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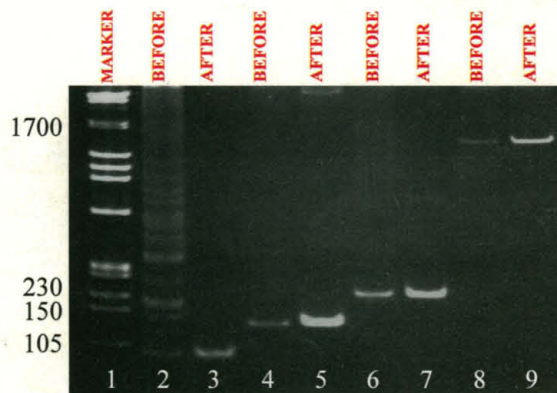
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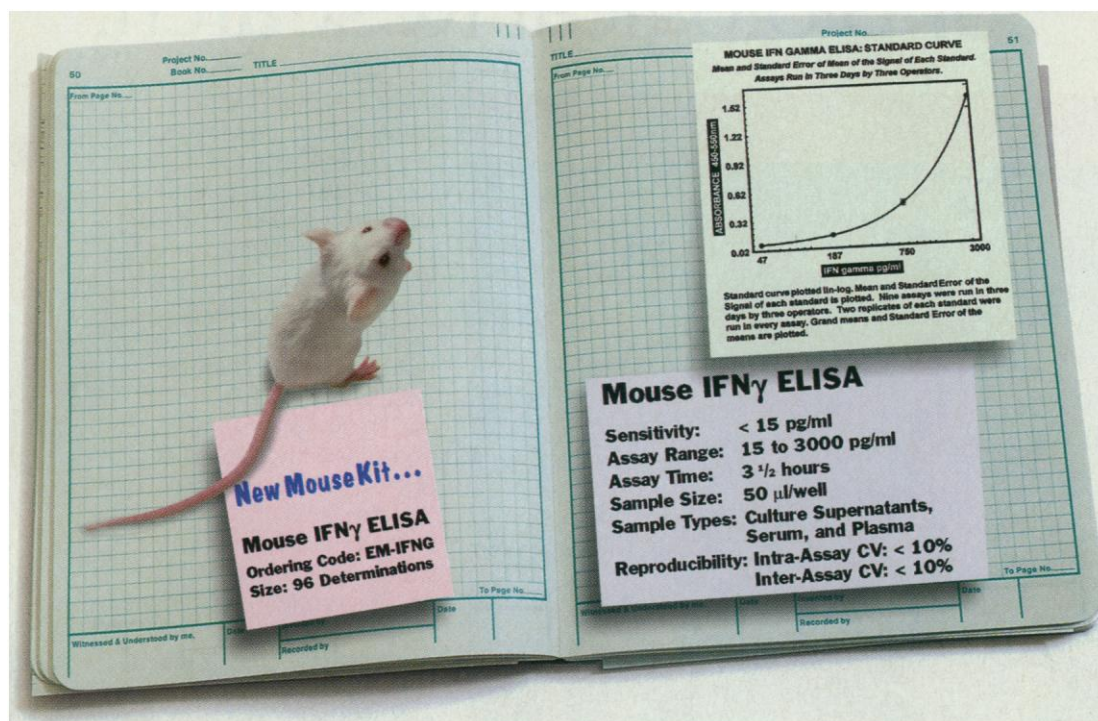
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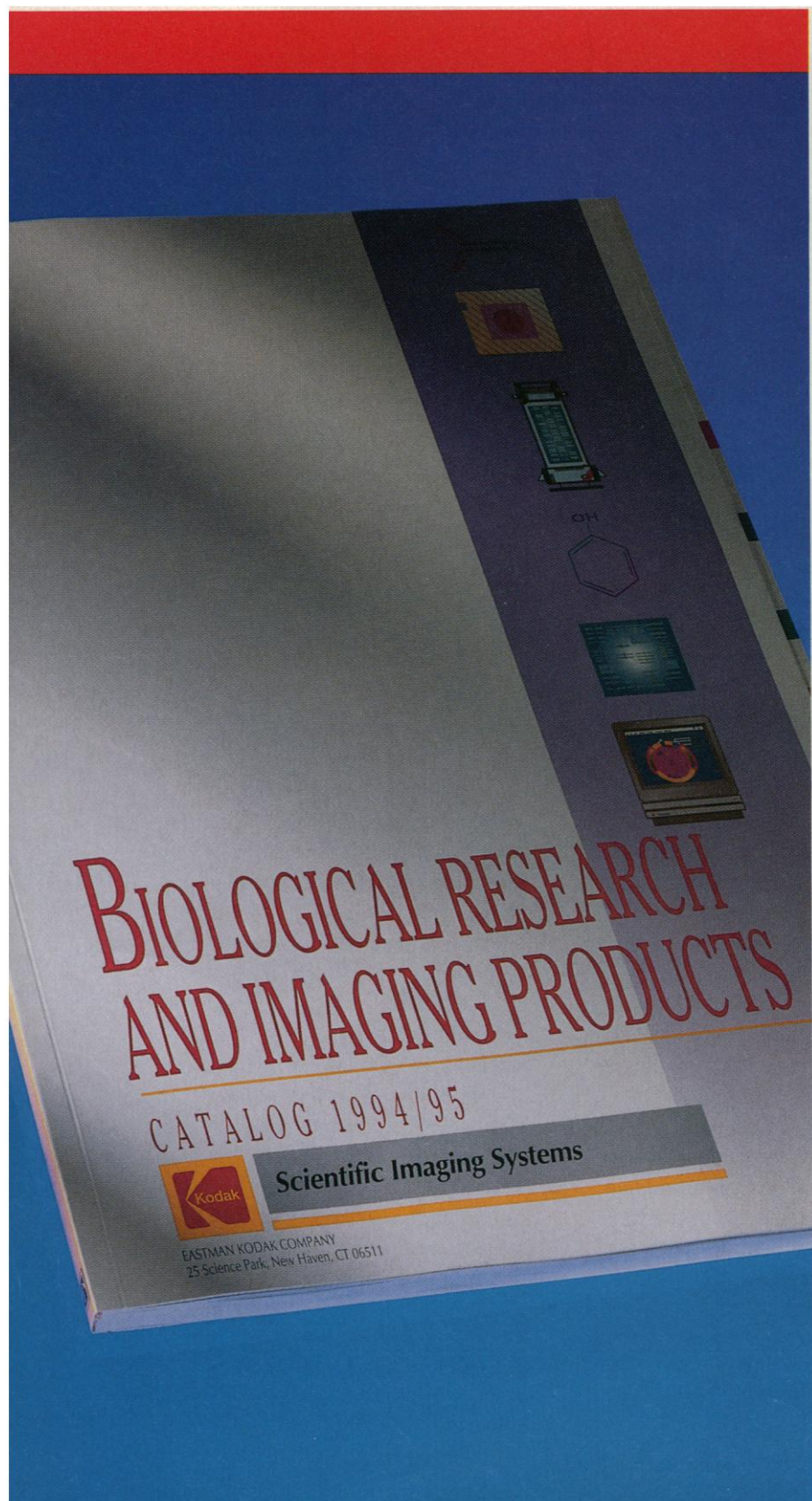
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speaks on science

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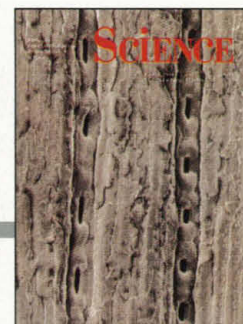
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Scanning electron micrograph of stomatal rows from a modern limber pine needle (image width is ~1 mm). The density of stomata (pores that permit a plant to exchange gases with the atmosphere) of needles from fossil pack rat middens decreased 17% during the last

deglaciation, concomitant with a 30% increase in atmospheric CO₂. See page 239. [Micrograph: Peter K. Van de Water, Department of Geosciences, and David Bentley, Division of Biotechnology, Arizona Technology Laboratory, University of Arizona, Tucson]



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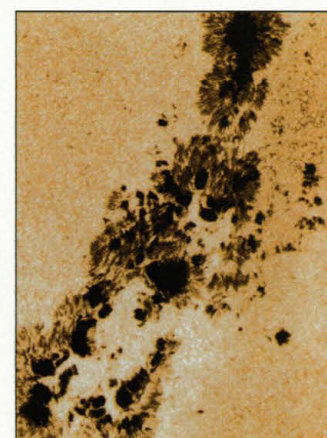
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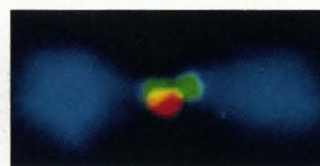
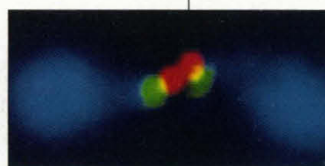
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Decisions, decisions

Perceptual judgments, such as deciding the direction of motion of an object, require processing of neuronal signals within the cerebral cortex. Salzman and Newsome (p. 231) explored how this processing takes place by recording from and stimulating neurons in the visual cortex of rhesus monkeys while the monkeys performed a motion discrimination task. The monkeys' performance was best described as being governed by a "winner-take-all" decision-making mechanism that favored one stimulus or the other, rather than by a vector averaging of the two signals, a mechanism used in other parts of the brain.

■

Enhancer coupling

Although two *rel*-related molecules, dorsal and nuclear factor κ B (NF- κ B), regulate two diverse processes, dorsal-ventral patterning in *Drosophila* and hematopoiesis in mammals, the signaling pathway that these transcription factors participate in appears conserved. González-Crespo and Levine (p. 255) show that this conservation extends into the nucleus to the enhancers to which these factors bind. When coupled to a reporter gene, a target enhancer of NF- κ B, the κ immunoglobulin light chain enhancer, can generate stripes in the *Drosophila* embryo in a pattern similar to that generated by the *rhomboid* enhancer. Thus, conserved enhancers can couple similar signaling pathways to diverse genes.

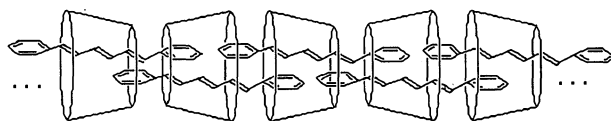
■

Myc pockets

The Myc protein is a key transcription factor that is aberrantly expressed in many cancers. Gu

Hooking cyclodextrins into nanotubes

One approach for making nanotubes is to string cyclodextrins (CDs), which are cyclic polysaccharides, along a polymer chain. Li and McGown (p. 249) now show that rigid nanotube aggregates can be formed from larger CDs by sonicating aqueous solutions of



these molecules with rigid diphenylhexatriene (DPH) molecules. A variety of characterization methods suggests that the average nanotube contains 20 β -CDs or 30 γ -CDs linked by DPH molecules, which potentially could act as "molecular wires."

et al. (p. 251) show that Myc associates in vivo with p107, a protein related to the tumor suppressor Rb. This interaction, involving the transactivation domain of Myc and the pocket domain of p107, results in suppression of Myc's transactivation function. Mutant forms of Myc from Burkitt lymphoma cells are not functionally suppressed by p107, although they still bind to it. Disruption of a regulatory interaction between Myc and p107 may be important in tumorigenesis.

■

Climate proxies

Valley glaciers, which occur in many continents and climate belts, are sensitive records of climate change and can be used to establish an independent estimate of global climate change provided that their dynamics are understood. Oerlemans (p. 243) shows that the record of retreat (that is, changes in glacial length) of many valley glaciers is coherent globally after accounting for variations in glacial geometry and climate sensitivity. The mean rate of retreat is consistent with a global warming of 0.66 kelvin during the past 100 years.

The sun's luminosity is not

exactly constant but changes during the 11-year magnetic cycle as well as on longer time scales, which raises the question of whether some part of global climate change might be attributable to variations in solar output. By looking at more than a century's worth of solar data from the Royal Greenwich Observatory, Foukal (p. 238) concludes that luminosity variations large enough to have a significant effect on the Earth's climate during the past few millennia can be ruled out because the concomitant changes in magnetic activity would have shown up in the carbon-14 and beryllium-10 records.

The morphology of stomata of leaves of many plants change systematically with atmospheric carbon dioxide (CO_2) concentrations. The large numbers of accurately dated fossils needed to use such a record can be obtained from pine needles preserved in pack rat middens. Van de Water *et al.* (p. 239; see cover) measured stomatal densities and carbon-13/carbon-12 ratios from 41 middens from the western United States with dates from about 30,000 years ago. The data imply that CO_2 concentrations increased abruptly by about 30 percent 15,000 years ago, in accord with the ice core

record, and that water use efficiency in pine increased by about 15 percent.

■

Not by peptides alone

Human $\gamma\delta$ T cells respond to antigens from mycobacteria, but the nature of these antigens has been difficult to determine. Constant *et al.* (p. 267) isolated four structurally related ligands from a *Mycobacteria tuberculosis* strain that stimulated the proliferation of a subset of human $\gamma\delta$ T cells. Nuclear magnetic resonance and mass spectroscopy revealed that one of these antigens, TUBag4, contains a 5' triphosphorylated thymidine group. The stimulatory pathway for these nonpeptide antigens is still unclear but may eventually provide insight into autoimmune diseases involving $\gamma\delta$ T cells.

■

Taking the lead

It has been generally thought that centromeres proceed first when chromosomes move. Chikashige *et al.* (p. 270) studied premeiotic chromosome movement in fission yeast. Telomeres proceed first in premeiotic chromosome movement until chromosome segregation, at which point the centromeres lead like they do in mitosis. The function of this initial telomere movement is unknown but may facilitate homologous pairing.

■

Hot or not so hot?

Recent high-pressure experiments have yielded drastically different melting temperatures for MgSiO_3 perovskite, the major phase in the lower mantle. Heinz *et al.* (p. 279) and Boehler and Zerr (p. 280) discuss some of the differences in the results.

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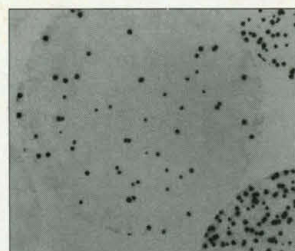
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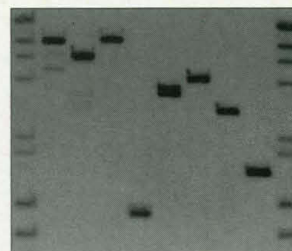
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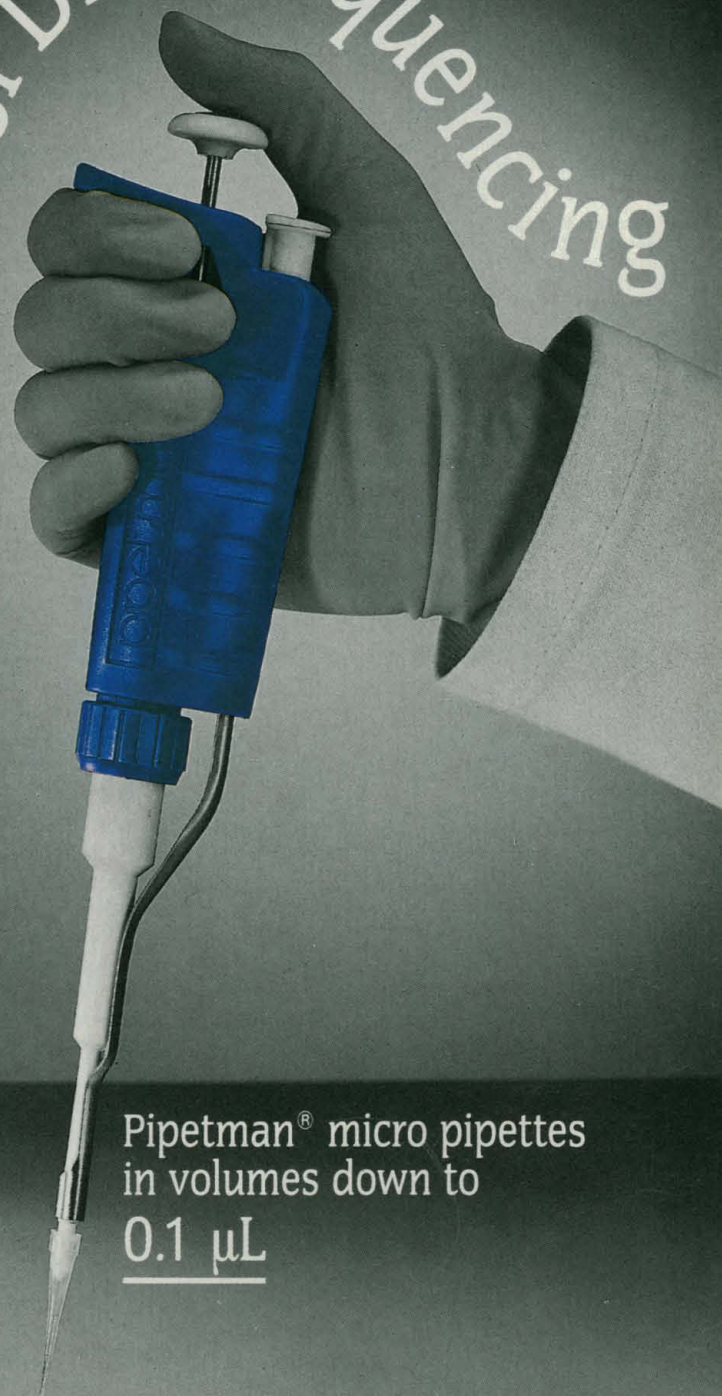
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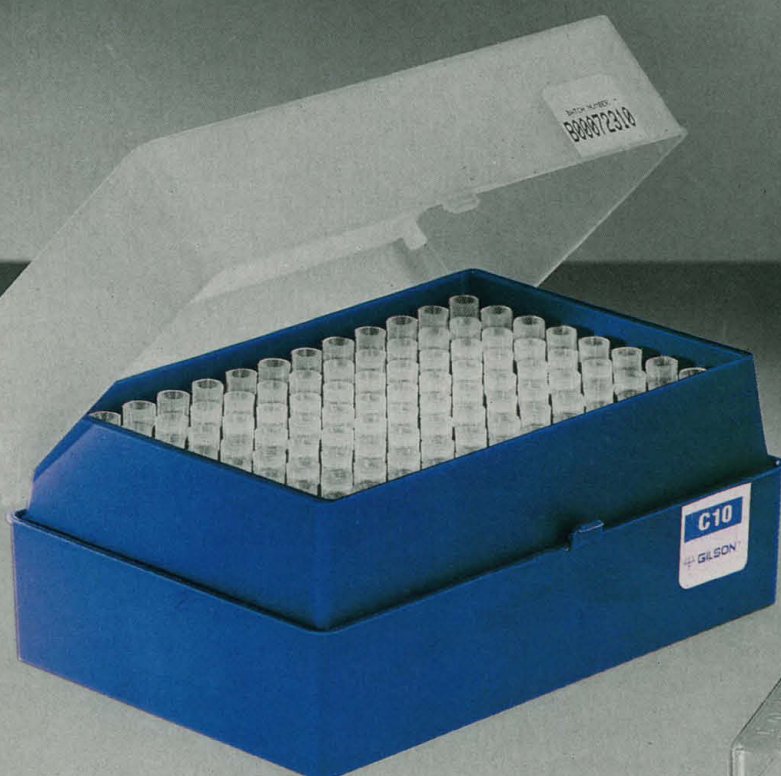
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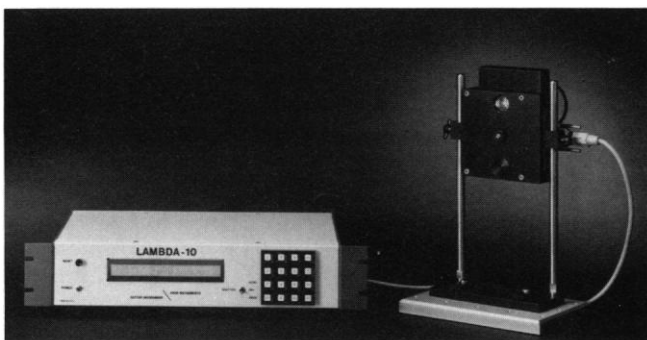
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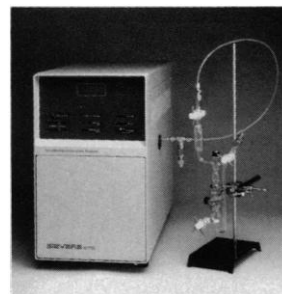
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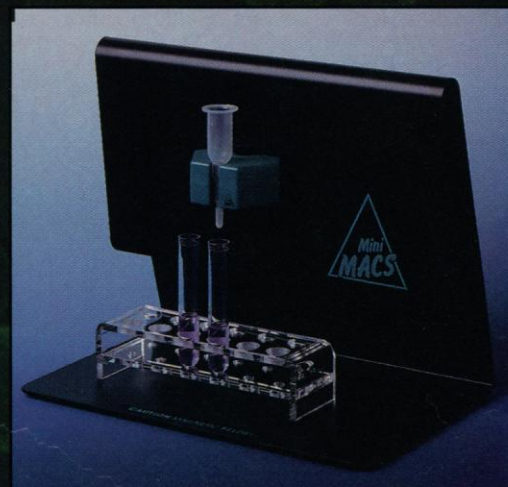
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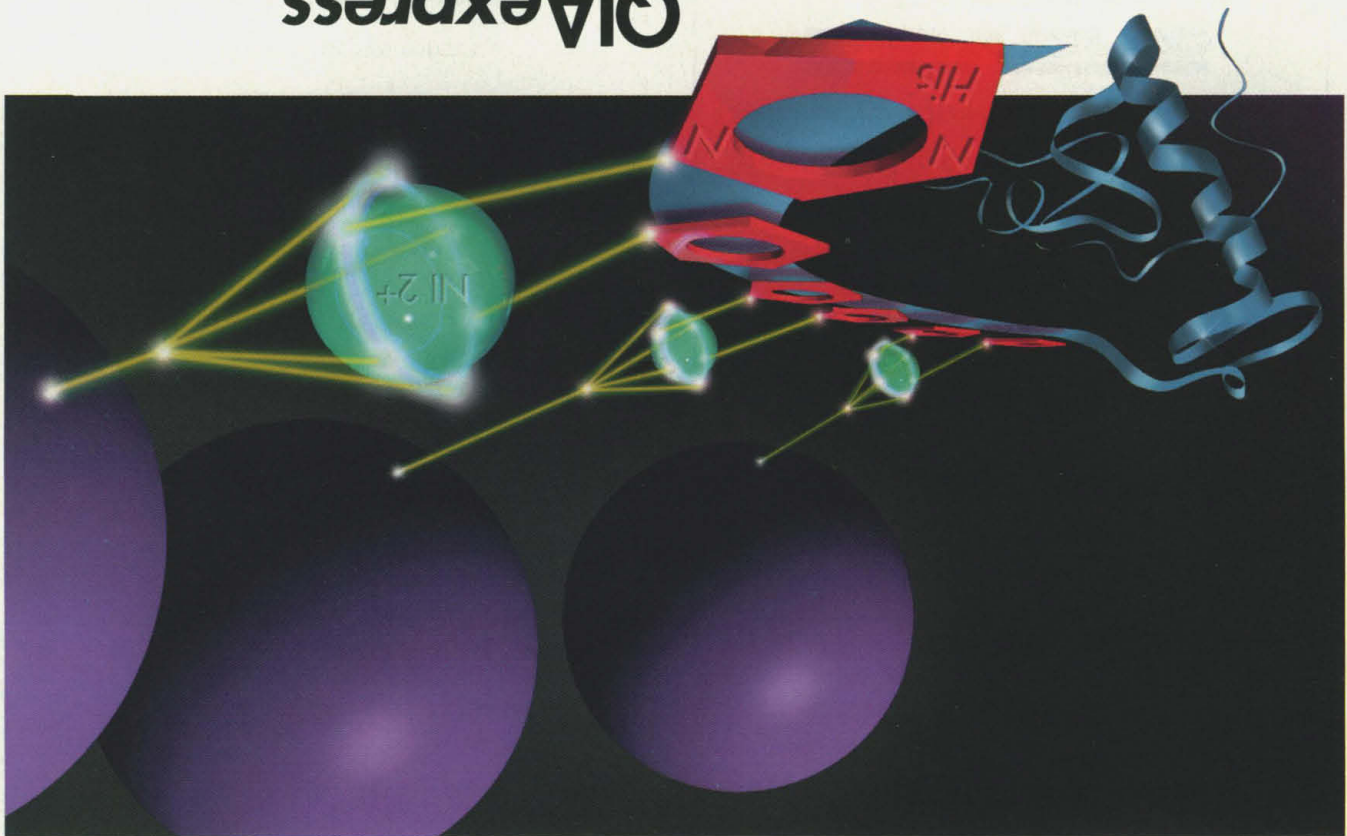
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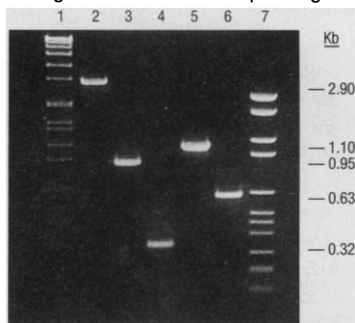
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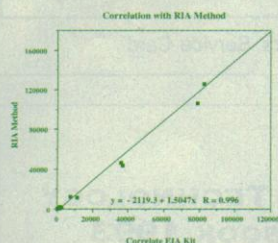
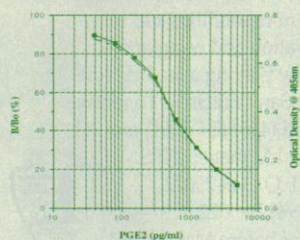


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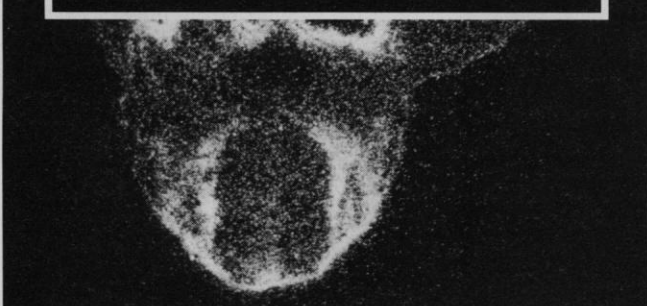
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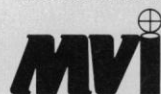
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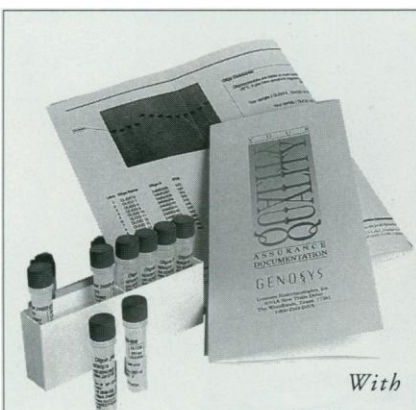
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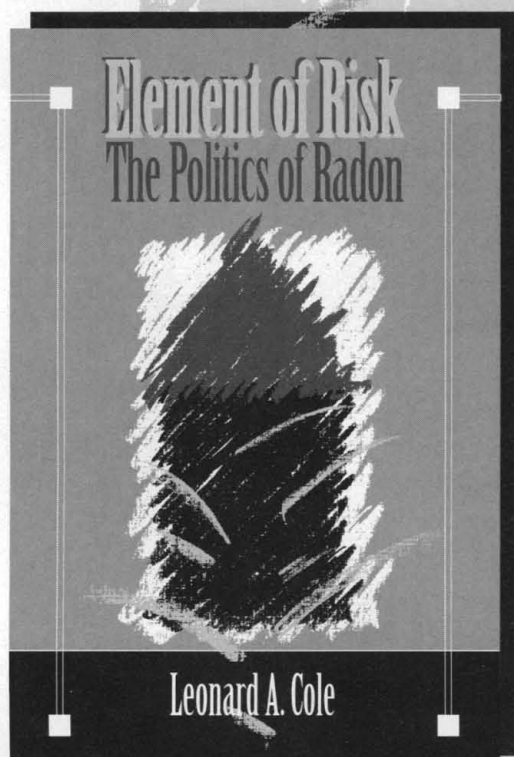
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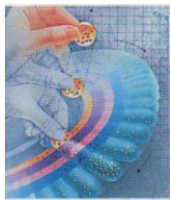
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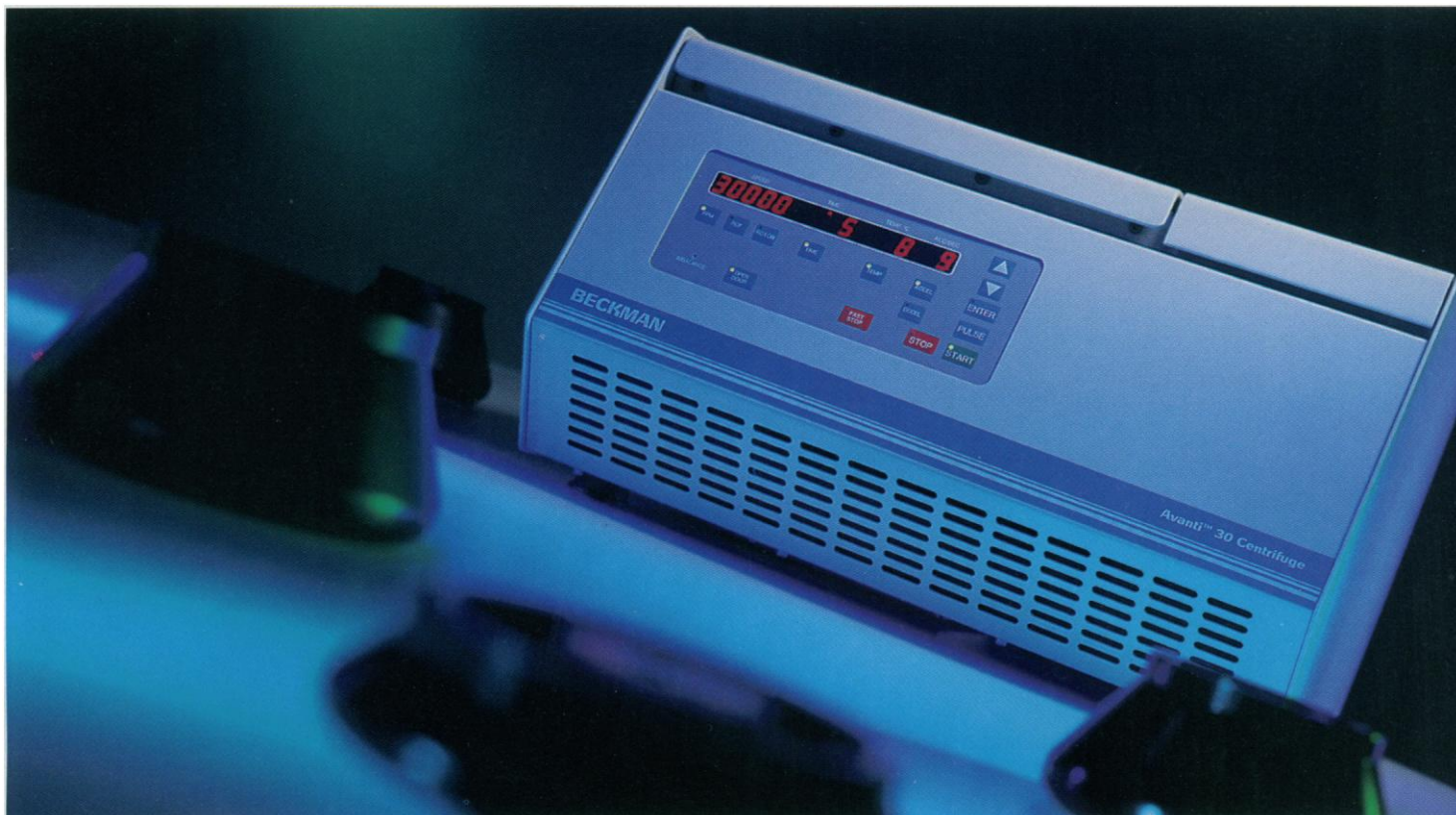
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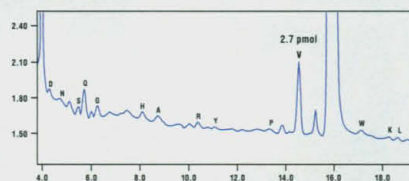
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Raw data from blotted spot of 2-D gel of yeast enzyme extract, showing smooth baseline, clean background and yield for the first residue.

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Basic Research for the Elucidation of

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1. Elementary Processes
2. Perception & Cognition
3. Movement & Behavior
4. Memory & Learning
5. Language & Thinking

(M) Biological Functions through Molecular Level Approaches

1. Expression of Genetic Information
2. Morphogenesis
3. Molecular Recognition & Responses
4. Energy Conversion

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(awards to be announced in April of the following year)

Applications for **Short-Term Fellowships** and **Workshops** can be submitted **throughout the year**

Guidebooks and application forms will be available in mid-April 1994 and may be obtained upon written request by addressing the form below to the HFSP. Applications using previous year's forms are not accepted.

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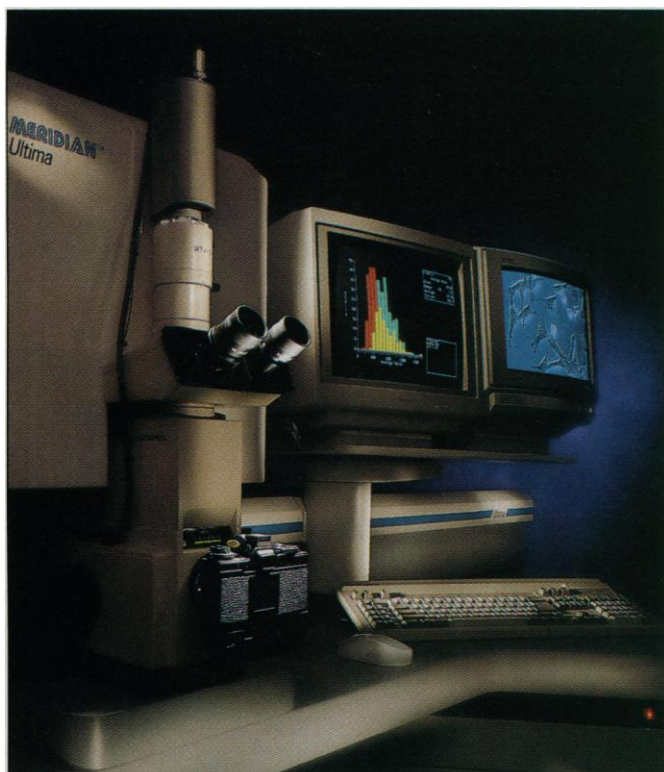
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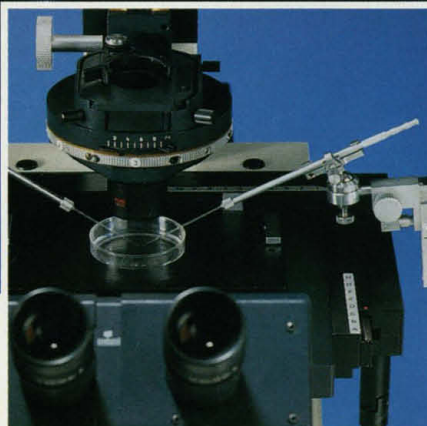
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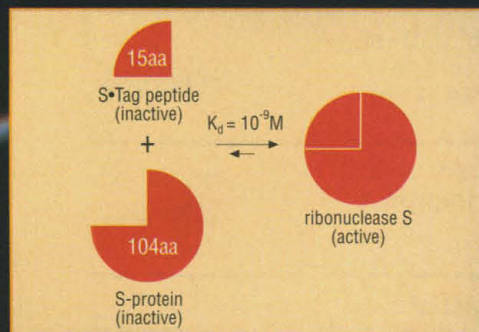
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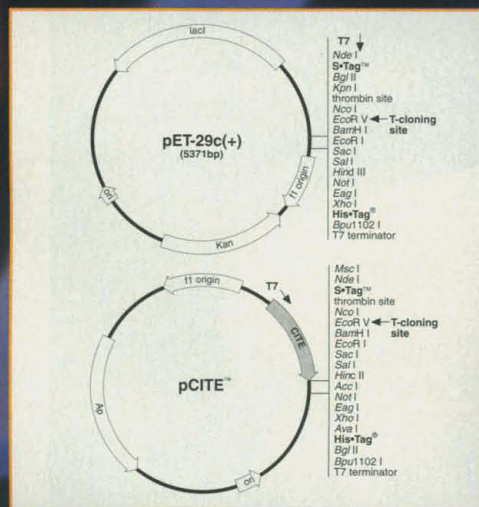
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References

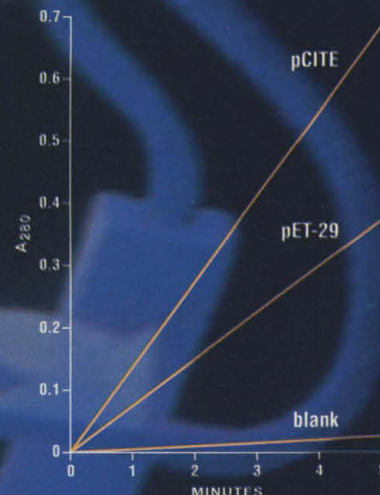
- Richards, F.M. and Wyckoff, H.W. (1971) in "The Enzymes," Vol. IV (Boyer, P.D., Ed.), pp. 647-806. Academic Press, New York.
- Kim, J.-S. and Raines, R.T. (1993) *Protein Science* 2, 348-356.

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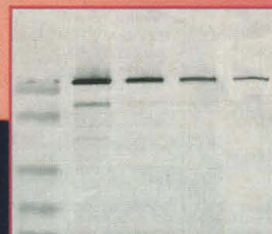
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S•Tag purification of β -galactosidase fusion protein made from a pET-29 recombinant. Crude extract (left) and purified protein (right).



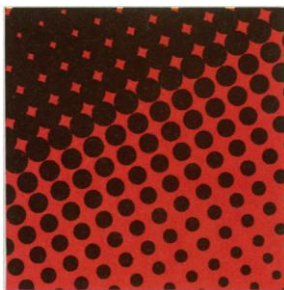
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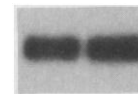
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Northern blot of rat
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Southern blot of EcoR1
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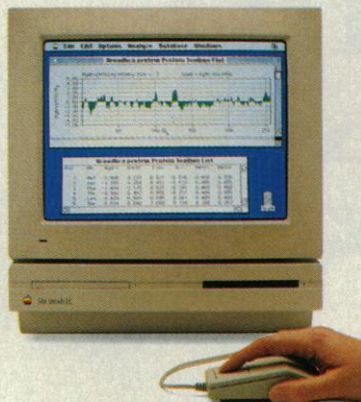
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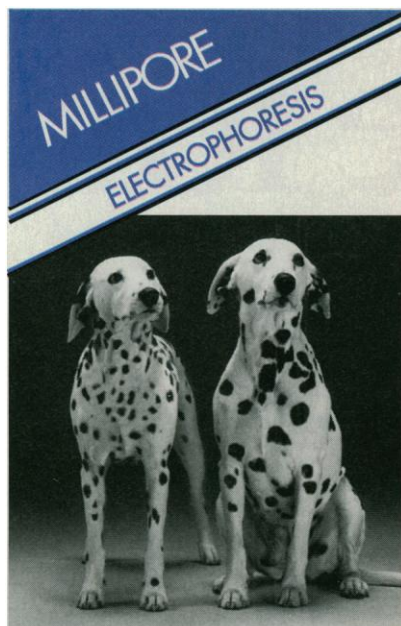
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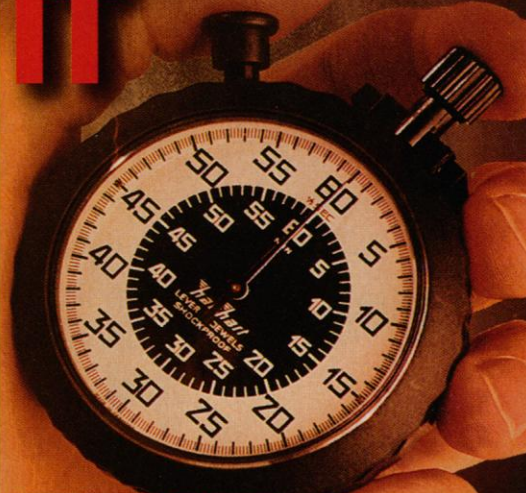
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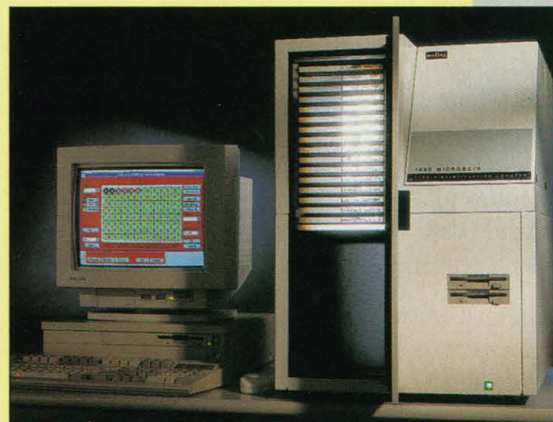
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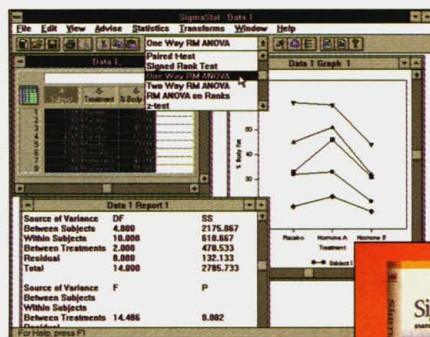
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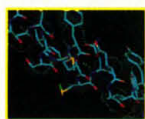
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