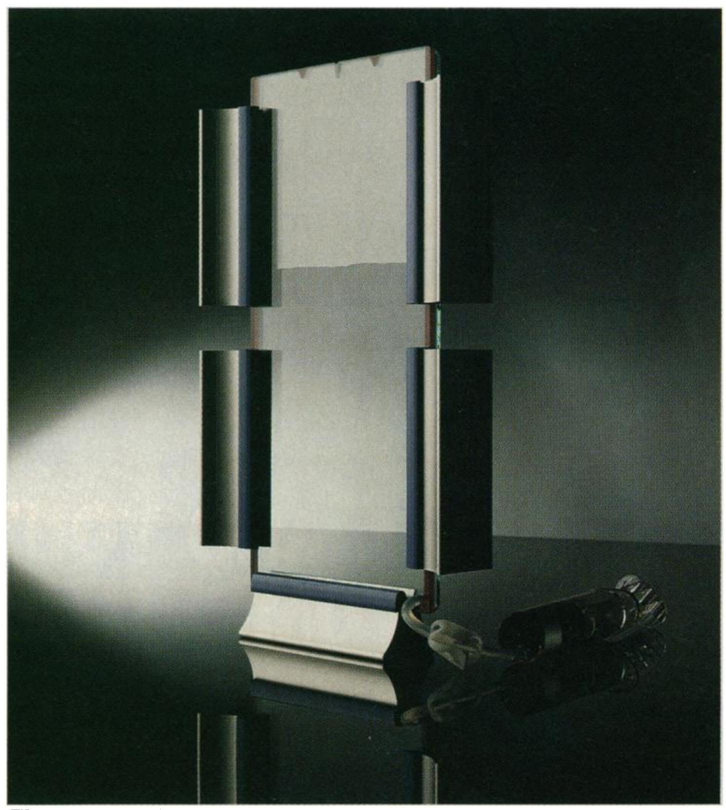

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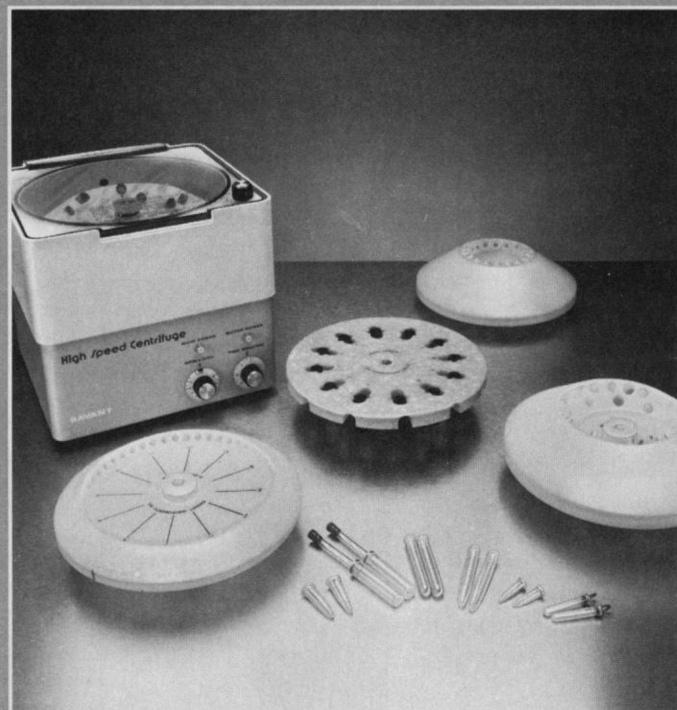

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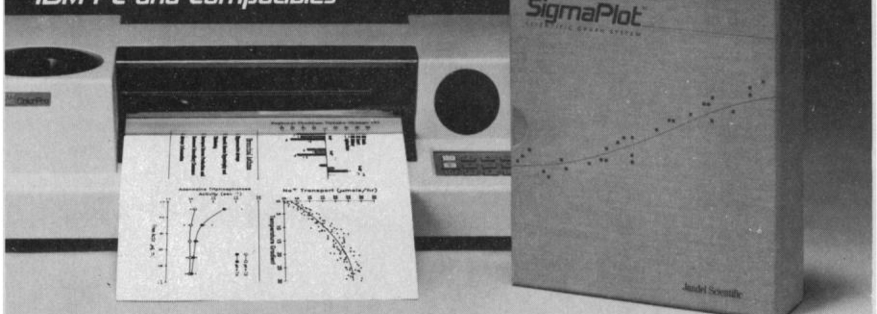

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