American Association for the Advancement of Science

# SCIENCE

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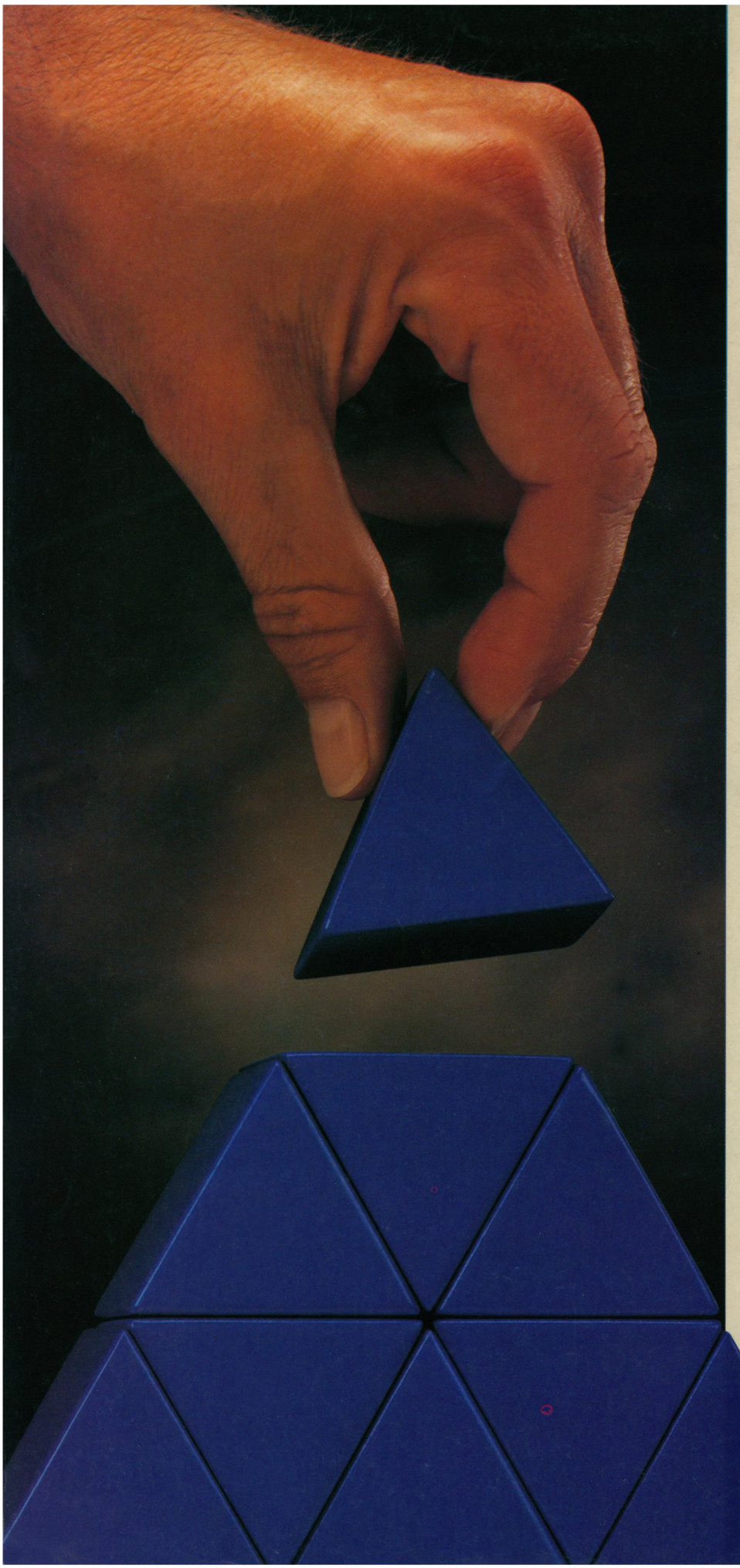

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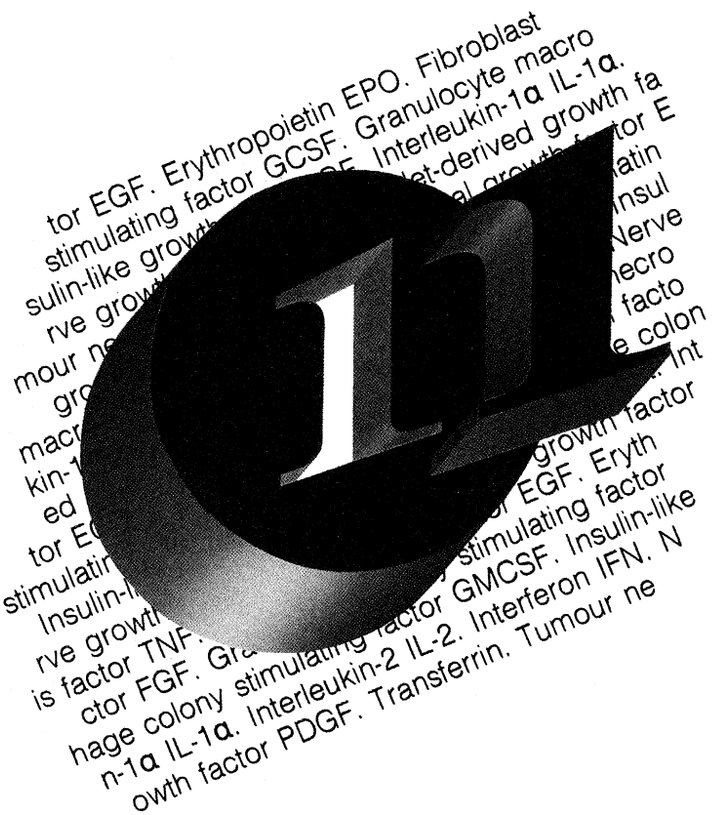
COVER In the Aleutian Islands, Alaska, sea otters (*Enhydra lutris*) prey upon benthic herbivores (mostly sea urchins), which in turn prey upon benthic seaweeds. Detritus from these seaweeds fuels production in nearshore food webs, such that organisms at islands with otters and abundant seaweeds grow faster than do those at islands dominated by herbivores. See page 170. [Photograph copyright Jeff Foott]

# First choice for growth factors

## Four new radioimmunoassay systems

| Product | Ordering code |
|---|---|
| ● **Interleukin-1β[$^{125}$I] assay system** | RPA 533 |
| ● **Tumour necrosis factor α[$^{125}$I] assay system** | RPA 532 |
| ● **Fibroblast growth factor (basic)** [$^{125}$I] **assay system** | RPA 534 |
| ● **Platelet-derived growth factor** [$^{125}$I] **assay system** | RPA 536 |




**All of these growth factor assay systems offer significant advantages over currently used bioassay techniques.**

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The antiserum provided in each of the assay systems is highly specific to the antigen being determined resulting in low cross reactivities with associated compounds.

### ● Good sensitivities and wide working ranges

| | Sensitivity | Working ranges |
|---|---|---|
| IL-1β[$^{125}$I] assay system | ~0.22 fmol/tube<br>~3.8 pg/tube | 0.3-40 fmol/tube<br>5-696 pg/tube |
| TNFα[$^{125}$I] assay system | ~0.5 fmol/tube<br>~8.5 pg/tube | 1-125 fmol/tube<br>17-2125 pg/tube |
| bFGF[$^{125}$I] assay system | ~0.88 fmol/tube<br>~14.5 pg/tube | 1.25-80 fmol/tube<br>20.6-1320 pg/tube |
| PDGF[$^{125}$I] assay system | ~0.8 fmol/tube<br>~24 pg/tube | 1.56-200 fmol/tube<br>46.8-6000 pg/tube |

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Existing bioassay techniques can take up to 72 hours to complete. These new radioimmunoassays can be run overnight.

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|---|---|
| Interleukin-2[$^{125}$I] assay system | RPA 531 |
| Interleukin-1α[$^{125}$I] assay system | RPA 528 |
| Interleukin-2, reagent pack for RIA | IM 1972 |

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## Evolution of atmospheres

THE solar system has been evolving for 4.5 billion years, and during that time chemical and physical processes have operated on a common inventory of gases to produce diverse atmospheres around the planets. The atmospheres of the outer planets (Jupiter, Saturn, Uranus, Neptune, and Pluto) were largely mysterious until recently, and in the last 15 years much has been learned from observations made with both land- and space-based instruments; in August the Voyager spacecraft will fly by Neptune and take a close-up look at that planet. Lunine discusses what is known of the molecular species that are found in the cold atmospheres of the outer planets and some of their satellites (Triton, Titan, and Charon) and what photochemical, dynamic, and chemical processes probably contributed to atmospheric evolution (page 141). In conjunction with information about the atmospheres of Earth and the other terrestrial planets, these outer planet data are contributing to the formulation of theories of solar system evolution.

## Carbonatite lava

OLDOINYO Lengai is a steep cone-shaped volcano in northern Tanzania. It has erupted explosively about ten times in the past century; there have also been a number of lava flows. The volcano has an unusual type of lava called carbonatite; carbonatite magmas are thought to originate deep (about 100 kilometers) in the mantle and to be driven by $CO_2$, which is abundant. The carbonatite magmas are unlike most silicate magmas, and it is this lava that distinguishes Oldoinyo Lengai from all of the world's other active volcanoes. Krafft and Keller were able to measure the temperatures of lava flows and active lava lakes during an eruption in June 1988 (page 168). The highest temperature recorded was 544°C at one of the lakes; this temperature is several hundred degrees cooler than the coolest silicate lavas. Chemically the lava was rich in $Na_2O$ and $CO_2$; it was almost completely free of water. Details of the physical and chemical features of the carbonatite lava are providing insights into its crystallization history and into the melting conditions in the earth's mantle that produced this unusual material.

## Kelp and carbon

KELP forests in the ocean along the Aleutian Islands are major suppliers of organic carbon to local ecosystems (page 170). Situations that reduce the productivity of kelps—oil spills, the presence of grazing sea urchins, catastrophic storms, and El Niño events—can, as a result, have ramifications throughout the kelp-based food web. Kelp abundances at different Aleutian Islands differ by orders of magnitude depending on whether there is a local sea otter population (cover), because the otters feed on sea urchins that otherwise devour the kelp forests. Duggins *et al.* traced natural carbon that had been fixed by the kelps (it has and retains a carbon isotope signature different from that of carbon fixed by phytoplankton) in detritivores (crabs and amphipods), suspension feeders (mussels and barnacles), and later into their predators (fishes, cormorants, and sea stars). Suspension feeders grew faster where kelps flourished. Nearshore consumers obtained, on average, more than half their organic carbon from kelps at kelp-rich islands; even at islands where sea urchins were abundant, about a third of the carbon was kelp-derived. Kelp forests provide habitats for diverse marine organisms and affect the hydrodynamic environment of the coast. They grow widely and appear to play a more major role in nearshore ecosystems than was previously realized.

## Fragment transfers

A technique has been added to the small but growing list of methods for inserting foreign DNA into cells (page 175). The procedures of Richa and Lo work with very large pieces of DNA—10 megabases or more—and do not require cloning; other transfer techniques are typically effective only for fewer than 100 kilobases. Fragments of human chromosomes were dissected and injected directly into the nuclear region of fertilized mouse eggs. The transferred fragments had distinctive repeating human DNA sequences, so the human DNA could be followed as, first in culture and then in a surrogate mother, the egg matured into an embryo and then into a mouse. Although each fertilized egg received only one chromosome fragment, that fragment was replicated and showed up in hundreds to thousands of cells in the embryos and eventually in the baby mouse. This technology should facilitate the production of mouse models of human genetic diseases for which the portion of the chromosome that is associated with the disease is known.

## Blocking blood vessel blockage

BLOOD vessels that have been injured through disease, surgery, or balloon catheterization (a clinical procedure for opening occluded vessels) may become blocked as a consequence of excessive cell proliferation. Vessel narrowing under these circumstances has been shown by Powell *et al.* to be linked to actions of the local angiotensin system, because the response can be inhibited with the drug cilazapril that blocks the angiotensin-converting enzyme (page 186). In rats, cilazapril prevented narrowing of blood vessels that had been traumatized experimentally by balloon catheterization. The results raise the possibility that cilazapril, perhaps in conjunction with heparin which has a milder suppressive effect on proliferation, might help clinically to repair vascular injuries. While a low level of smooth muscle cell proliferation in the vessels during development and during minor repair is a part of normal physiology, the high levels of proliferation that accompany arteriosclerosis are pathologic.

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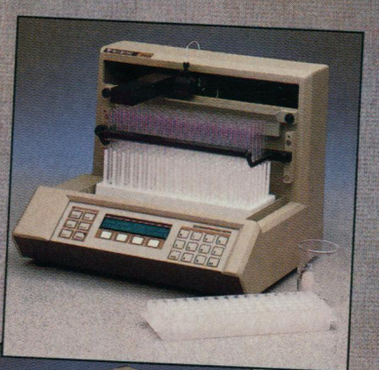
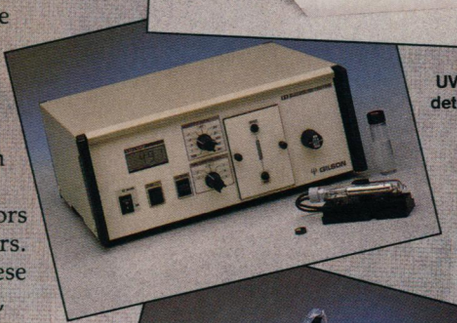
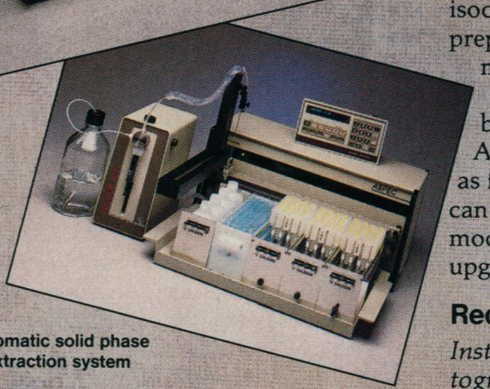


Multi-mode fraction collector



UV/VIS detector



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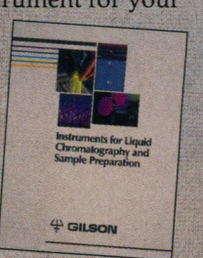


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# Communism, Capitalism, and Dissent

The recent confrontation between the reformers and the authorities in China was presaged by a controversial reform movement in the scientific community. The conventional wisdom from newspaper headlines is that communism is a failed system and that reforms to introduce capitalism in China are needed to mitigate that failure. If so, is it coincidental, irrelevant, or inevitable that science is involved?

The answer to that question may require another approach—to view the confrontation more as one between democratic urges and authoritarianism, a confrontation in which science has played and will play a major role. The pure capitalism, proposed by Adam Smith, does not exist in the world today any more than does pure communism. Almost every "capitalistic" state has enormous overlays of socialism, because the people in these countries are unwilling to accept the harshness and inhuman sacrifice that are part and parcel of pure capitalism. Programs of the current welfare state, manifest to greater or lesser degree in all the successful "capitalistic" nations, have pushed those nations along the path that the socialists advocated in a bygone era. Communism, on the other hand, had the phrase, "dictatorship of the proletariat," to justify an authoritarian regime. That, it might be hypothesized, was a fatal flaw. For perhaps if communism had added some democratic initiatives, the leavening effect of free expression would have gradually modified communism to introduce capitalistic principles just as capitalism adopted many socialistic ones.

Dictatorships, like limited wars, have a way of escalating. Each new dissent, a little more violent than the previous one, pushes the dictators toward more repression. That repression works in two directions: it prevents the people from getting the information they need to work efficiently, and it cuts off feedback to the authorities to allow them to modify poor programs. Science is particularly sensitive to such information blockage. It is an endeavor that requires individuality, challenges to authority, and a minimum of centralized direction. The absence of those characteristics has a chilling effect on innovation as the quality of science emerging from the Soviet Union and China testify. A dictatorship can put up with poor science if it can depend on espionage and imitation to produce modern goods. But the standard of living in a dictatorship will consistently lag behind that of the democratic countries, that benefit from the corrective action of dissent. The old dictators of the Soviet Union, and perhaps the current ones in China, assumed that this deficiency could be handled with strict censorship and the minimizing of foreign contacts. However, science and technology have begun to remove that option. The radio and computer have been followed by satellites, fax machines, and jet travel. The dreaded comparisons with democratic standards of living keep leaking through despite barbed wire, walls, and isolationism.

Gorbachev seems to have recognized the relation between political and economic reform and is trying to introduce some democratic overlays and some capitalism. China's current leaders seem to think they can introduce capitalism without democratic initiatives. It seems unlikely that any modern nation can exist forever half-slave and half-free. The pressure on dictatorships to embrace democratic reforms will inevitably come from the longing of the human soul for freedom, but that pressure is increased by scientific advances that make it more difficult to control communications with outsiders and provide evidence that inventiveness improves the standard of living.

There is little doubt that some of the present difficulties of communistic regimes lie in the pragmatic deficiencies of communism, but democracy has imperfections too. Furthermore, it is not simple for democracies in impoverished countries to produce the discipline needed to divert current income to capital investments for the benefit of future generations. Nevertheless, the danger of the "benevolent dictatorship," whether in the guise of one man, the proletariat, or an oligarchy, has been revealed by experience. Once those in power convince themselves that they know better than the masses, a self-defeating cycle of repression, misinformation, and corruption is initiated.

Like a chemical system approaching equilibrium, it may be that the welfare state is a thermodynamically stable system that can be achieved by introducing either socialism into capitalism or capitalism into socialism. The essential ingredient for progress is democracy, and modern science and technology make it more and more difficult to prevent that progress to a higher standard of living and a fairer society.—DANIEL E. KOSHLAND, JR.

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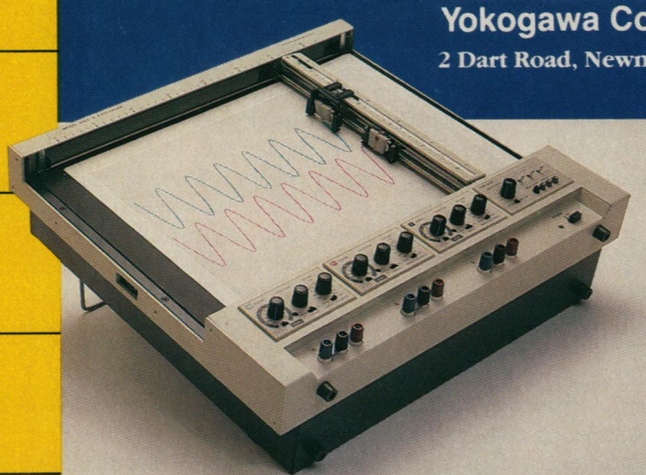

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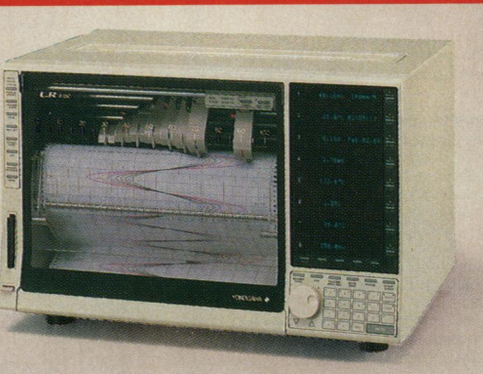

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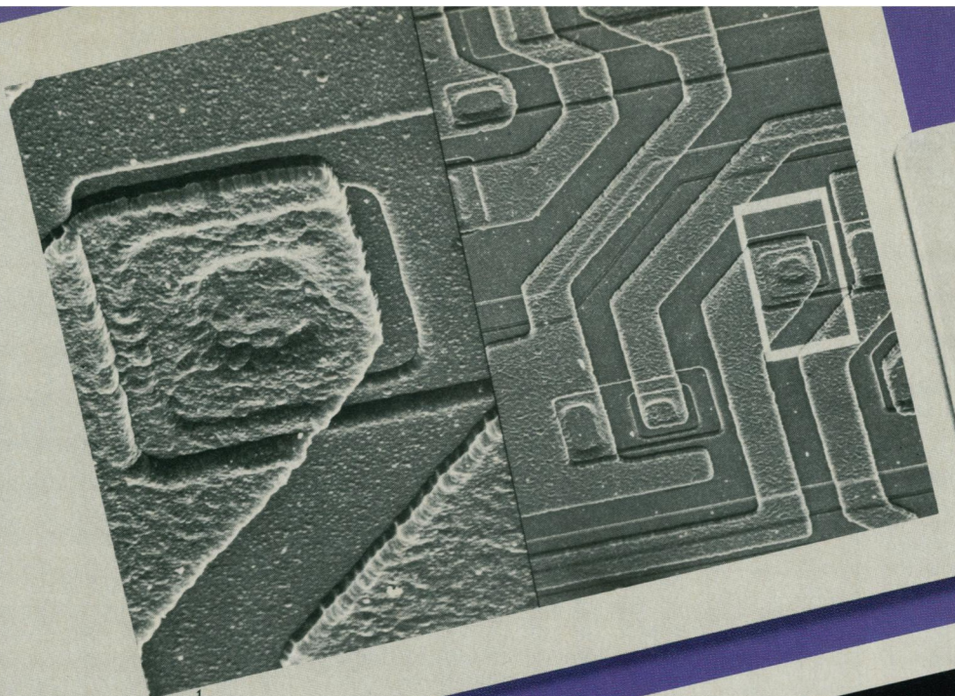

Fig. 1


Fig. 2

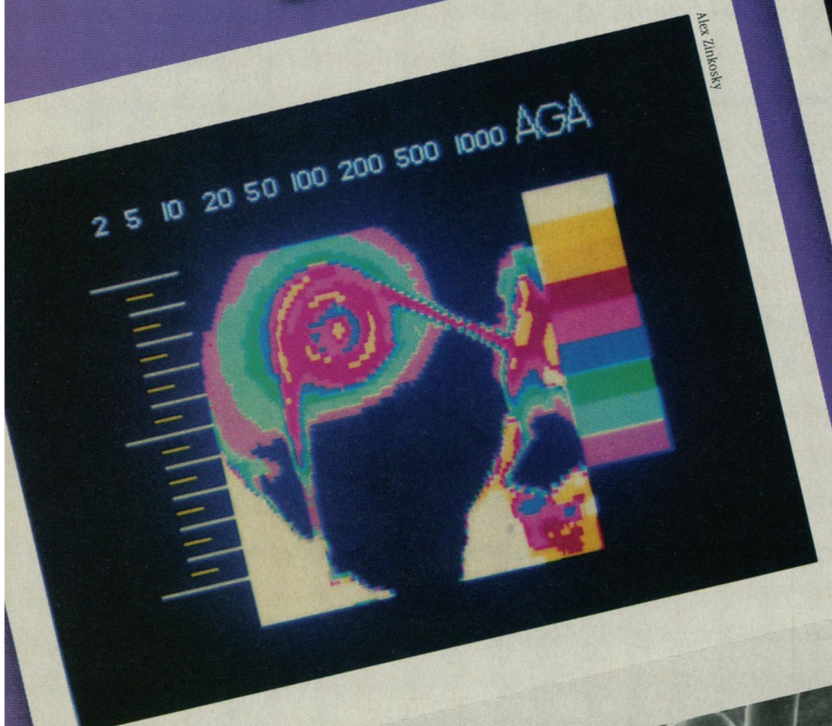


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Fig. 3

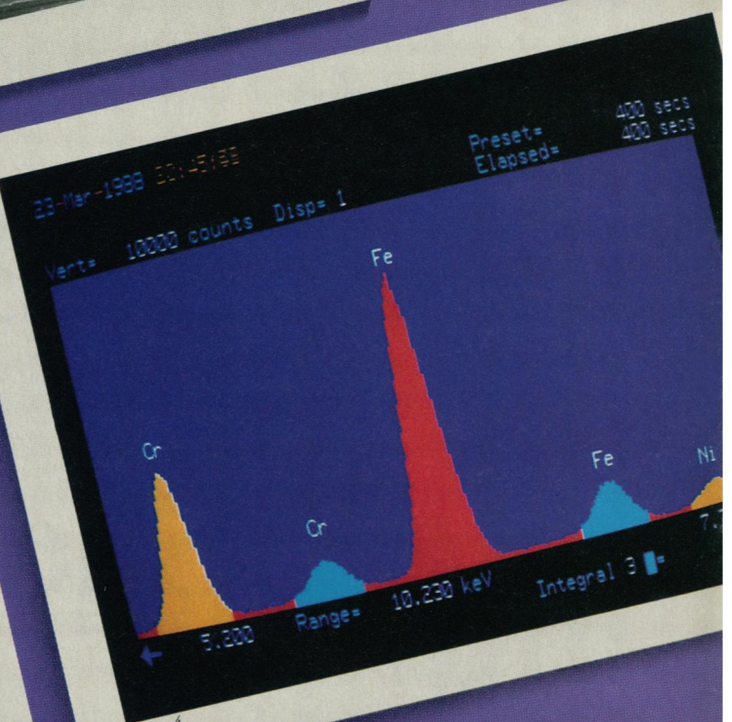


Fig. 4

Fig. 5

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The longevity test of an alternator operating in excessive heat (Fig. 3) was taken from a thermography system using the Polaroid FreezeFrame Video Image Recorder and color AutoFilm Type 339.

An x-ray spectrum to determine the composition of a stainless steel specimen (Fig. 4) was taken from an energy dispersive analyzer using the Polaroid DS-34 Direct Screen Camera and Polacolor ER Type 669 film.

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This S.E.M. image of a heart valve, magnified 18× (Fig. 5), is on Type 55 instant film. This black and white sheet film provides both a positive and negative to make high quality, professional images.

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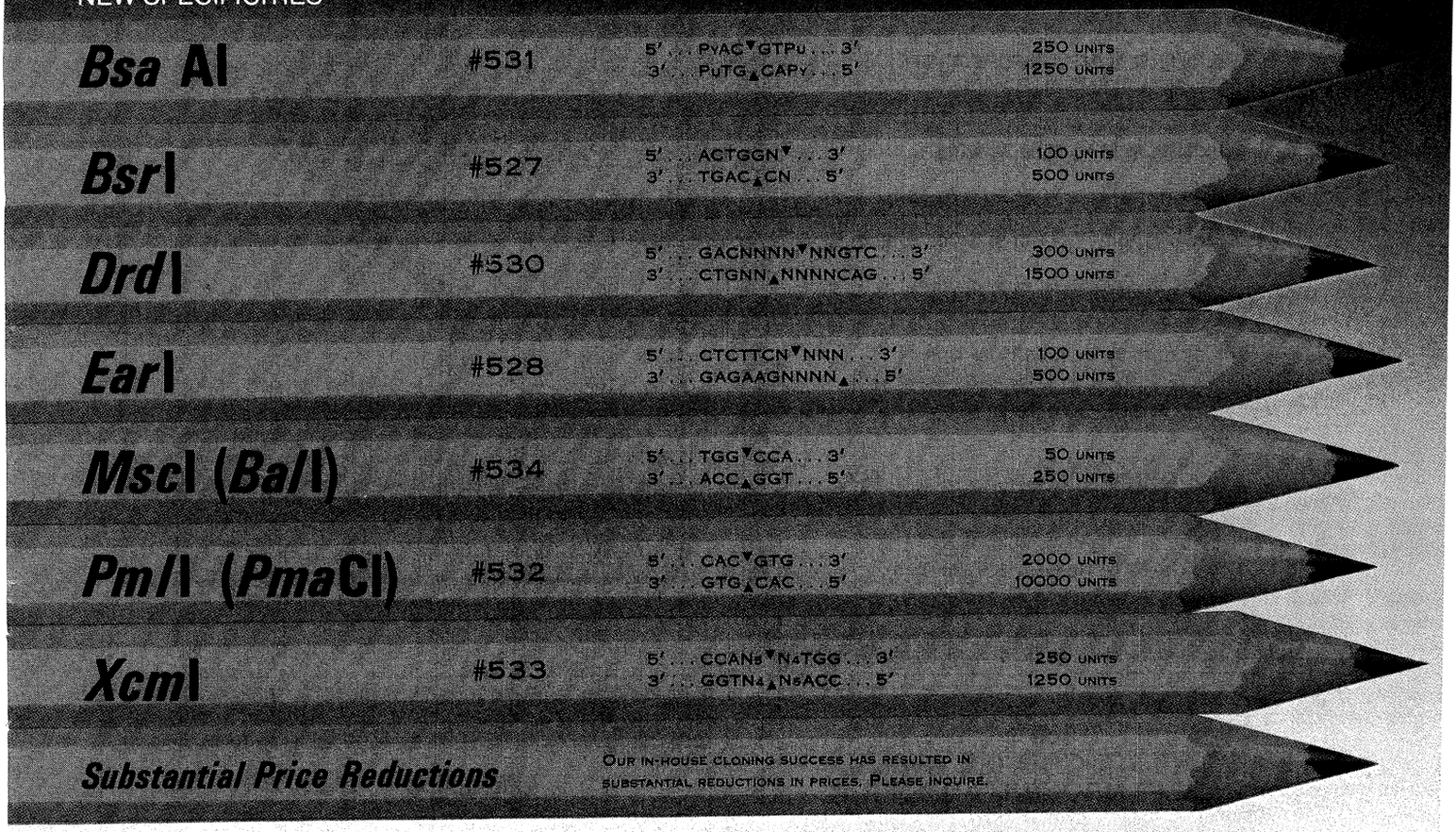


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# HUMAN GENOME I

## An International Conference On The Human Genome
## 1st Annual Meeting – October 2-4, 1989
## Town & Country Hotel
## San Diego, CA

*Co-Chairman:*
Daniel E. Koshland, Jr., Ph.D.
Editor of Science

*Co-Chairman:*
Charles R. Cantor, Ph.D.
Director of Human Genome Center
Lawrence Berkeley Laboratory

## PROGRAM

**KEYNOTE ADDRESSES**

Opening Welcome:
Richard Atkinson, President, American Association for the Advancement of Science.
Role of the Meeting:
Charles Cantor, Director, Human Genome Center, Lawrence Berkeley Laboratory.

**CURRENT STATUS OF THE GENOME PROJECT**

THE GENETIC MAP: Raymond White, Howard Hughes Medical Institute, University of Utah.
RESTRICTION MAPS: Cassandra Smith, University of California, Berkeley.
CLONING: Ronald Davis, Stanford University School of Medicine.
ORDERED LIBRARIES: Sydney Brenner, MRC Molecular Genetics Unit, Cambridge, England.
APPLICATIONS: Thomas Caskey, Howard Hughes Medical Institute, Baylor College of Medicine.
SOCIETAL IMPLICATIONS: Daniel Koshland, University of California, Berkeley.

**TECHNIQUE INNOVATIONS**

PCR OF SINGLE SPERM: Norman Arnheim, Ahmanson Center for Biological Research, University of Southern California.
SEQUENCING METHODS: George Church, Harvard Medical School.
DNA CLEAVAGE: Peter Dervan, California Institute of Technology.
RADIATION HYBRIDS: David Cox, University of California, San Francisco.
IN SITU HIBRIDIZATION: Jeanne Lawrence, University of Massachusetts Medical Center.
RAPID MAPPING: Glen Evans, Salk Institute.

**INTERESTING REGIONS**

CYSTIC FIBROSIS: Francis Collins, Howard Hughes Medical Institute, University of Michigan Medical Center.
TELOMERES: Robert Moyzis, Los Alamos National Laboratory.
IMMUNOGLOBULINS: Tasuku Honjo, Kyoto University Faculty of Medicine.
IMMUNOGLOBULINS: Hans Zachau, Institute for Physiological Chemistry, University of Munich.
T-CELL RECEPTORS: Leroy Hood, NSF Science and Technology Center for Biotechnology, California Institute of Technology.
FRAGILE X: Jean-Louis Mandel, Institut de Chimie Biologique, Strasbourg.

**APPLICATIONS**

HUMAN EVOLUTION: Allen Wilson, University of California, Berkeley.
MULTIGENE DISEASES: Eric Lander, Whitehead Institute for Biomedical Research, Cambridge, Massachusetts.
HUMAN DIVERSITY: Jean Dausset, Human Polymorphism Study Center (CEPH).
SEX DETERMINATION: David Page, Whitehead Institute for Biomedical Research.
UNSTABLE SEQUENCES: Michio Oishi, University of Tokyo.
INTERPRETING SEQUENCE: Russell Doolittle, University of California, San Diego.

**ORGANIZATION – DIFFERENT VIEWS OF CURRENT AND FUTURE SCIENCE AND PROCEDURES**

HUGO: Victor McKusick, Johns Hopkins University School of Medicine; President, The Human Genome Organisation (HUGO).
NIH: James Watson, Cold Spring Harbor Laboratory; NIH Human Genome Project.
DOE: Charles Cantor, Human Genome Center, Lawrence Berkeley Laboratory.
EEC: Peter Pearson, Johns Hopkins University School of Medicine.
JAPAN: Nobuyoshi Shimizu, Keio University School of Medicine.
INFOMATICS: David Lipman, National Library of Medicine.
OVERVIEW: Renato Dulbecco, Salk Institute.

**POSTER SESSIONS AND EXHIBITS**

Registrants of the meeting may submit abstracts for poster sessions by requesting abstract forms on the registration tear off below. Exhibits will be open to all attendees and interested researchers Monday, Tuesday and Wednesday.

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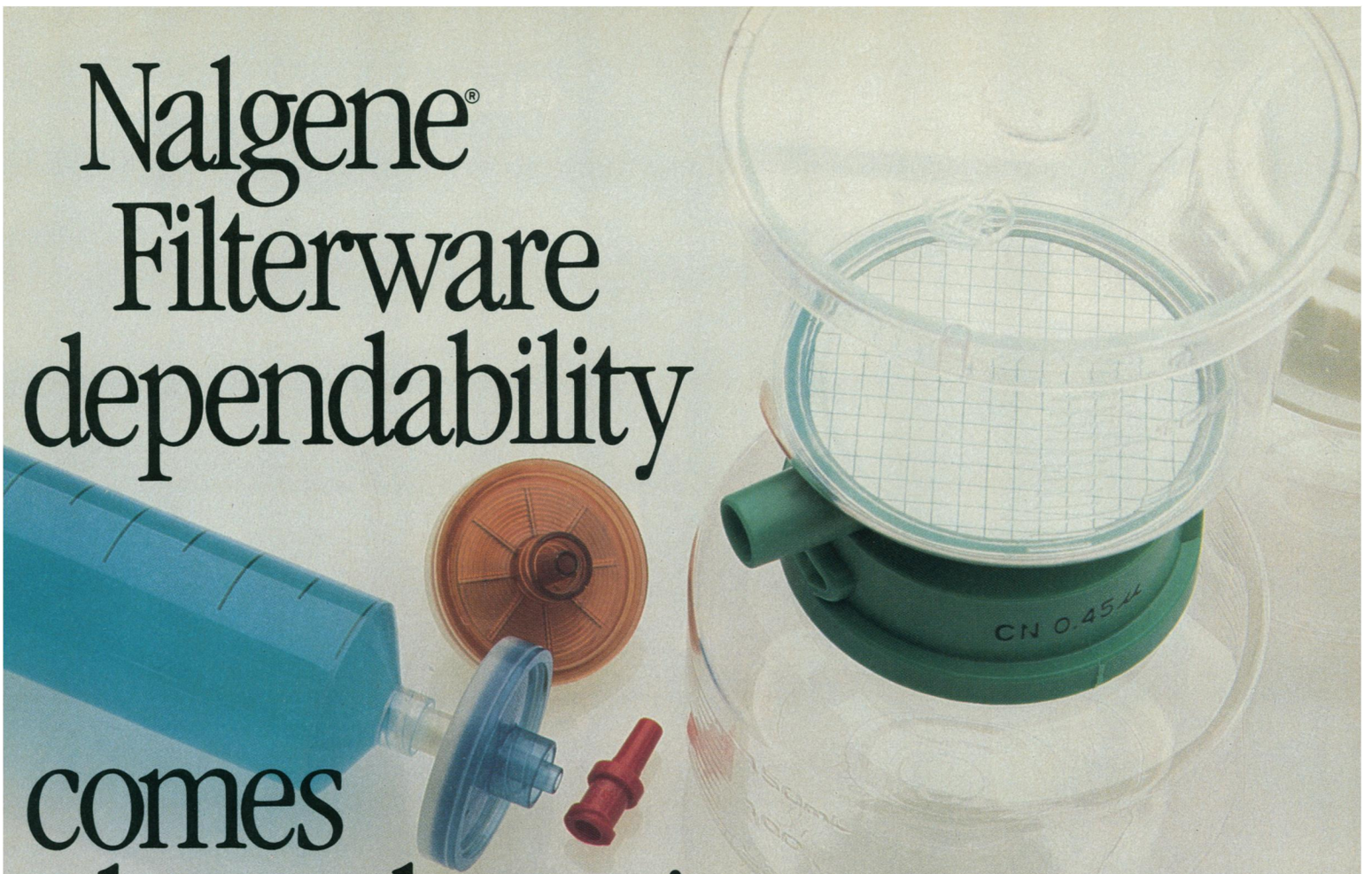


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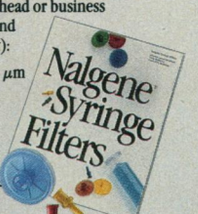


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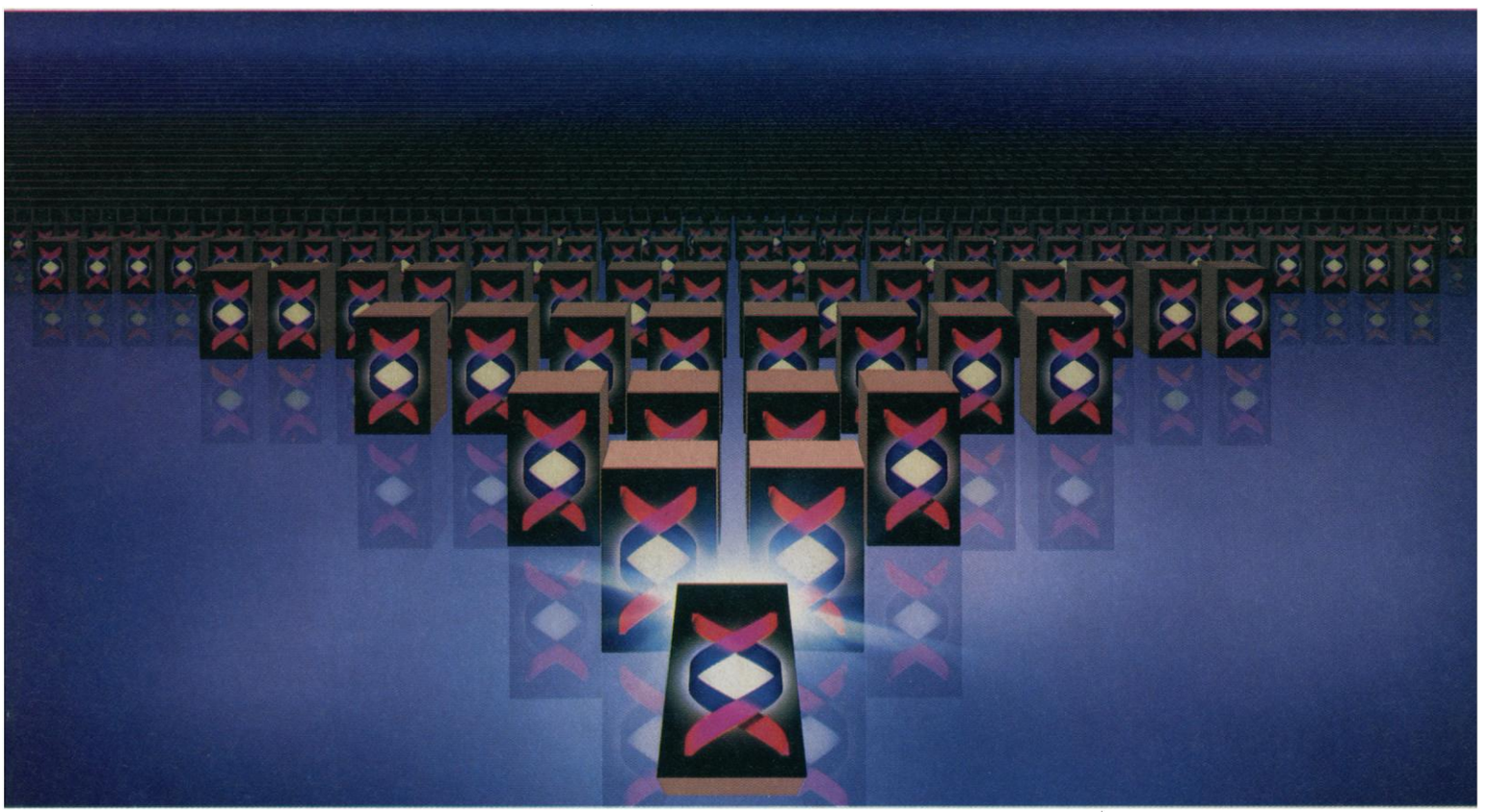

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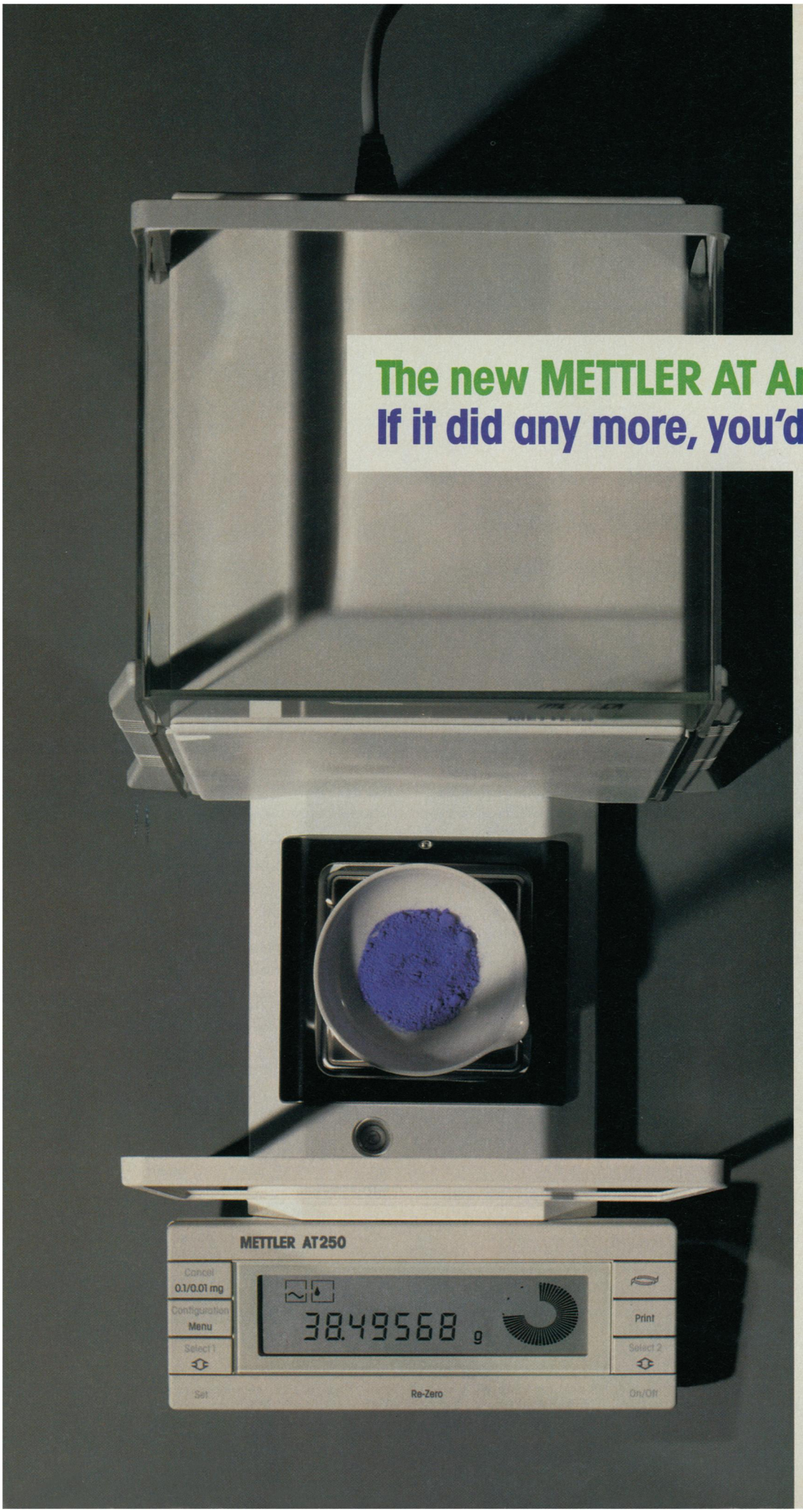


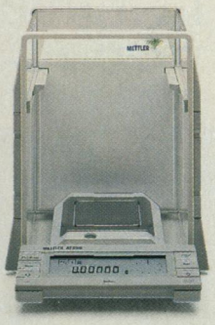

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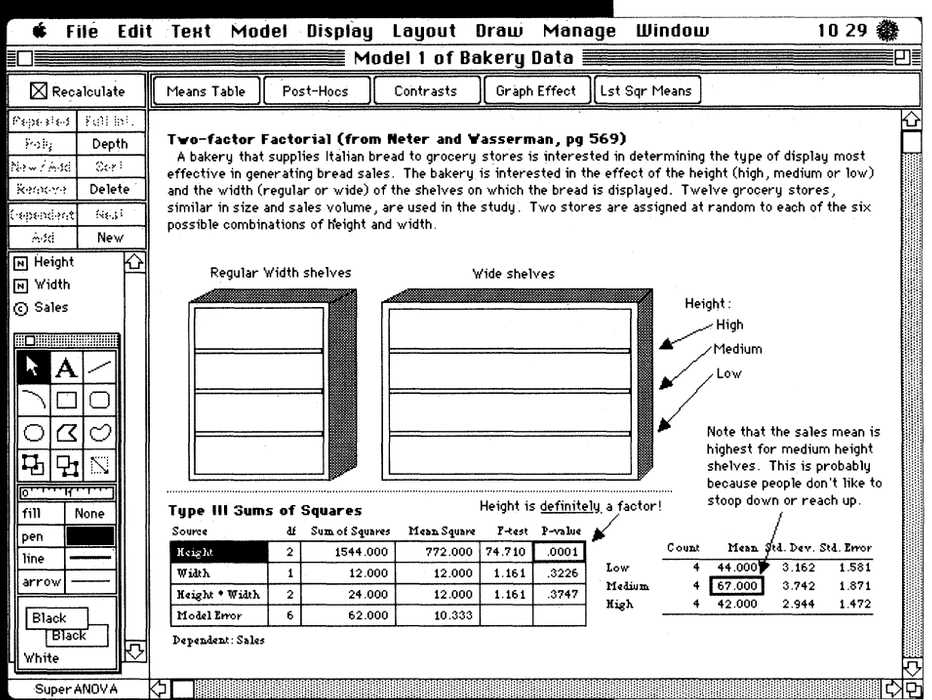


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## Entry information

The first group of awards will be presented at a special ceremony in March 1990. Articles and programs appearing during 1989 are eligible. Entries must be about cancer, cancer research, or cancer therapy; they must have appeared in a national or local mass-communication medium oriented to a lay, non-technical audience, and they must be submitted in English or accompanied by an English translation.

Complete entry requirements are contained in the awards brochure and official submission form which will be available in September 1989. For copies, write to:

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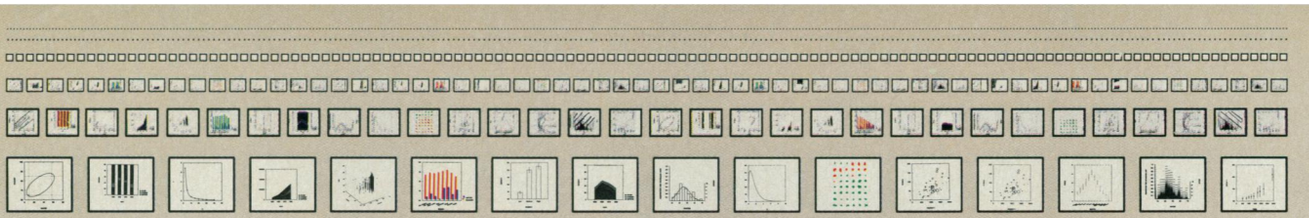

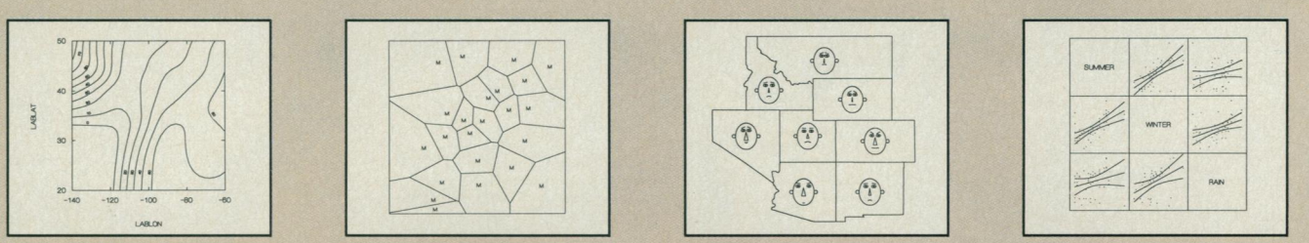


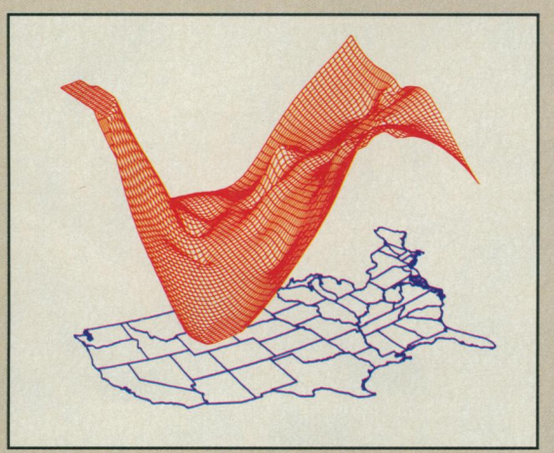

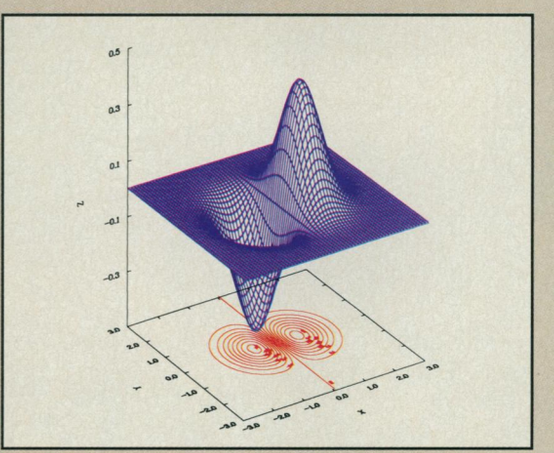


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