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PLANT BIOLOGY



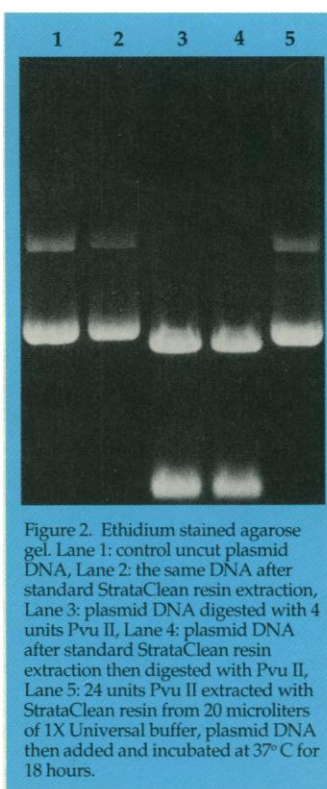
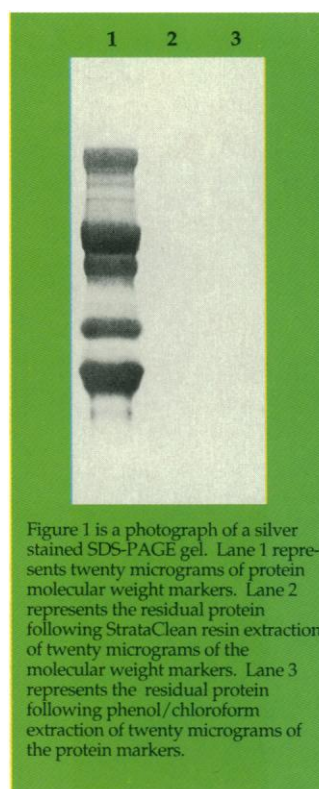
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COVER Shown is a wild-type flower of *Antirrhinum majus* (snapdragon), a plant used for genetic and molecular studies of the mechanisms of flower development. Lower parts of the corolla leaves have been removed, revealing reproductive organs (the pistil and four stamens). Z. Schwarz-Sommer *et al.* have studied homeotic genes in *Antirrhinum majus* (page 931). In this issue is a collection of articles that describe progress in understanding molecular aspects of plant biology. See pages 923 to 966. [Photograph by Dietrich Bock]

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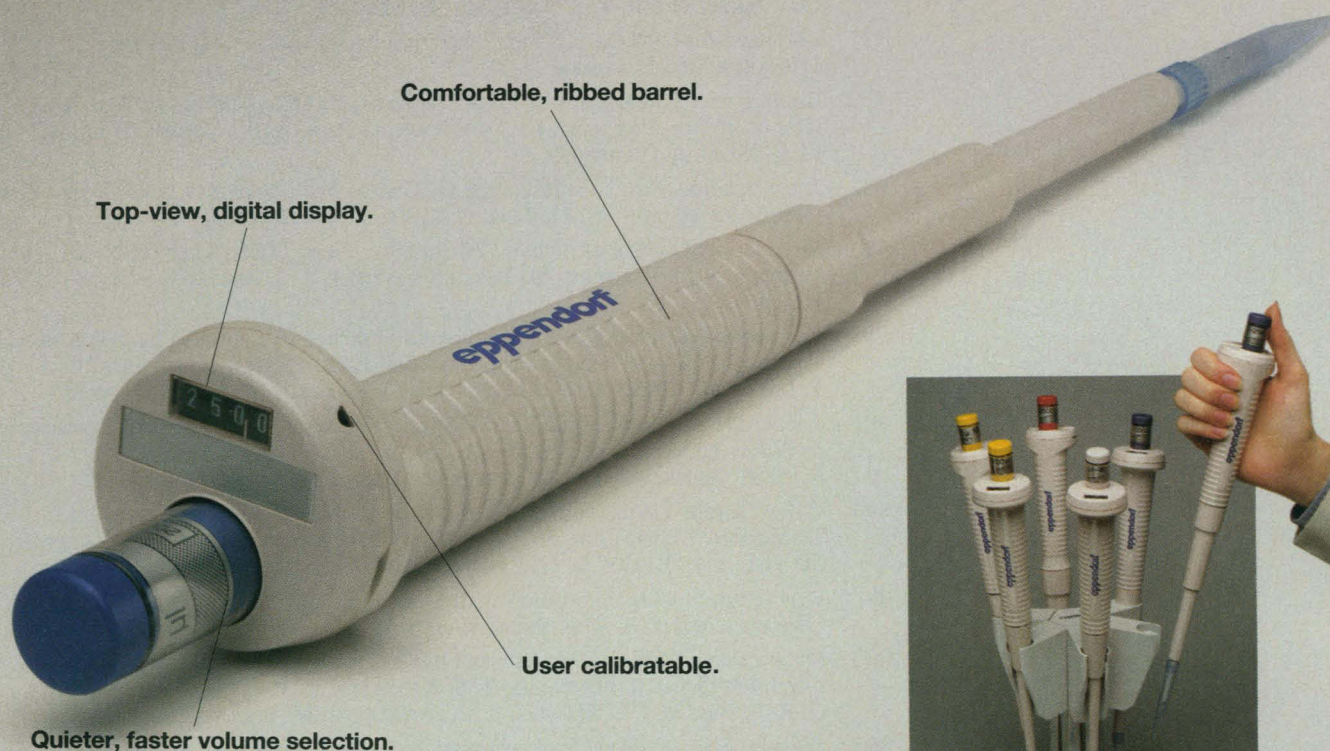
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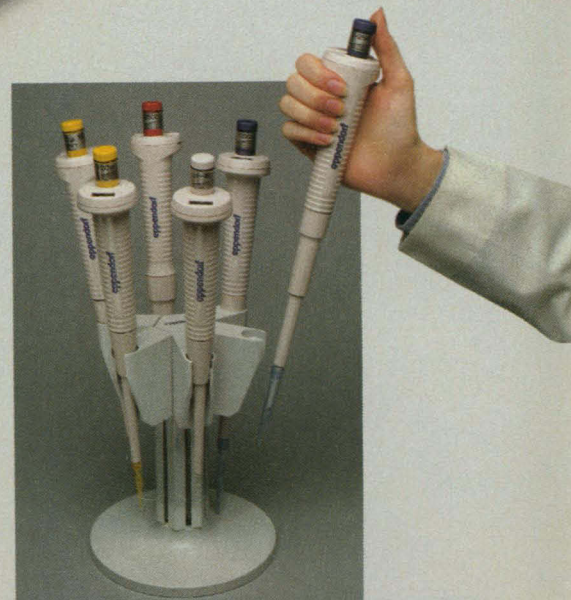


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This Week in SCIENCE

Plant passages

ONE of the interesting differences between plants and animals is that, barring a transplant, an old animal generally has all old parts (tissues, organs, appendages) whereas an old plant will have a mixture of the old and the new. On a regular basis, plants produce new shoots, and these shoots go through several post-embryonic phases of development—the juvenile vegetative phase, the adult vegetative phase, and the reproductive phase—marked by distinguishing morphologic, cellular, and biochemical features. Poethig provides an overview of recent studies in a number of plant systems that are directed toward understanding what factors contribute to the unfolding of the plant's developmental plan (page 923). As in animals, combinations of genetic and epigenetic factors and biochemical processes (such as methylation) participate in producing these independent but overlapping phases. Six other articles (pages 923 to 966), two reports (pages 1002 to 1006), two news stories (pages 910 to 912), and this week's editorial (page 881) also focus on recent developments in plant biology.

Ecosystem response to climate warming

DURING the last 20 years, the air and water temperatures at the Experimental Lakes Area (ELA) in Ontario, Canada, have risen by about 2°C and the ice-free season has grown by some 3 weeks (page 967). The temperature change and declining precipitation at the ELA have had pervasive and profound effects, altering the biology, chemistry, and physical properties of this boreal ecosystem, and disrupting flora, fauna, food webs, and the ability of the system to renew itself. The region has become drier, fires have occurred more frequently, the concentrations of solutes in the lake water have increased, water renewal has been retarded, the number of plankton has increased although total productivity

has not, and suitable and commodious habitats for larger organisms (like trout and opossum shrimp) have become fewer. Do these changes, which are described by Schindler *et al.*, represent a local preview of what the effects of global warming could be?

Big chills

ANTIFREEZE molecules—whether in the bloodstreams of fish in polar waters or in the gasoline tanks of automobiles—prevent ice from forming by interfering with crystal formation; a liquid containing an antifreeze can freeze only when it has been chilled to a temperature lower than its normal freezing point. Nucleators have the opposite effect: they promote the formation of ice. The induction or inhibition of crystal formation is important in both biological systems (how frost bacteria destroy crops) and in the nonbiologic (how rain clouds might be seeded). Alcohols can have both antifreeze and nucleating effects depending on whether they mix into the solution or form surface monolayers. Gavish *et al.* used grazing-incidence x-ray diffraction to monitor the induction of ice nucleation by alcohol monolayers (page 973). At the monolayer-solution interface, hexagonal ice crystals and hexagonal OH groups from the alcohol apparently fit nicely together; this promotes ice formation and oriented crystal growth. The raised freezing point in these studies was sensitive to the length of the alcohol chain, the number (even or odd) of carbon atoms in the chain, and the percentage of the surface of the liquid droplet that was covered by the nucleating alcohol.

Floor plate induction

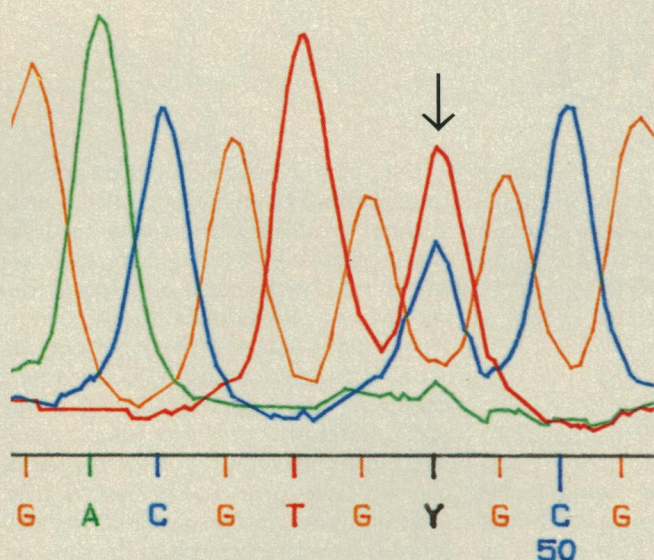
THE floor plate acts as a command center for the developing central nervous system in vertebrates: chemical signals released by the floor plate affect the differentiation of nearby cells, and they attract and provide guidance to axons that are growing out of

nerve cells. What factors affect the differentiation of the floor plate itself? Placzek *et al.* used the signal made by floor plate cells, a chemoattractant, as a marker for these cells and found that floor plate is induced by notochord (page 985). Signals from mesodermal cells of the underlying notochord were necessary and sufficient (during a critical time period in the development of the embryonic chick) for the formation of the floor plate in the neural tube. Furthermore, ectopically grafted notochords were able to induce the development of floor plate cells in areas of the neural tube that normally do not produce this type of cell.

Gene defect in muscle disorder

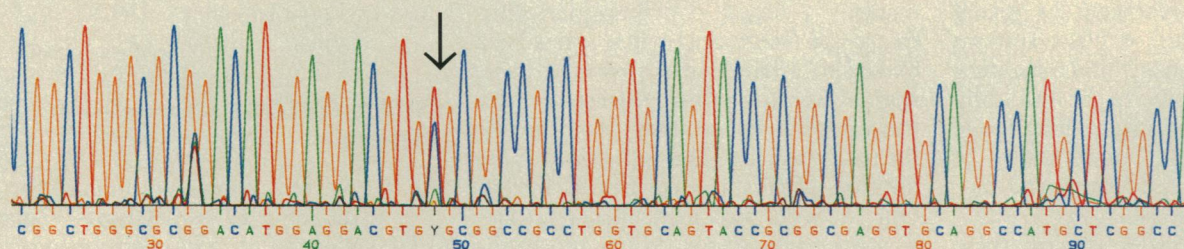
A defect in a gene on human chromosome 17 is closely associated with the development of hyperkalemic periodic paralysis (HYPP) with myotonia, one of the muscle dystrophies (page 1000). The defective gene encodes the α subunit of a sodium channel that resides in the membranes of muscle cells; previous electrophysiologic studies had indicated that this channel functions improperly in cells of patients with HYPP. Fontaine *et al.* cloned the α -subunit gene and then studied its occurrence in a large family in which HYPP is common; the presence of the variant gene was tightly linked to the occurrence of the disorder, and the gene was tightly linked physically to the human growth hormone gene *GH1*. HYPP generally begins early in life: in the family studied for linkage analysis, the average age of onset was 6.5 years (with the range extending from 2 to 15 years). At first, there are episodes of muscle weakness; there is excess potassium in the blood and depolarization of cell membranes; later, paralysis occurs. The association of the gene defect in HYPP with a growth hormone gene may explain a 100-year-old report of a family in which the occurrence of a periodic paralysis was linked to short stature.

■ RUTH LEVY GUYER



Direct genomic solid phase sequencing of the human apolipoprotein E gene for diagnosis of a heterozygotic point mutation, Hultman and Uhlén (1990) submitted for publication.

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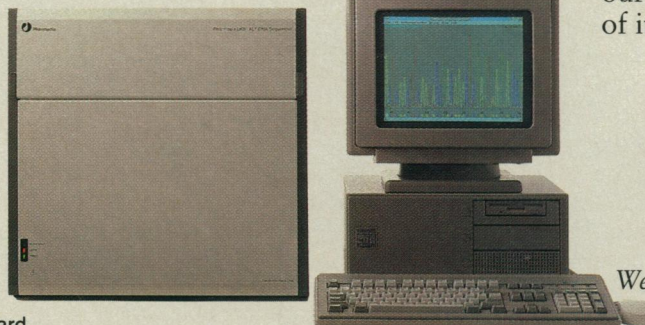
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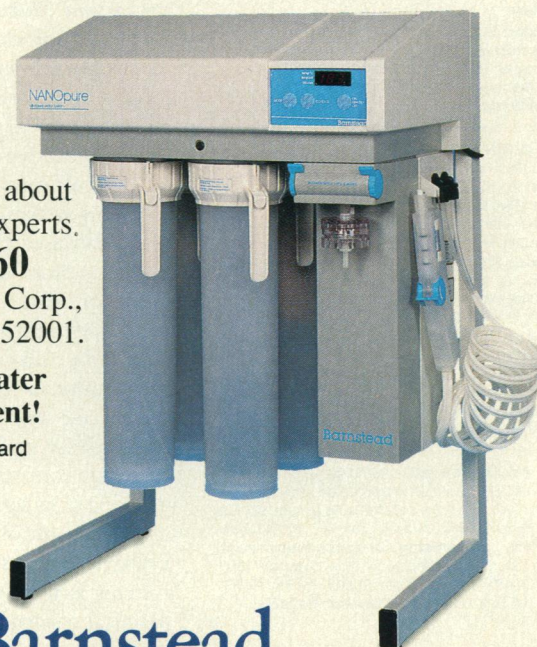
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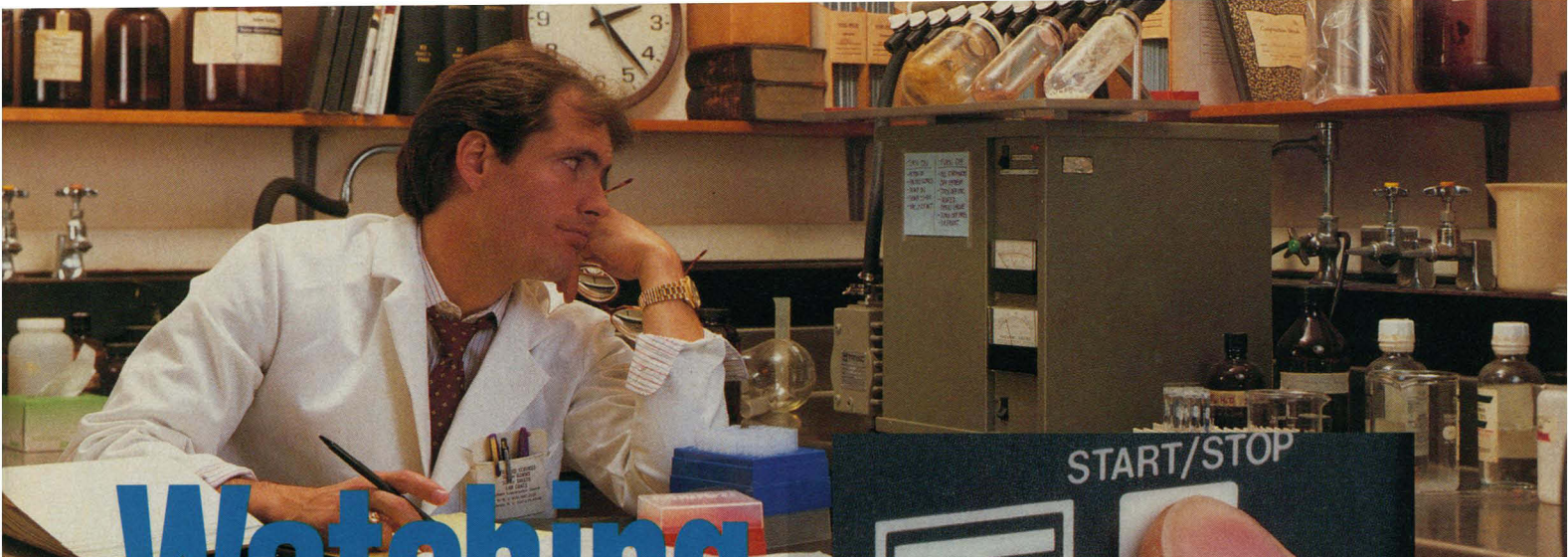
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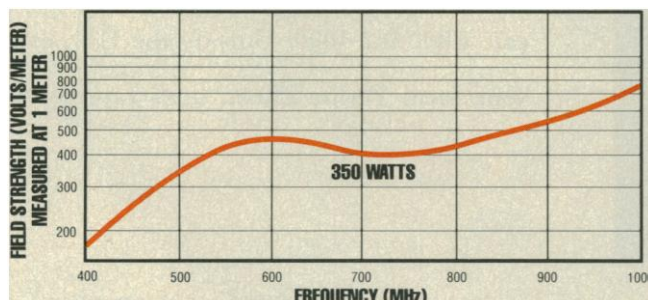
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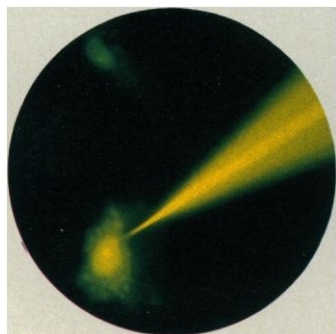
Luckow, V. and Summers, M. (1988) *Biotechnology* 6, 47-55

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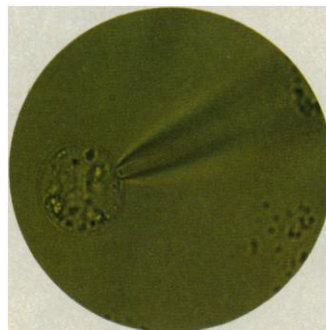
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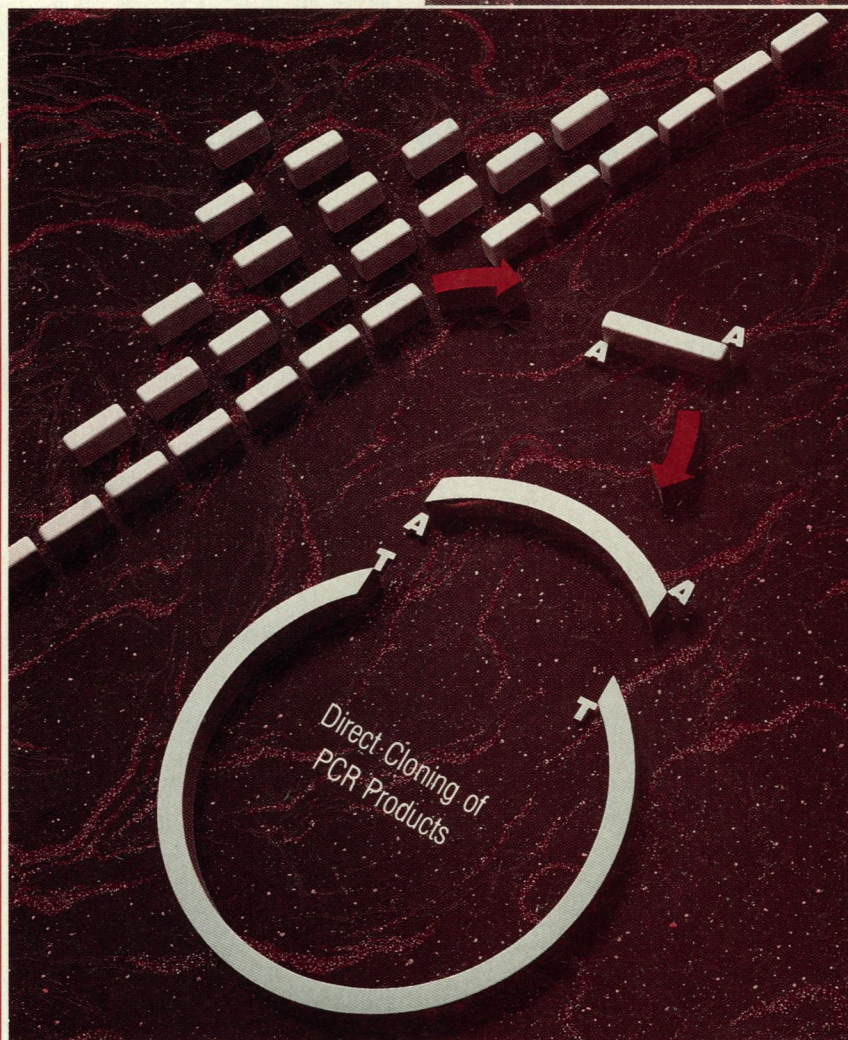
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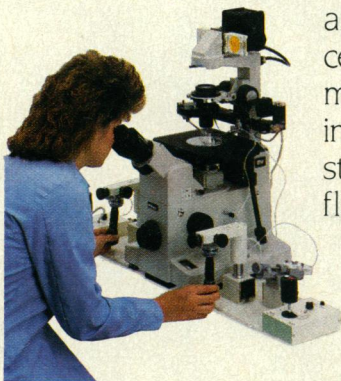
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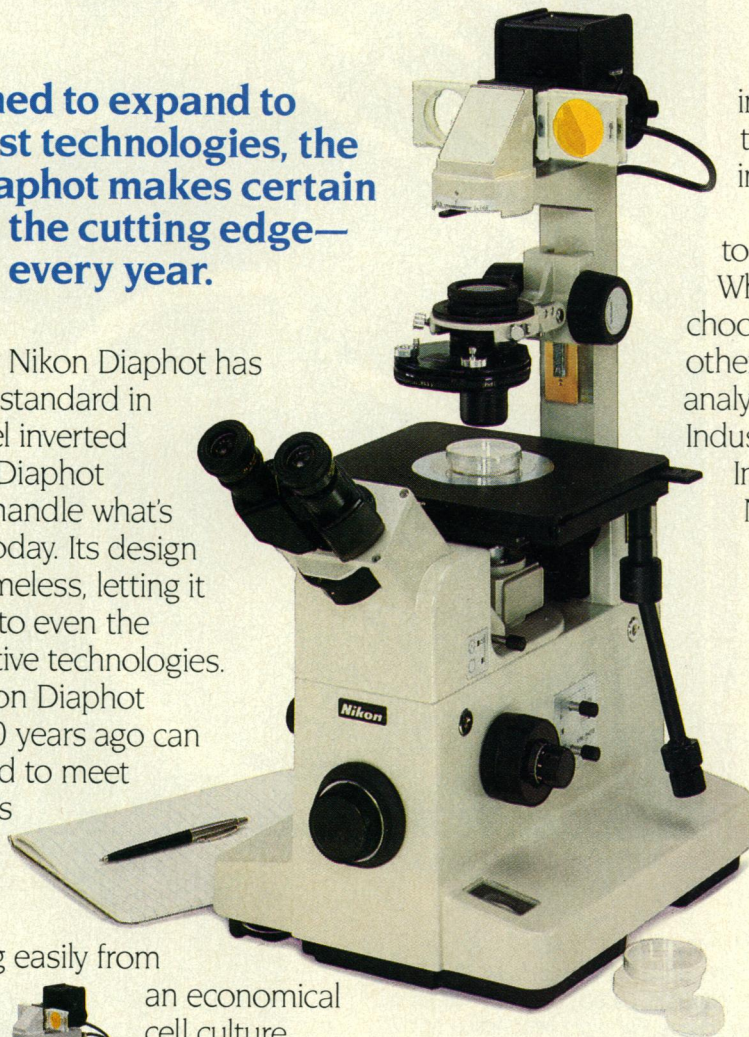
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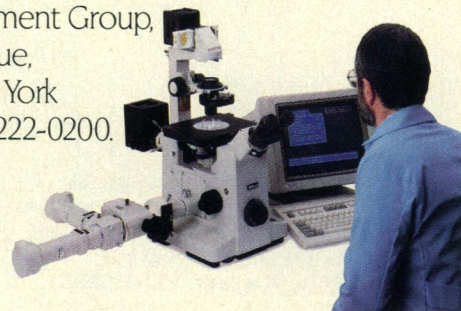
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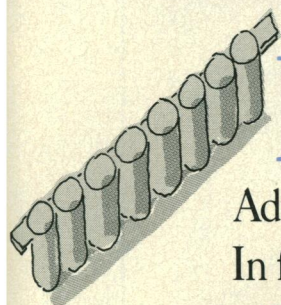
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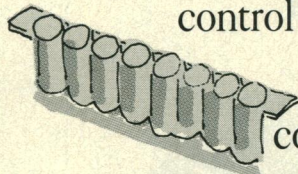
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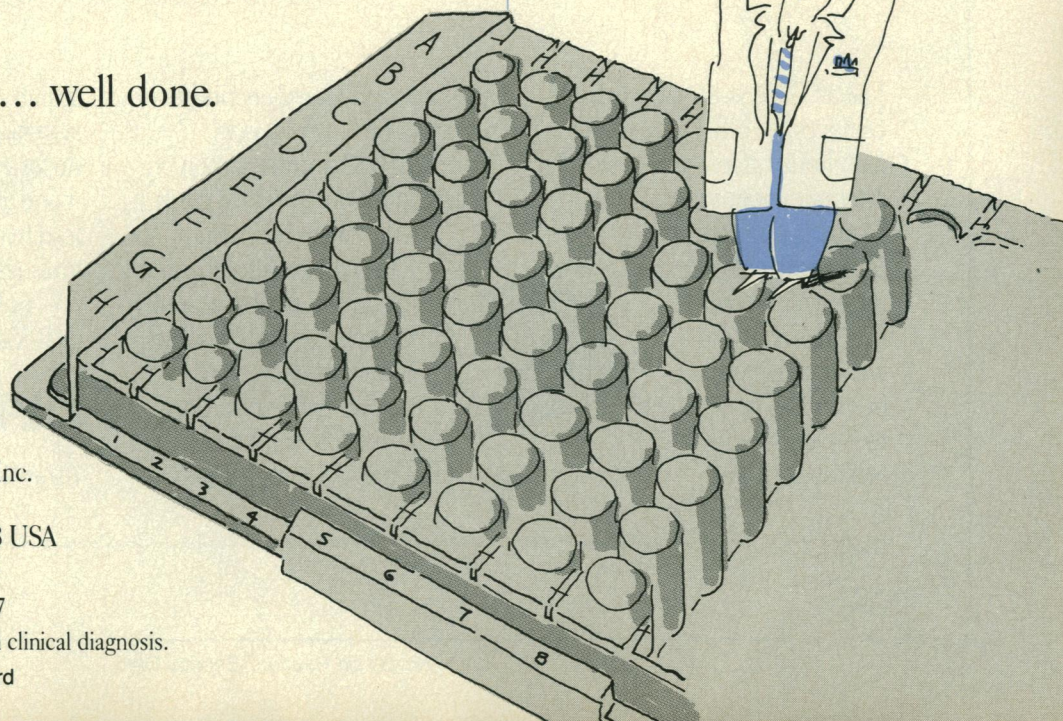
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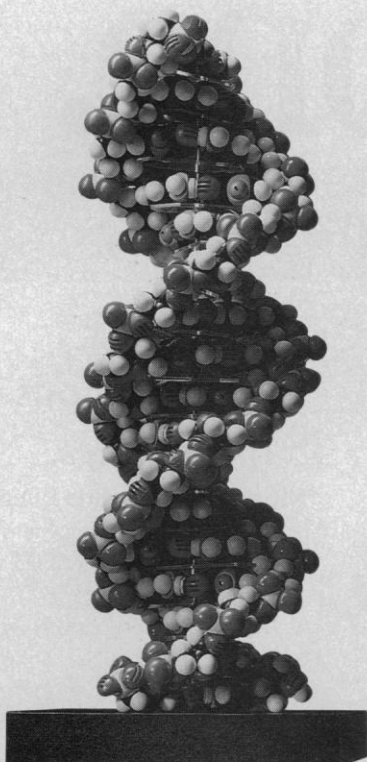


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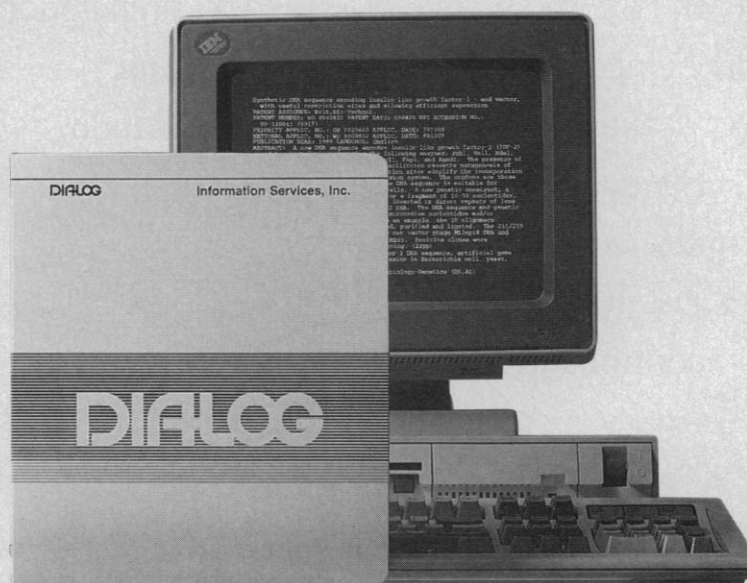
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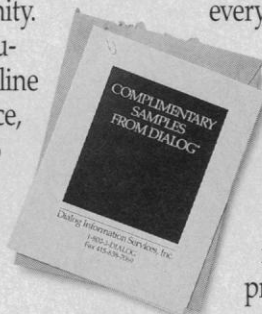


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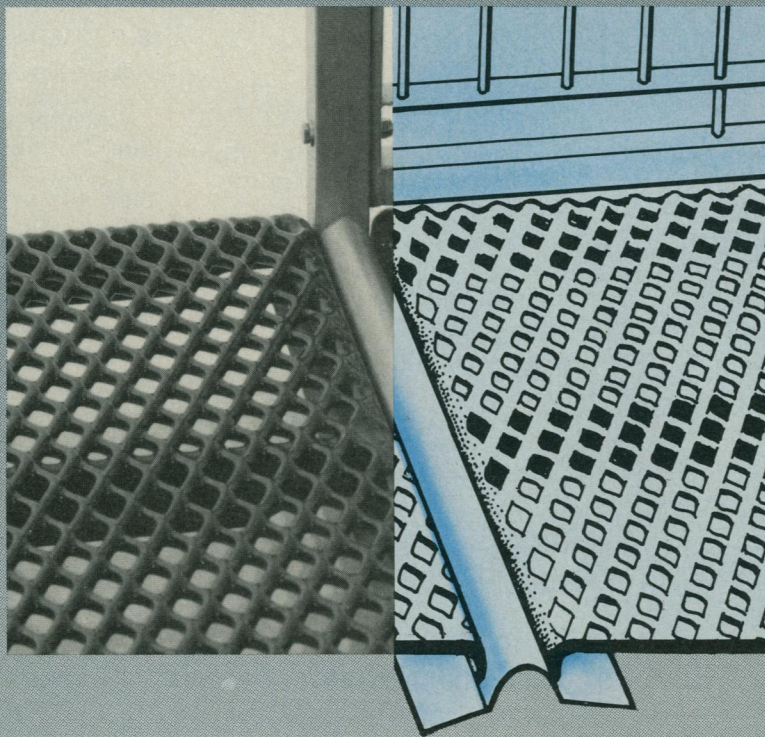
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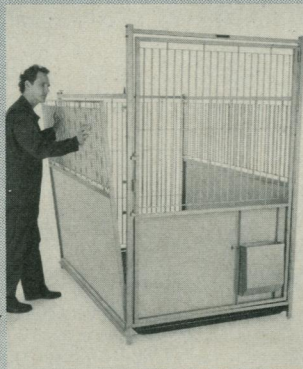


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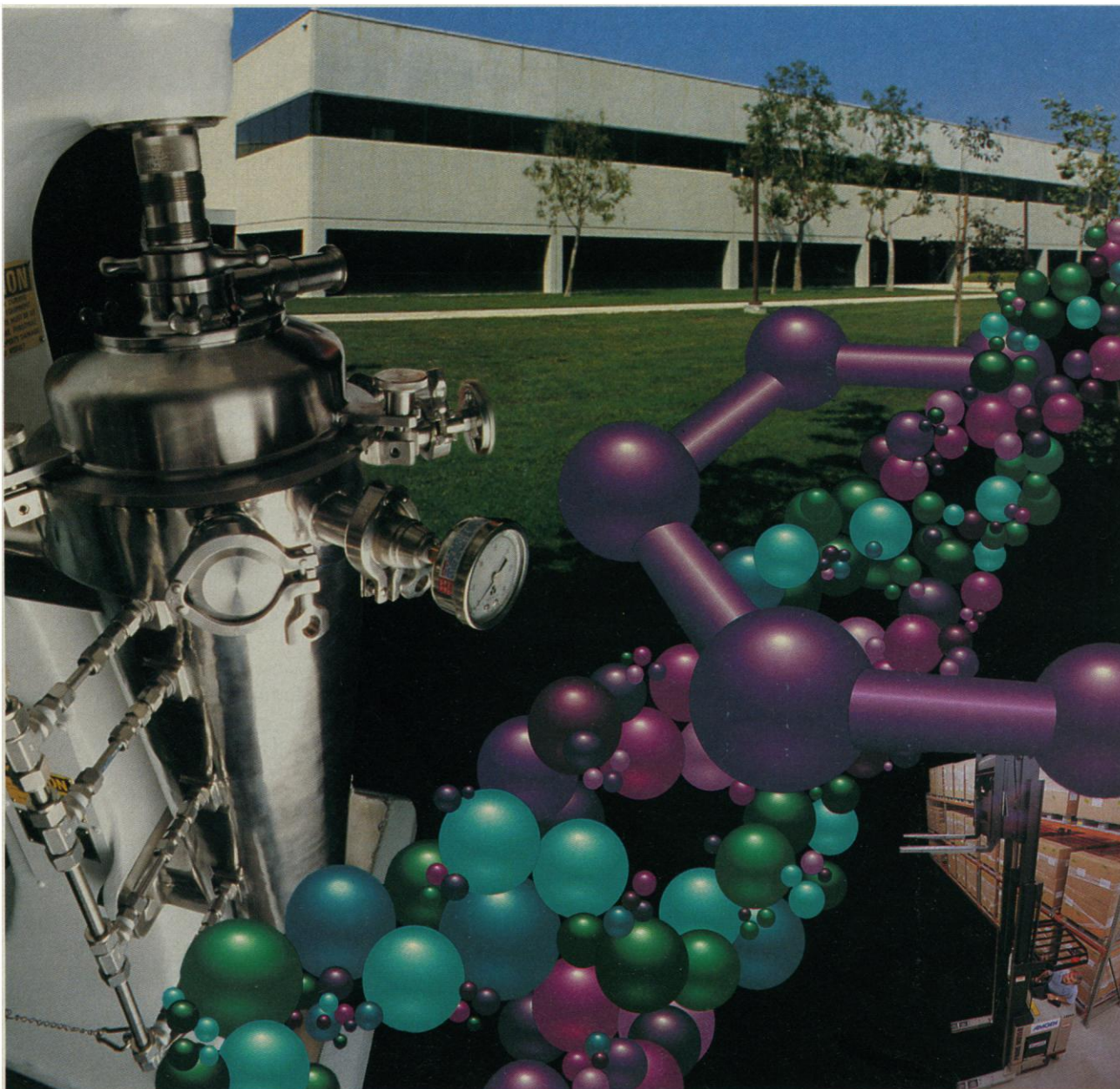
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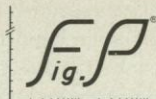
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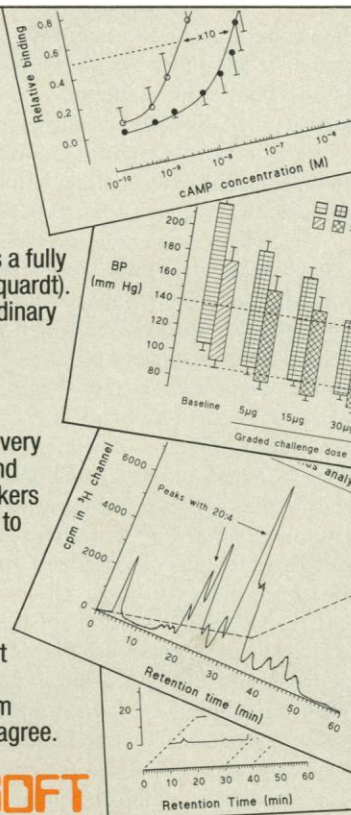
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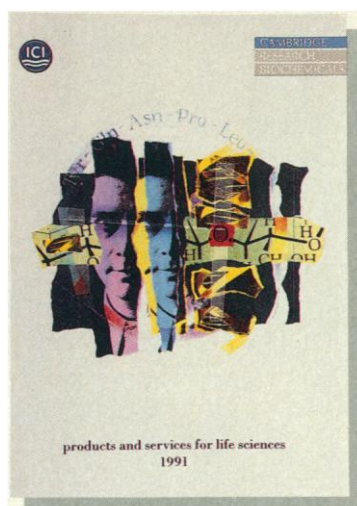


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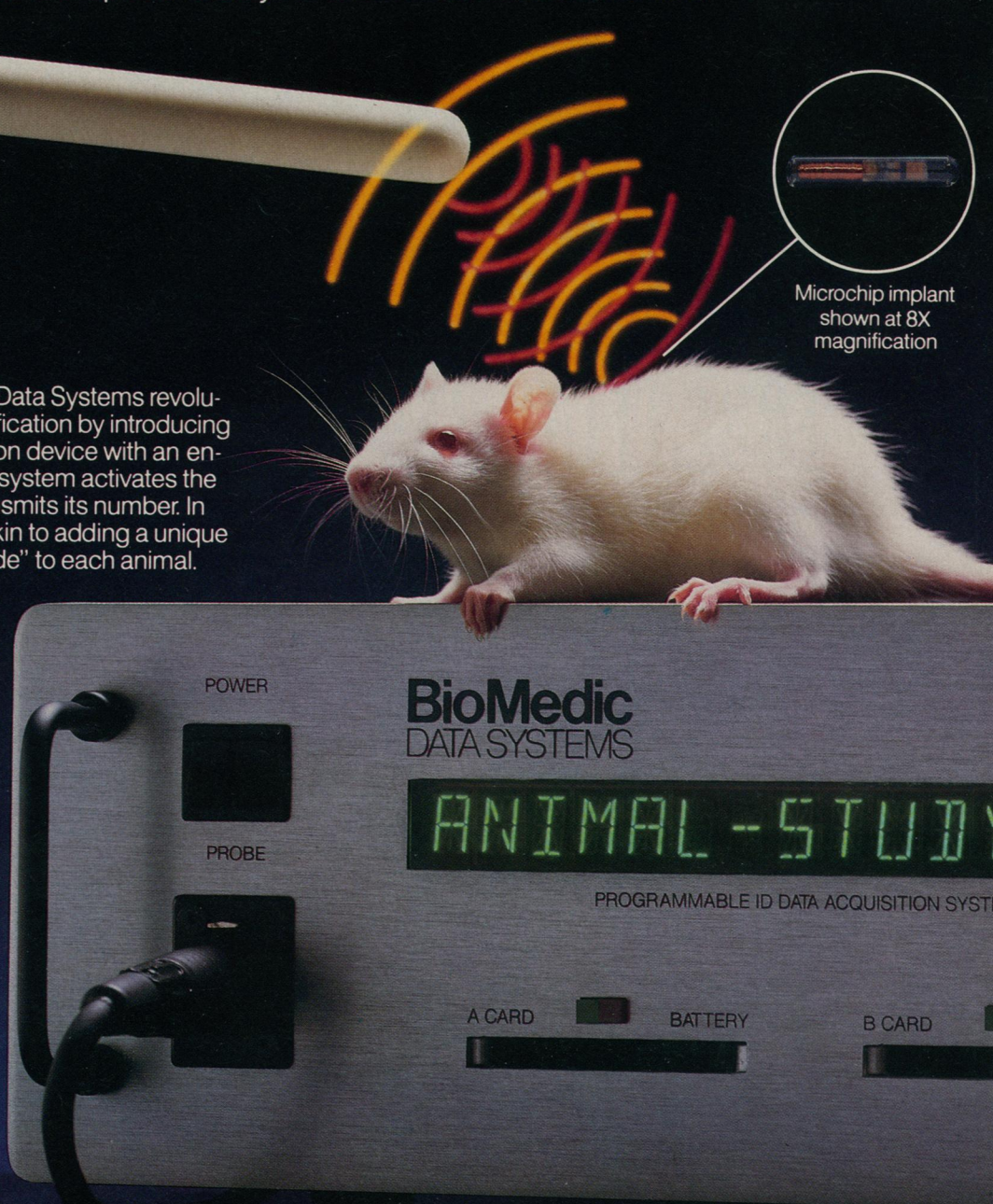
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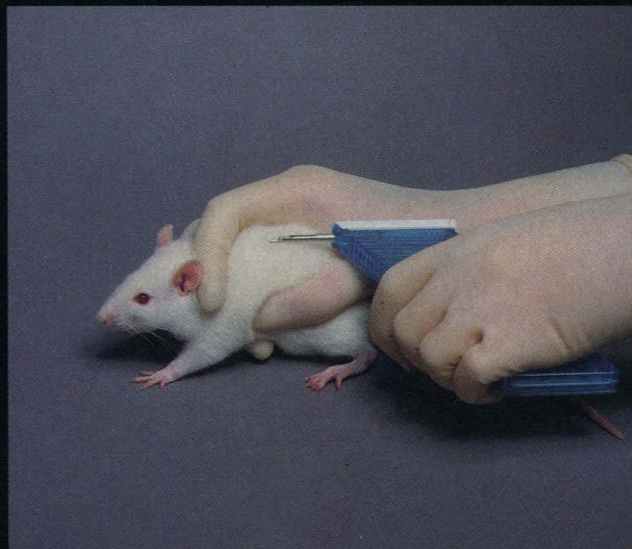
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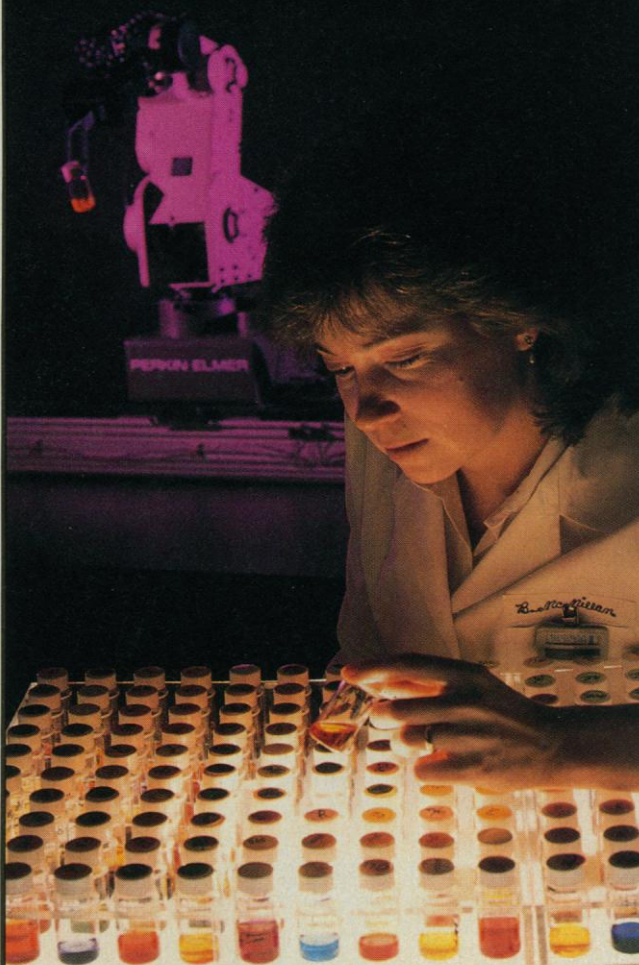
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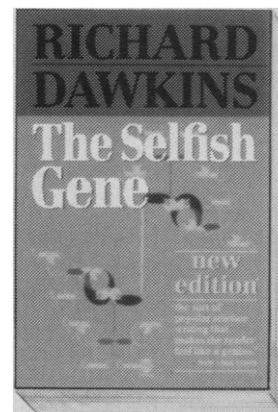
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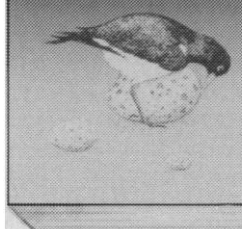
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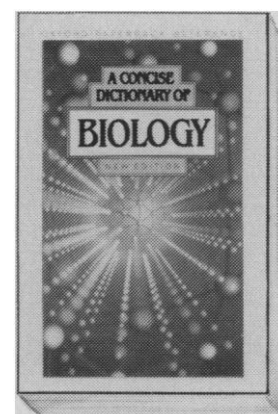
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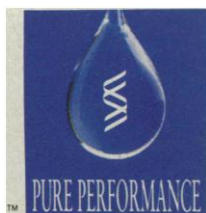
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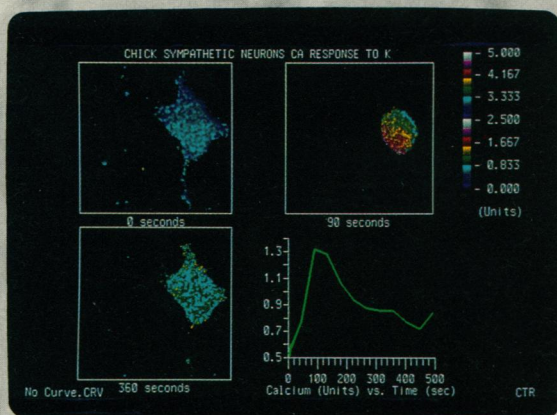
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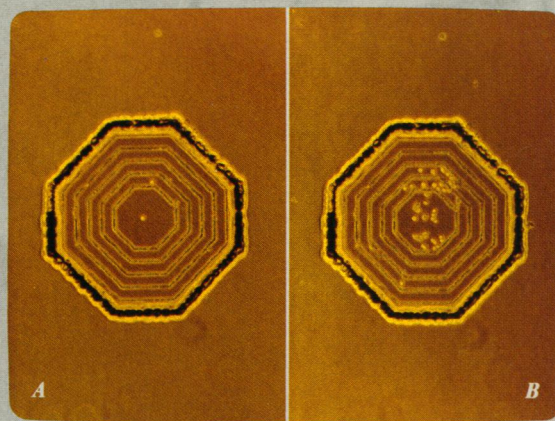
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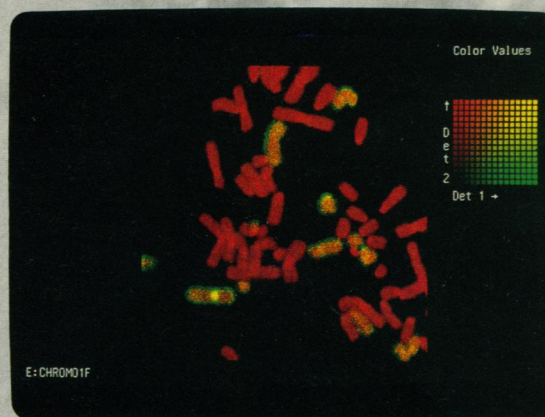
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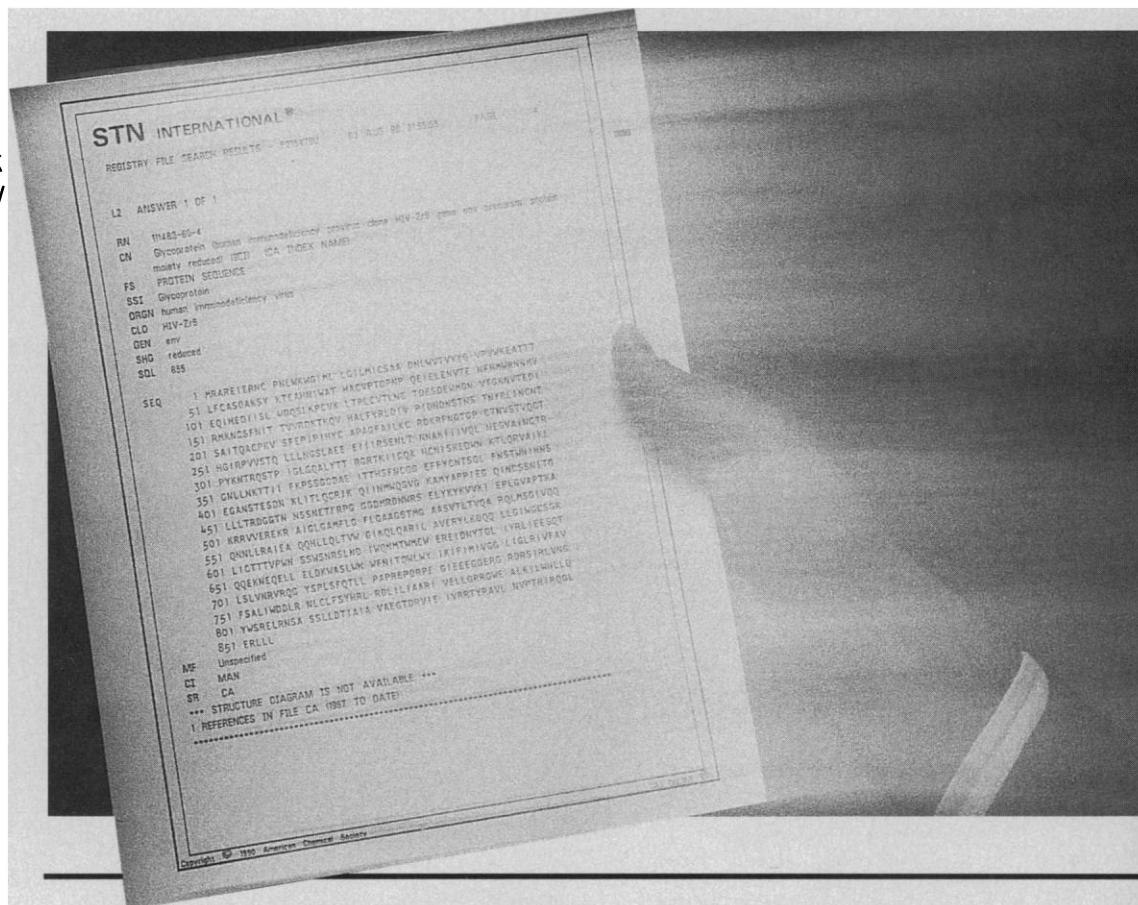
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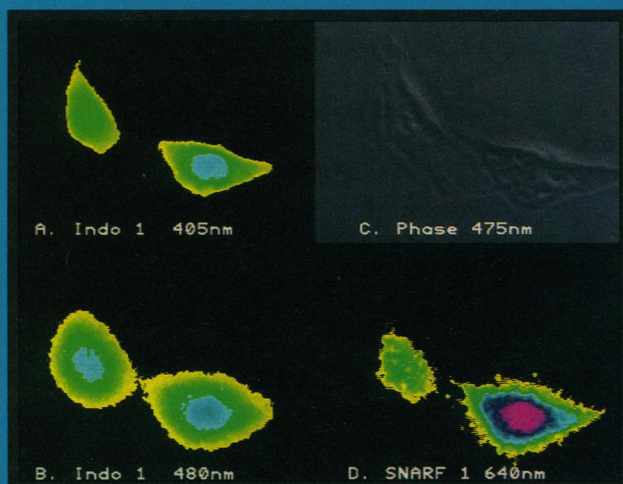


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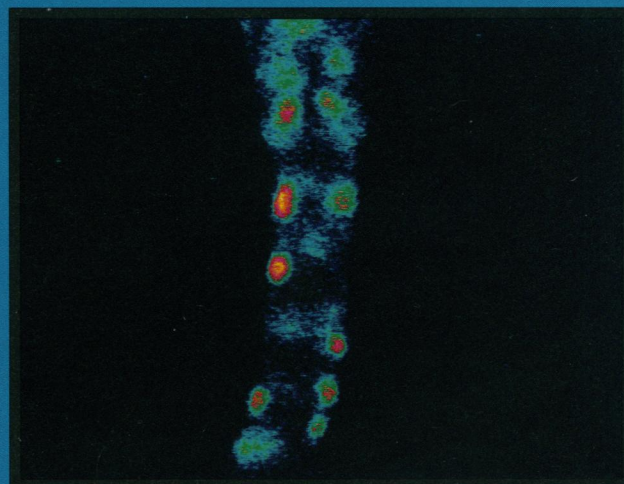
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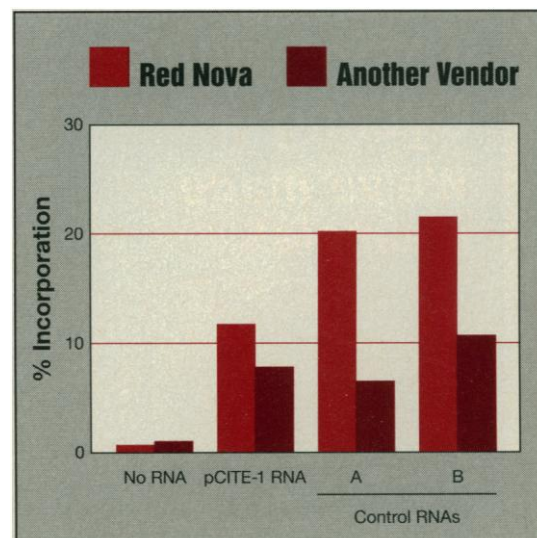
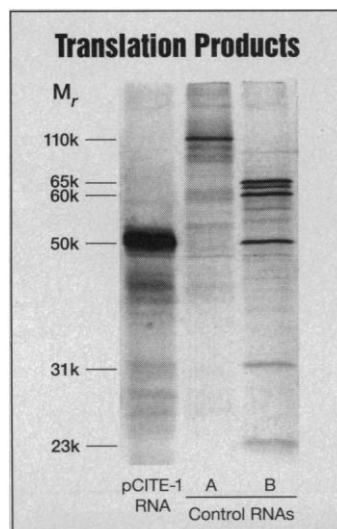
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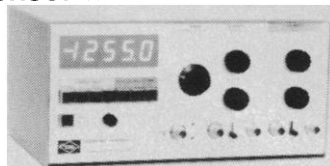
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1. Parks et al. (1986) *J. Virol.* **60**, 376.
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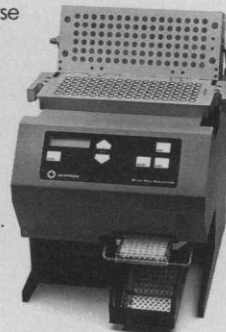
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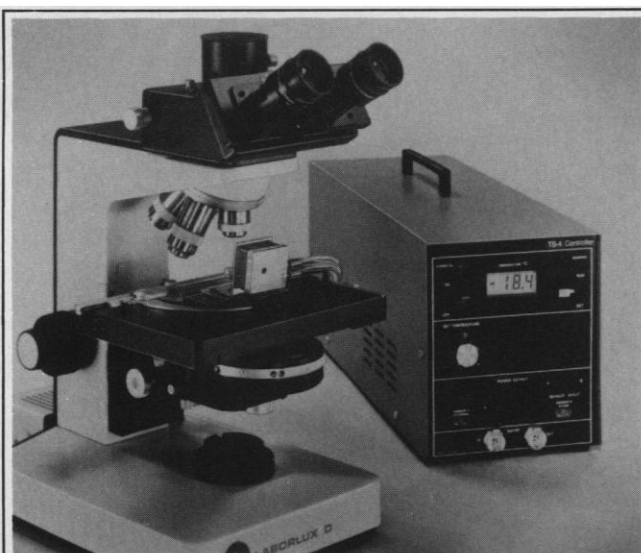
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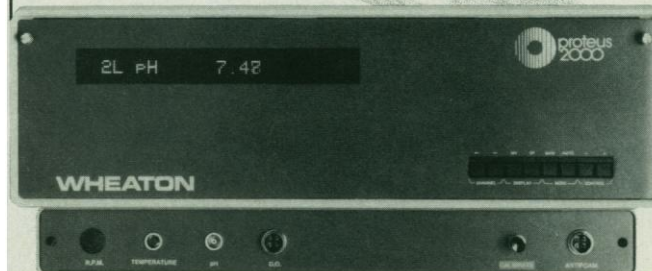
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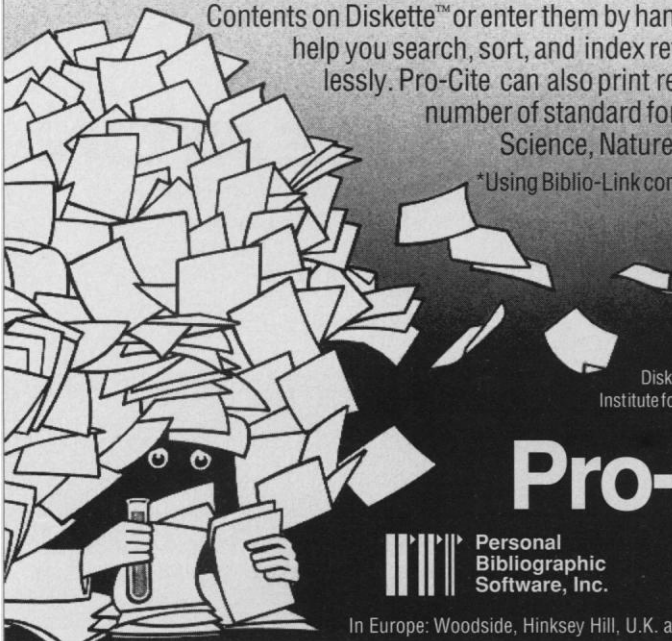
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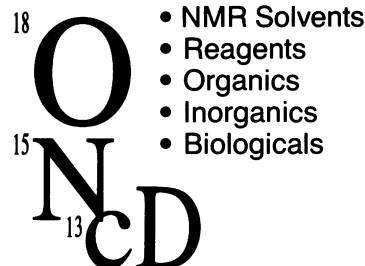
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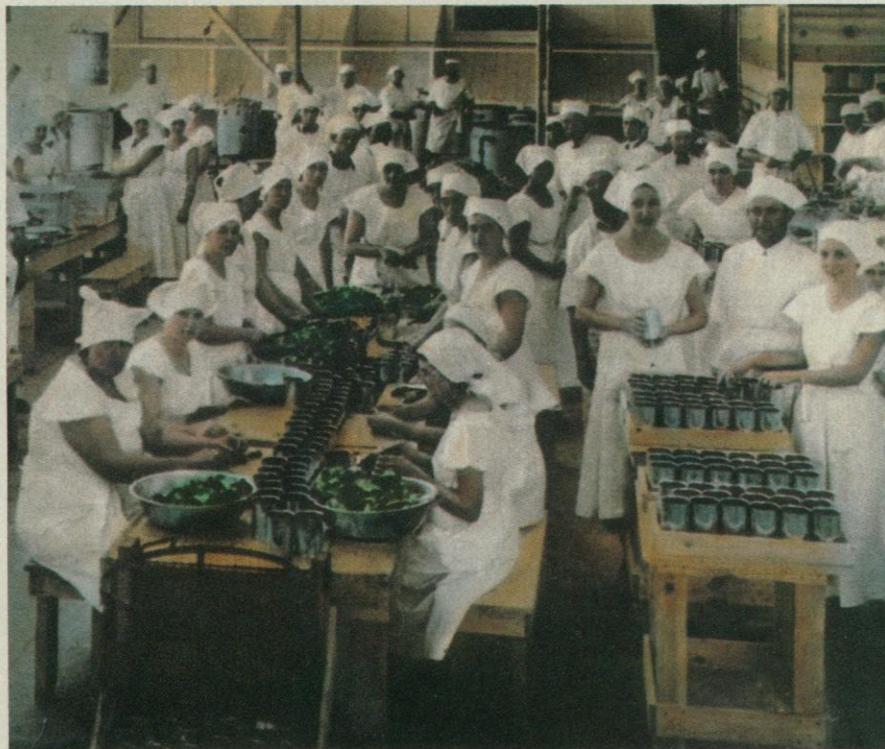
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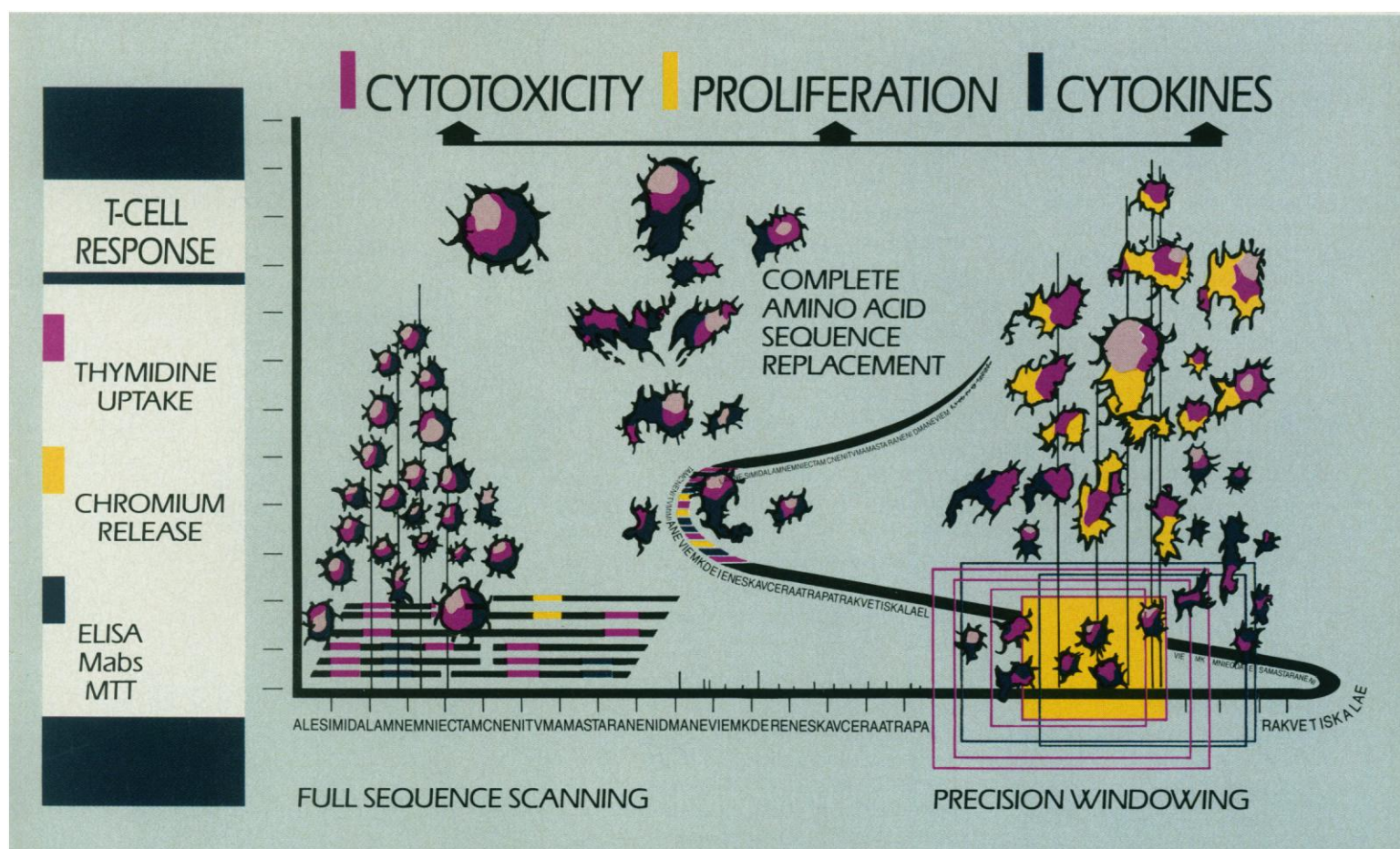
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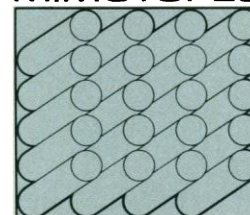


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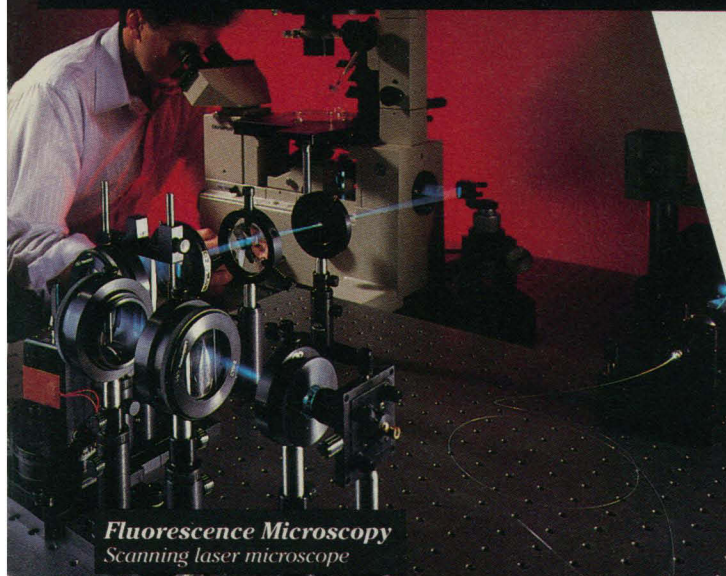
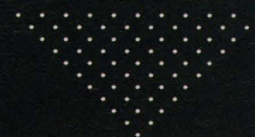
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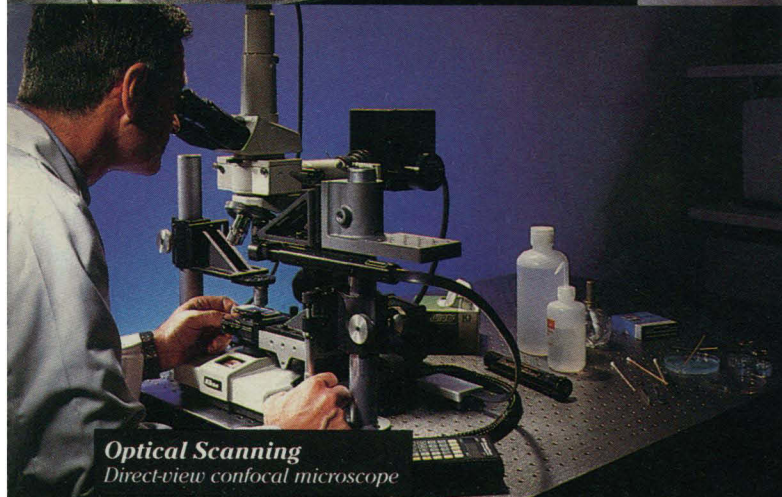
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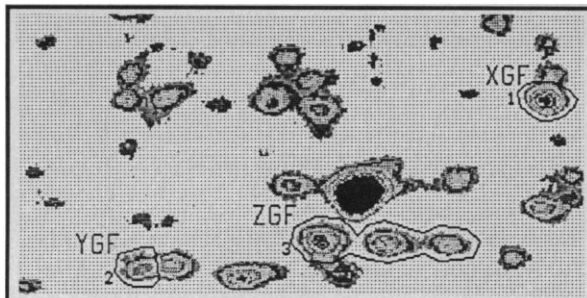
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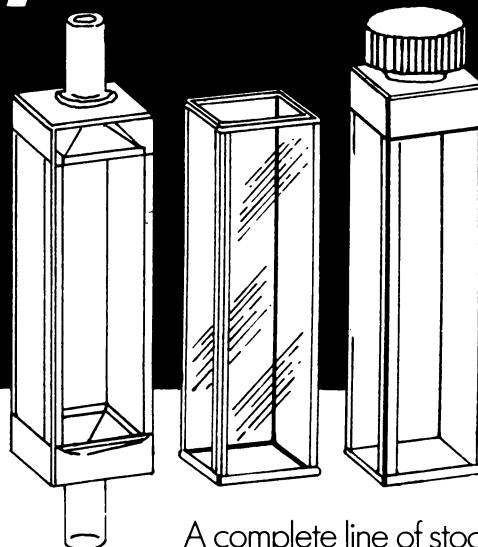
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Elaine Fuchs, *Univ. of Chicago*
Goro Eguchi, *Inst. for Fundamental
Res. Aichi, Japan*

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Tom Guilttoyle, *Univ. of Missouri*
Toshio Kuroki, *Univ. of Tokyo*

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Ralph Mott
Makio Ogawa
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