American Association for the Advancement of Science

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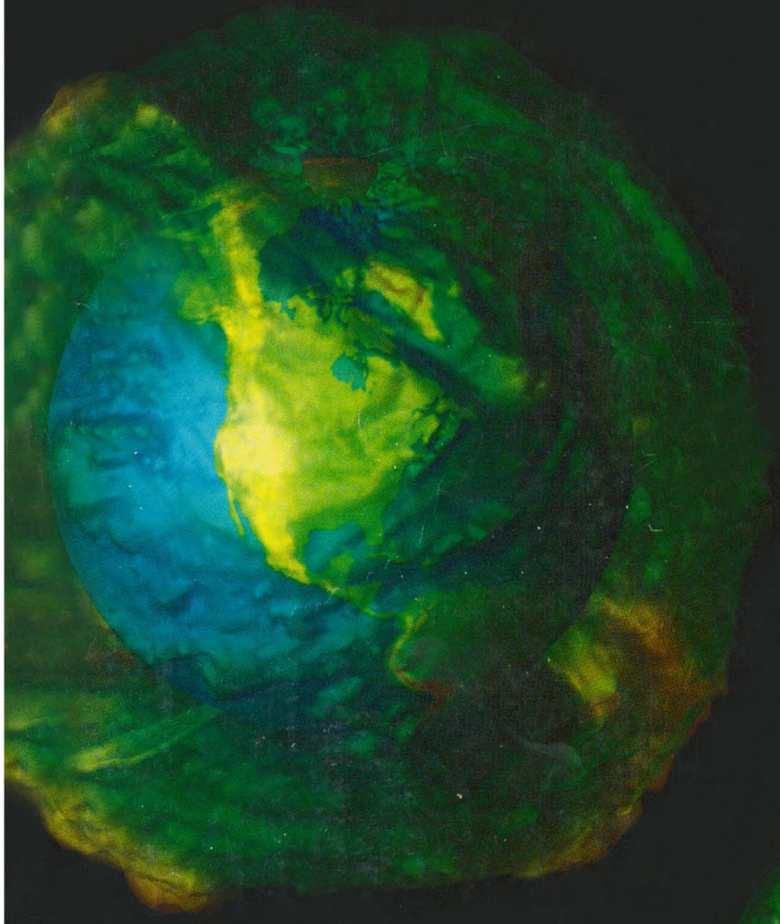
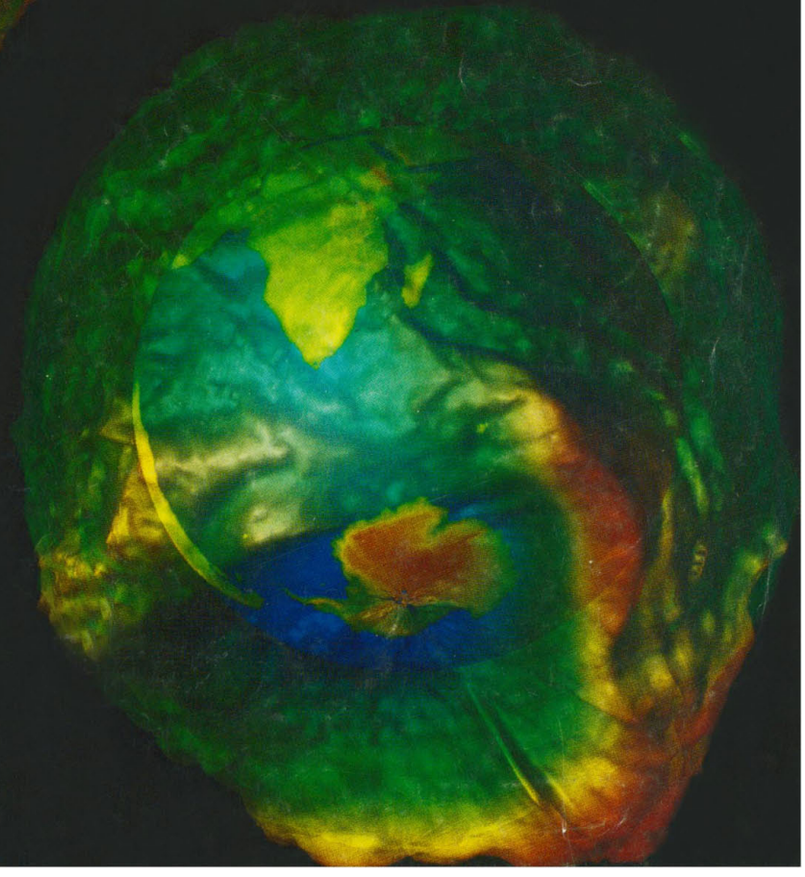
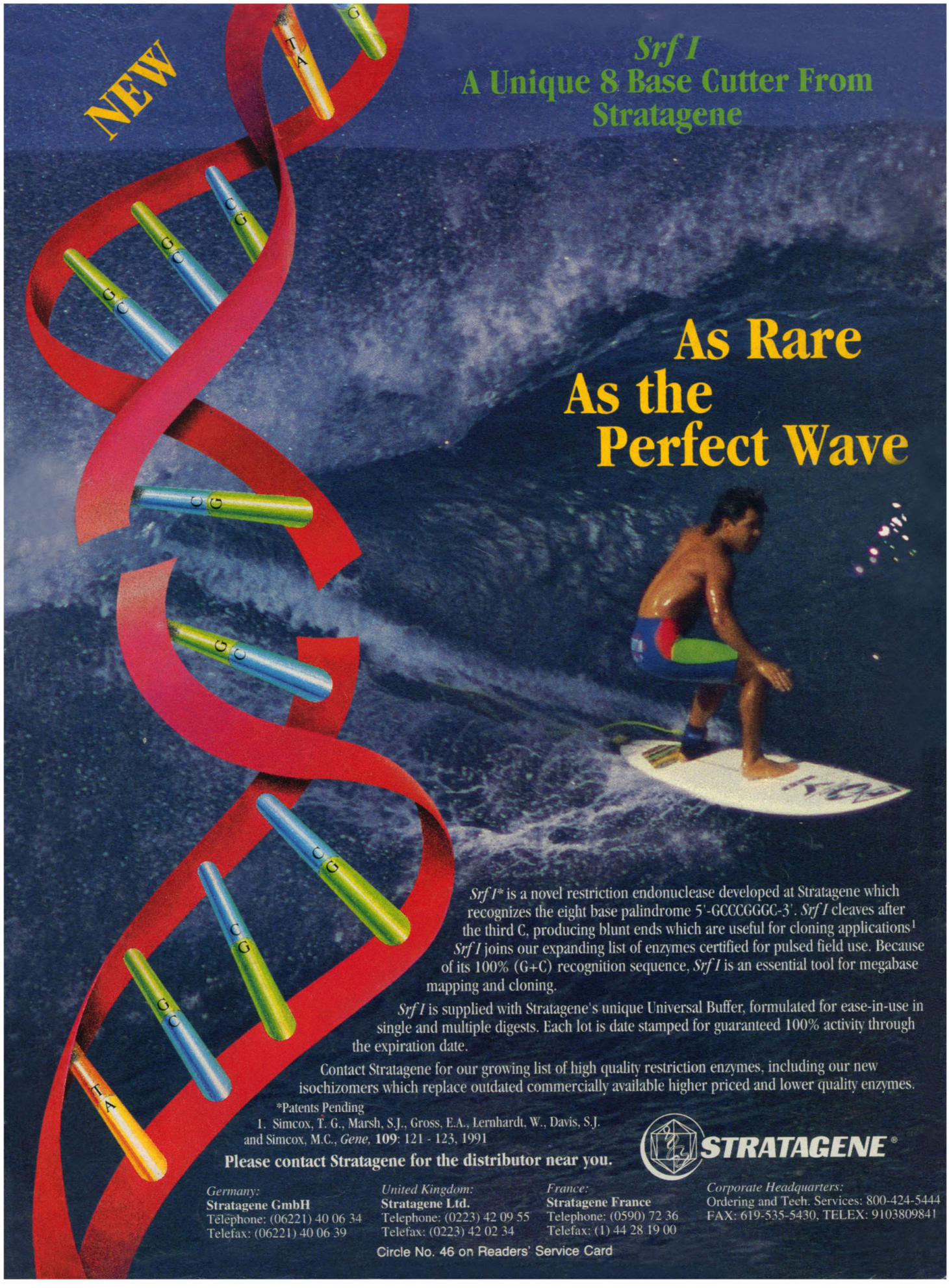


Computers in Science

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*Patents Pending
1. Simcox, T. G., Marsh, S.J., Gross, E.A., Lernhardt, W., Davis, S.J. and Simcox, M.C., Gene, 109: 121 - 123, 1991
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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The price of success at the Whitehead 25

NEWS & COMMENT

RESEARCH NEWS

SPECIAL SECTION

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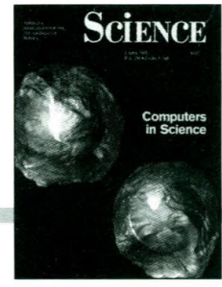
DEPARTMENTS

COVER

This computer visualization of global stratospheric ozone levels for 1 October 1991 highlights the Antarctic ozone hole (thin, dark blue region on lower globe). Powerful computer models are heating up research climates in molecular biology, chemistry, materials science, physics, and math—see the 19-page special report (page 44) and Bell's Perspective (page 64). [Image: Lloyd A. Treinish, using IBM's POWER Visualization System on data from NASA/Goddard's National Space Science Data Center]



RESEARCH ARTICLE

REPORTS

TECHNICAL COMMENTS

80 200-million-year-old metamorphic diamonds from China

34 & 86
Flying primates get their wings clipped

◩ Indicates accompanying News story or Perspective

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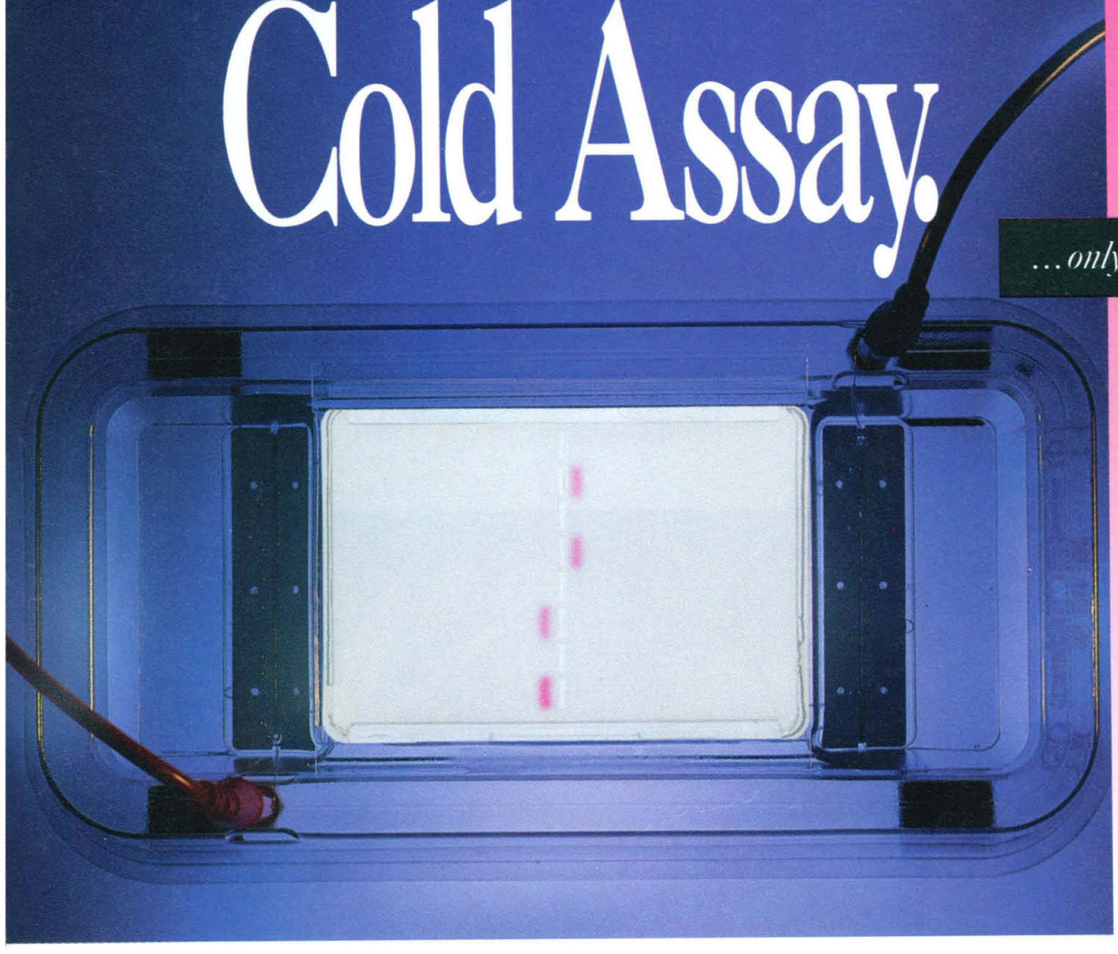

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edited by PHIL SZUROMI

European forests

Surveys of growing stock and growth patterns covering about a third of European forests through the 1970s and 1980s show that forest resources increased as much as 25 percent. This is contrary to widely held views of forest decline throughout Europe. Kauppi *et al.* (p. 70) review forest inventory statistics and other data that are available from Austria, Finland, France, Sweden, Switzerland, and the former West Germany and conclude that the fertilization effects of pollutants may have overridden damaging effects so far. Although there are notorious examples of forest destruction, such as that visible north of the Arctic Circle around a smelter in northwestern Russia, in other areas extensive forestation programs and improvements in silviculture have added to forest biomass.

The CO_2 sink

Only about half of the anthropogenically produced CO_2 has accumulated in the atmosphere; the sink for the rest has been uncertain. Quay *et al.* (p. 74) present carbon isotopic data that suggest that almost all of this missing CO_2 is being taken up by the oceans rather than the biosphere. Implications of this and other recent work on the CO_2 budget are also overviewed by Kerr in a news story (see p. 35).

Metamorphic diamond

Most natural diamonds derive from depths of greater than 130 kilometers in the mantle and were brought rapidly to the surface by volcanic eruptions. Shutong *et al.* (p. 80) now report a second occurrence of diamond that apparently formed instead by high-pressure metamorphism of crustal rocks. The diamonds were found in rocks in central China and coexist with other high-pressure minerals such as coesite and jadeite. Burial of crust to great depths, metamorphism, and subsequent exhumation back toward the surface most likely resulted from continent-continent collision about 200 million years ago.

The *Medea* factor

While screening diverse hybrid strains of the common flour beetle *Tribolium castaneum* for reproductively detrimental traits, Beeman *et al.* (p. 89) discovered a new class of selfish genes. Because this gene or gene complex acts maternally to cause the death before pupation of any progeny that do not inherit a copy from the mother, it has been designated the *Medea* factor (for maternal-effect dominant embryonic arrest). Similar mechanisms of genetic self-selection appear to be unprecedented in the animal kingdom. Yet, *Medea*-like factors were also found in congeneric species, one that at present cannot interbreed with *T. castaneum*, suggesting that such factors may be widespread in both plants and animals. In an accompanying Perspective, Bull *et al.* (p. 65) discuss some of the evolutionary implications of the *Medea* factor.

Competition in development

In the early stages of *Drosophila* development, the pattern of the embryo is established by interactions among a cascade of proteins. Hoch *et al.* (p. 94) analyze how two regulatory proteins, encoded by the genes *knirps* and *tailless*, refine the spatial domain of expression of the gap gene *Krüppel*, which is required for the formation of thoracic and abdominal segments. *Krüppel* is activated when the anterior morphogen *bicoid* is bound to the *Krüppel* gene promoter and repressed by the *tailless* and *knirps* proteins. Hoch *et al.* have found that the binding sites for *tailless* and *knirps* proteins in the *Krüppel* gene promoter overlap with those for the *bicoid* protein. Thus, the amount of *Krüppel* gene transcription is determined at least in part by competition between the activating *bicoid* morphogen and the repressing *knirps* and *tailless* proteins for the same sites in the *Krüppel* gene promoter.

Cancer screen

One of the leading causes of cancer deaths in the world is colorectal cancer. If it is detected before it spreads into surrounding tissues, a majority of cases can be cured. However, beyond periodically checking for blood in stools (which may or may not indicate a cancerous lesion), no sensitive test has been available for the early screening of precancerous lesions. Sidransky *et al.* (p. 102) have devised a method in which a stool sample can be screened for the mutant oncogene *ras*, which is commonly present even in tumors classified as benign. Application of this rational strategy in combination with other noninvasive tests based on additional implicated oncogenes should make early detection practical. In a news story, Marx (see p. 32) discusses the potential applications.

Controlling interleukin-1

The cytokine interleukin-1 (IL-1) is a protein that is involved in inflammation, septic shock, wound-healing, and the growth of certain leukemias. Thus it is a target for therapeutic agents. IL-1ß is synthesized as an inactive precursor, which is cleaved by a protease to produce the active form of the protein. Cleavage is carried out by the protease IL-1ß converting enzyme. Cerretti *et al.* (p. 97) have cloned a complementary DNA that encodes IL-1ß converting enzyme and show that the recombinant protein can process precursor IL-1ß to the mature active form. The gene encoding the protease is located at a chromosomal site that is frequently rearranged in human cancers. Agents that inhibit the activity of the converting enzyme may be useful in controlling cellular processes that involve IL-1ß and thus may be useful therapeutically.

Specificity and sensitivity in the immune system

The immune system must recognize and deal with innumerable invaders and intrusions. But how is the immune system able to generate receptors (be they immunoglobulin or T cell antigen receptors) on lymphocytes that, on the one hand, are randomly specific for almost anything, and thus of low affinity, while at the same time able to trigger the cell at extremely low levels of antigen? This paradox is resolved on T cells by the use of antigen receptors with low affinity that are helped by the co-receptors CD4 or CD8. Carter and Fearon (p. 105) now have evidence that the immunoglobulin on B cells is aided in a similar fashion by CD19, a B cell–specific protein.

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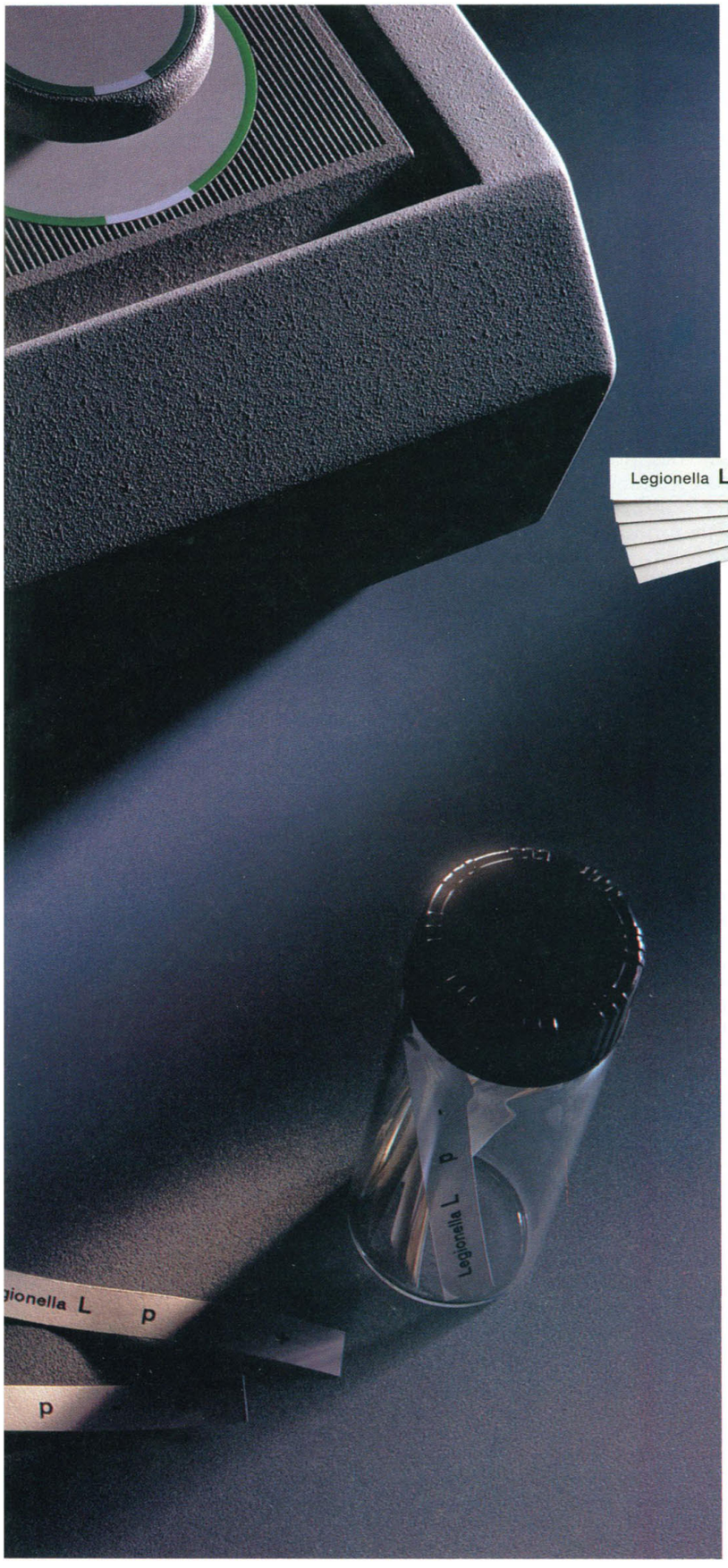

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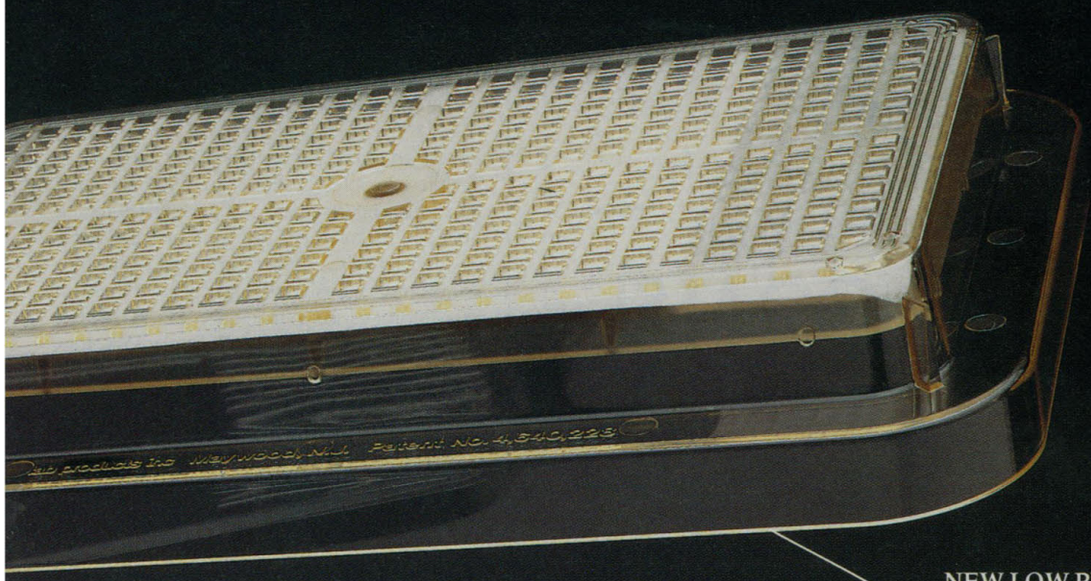

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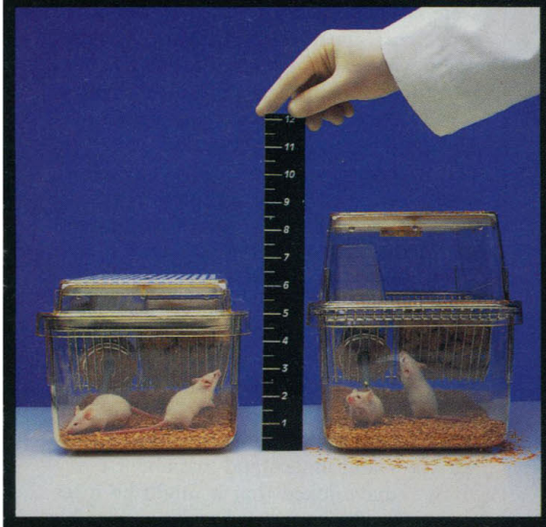

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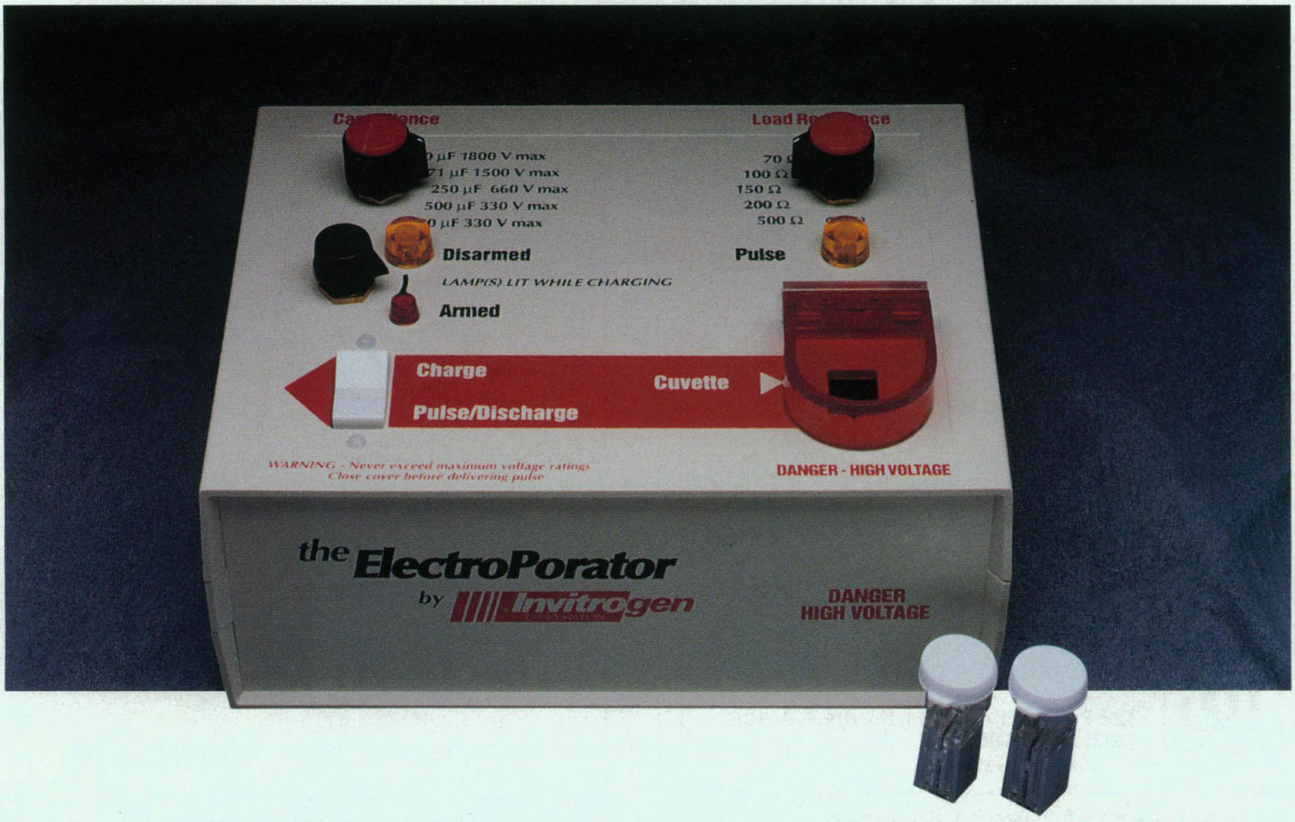

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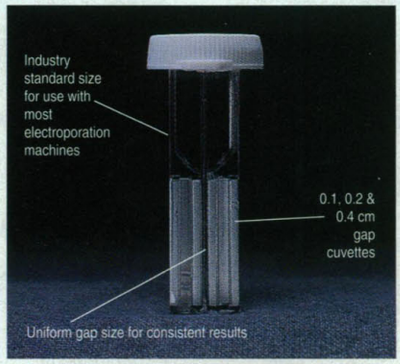

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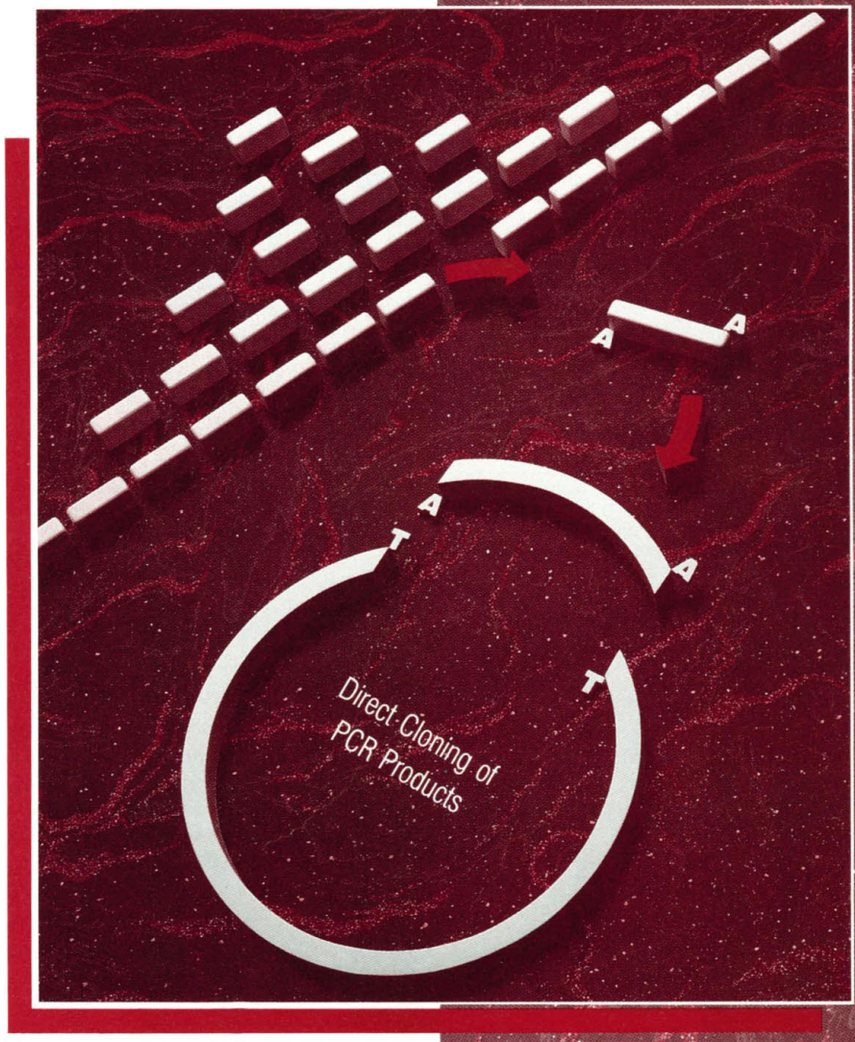

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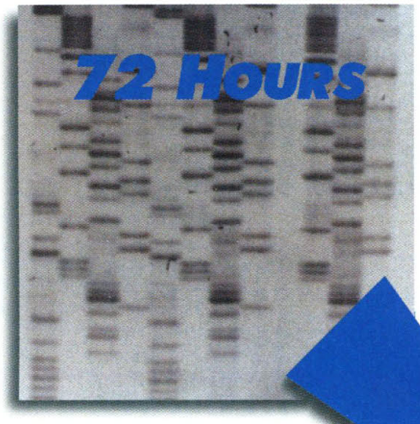
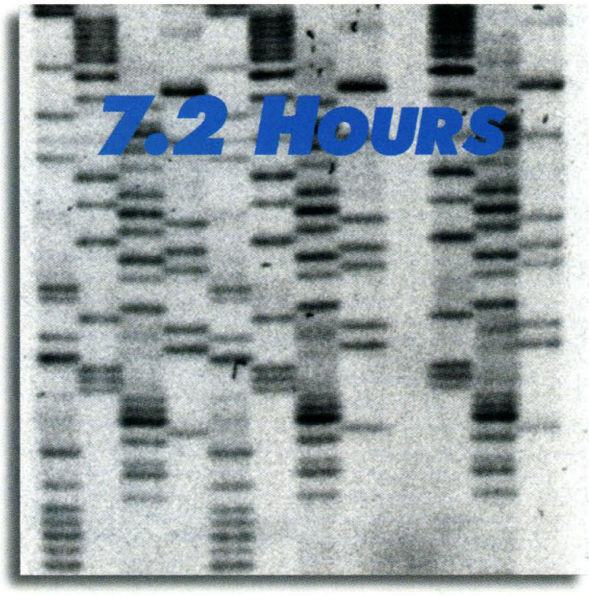


72 hour exposure of ^{35}S labeled sequencing gel to Kodak XAR5 X-ray film.



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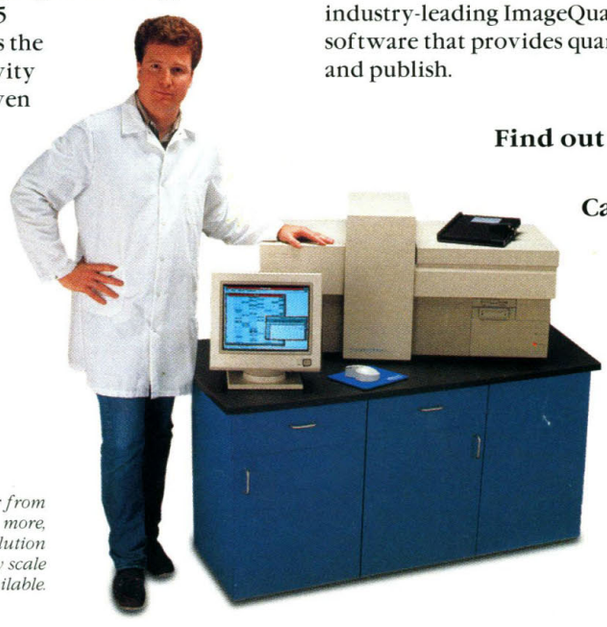

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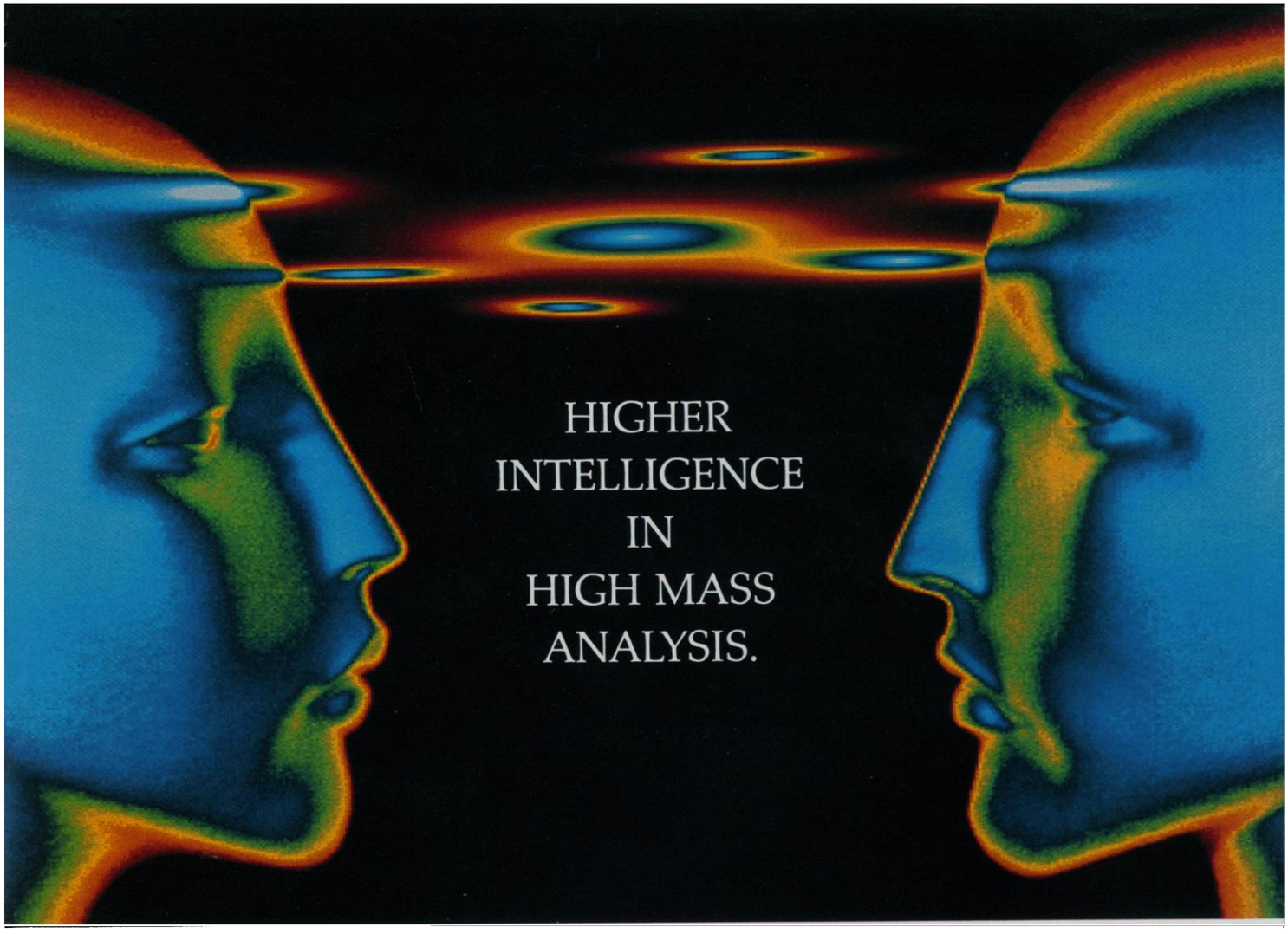

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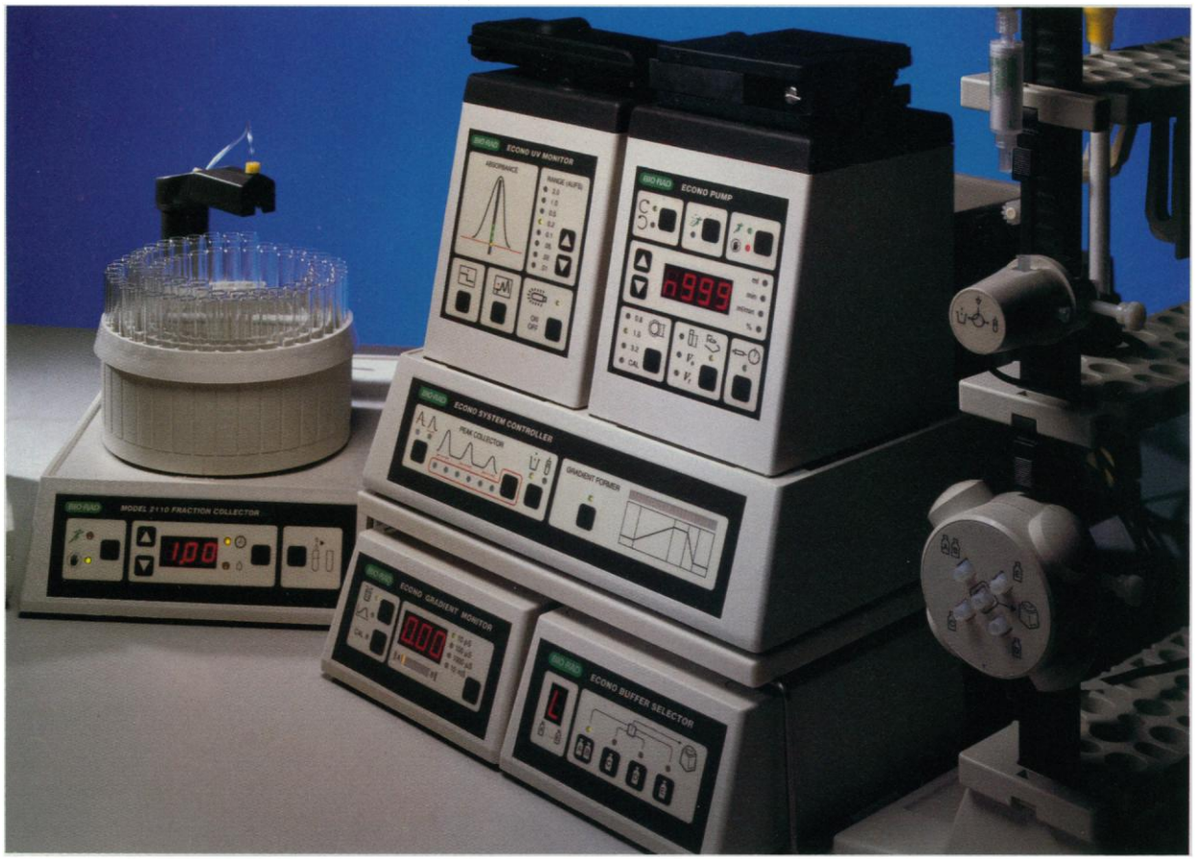

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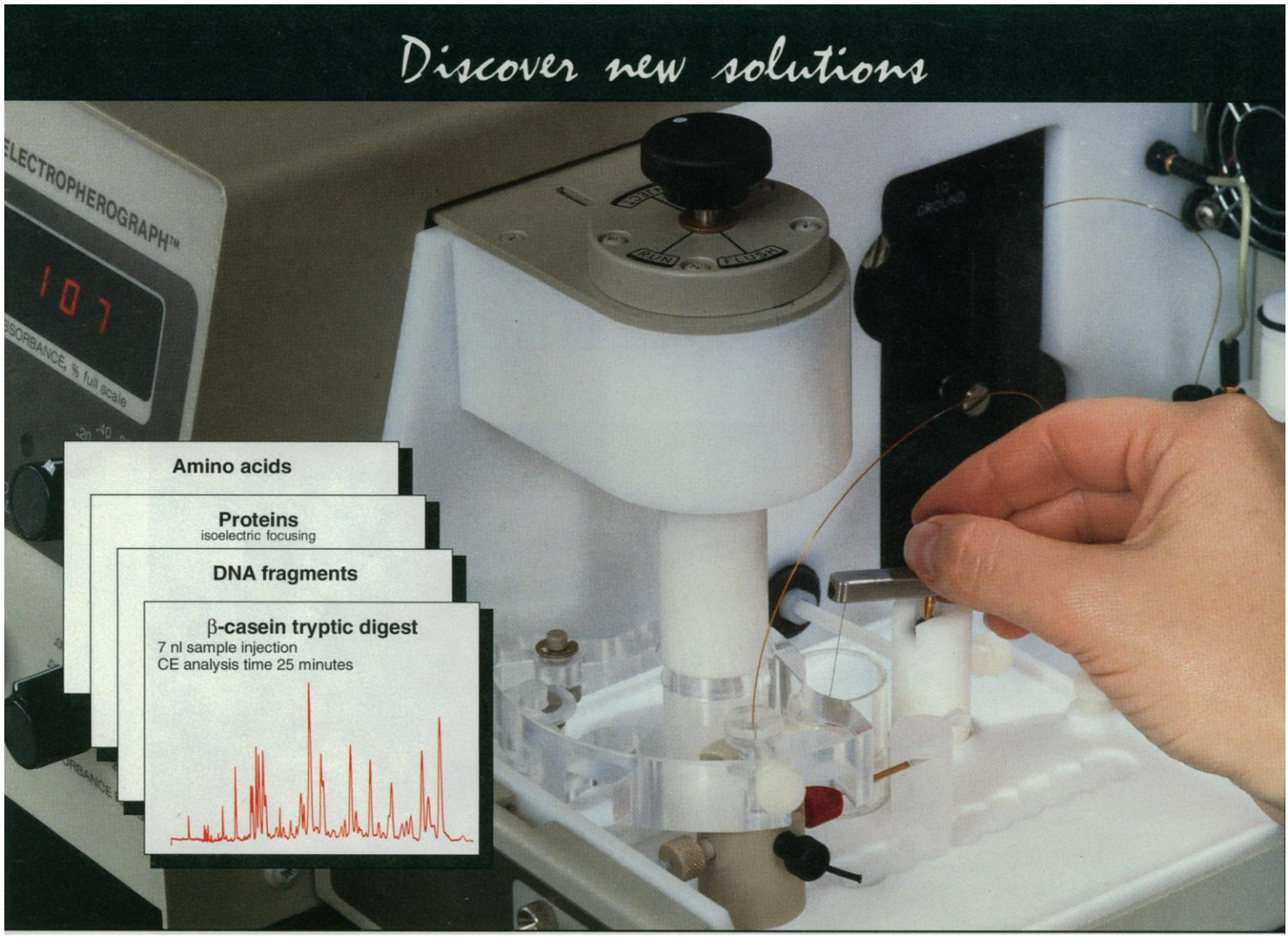

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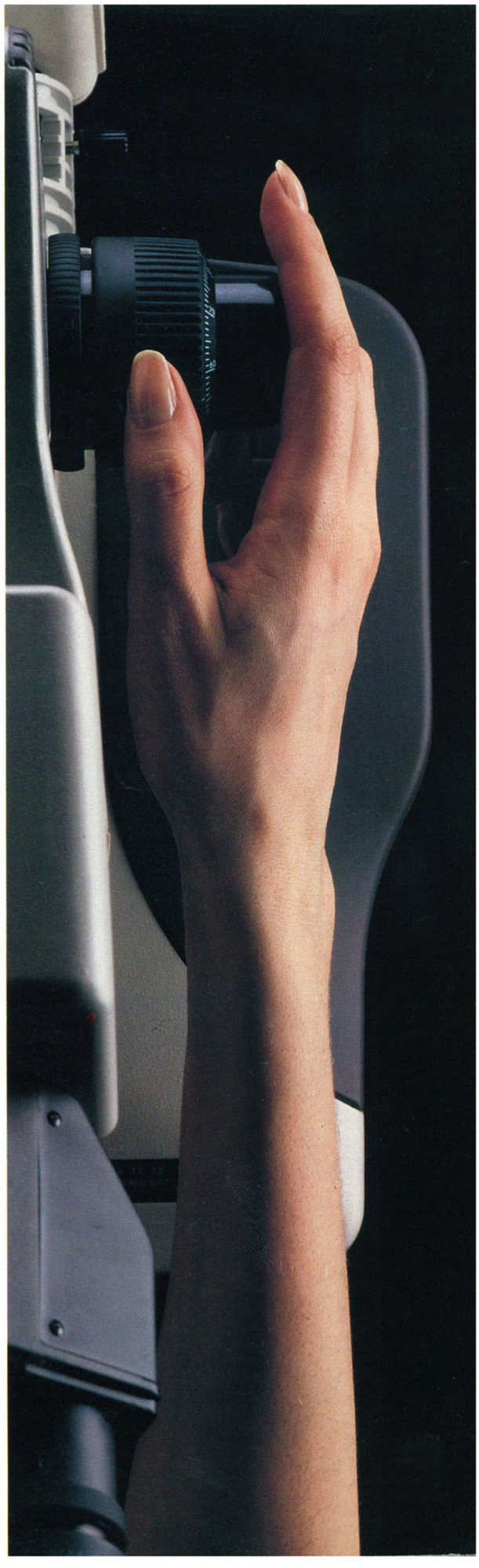

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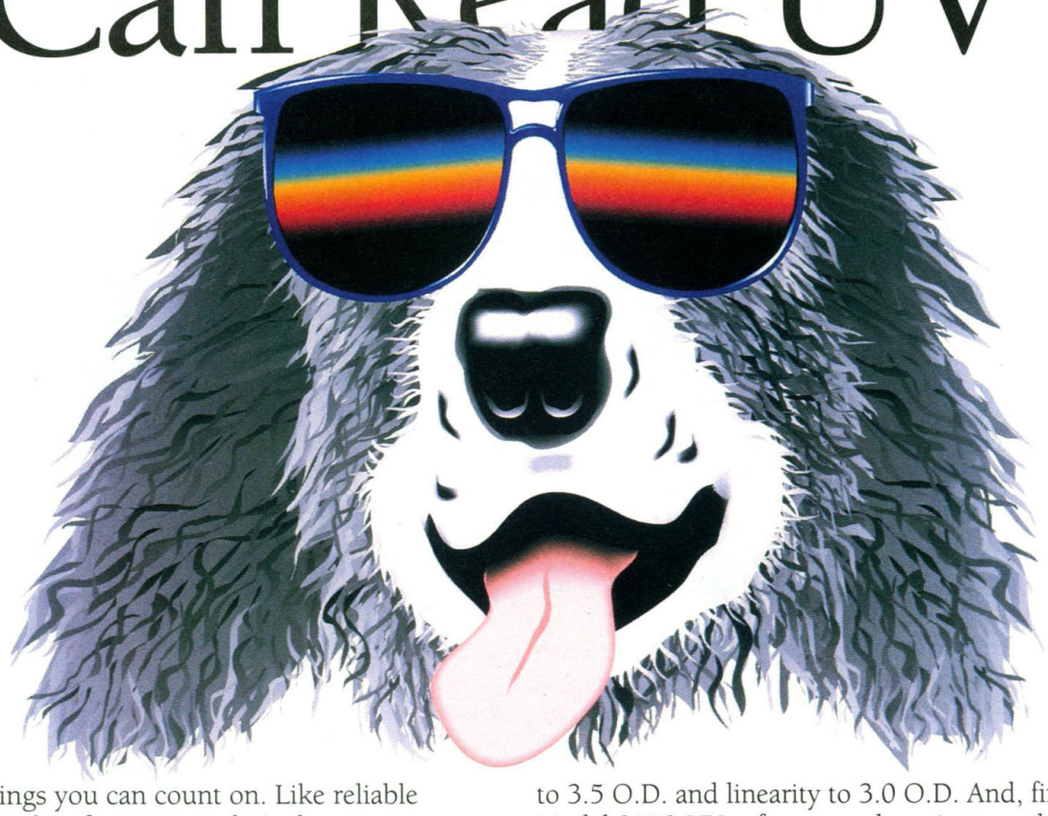

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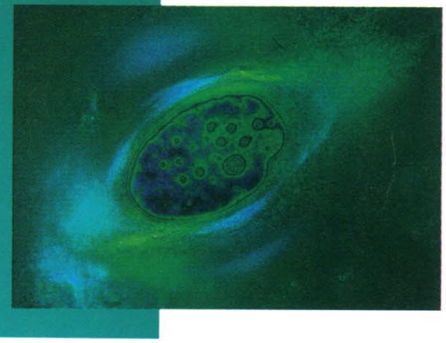

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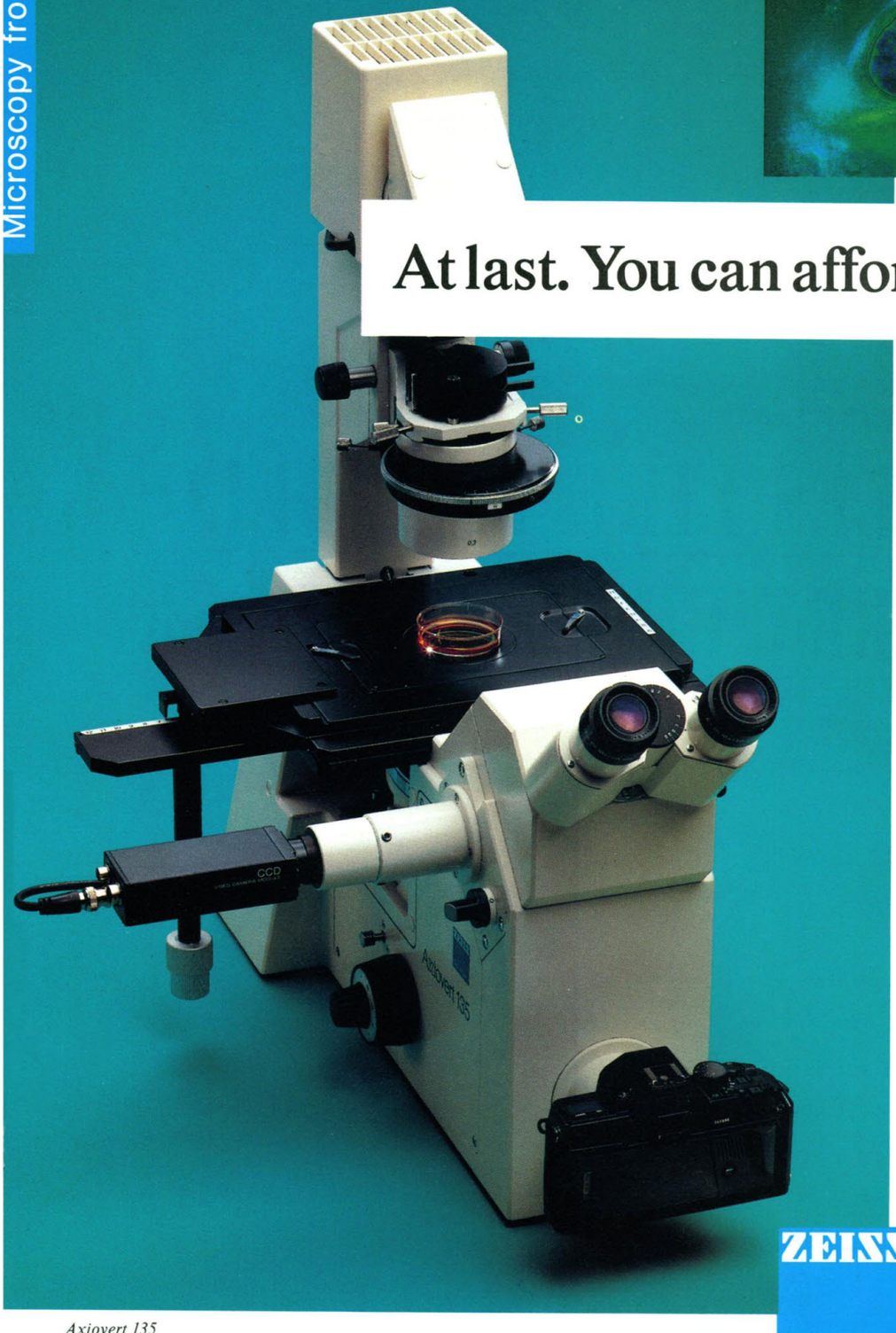

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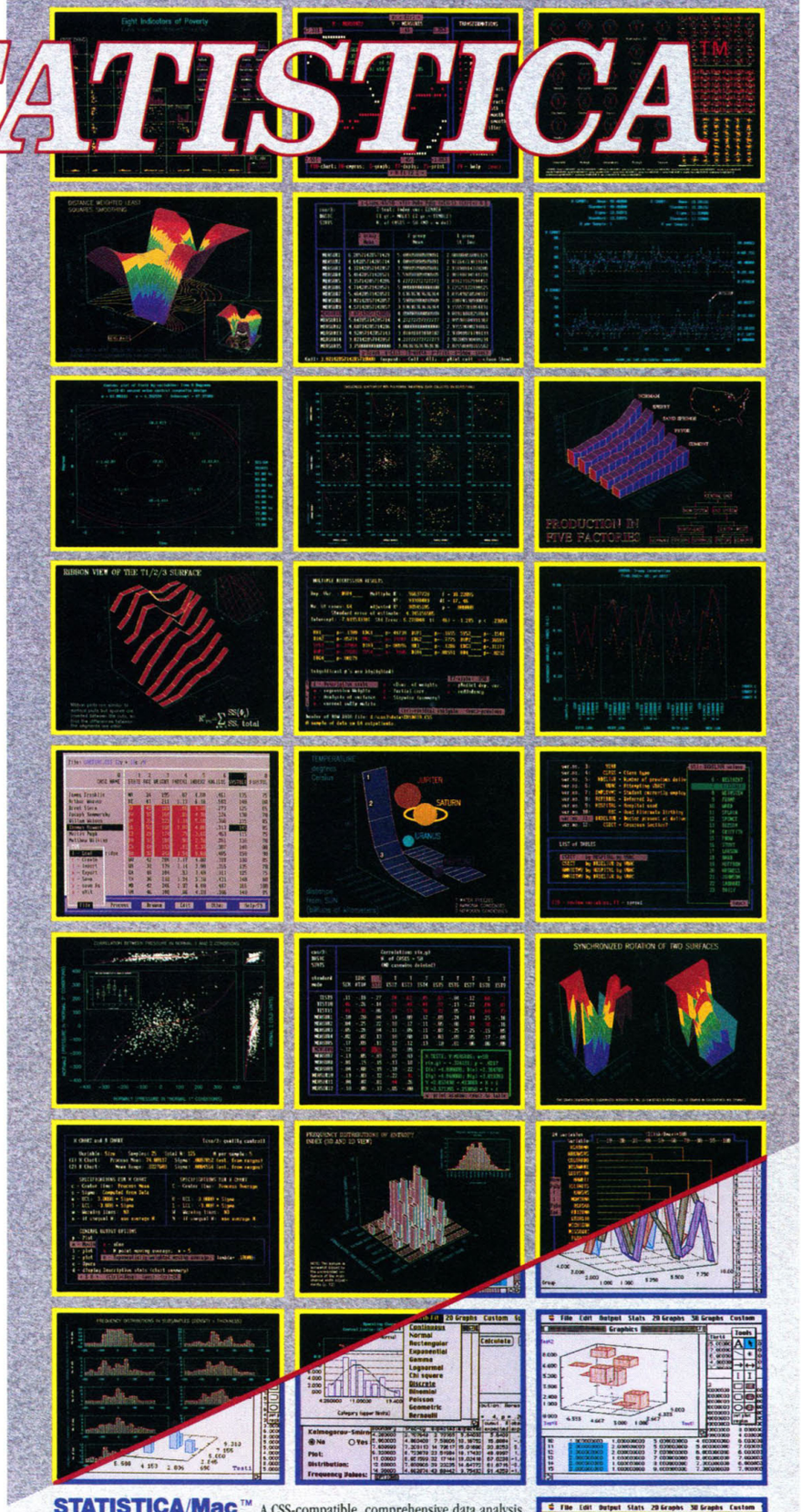

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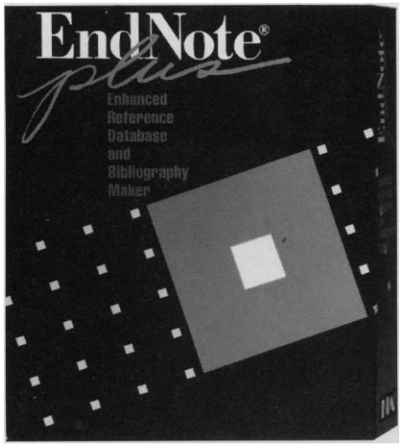

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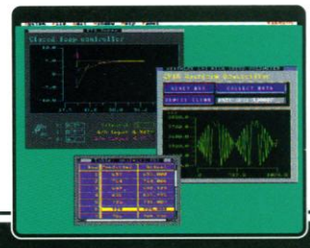

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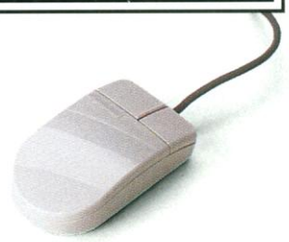

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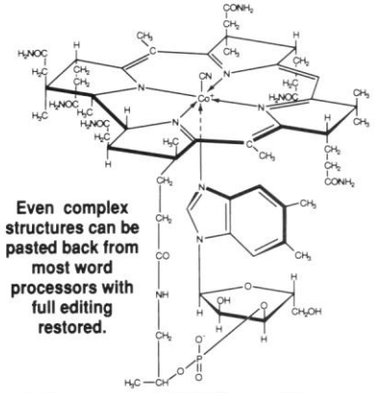

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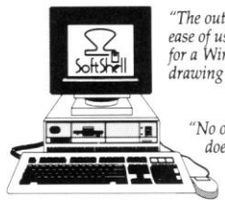

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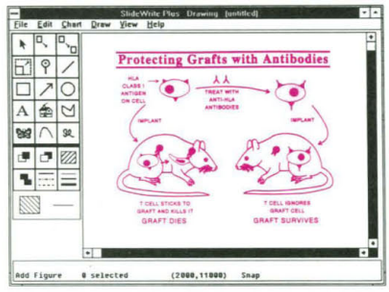

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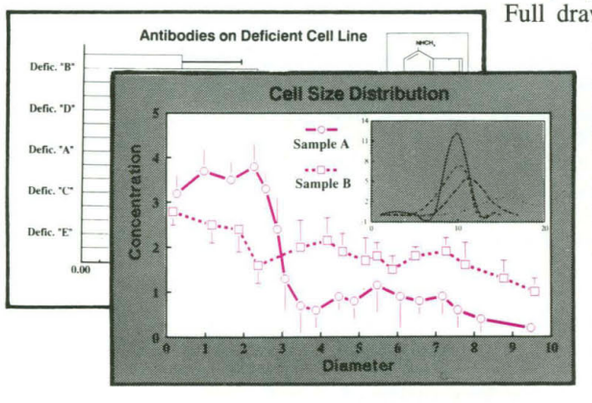

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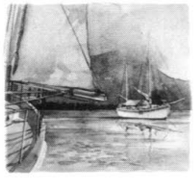

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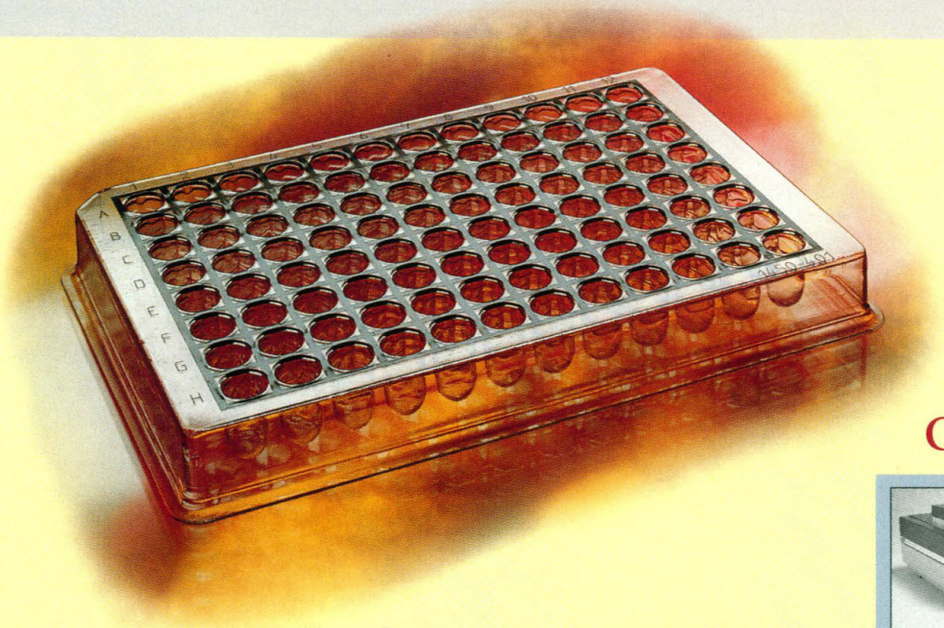

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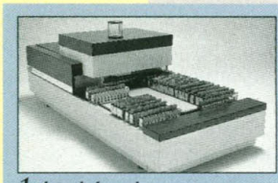

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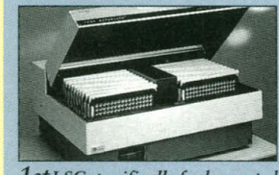

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