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SCIENCE

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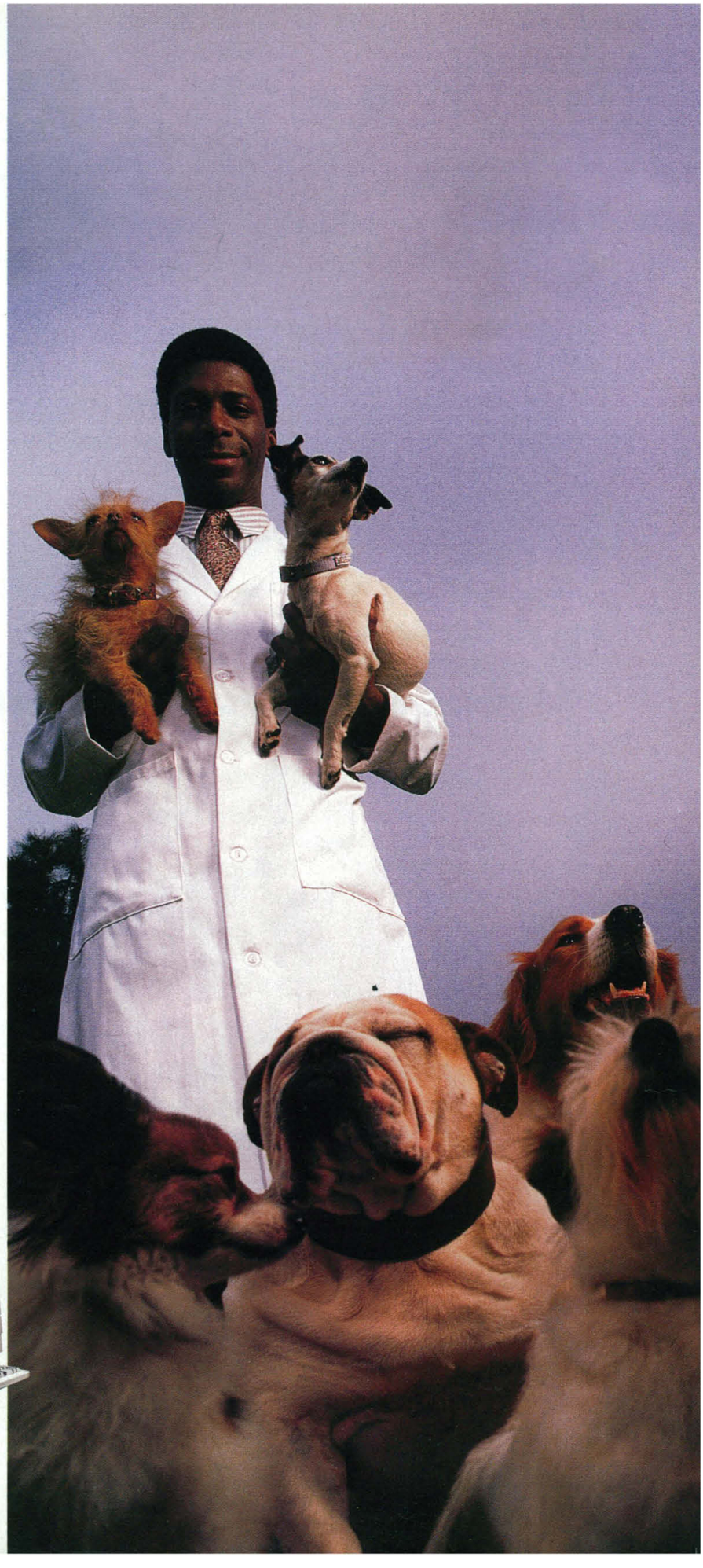

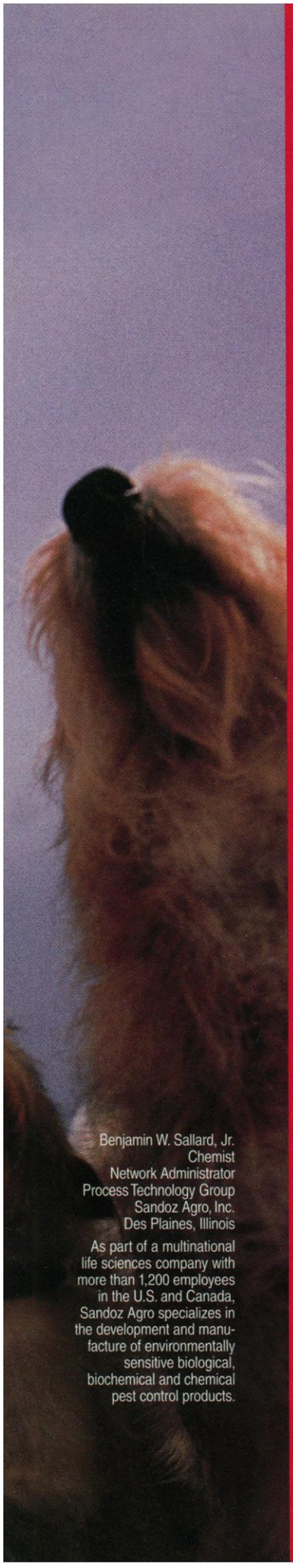

Benjamin W. Sallard, Jr.
Chemist
Network Administrator
Process Technology Group
Sandoz Agro, Inc.
Des Plaines, Illinois

As part of a multinational life sciences company with more than 1,200 employees in the U.S. and Canada, Sandoz Agro specializes in the development and manufacture of environmentally sensitive biological, biochemical and chemical pest control products.

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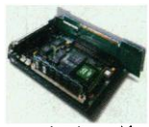

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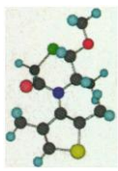

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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Making the right connections

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Plasma protein complex

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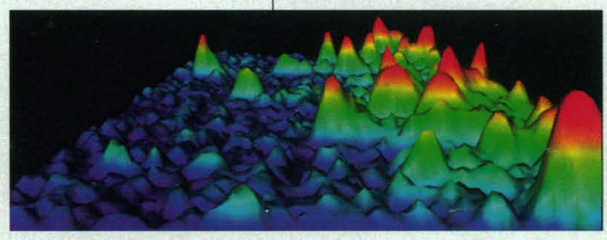
COVER

The Ulysses spacecraft superimposed on a soft x-ray image of the sun. The dark regions on the sun and the gaps in the sun's corona above the poles are coronal holes. The focus of the Ulysses mission is to explore the polar regions of the heliosphere. See the Reports in a special section beginning on page 1005 for results from Ulysses's pass over the sun's south pole. [Images: Courtesy of the European Space Agency]

TECHNICAL COMMENTS

1045
Calcium sparks in heart cells



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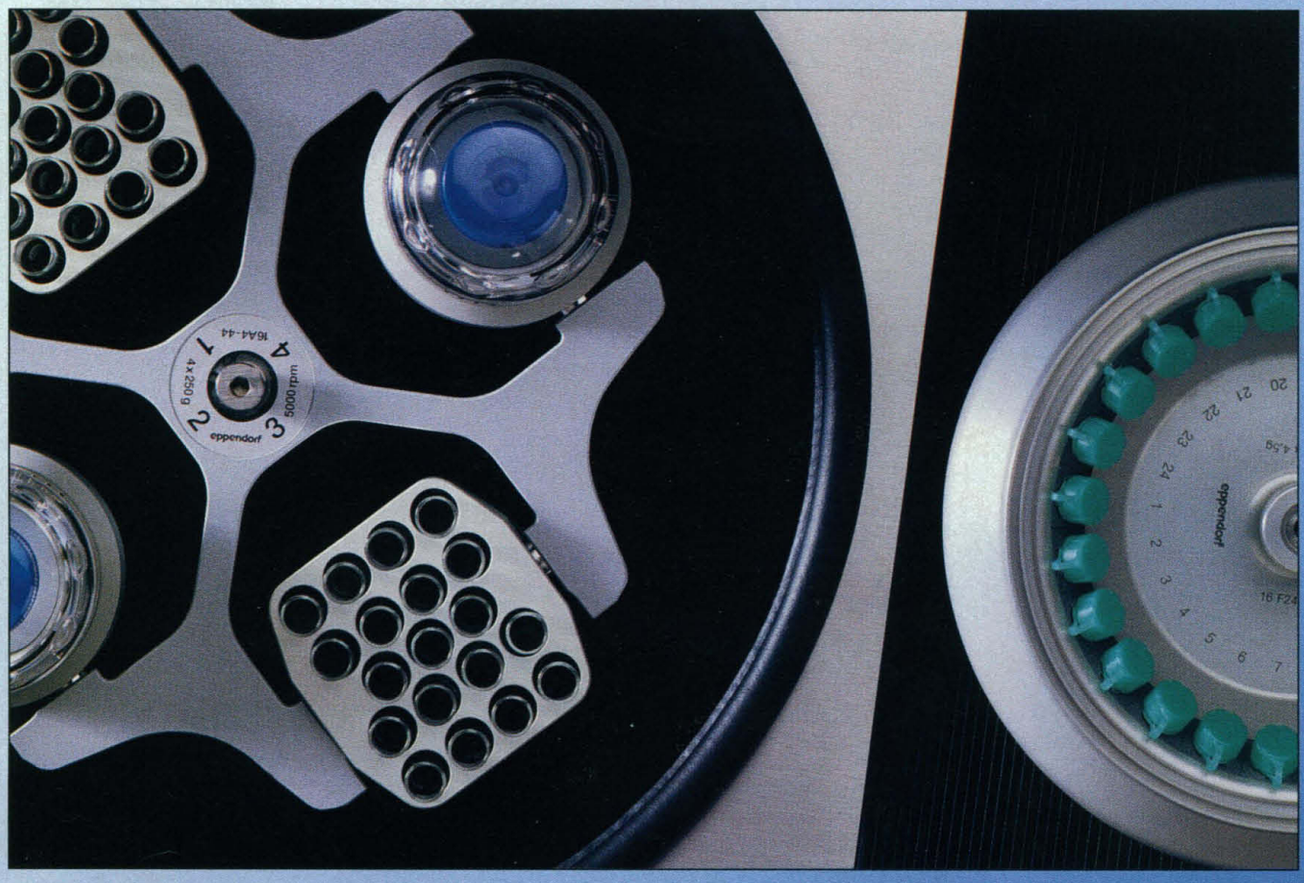

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edited by DAVID LINDLEY

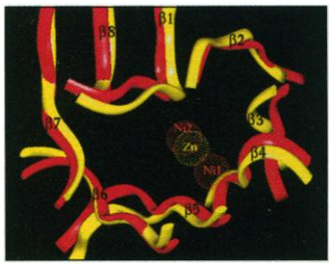
Cleaning up cars

Policies aimed at reducing automobile emissions may not always have the desired effect. Beaton *et al.* (p. 991) surveyed car emissions according to model age and maintenance histories, and show that poorly maintained new cars can be worse polluters than old cars lacking catalytic converters. And although electric cars are supposed to be clean, Lave *et al.* (p. 993) conclude that production and recycling associated with use of lead-acid batteries, for now the most cost-effective type, will generate up to 60 times the lead pollution of a car running on leaded gasoline.

■

Urease revealed

Urease from the jack bean plant was, in 1926, the first enzyme to be crystallized, and later became



the first identified nickel metalloenzyme. Jabri *et al.* (p. 998; see also Perspective by Lippard, p. 996) have now established the crystal structure of urease from *Klebsiella aerogenes*. The enzyme is a triangular trimer of T-shaped $\alpha\beta\gamma$ subunits, with the two nickel sites 3.5 angstroms apart on an $\alpha\beta$ barrel domain. The nickel atoms are each differently coordinated in a way that can explain their ligation to urea, which the enzyme hydrolyzes to carbon dioxide and ammonia. The barrel domain in urease closely resembles a corresponding structure in adenosine deaminase, which has zinc instead of nickel atoms and catalyzes a mechanistically similar reaction.

■

Lack of tolerance

In response to moderately elevated temperatures, the protozoan *Tetrahymena thermophila* pauses to manufacture heat shock proteins before resuming growth and accumulates a ribosome-associated cytoplasmic RNA (G8). To investigate the function of G8 RNA, Fung *et al.* (p. 1036) inactivated the *T. thermophila* G8 genes. The G8-deficient cells mounted an apparently normal heat shock response, but were unable to establish thermotolerance, an outcome of the heat shock response that enables cells to resist thermal killing. Although G8 RNA plays a role in maintaining a functional translational machinery at high temperatures, it is evidently not essential to all forms of heat tolerance.

■

Controlled excitement

Excitation of cardiac muscle cells leads to a precisely controlled contraction. The process relies on movement of Ca^{2+} into the cell through voltage-dependent channels in the plasma membrane, which triggers release of intracellular stores of Ca^{2+} from the sarcoplasmic reticulum via its ryanodine receptors (RyRs). Such a system might seem prone to an all-or-none release of internal Ca^{2+}, but López-López *et al.* (p. 1042) and Cannell *et al.* (p. 1045) present evidence that localized release of Ca^{2+} from RyRs is tightly coupled to entry of Ca^{2+} through single, closely opposed channels in the plasma membrane. This arrangement apparently allows for controlled amplification of the excitatory signal, permitting modulation of the strength of a contraction.

■

Nuclear importation

Proteins destined for a cell's nucleus are made in the cytosol and must be actively transported across proteinaceous pores in the nuclear envelope. Weis *et al.* (p. 1049) show that a protein found in the cytosol of human cells binds to nuclear localization sequences that act as signals for targeting to the nucleus, and promotes transport to the nuclear pores; there, another protein stimulates energy-dependent transfer across the nuclear envelope. The import receptor directly binds both of the known types of nuclear localization signals and is thus likely to be necessary for the import of most nuclear proteins.

■

Primitive processing

Ribosomal precursor RNA is processed in the nucleolus of eukaryotes by a ribonucleoprotein (RNP) particle that contains U3 RNA. Potter *et al.* (p. 1056) have studied the endonuclease involved in the processing of ribosomal RNA (rRNA) in the archaebacteria *Sulfolobus acidocaldarius*, and find that the rRNA processing activity contains a 159-nucleotide RNA with sequence and structural similarity to U3 small nucleolar RNA. Like RNA, this archaebacterial U3 may act in rRNA processing at sites that are analogous to those at which yeast U3 acts in yeast pre-rRNA, suggesting that the use of a U3-containing RNP for rRNA processing predates the split of the archaea and eukaryotes.

■

Ancient apian alimentation

From bees preserved in amber 25 to 40 million years old, Cano and Borucki (p. 1060; see also news by Fischman, p. 977) have extracted a bacterial spore similar to those of *Bacillus* species that live symbiotically in the gut of modern bees, where they aid metabolic processes. Remarkably, the spore was revived and cultured. DNA analysis of the cultured bacteria, coupled with careful exclusion of contamination and consideration of the evolution of DNA sequences, indicates that the spore may indeed have been trapped in the amber when it formed.

Looking up at the sun

Our understanding of the sun, the solar wind and magnetic field, and cosmic rays and dust has been largely based on data collected from Earth or from satellites near the ecliptic plane of the solar system. The goal of the Ulysses mission, which left the ecliptic after swinging around Jupiter in 1992, was to gather data from above the poles of the sun. Ten reports in this issue, beginning with an overview by Smith *et al.* (p. 1005), present results from the traverse of Ulysses to high latitudes and its passage over the solar south pole in 1994, near the time of solar minimum. Solar wind speed increased toward the south pole, reaching a constant 750 kilometers per second, and 26-day oscillations in the wind speed were evident only to about −50° latitude. Fluxes of cosmic rays varied little with latitude, in contrast to earlier predictions.

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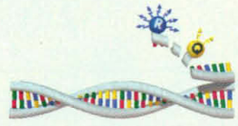

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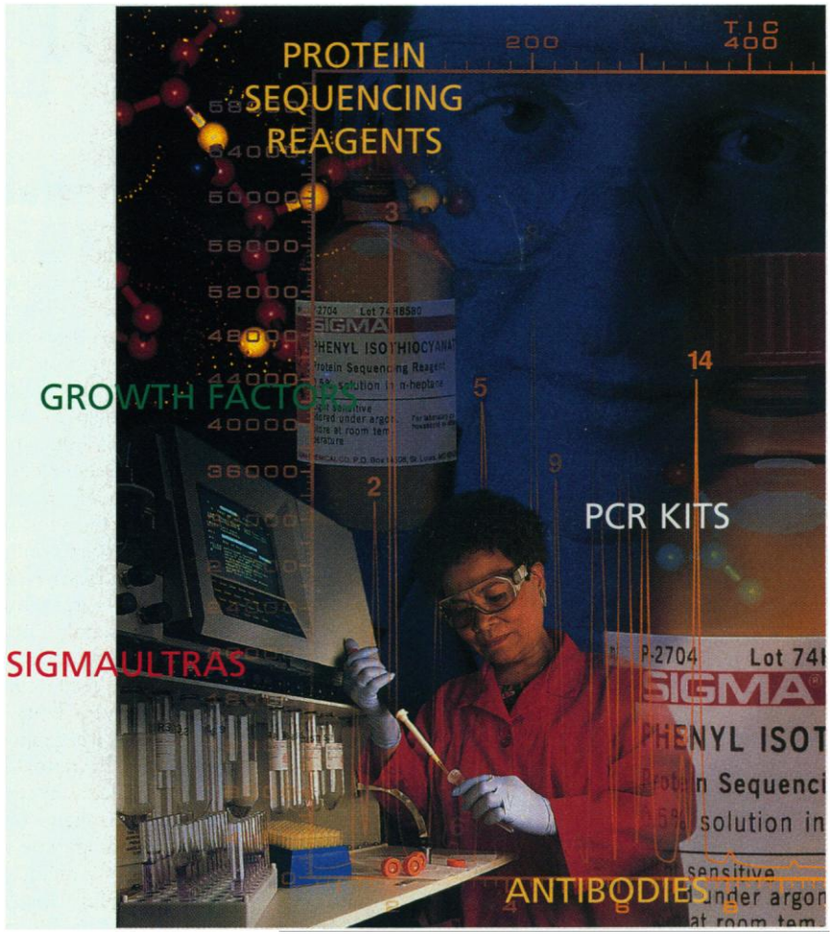

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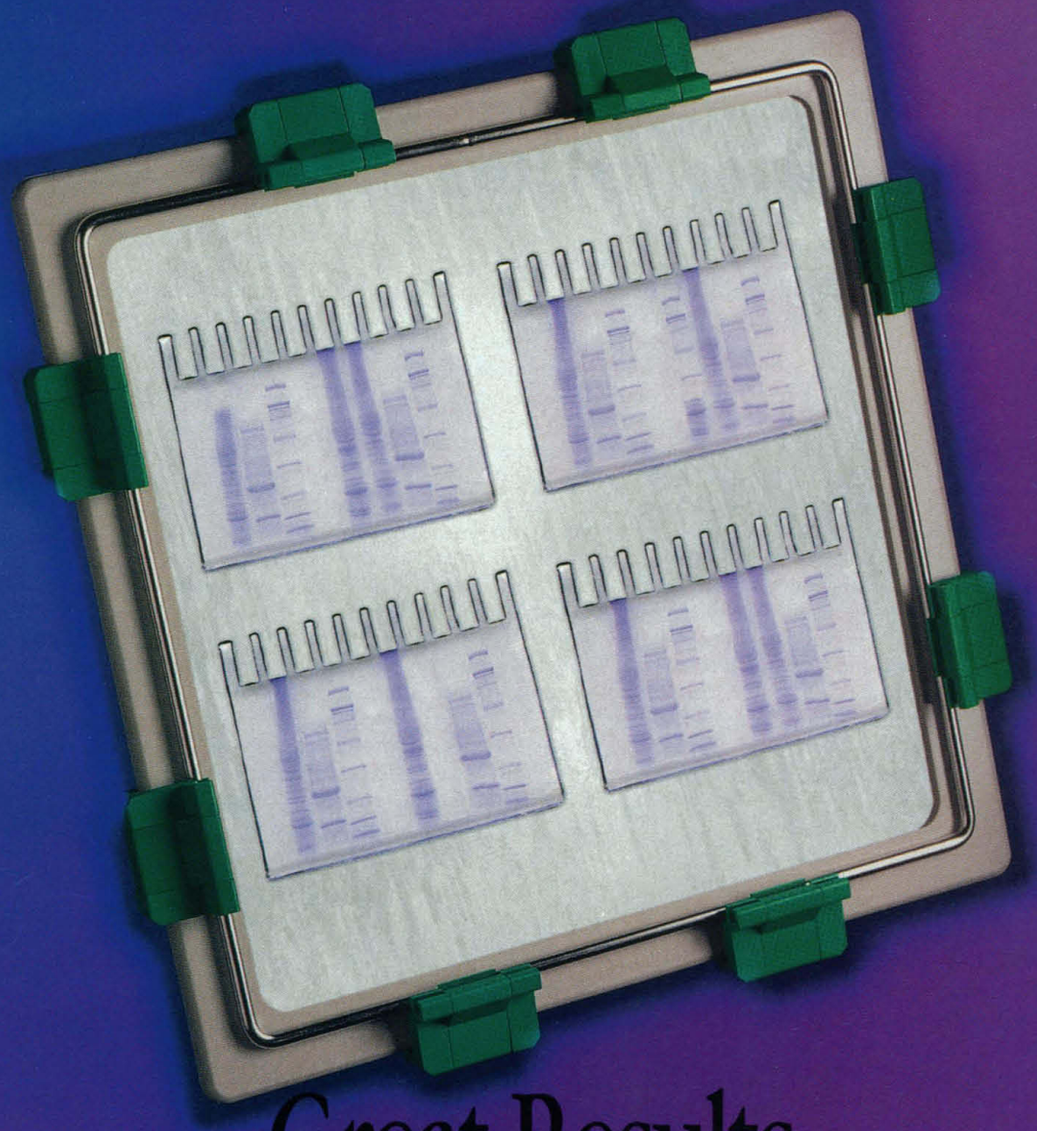

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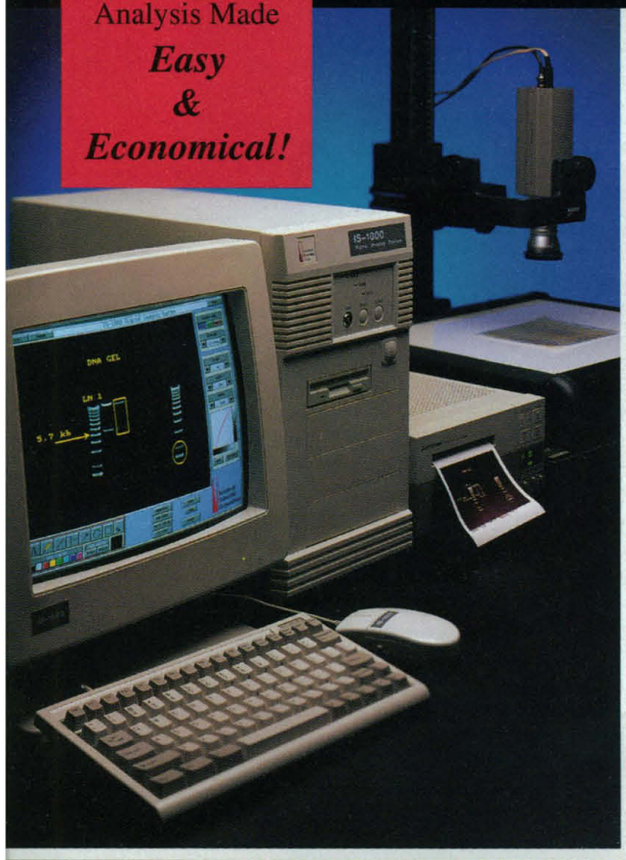

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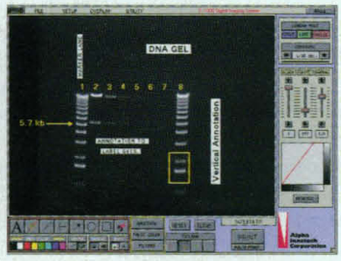

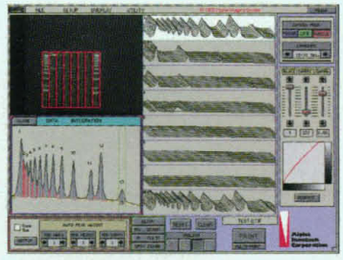

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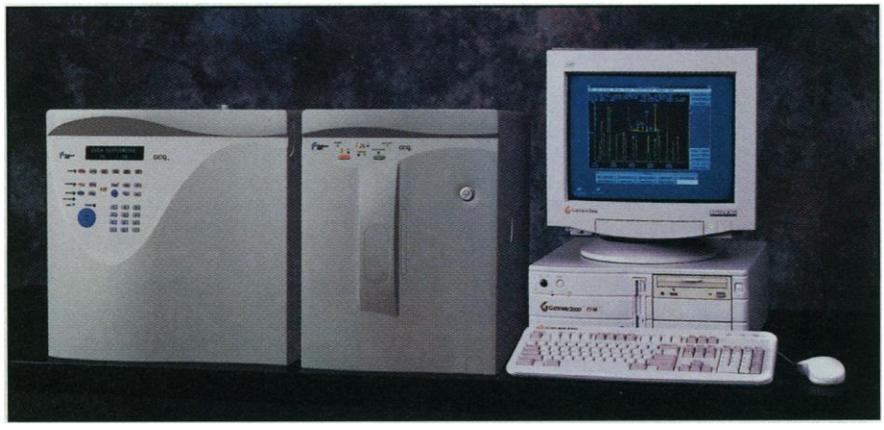

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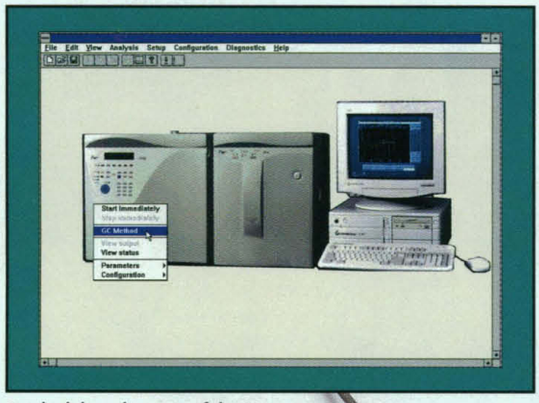
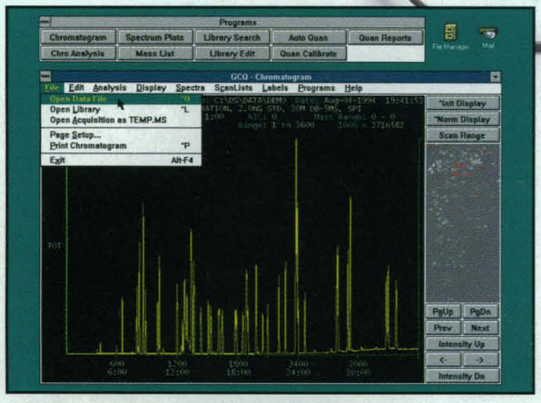


Simply click on the image of the GC or mass spec to access the method editor.



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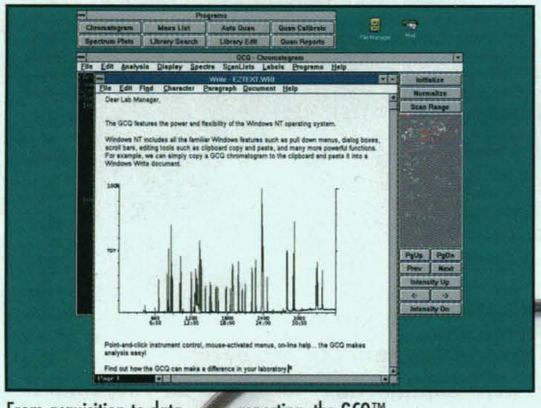

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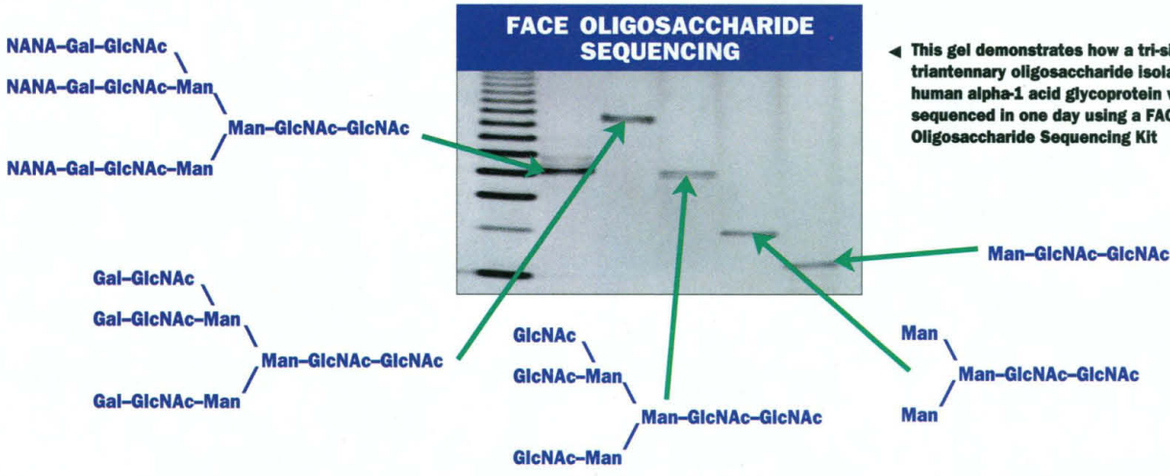

◀ **This gel demonstrates how a tri-sialylated, triantennary oligosaccharide isolated from human alpha-1 acid glycoprotein was sequenced in one day using a FACE N-linked Oligosaccharide Sequencing Kit**

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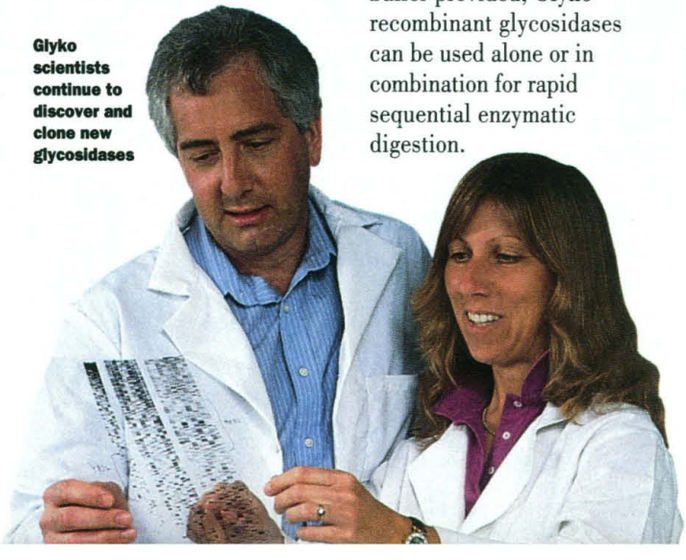
Glyko scientists continue to discover and clone new glycosidases



Better enzymes because they're recombinant, extensively characterized, and highly purified

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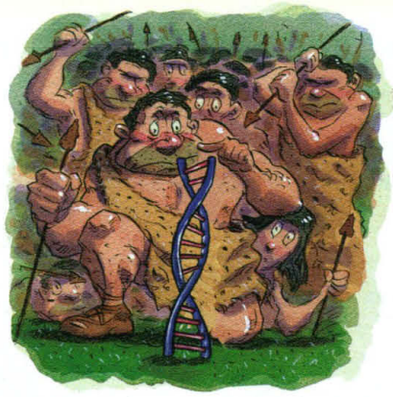

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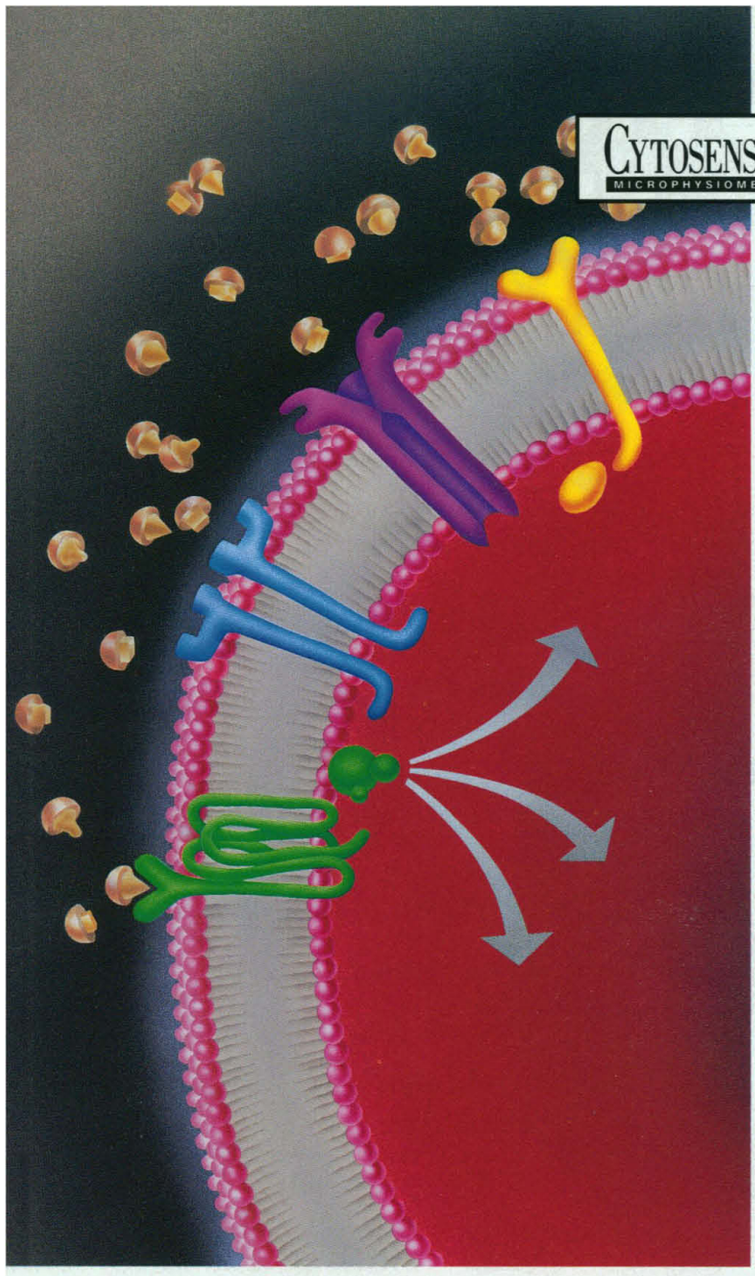

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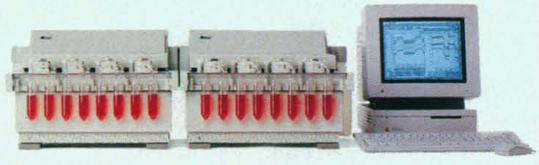

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1. *Science* **257**, 1906-1912, (1992) 2. *J. NIH Research* **5**, 69, (1993)

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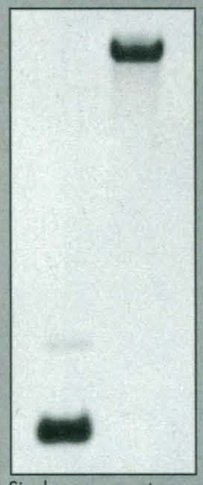

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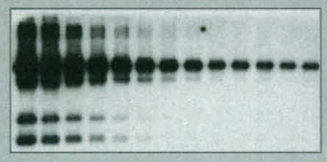

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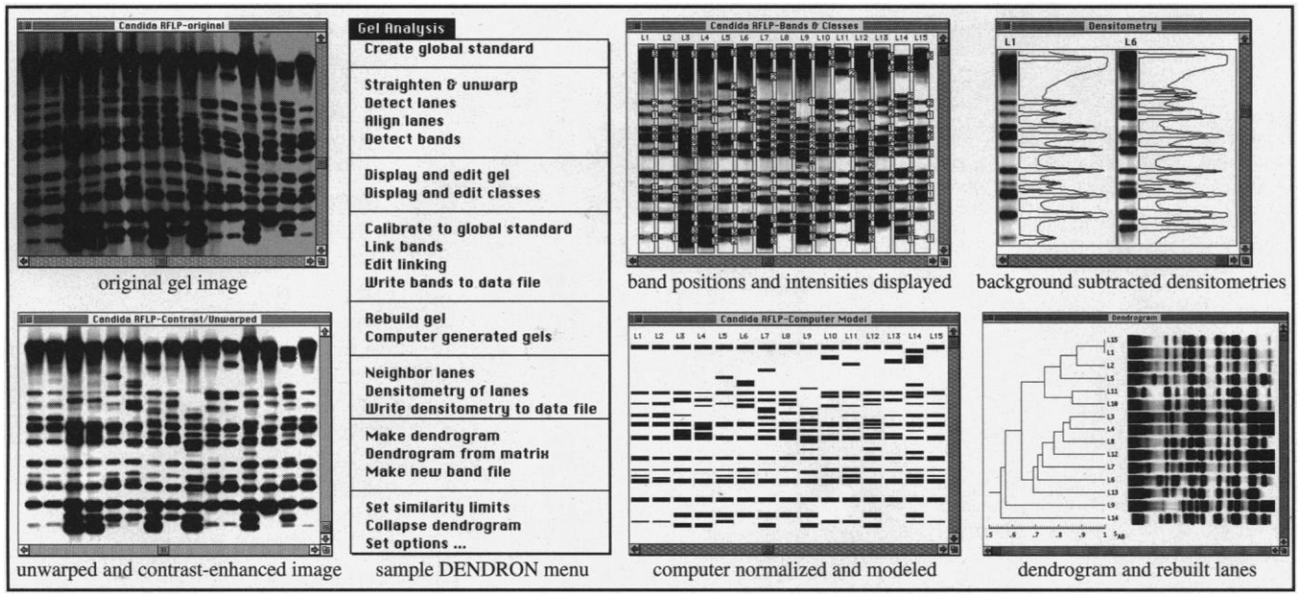

original gel image | band positions and intensities displayed | background subtracted densitometries

unwarped and contrast-enhanced image | sample DENDRON menu | computer normalized and modeled | dendrogram and rebuilt lanes

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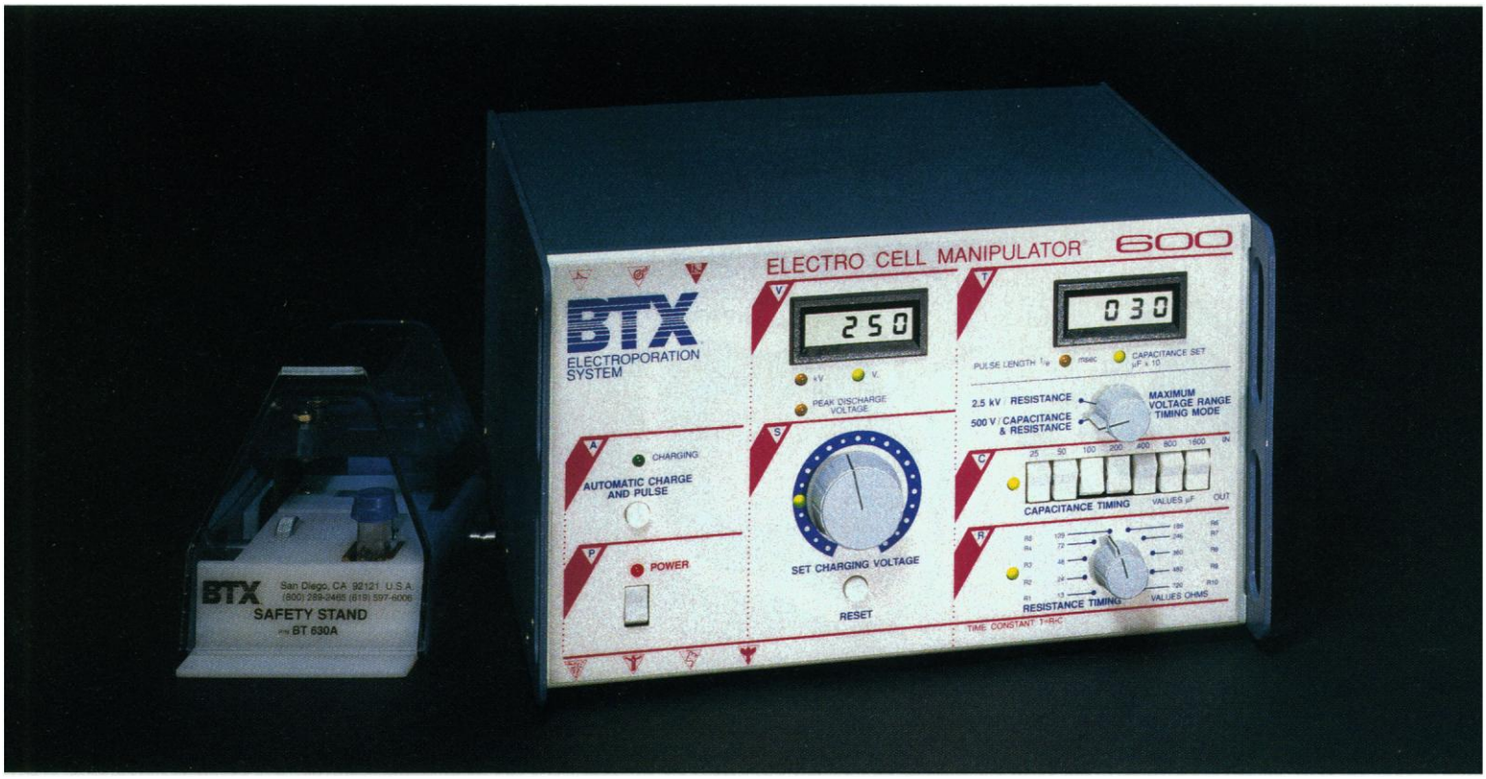

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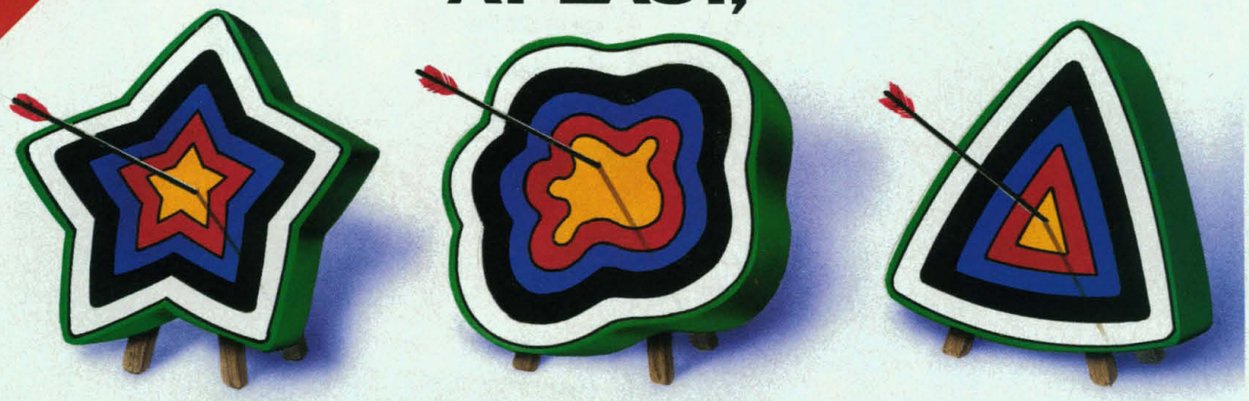

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