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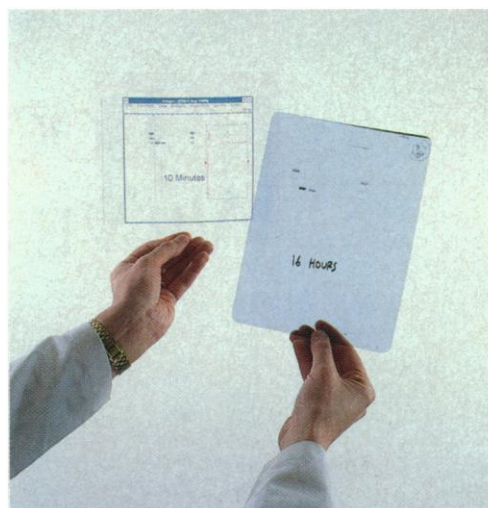
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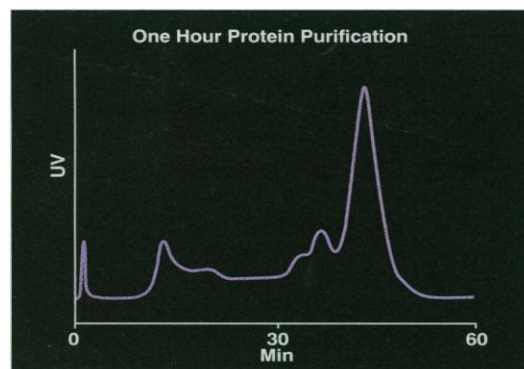


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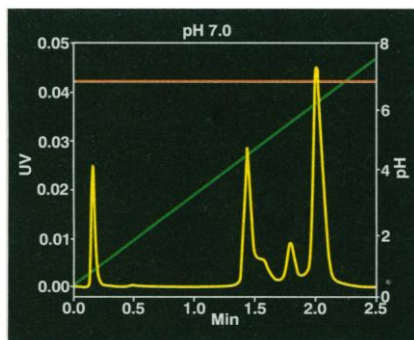
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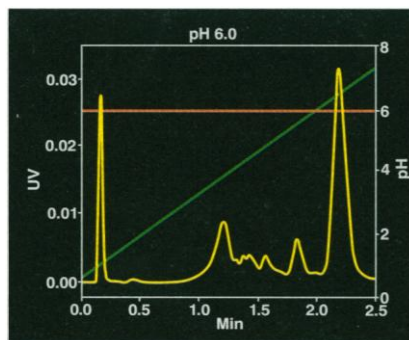


*Anion exchange separation of recombinant protein with
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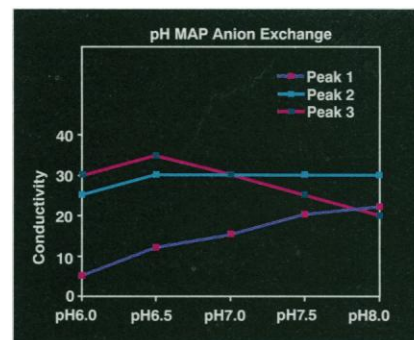
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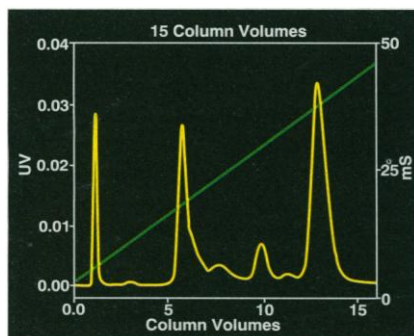
We began by running the separation at several pHs.



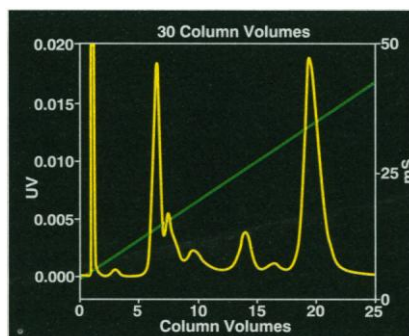
Confirmed the optimum pH at 6.0.



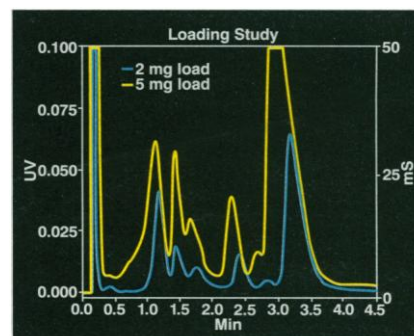
Plotted experimental results from built-in spreadsheet.



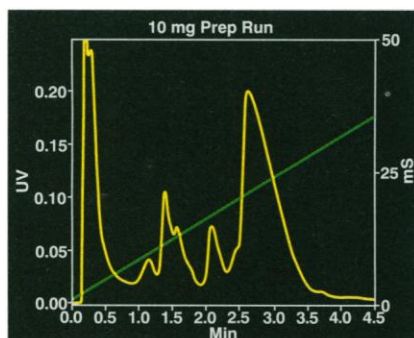
Tested gradient slopes for improved resolution.



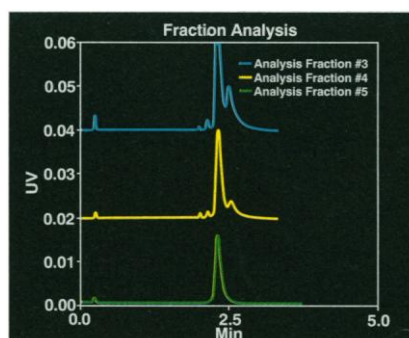
Selected 30 column volume gradient as optimum.



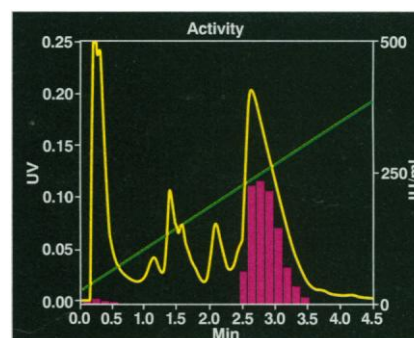
Studied the effect of loading at 2 mg and 5 mg.



Ran a 10 mg prep. Collected fractions.



Analyzed fractions by reversed phase.



Checked biological activity and purity.

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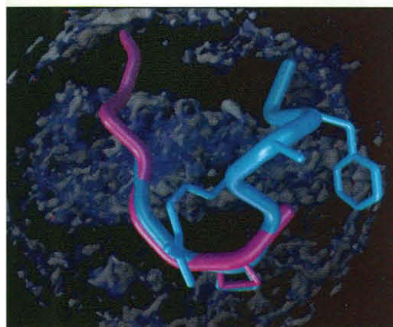
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COVER

Cross section of an adult mouse heart grafted with fetal heart muscle cells isolated from transgenic mice. The nuclei of the fetal heart cells (black dots) were visualized with a stain specific for a nuclear enzyme. These engrafted cells are integrated with the host

heart muscle. Such intracardiac grafting might be useful in repairing damaged heart muscle. See page 98 and the News story on page 31. [Digital image: Craig P. Wilson, Krannert Institute of Cardiology]



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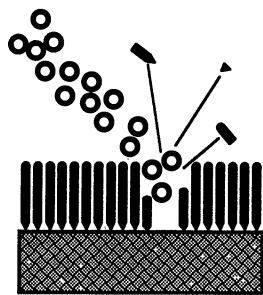


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Thin ceramic films have a number of useful applications, including reducing wear on load-bearing surfaces, providing scratch resistance to optical-quality surfaces, and acting as sensors. However, many routes for generating ceramic films require high temperatures, which precludes their use for coating many plastics and polymers. Bunker *et al.* (p. 48) review a number of developments in which low-temperature routes



(below 100°C) that mimic bone and shell formation are used to form high-quality, dense polycrystalline films of oxides, hydroxides, and sulfides.

Ozone and food production

Tropospheric ozone is a pollutant normally associated with urban areas, but many major agricultural areas are near urban areas and can be subject to the effects of increasing ozone concentrations, one of which is decreasing crop yields. Chamides *et al.* (p. 74) performed a global simulation of nitrogen oxide emissions, a major precursor to ozone production, in these large areas of mixed urban and agricultural activities during summer months. They estimate that by the year 2025, 30 to 75 percent of the world's grain crops will be grown in areas where ozone concentrations could reduce crop yield.

El Niño chaos

El Niño–Southern Oscillation (ENSO) cycles occur irregularly every 3 to 6 years or so. One factor controlling the cycles is the presence of equatorial waves driven by interaction of the ocean and atmosphere, but this interaction cannot account for the irregular behavior. In complementary modeling and theoretical studies, Jin *et al.* (p. 70) and Tziperman *et al.* (p. 72) suggest that interaction of this oscillator with the seasonal cycle results in several nonlinear resonances. The ENSO cycle jumps irregularly among these resonances and thus exhibits a low-order chaotic pattern and irregular occurrence.

Alternating quakes?

The East African Rift marks a major region of continental extension and an area of active seismicity. In an analysis of a recent earthquake sequence, Girdler and McConnell (p. 67) show that the western branch of the East African Rift system extends farther north into the Nile Valley than previously thought. Furthermore, during a period of about 17 months, seismic activity alternated between two fault systems east and west of the Nile.

Perturbed patterns

Oxidation of CO on platinum surfaces can spontaneously lead to pulse and spiral patterns on the order of 2 to 200 micrometers. Graham *et al.* (p. 80) studied the effect of microscopic boundaries on this process by patterning the surface. After growing an inert titanium overlayer on a Pt(110) surface, they used photolithographic methods to selectively etch away a patterned platinum surface. Boundaries similar in size to the patterns give rise to new effects, such as the pinning of spirals to titanium islands arranged in a grid.

Molecular aqueducts

Nephrogenic diabetes insipidus (NDI) is a disease in which the kidneys do not respond to the

antidiuretic hormone vasopressin and therefore fail to concentrate urine. A mutation in the gene encoding the vasopressin receptor is responsible for the usual X-linked form of NDI, but Deen *et al.* (p. 92) have identified and studied a patient in whom that receptor is normal. They find instead that the patient is a heterozygote for two mutations in the gene that encodes aquaporin-2, a water channel in the kidney's collecting ducts. Expression of both mutant forms of aquaporin-2 confirmed that the channel was nonfunctional. Thus, aquaporin is a human water-channel regulated by vasopressin.

Bends and loops

The V3 loop of the human immunodeficiency virus–type I (HIV-1) envelope protein is critical for viral infectivity and is the site recognized by most antibodies that inactivate (neutralize) the virus. Ghiara *et al.* (p. 82) determined the crystal structure of a 24–amino acid peptide from the V3 loop in a complex with a fragment from a neutralizing antibody. The tip of the V3 loop contains a type III–I double bend that was not predicted by previous computer simulations. Knowledge of V3 loop conformation may facilitate the design of vaccines and drugs to inhibit HIV-1 infection.

Mitochondrial electron transfer

To students of biochemistry, electron transfer may be most familiar as a part of the mysterious and complex process by which mitochondria generate adenosine triphosphate from the combustion of foodstuffs. Electrons flow through a series of carriers, which are associated with the mitochondrial membrane, and participate in oxidation-reduction reactions that generate a proton gradient. One of the difficulties in elucidating this chemistry has been the intractability of membrane proteins. Chen *et al.* (p. 86) present the structure of a soluble, three-component electron transfer chain from *Paracoccus denitrificans*. The paths taken by the electrons may depend not only on the geometry of the carriers but also on conformational changes of the protein scaffolds.

Young at heart

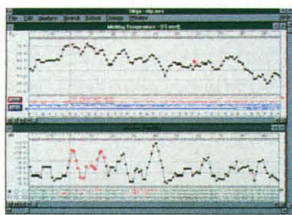
One reason for the high morbidity and mortality associated with heart disease is the inability of adult cardiac muscle to regenerate after injury. A possible therapeutic approach would be to graft developing embryonic cells into damaged sites, but the transplanted cells must couple with the adult cells to form functional muscle. Soonpaa *et al.* (p. 98; see cover and news story by Nowak, p. 31) generated transgenic mice in which the cardiomyocytes carried a β -galactosidase marker. Light microscopy revealed that transplants of embryonic cardiomyocytes from these transgenic mice into adult mice formed stable grafts. Electron microscopy revealed the formation of intercalated disks between the embryonic and adult cells, which suggests that functional gap junction connections may also form.

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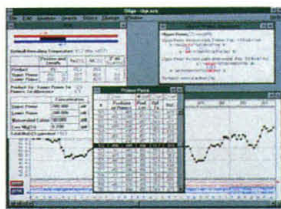


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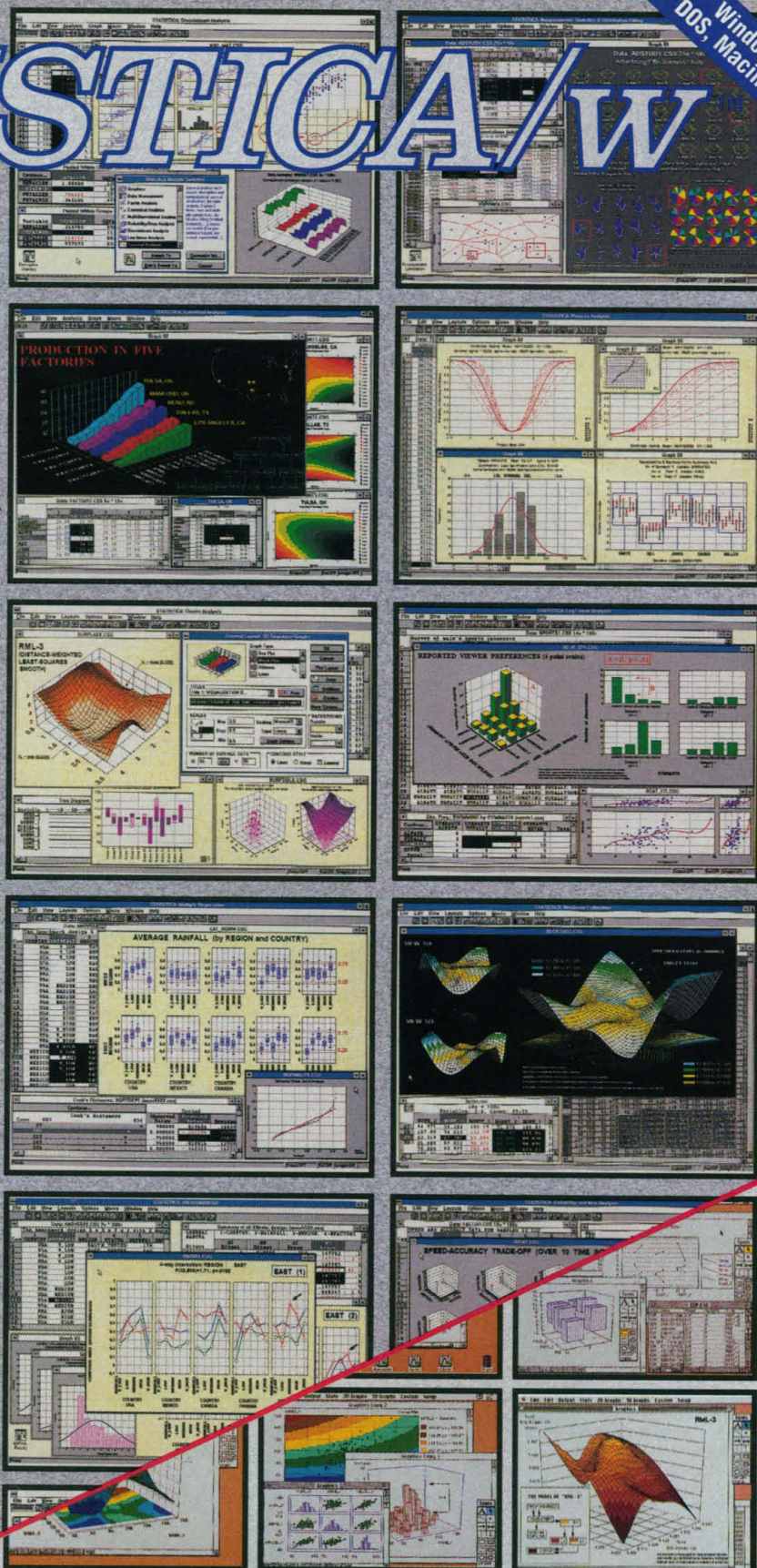


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GRAINCOLLECTION

HUMANS' NATURAL ECOLOGICAL NICHE

SERGIO TREVIÑO

Translated by:
Rebeca San Martín-Feeney

The logically harmonious thesis contained in this work will revolutionize our current way of thinking about human origins and behavior.

Ernst Mayr, Professor of Zoology, Emeritus, at Harvard University, considered by many to be the greatest evolutionist of the century, has written to the author:

"...I am rather inclined to accept your thesis of the role of graincollecting in the history of mankind, persuaded by your arguments and those of others.

Thank you very much for your interesting and closely argued book!"

How did bipedalism, the loss of body hair, and tool use originate? After more than 130 years of scientific research, the origin of these basic human characteristics is still unknown. Bipedalism, the loss of body hair, and tool use originated 14 million years ago, when our very distant ancestors, *Ramapithecus*, turned graincollectors. Erroneously, we still equate biological evolution with "progress", and therefore, believe humans descend from knuckle-walking, hairy, unskilled tool users who resembled the living great apes, when, in fact these apes descend from bipedal, naked, skilled tool users, who resemble modern man.



The large intestine, humans' largest internal organ, is presently used only to absorb water and electrolytes, although its sacculated nature indicates an evolutionary adaptation to digest cellulose. This intestine's movements are so slow that the first radiologist to observe it said it presented a picture of still life. Much of this inactivity can be attributed to mankind's omnivorous diet. Nonetheless, it follows that, when following an **exclusively** granivorous, cellulose-digesting diet, our large intestine proves to be much more useful and efficient, since our ancestors up to 50 thousand years ago **always** used it to digest cellulose fiber. We are presently neglecting a very useful capability that our ancestors adaptively acquired. Humans, as **all** other primates, were meant to be vegetarian cellulose-digesters and have slim bodies. The size of the human mouth is small for almost any type of omnivorous feeding, making this feature, as well as our powerful teeth, characteristic more of seed-eaters than of carnivorous or omnivorous mammals.

It is inconceivable to think that hominids and their protohominid ancestors lived in the savannas for millions of years and never developed the practice of feeding from gramineous seeds until the discovery of agriculture, or until fire was used to cook food. If we take into consideration that early hominids were already **bipeds and tool users**, and **the seeds from grasses would lightly touch their hands as they walked in the long-grass grasslands**, it would be illogical to assume that, in spite of the many vicissitudes they suffered during so many million years of living in the savannas, they never tried to feed from these seeds or that they never thought of removing the seeds with their hands. The author argues that when injuring themselves by removing the seeds, they used a **natural** small stone tool to protect their hands, which achieved an unanticipated advantage: they improved their efficiency in removing and threshing seeds.

We invite you to read this book and explore in it the scientific bases of these arguments, upholding the importance of the role of graincollecting in human evolution and behavior.

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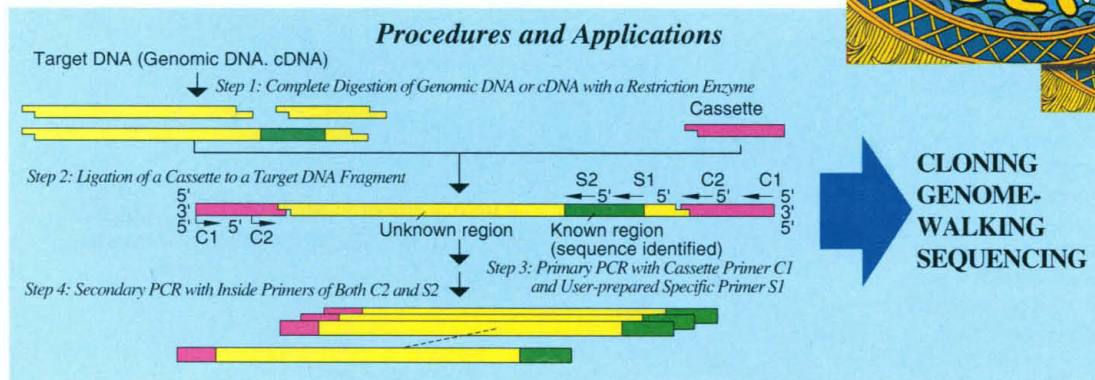
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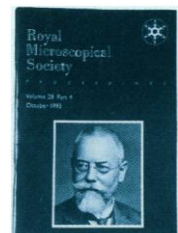
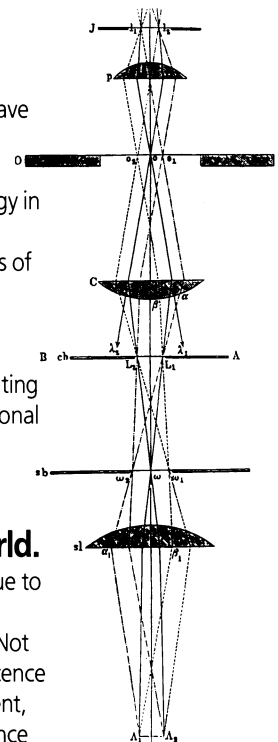
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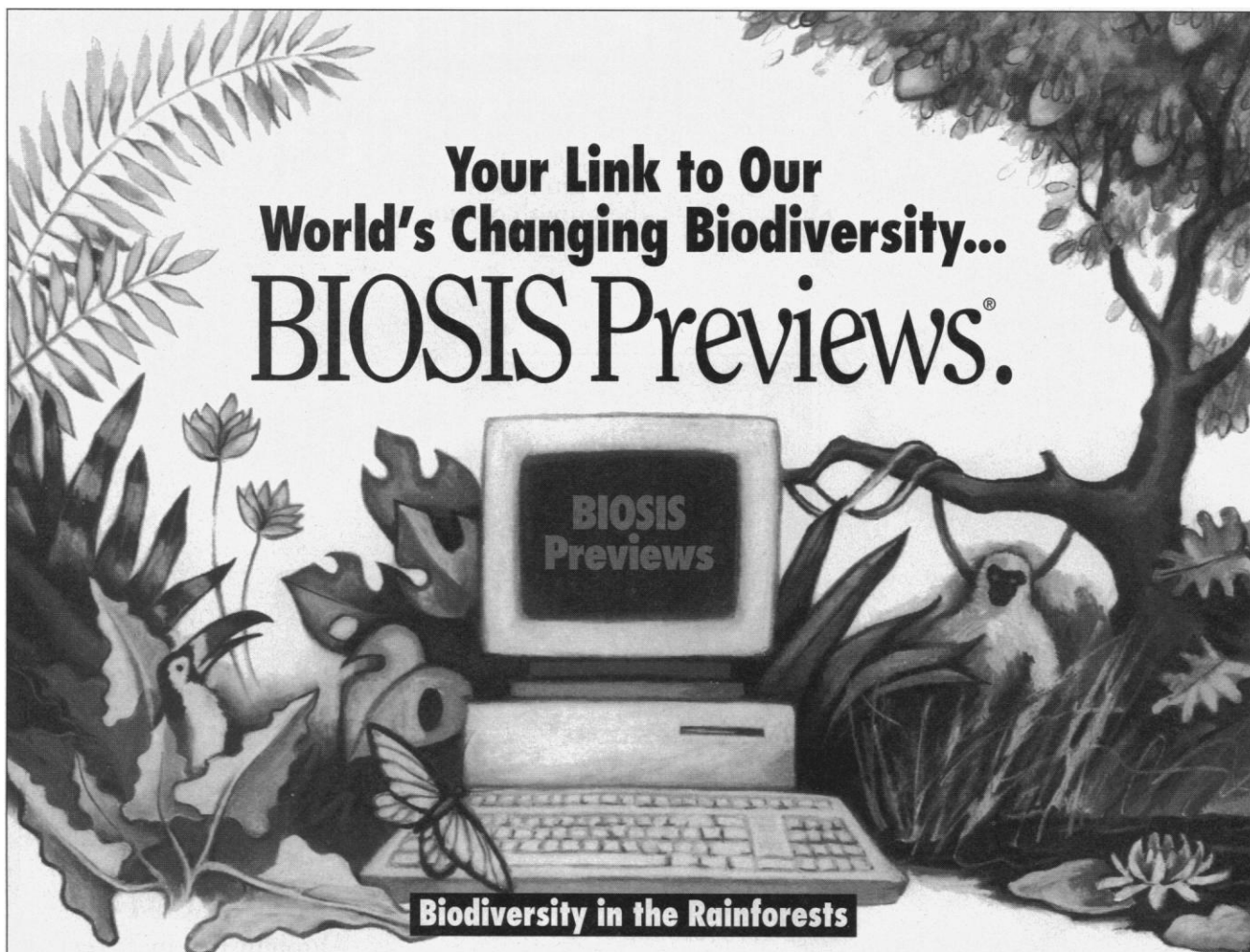


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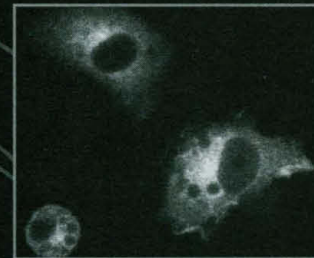


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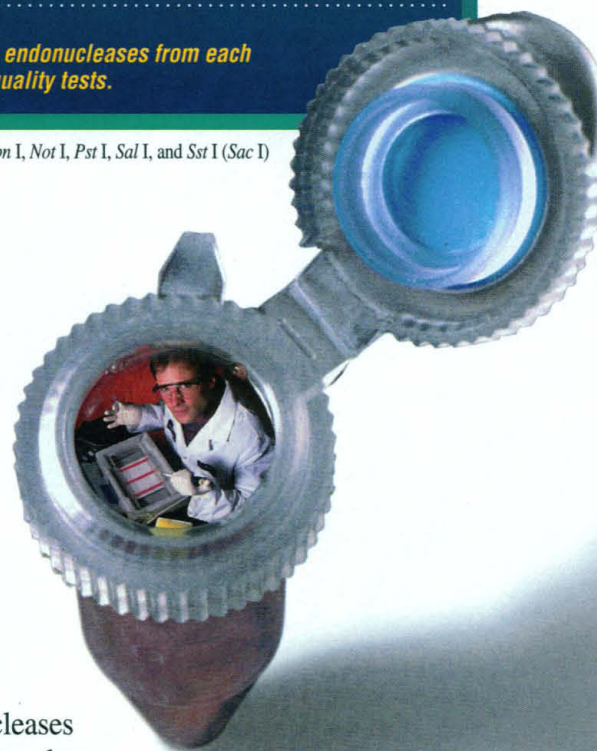
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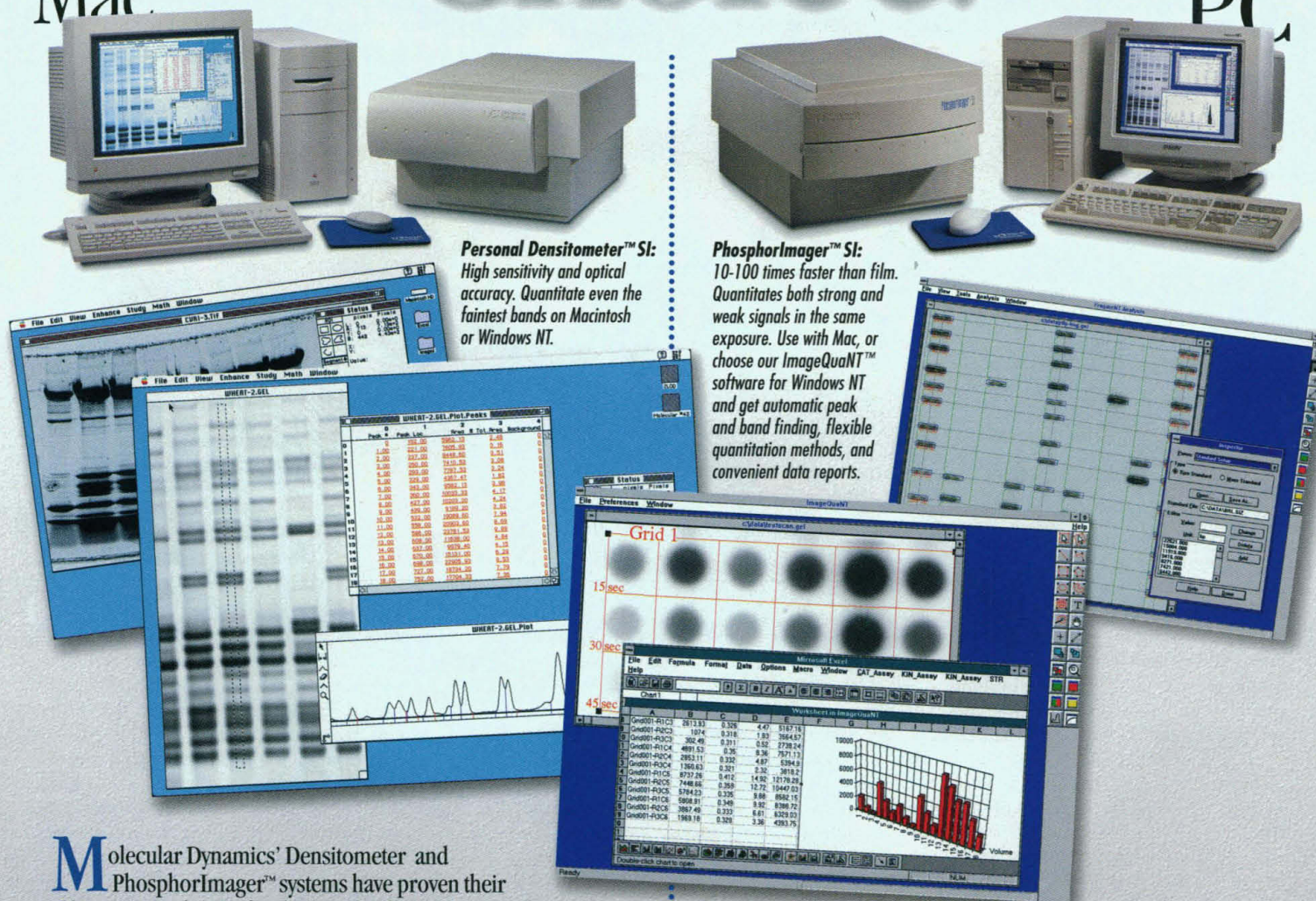
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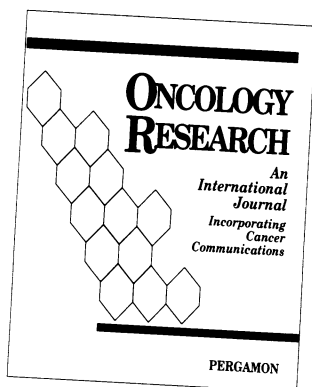
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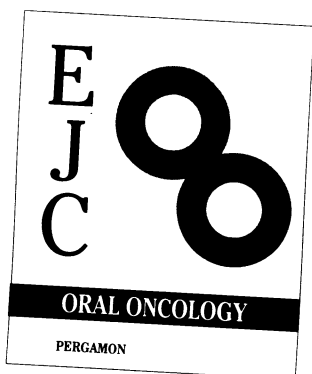
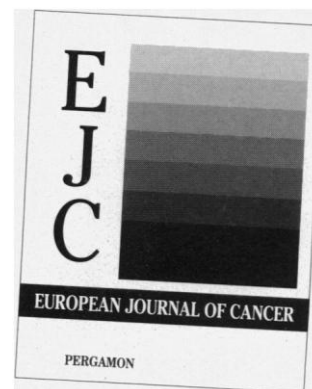
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