



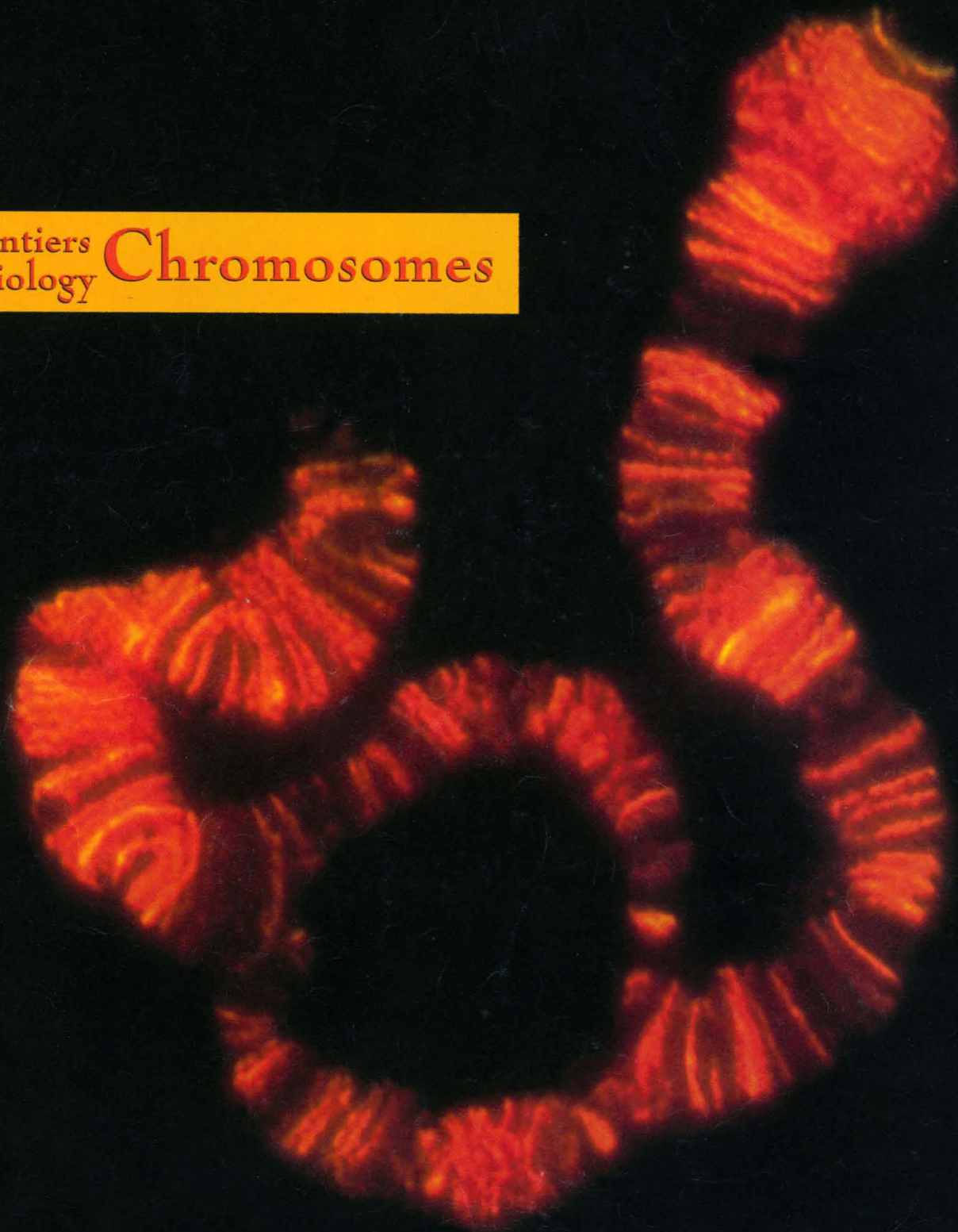
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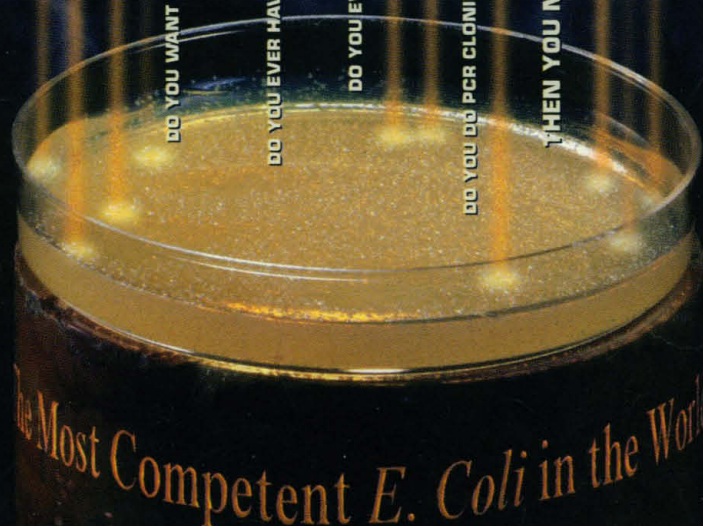
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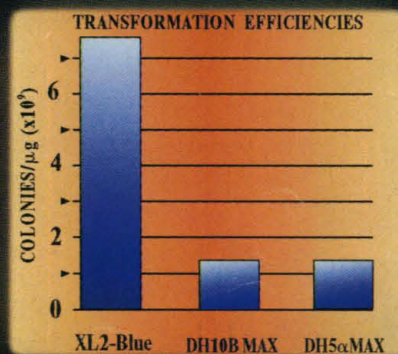
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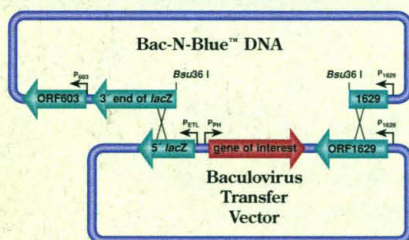
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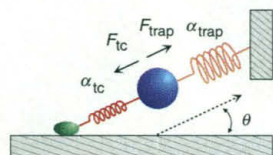
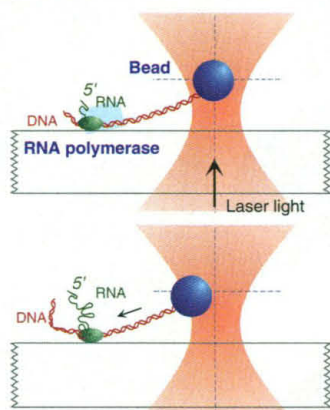
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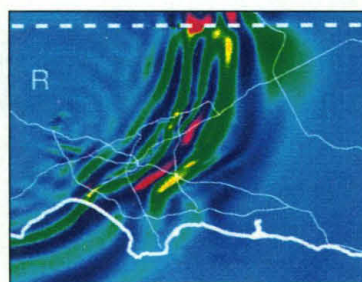
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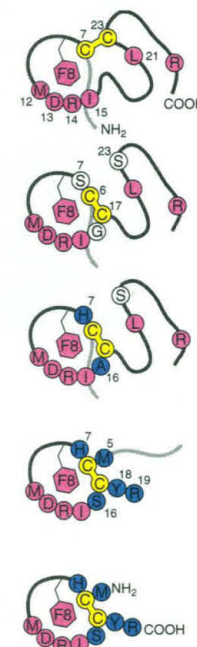
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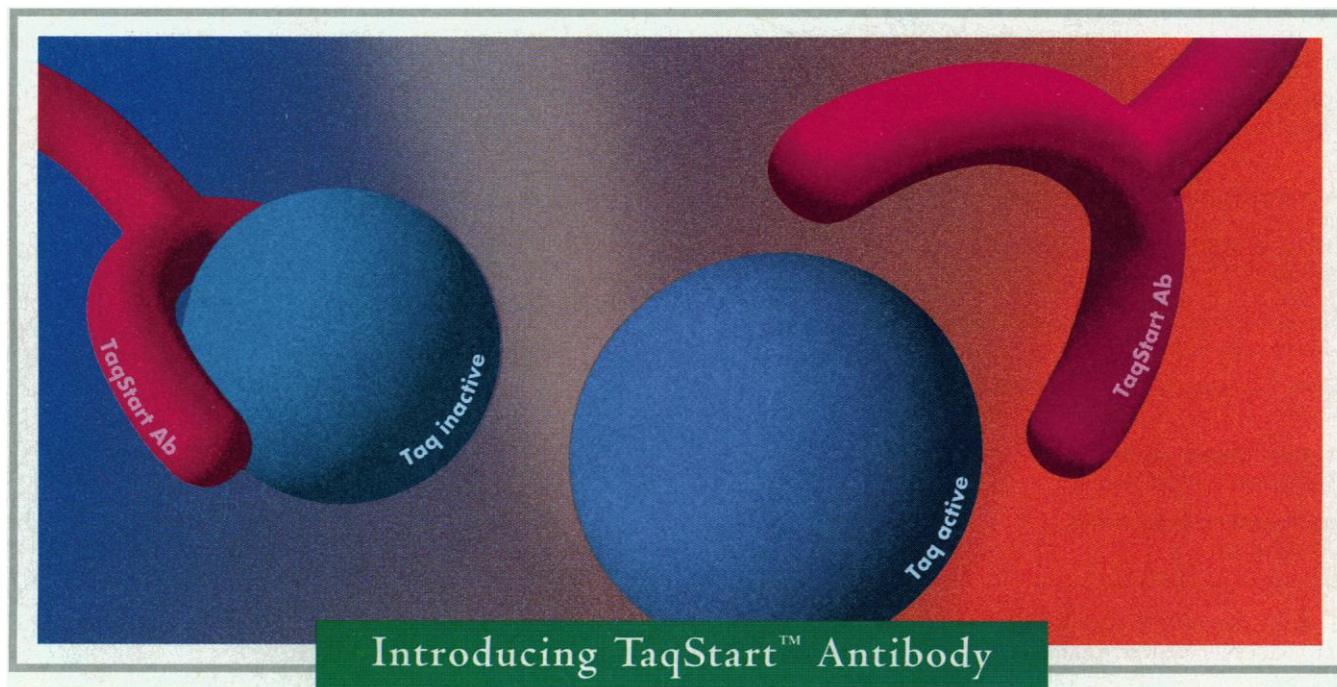
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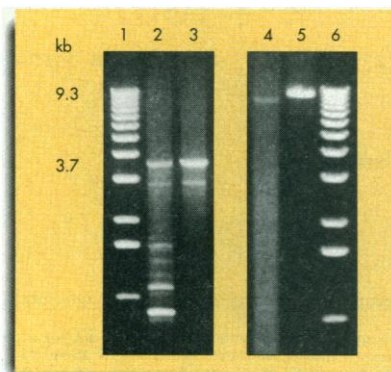
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THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Earthquake simulation

Recent earthquakes in California and Mexico show that major urban areas can experience significant damage and shaking from distant, moderately sized seismic events. Olsen *et al.* (p. 1628) simulated 2 minutes of long-period ground motion after a large earthquake on the San Andreas fault in southern California. Basin shapes and sediment loads in the San Fernando Valley and Los Angeles basins can amplify and prolong shaking compared to other locations at comparable distances from the fault.

Fluctuating flux

The difference between the measured flux of solar neutrinos and that expected from models constitutes the solar neutrino problem. McNutt (p. 1635) reports a correlation between variations in neutrino flux and changes in the solar wind that may indicate a need to revise standard neutrino physics. The correlation is consistent with resonant conversion of electron neutrinos to a nondetected type by interactions with the sun's magnetic field in the corona.

Quantum computers

A computer with logic elements constructed from quantum mechanical systems could in principle factor large numbers into primes, a problem beyond the capacity of conventional computers. However, the algorithm to do this assumes that the quantum computer would be completely isolated. Chuang *et al.* (p. 1633) show that even in the presence of interactions between the quantum computer and its environment that lead to decoherence, such computers may

be still realizable. Quantum error correction would be needed to stabilize the computations.

Aerosol source

The stratosphere contains a fine mist of highly concentrated liquid sulfuric acid particles that participate in reactions that can ultimately lead to ozone depletion. Volcanic eruptions inject matter into the stratosphere that can nucleate these particles, but where do the nuclei come from when volcanoes are inactive? Brock *et al.* (p. 1650) show that sulfuric acid-water particles are homogeneously nucleated in the upper troposphere over the tropics and are then transported up into the stratosphere.

Finely fabricated

Two reports focus on fabricating micro- and nanoscale devices. Snow and Campbell (p. 1639; see the Perspective by Dagata, p. 1625) can write metal lines and create metal-oxide-metal junctions with an atomic force microscope tip. The conducting tip can reduce TiO_2 to form Ti structures with 10-na-

nometer features. Lehmann and Stuke (p. 1644) have created three-dimensional microstructures of aluminum and aluminum oxide. A computer directs the movement of a pair of laser beams, and deposition from gas-phase reactants occurs where the lasers cross. They made a linear micromotor that is moved by thermal expansion and contraction; lasers are used to supply the heat.

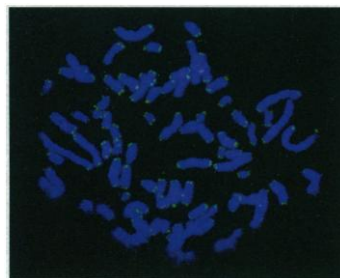
Hold the salt

The ability of plants to grow in saline soils is correlated with several physiological features, including ion transport. Rubio *et al.* (p. 1660) have identified an aspect of ion transport that is required for normal physiology of the plant but leads to sodium-induced toxicity when the plant is grown in the presence of excessive sodium. The HKT1 ion symporter normally transports K^+ along with Na^+ . At high Na^+ concentrations, however, HKT1 mediates additional Na^+ transport through a low-affinity site at the expense of K^+ transport. Mutations in a transmembrane domain resulted in improved ability to discrimi-

nate between Na^+ and K^+ and may contribute to improved salt tolerance.

Telomere protein

Chromosome ends, or telomeres, are complexes of double-stranded DNA hexamer repeats and proteins that need to be maintained to avoid DNA damage that can lead to cell cycle



disruption or malignancy. Chong *et al.* (p. 1663) report the cloning of the human telomeric repeat binding factor (TRF). Immunofluorescent labeling showed that the cloned protein localized in vivo to chromosome ends.

Editing and epilepsy

Neurons that express AMPA-sensitive glutamate receptors undergo an RNA editing mechanism whose physiological significance has been unclear. The edited subunits have a lower Ca^{2+} permeability because of an arginine for glutamine substitution in the pore-forming region of the receptor channel. Brusa *et al.* (p. 1677) produced transgenic mice that could not edit versions of some of their AMPA receptor subunit RNAs. The animals died within 21 days of birth after suffering several seizures. The phenotype of the animals shows the importance of RNA editing in the intact mammalian brain and provides a model for early onset epilepsy.

DNA replication origins in higher eukaryotes

In yeast, a multisubunit protein, the origin recognition complex (ORC), binds to replicator sequences and initiates DNA replication. Along with other proteins, ORC determines the frequency of initiation and is also involved in transcriptional silencing. Three reports describe the isolation of ORC-related proteins from higher eukaryotes (see the related news story by Marx, p. 1585). Gavin *et al.* (p. 1667) isolated proteins related to the largest ORC subunits, Orc1p and Orc2p, from multiple organisms and show that the human ORC proteins interact in vivo to form a complex. Gossen *et al.* (p. 1674) cloned the *Drosophila* homologs of Orc2p and Orc5p and find that DmOrc2 is most abundant during embryogenesis, the period of highest DNA replication. Ehrenhofer-Murray *et al.* (p. 1671) show that DmOrc2 can complement a silencing defect in the yeast *orc2-1* mutation but does not complement the replication defect, showing that these functions are separable.

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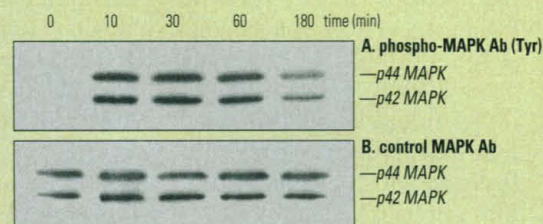
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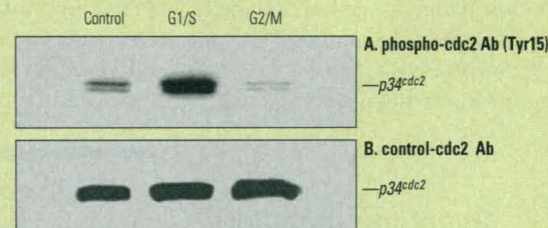
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Until fairly recently, brightfield and phase contrast were the most popular techniques used for microscopic studies. These techniques work well for studies of individual cells, but they are not adequate for imaging smaller entities such as some cellular organelles, proteins, antibodies, microtubules, RNA and DNA. Because fluorescence permits selective imaging and analysis of these substances with resolution down to several nanometers, it is becoming increasingly popular. Recent advances in optics design promise to make it an even more powerful technique.

As biomedical researchers continue to explore smaller and smaller entities, fluorescence microscopy is proving to be an exceptionally powerful tool.

Because fluorescent dyes, or fluorochromes, are absorbed selectively by different substances within a specimen, each substance can be targeted and observed separately. This has made possible techniques such as Fluorescence *in situ* Hybridization (FISH), for example, which has played a key role in identifying chromosomes and determining the number, size and location of specific DNA sequences in mammalian cells.

Smaller objects, finer details

Using fluorescence, scientists can resolve images that cannot be observed with ordinary light. The diameter of a single DNA molecule, for example, is about 2nm, while the finest detail that can be resolved by optical lenses is about 200nm. However, if a fluorescent dye is conjugated with the DNA molecule and the specimen is viewed with a fluorescence microscope, the molecule can be easily detected and measured.

Although it is a very powerful and relatively easy to use tool, fluorescence places extreme demands on the microscope's optics. The near-ultraviolet wavelengths that are used to excite the specimen are very high in energy. At the same time, the light emitted from the specimen is of much lower intensity than the light used to excite it, so the imaging optics must be designed to transmit as much light as possible. Care must also be taken to prevent autofluorescence emissions, which can mask and rob contrast from the image.

Special objectives required

Because today's ultrasensitive techniques place extreme demands on optics, the emitted fluorescence requires specially designed objectives with higher numerical apertures, enhanced brightness and higher UV light transmission than those used with other techniques. The new Nikon CF® PLAN FLUOR Universal Objectives have these characteristics.

Like all Nikon optics, the new CF PLAN FLUOR Objectives correct all the various chromatic aberrations from the center to the edges of the image, providing extreme sharpness over the entire field of view.

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The new CF PLAN FLUOR Objectives also offer higher numerical apertures to capture more of the available light emitted by the specimen. The N.A. of the 40X PLAN FLUOR, for example, is 0.75 compared with 0.7 for the 40X Plan Achromat. The N.A. of the 100X oil PLAN FLUOR is 1.3 compared with 1.25 for the 100X Plan Achromat oil.

For more information on Nikon's new CF PLAN FLUOR Universal Objectives, call Nikon at (516) 547-8567, fax us at (516) 547-0306 or contact us on the Internet at nikonbio@aol.com.

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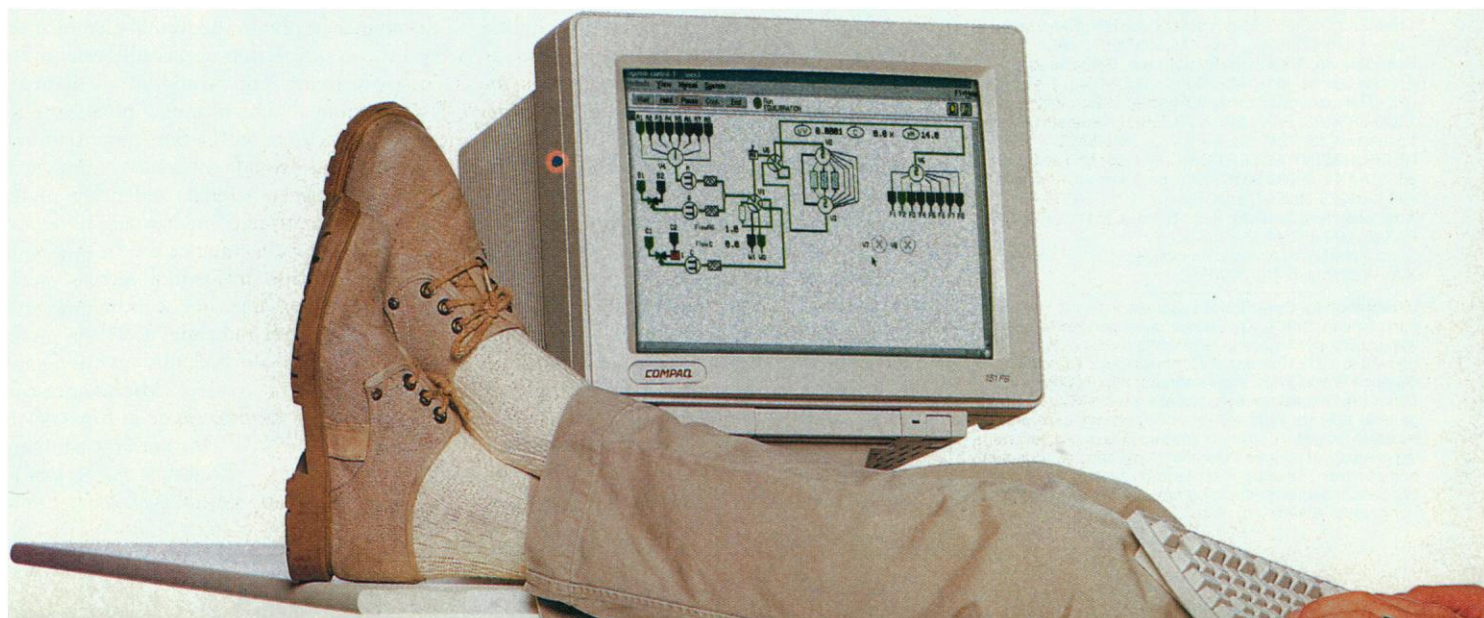
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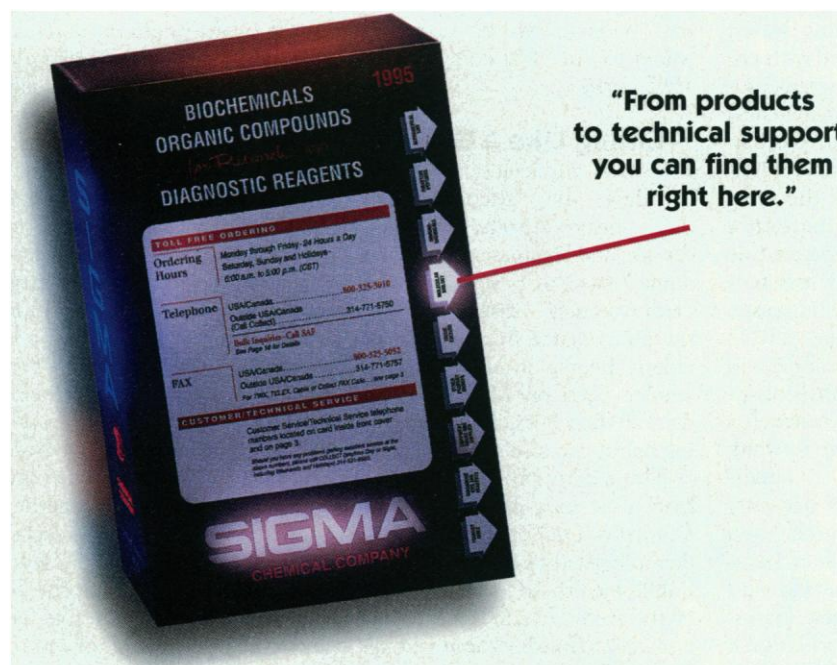
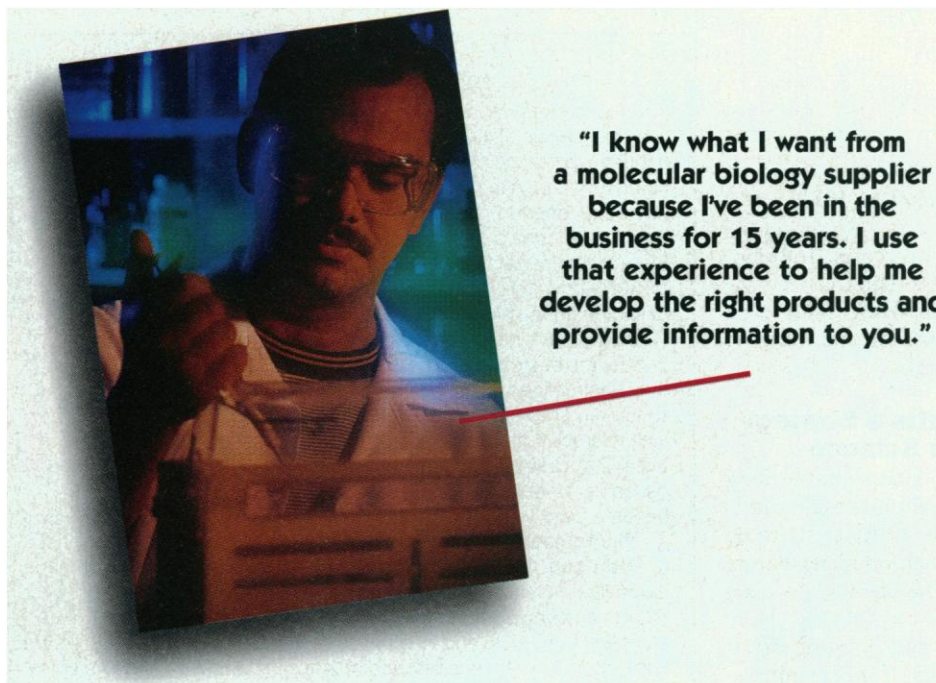
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- Presently directing research activities and product development for Sigma BioSciences.
- Published in *Journal of Cellular Biochemistry*, *Journal of Virology*, *Journal of General Virology*, and *EMBO*.
- Presented abstracts at American Society for Cell Biology Conferences, Symposium of the Protein Society, Annual Meeting of The American Society for Virology, and International Symposium on Column Liquid Chromatography.
- Prior to Sigma, worked five years in a molecular biology group in the pharmaceutical industry.
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FIGURE. Lane 1: 8.9 kb full-length RT-PCR product of APC transcript from 500 ng of total HeLa RNA isolated using TRIzol Reagent; lane 2: 1 Kb DNA Ladder.

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Product	Cat. No.	Size
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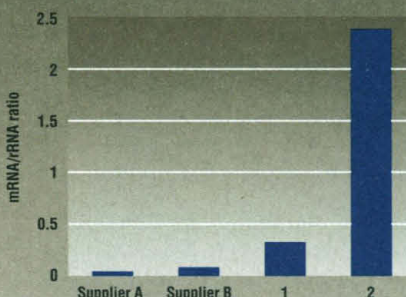
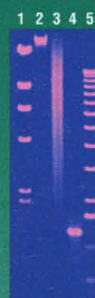


FIGURE. Comparison of mRNA quality purified by three different methods. Amount of GAPDH mRNA was compared to amount of rRNA remaining in each preparation. Supplier A: mRNA isolated by a guanidine isothiocyanate method and single-selection with oligo(dT) cellulose. Supplier B: mRNA isolated by a proteinase K-SDS method and single-selection with oligo(dT) cellulose. 1 and 2: mRNA isolated with the MESSAGEMAKER System and single or double selection with oligo(dT) cellulose.

Product	Cat. No.	Size
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FIGURE. Lane 1: λ DNA/Hind III Fragments; lane 2: 100 ng genomic DNA isolated from rabbit blood using DNAzol Reagent; lane 3: 500 ng genomic DNA, cut with EcoR I, lane 4: 1.3 kb rabbit globin PCR product from genomic DNA isolated using DNAzol Reagent; lane 5: 1 Kb DNA Ladder.

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Add ethanol, centrifuge 5 min.



RNA REMOVAL.
Centrifuge for 10 min.



DNA WASH.
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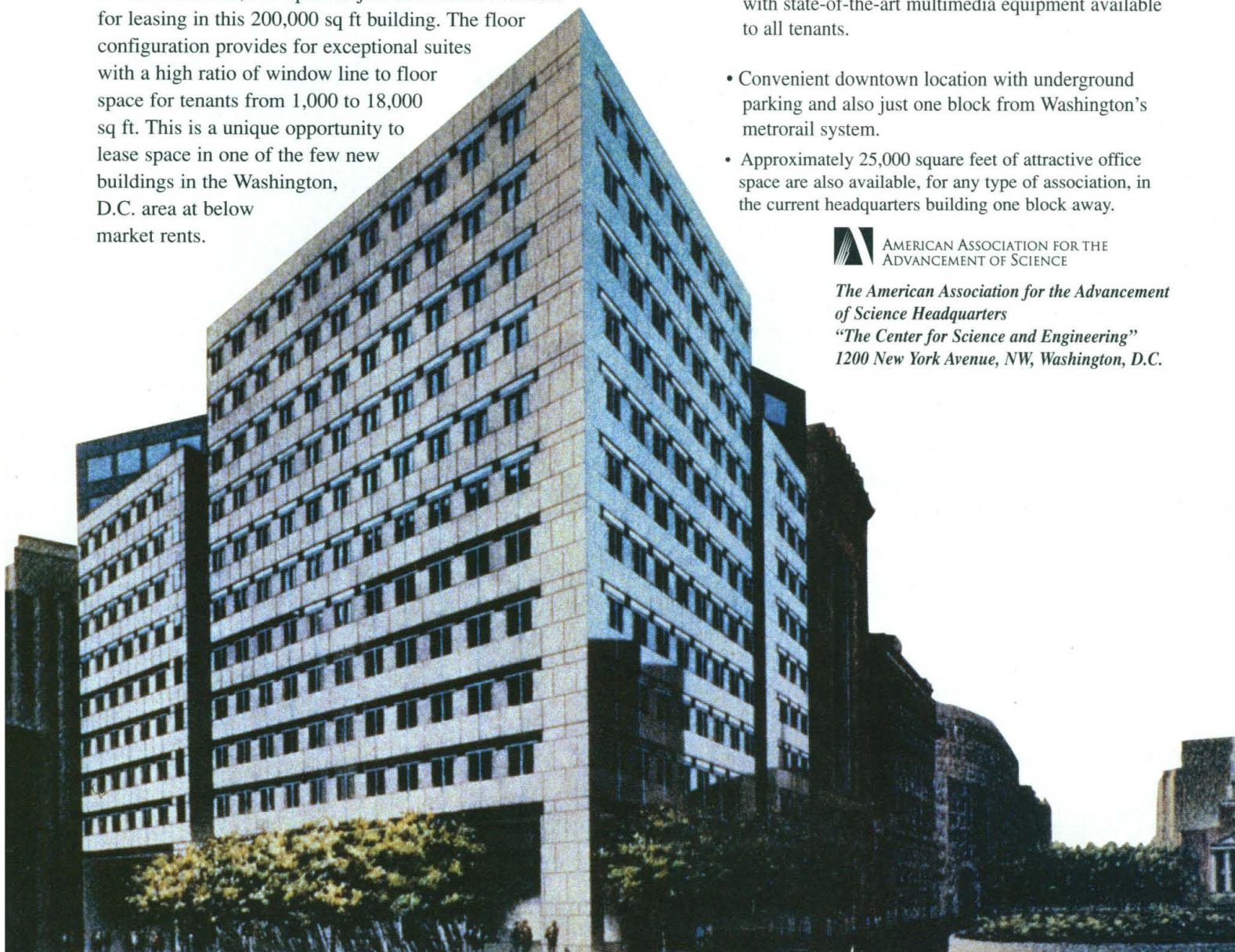
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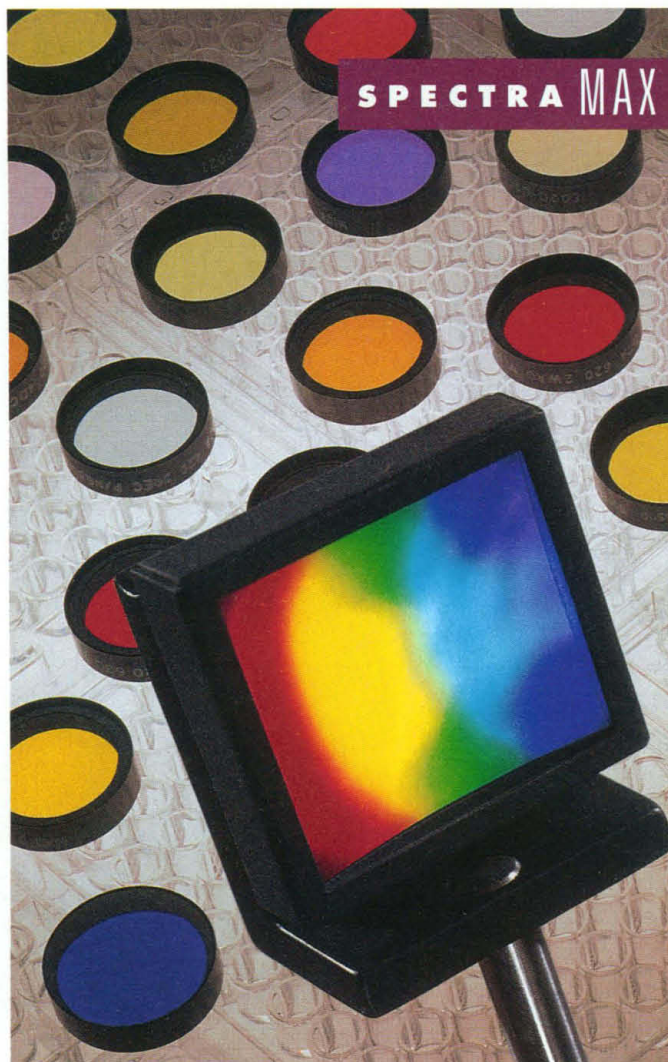
- Gas fired heating/cooling systems that exclude CFC's.
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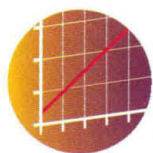
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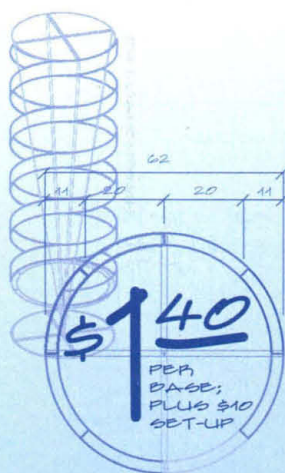
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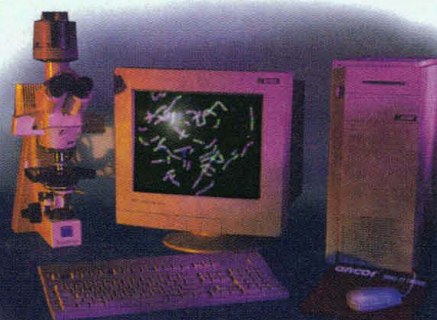
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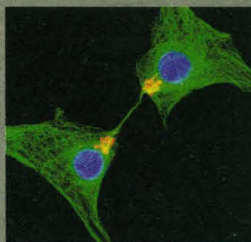
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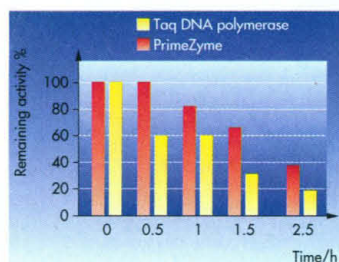
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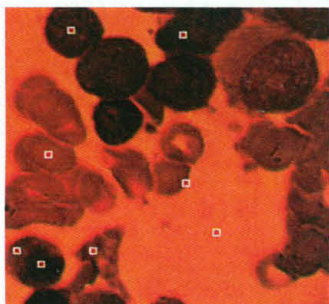
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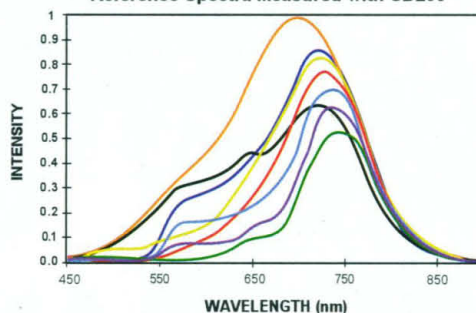
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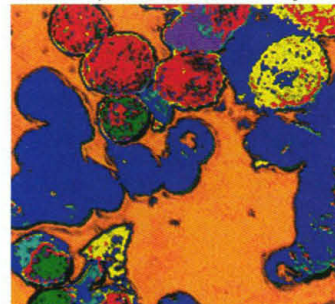
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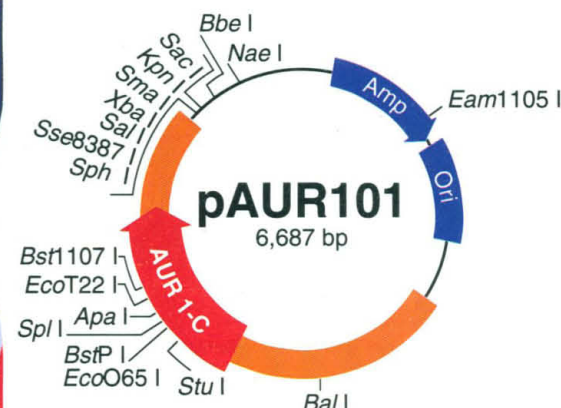
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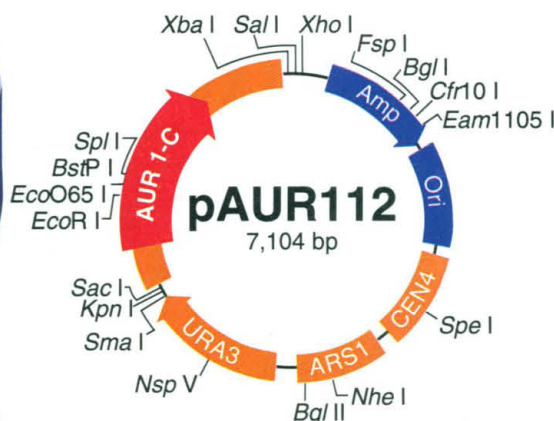
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Session II: June 23-July 6, 1996
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Smith College
Northampton, MA

FACULTY:

Dr. Steven A. Williams
Dept. of Biological Sciences, Smith College,
and Molecular and Cellular Biology,
University of Massachusetts

Dr. John R. McCarrey
Dept. of Genetics, Southwest
Foundation for Biomedical Research

Dr. Barton Slatko
New England Biolabs, Inc.
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Dr. Alan L. Scott
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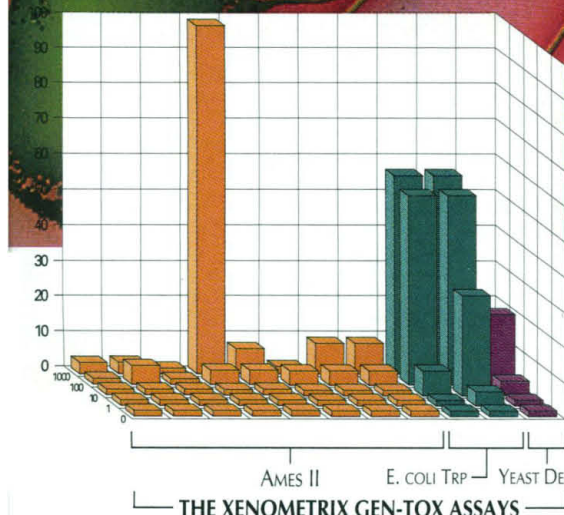
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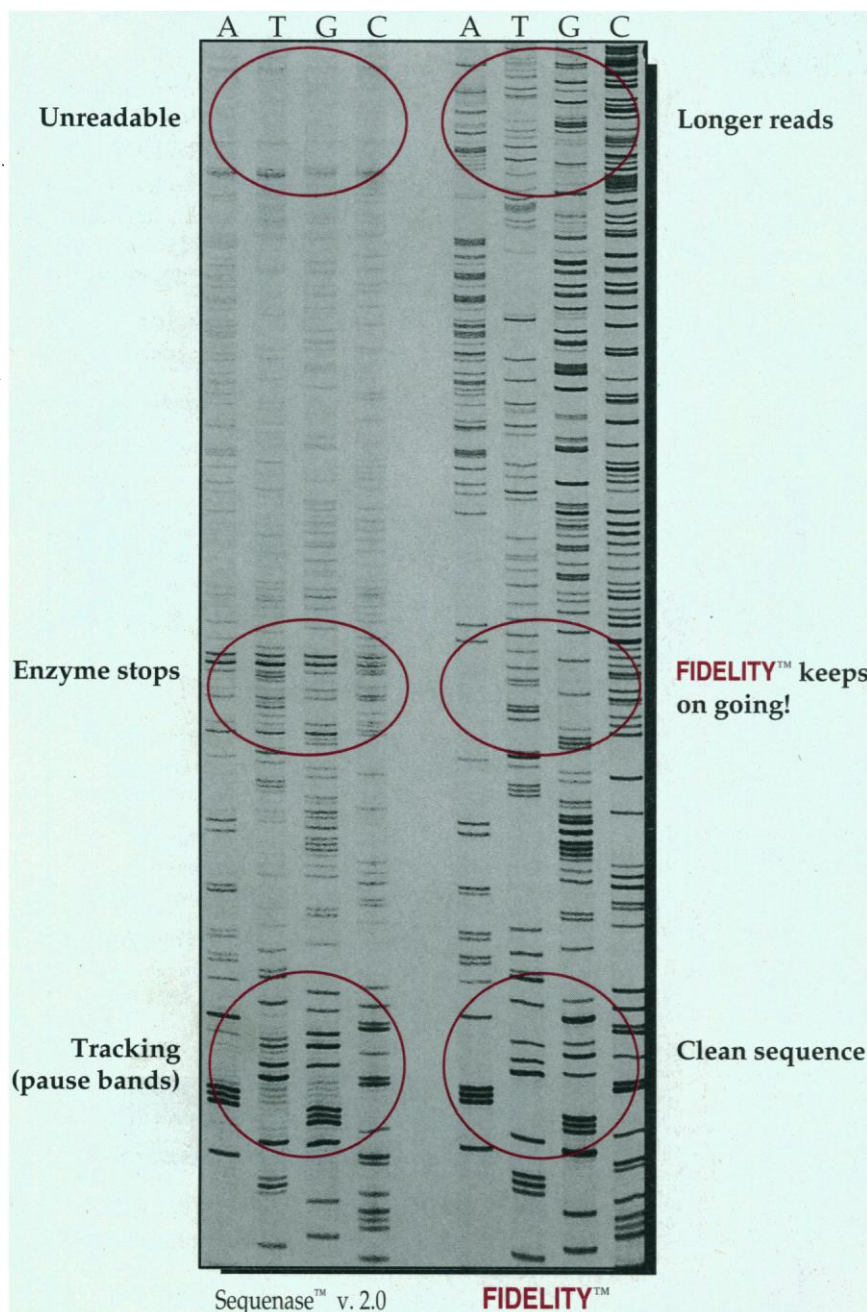
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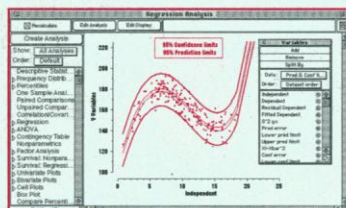
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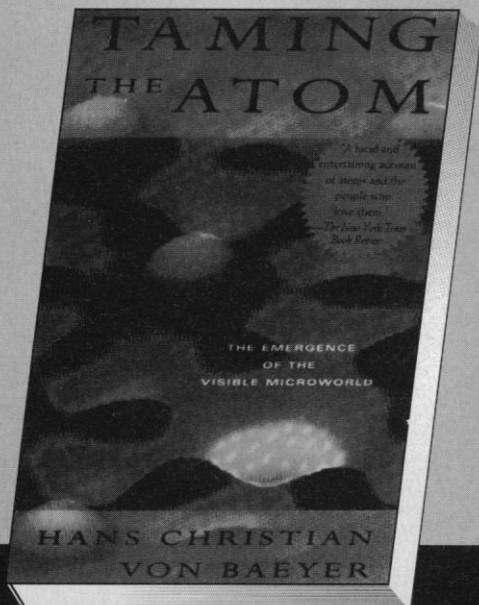
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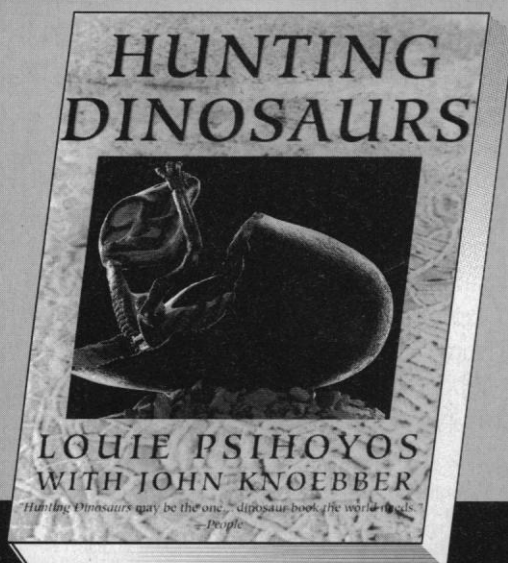
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Regulation of Apoptosis: Cellular, Molecular and Genetic Factors

John D. Mountz, University of Alabama at Birmingham

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Jauni Utto, Thomas Jefferson Medical College

Delivering Information to Clinicians in the Era of National Networking***

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Developmental Biology: Organogenesis***

Jeffrey A. Whitsett, Children's Hospital Medical Center, Cincinnati
Jeffrey I. Gordon, Washington University School of Medicine

The New Biology of Obesity

Jeffrey S. Flier, Harvard Medical School

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Eric G. Neilson, University of Pennsylvania
Robert J. Mayer, Harvard Medical School

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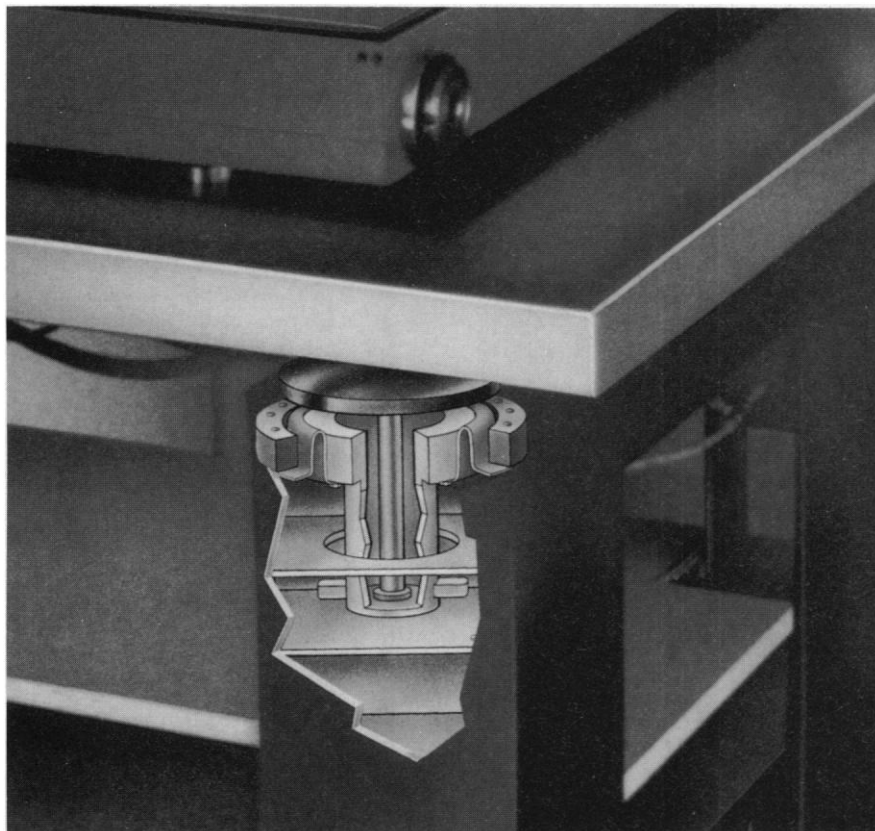
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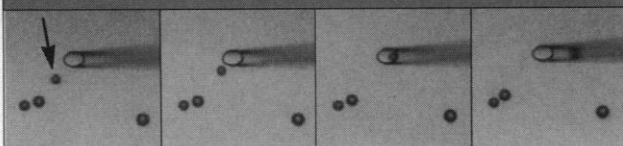
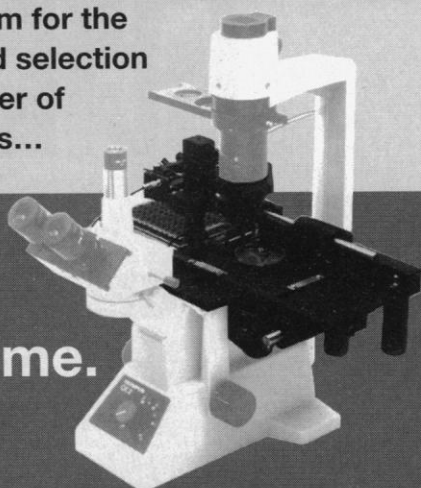
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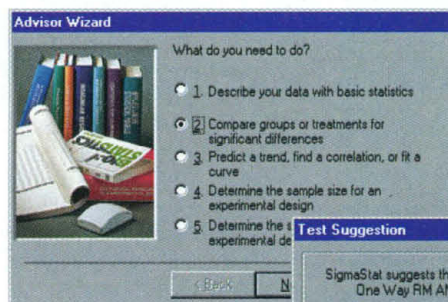
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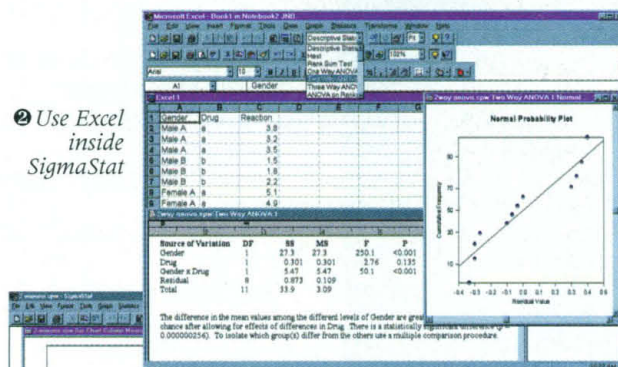
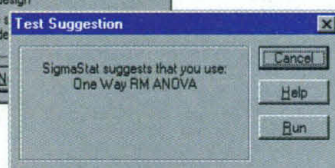
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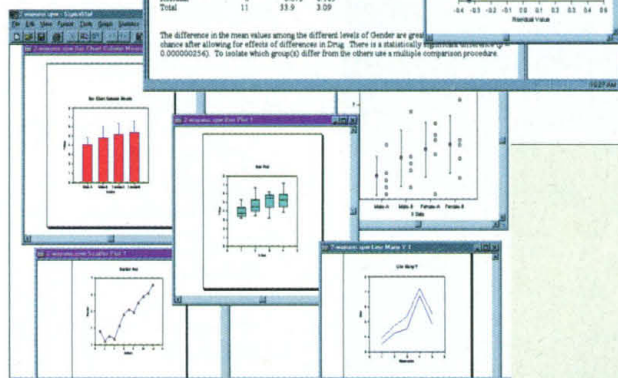


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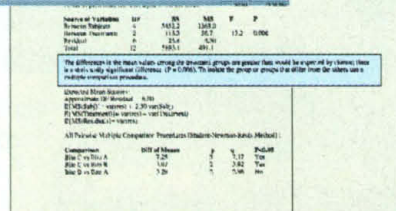
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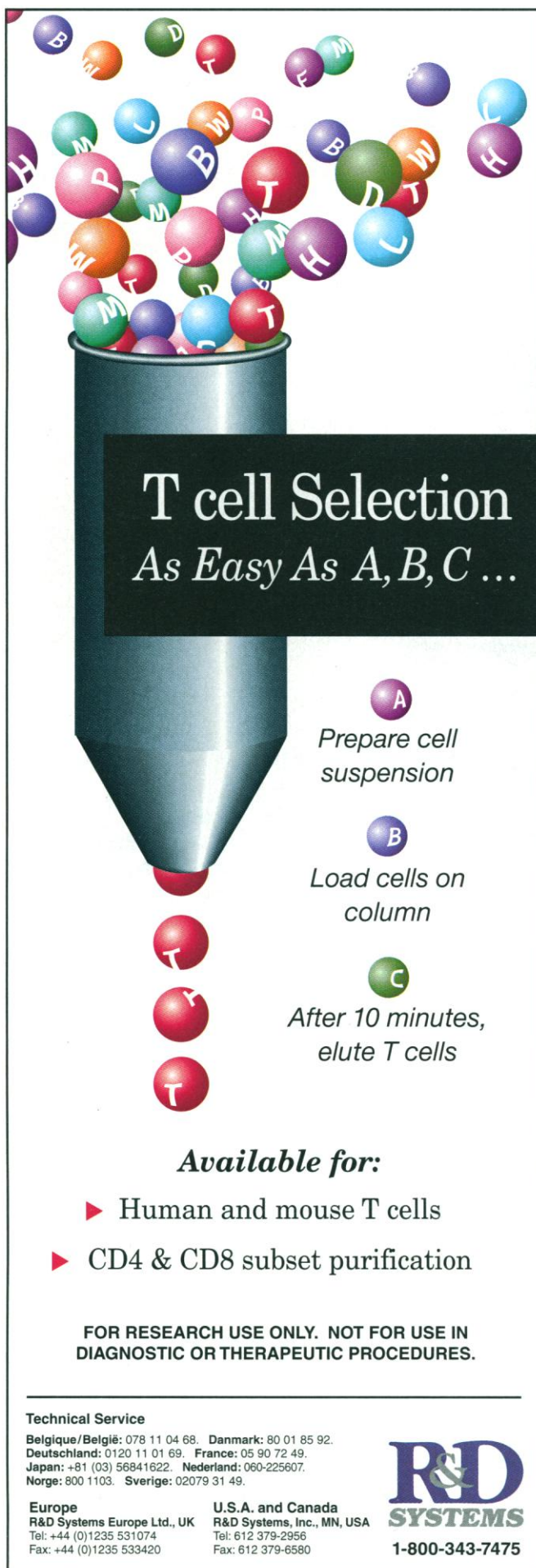


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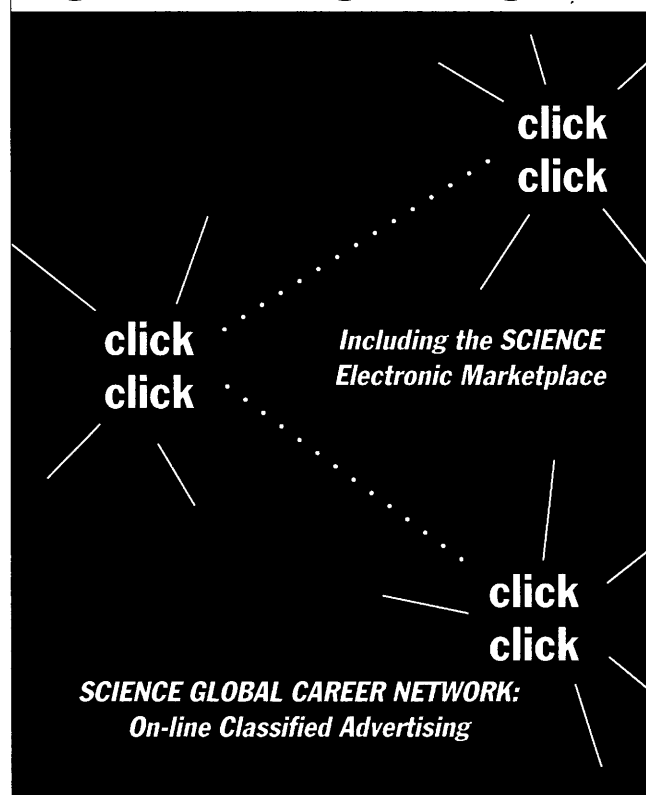
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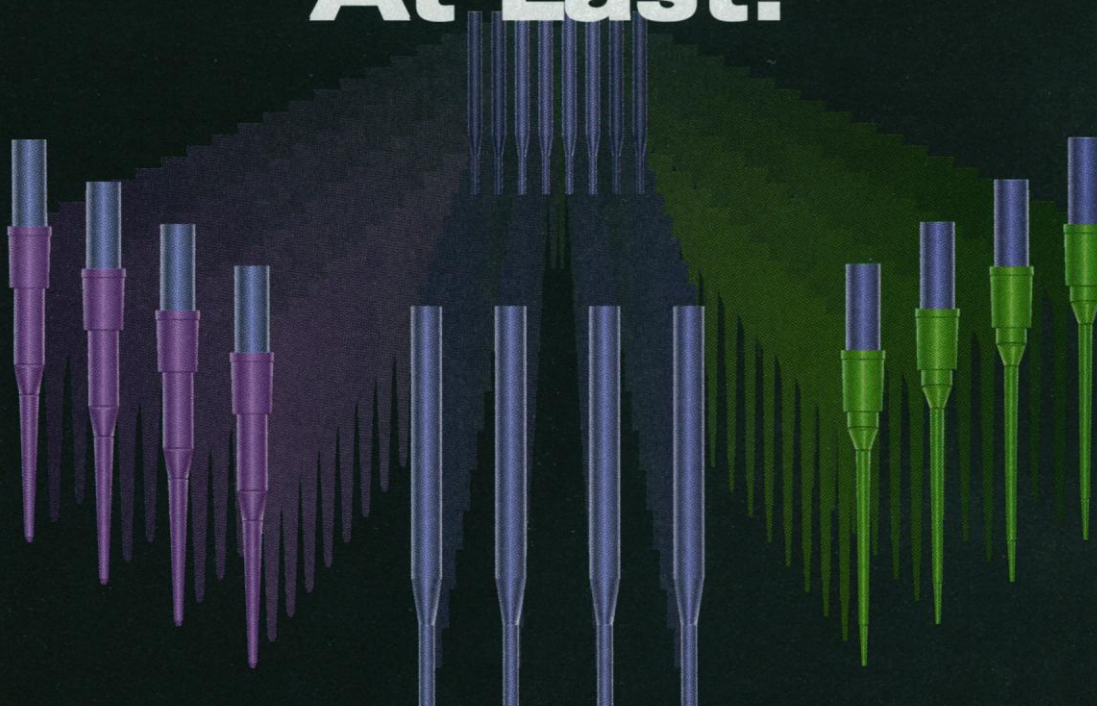
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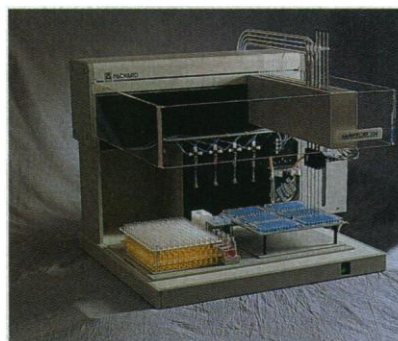
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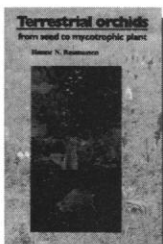
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