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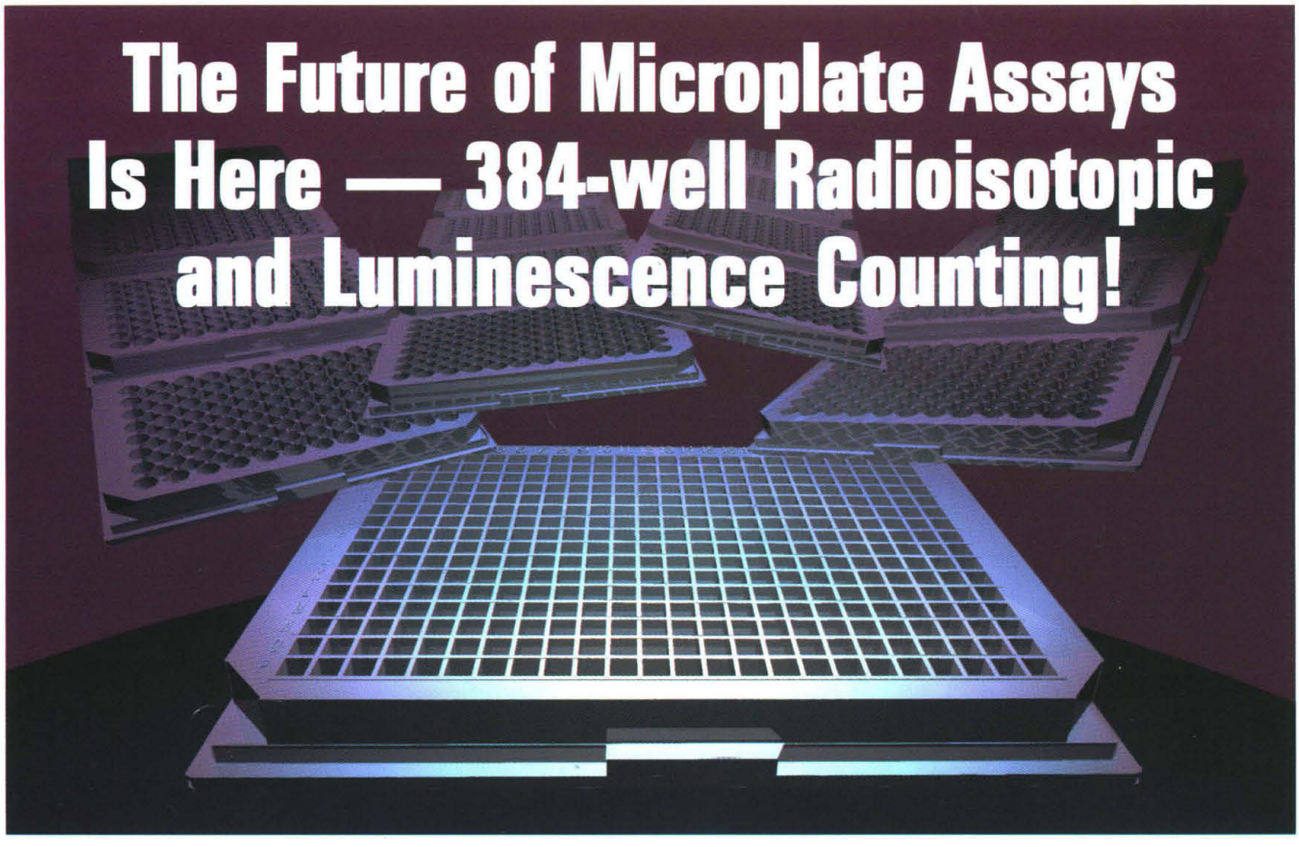
# SCIENCE

27 SEPTEMBER 1996 $7.00
VOL. 273 • PAGES 1765–1968

# The Future of Microplate Assays Is Here — 384-well Radioisotopic and Luminescence Counting!



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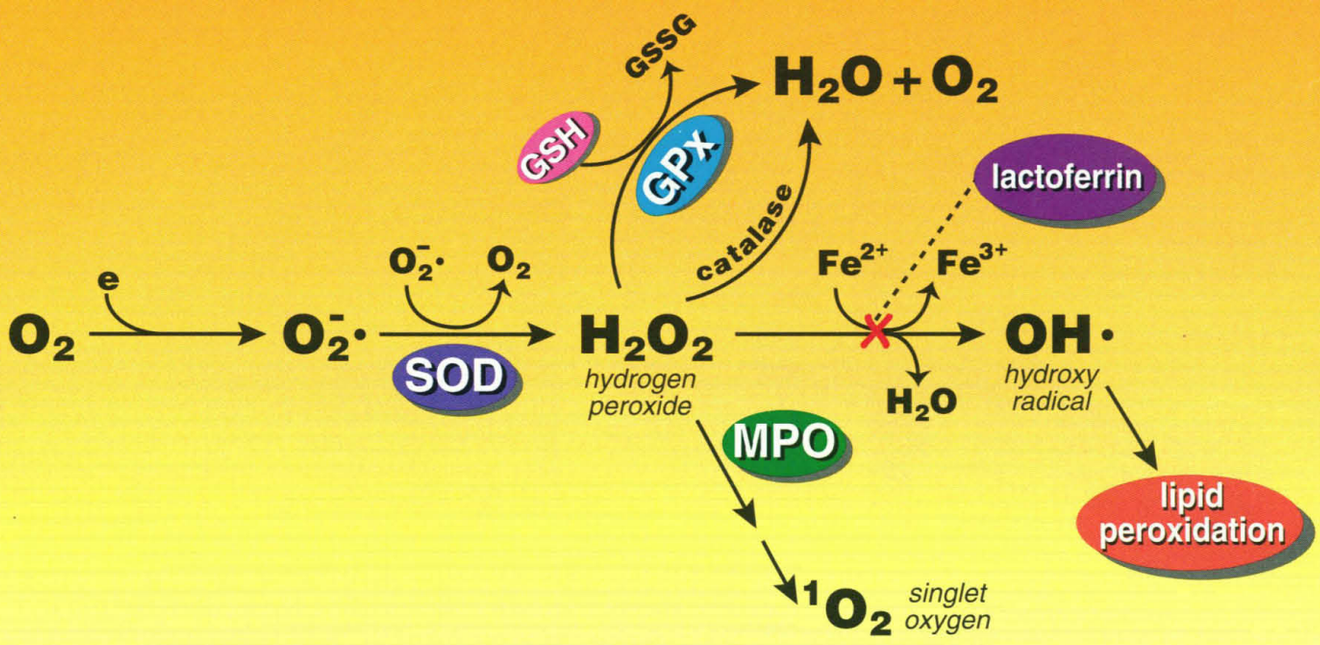


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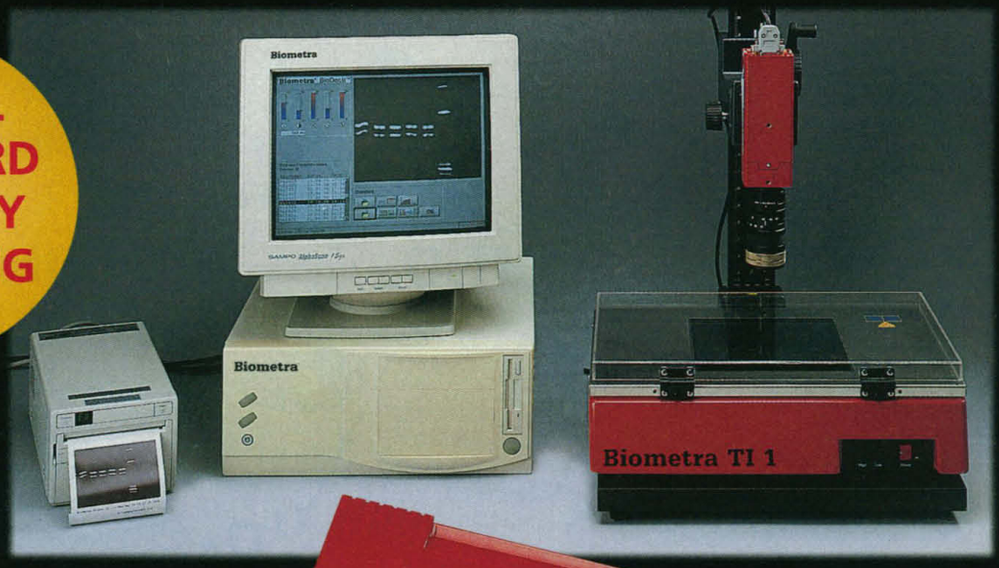


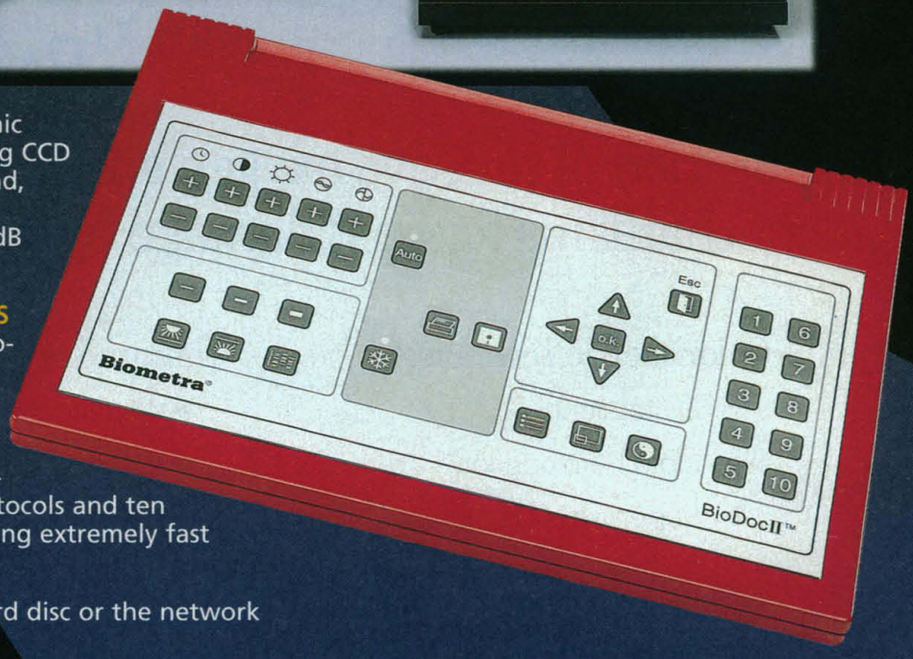


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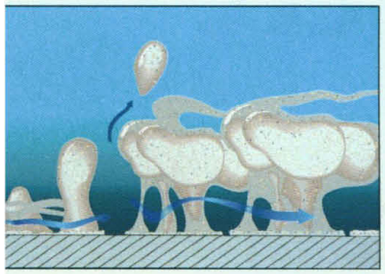

**1795**
Microbes star in biofilms


**1850**
How old is Dominican amber?

## NEWS & COMMENT



## RESEARCH NEWS



## PERSPECTIVES



## ARTICLES



## DEPARTMENTS





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COVER

Methane clathrate hydrate, an icy compound capable of sustaining its own combustion, displays intriguing formation kinetics as well as unusual plastic flow properties. Although naturally occurring methane hydrate may harbor the largest untapped reservoir of natural gas on Earth, the material properties of this ephemeral compound are not yet well understood. See page 1843. [Photo: John Pinkston and Laura Stern]


## RESEARCH ARTICLE

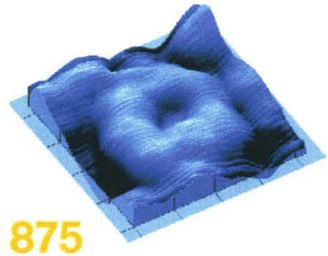


## REPORTS



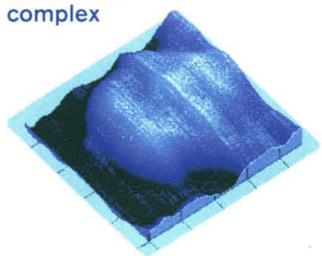
## TECHNICAL COMMENTS





1875

Nuclear pore complex



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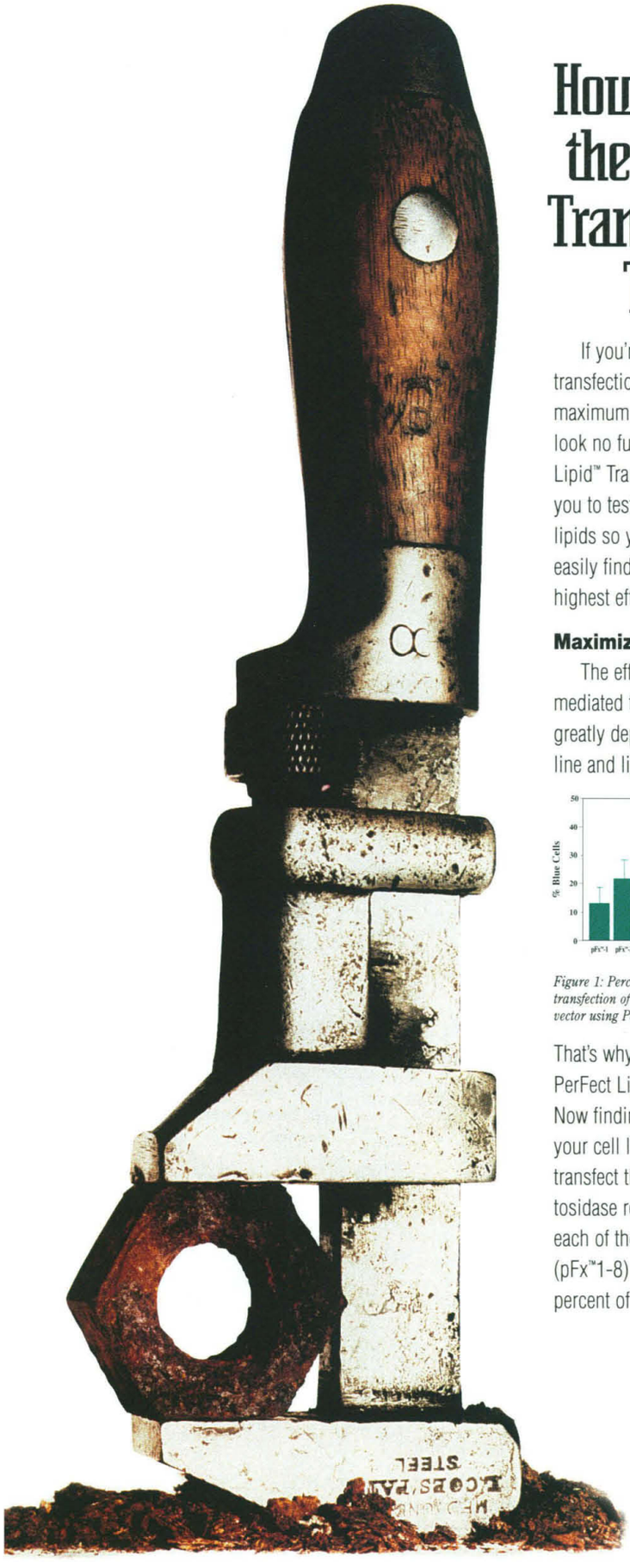

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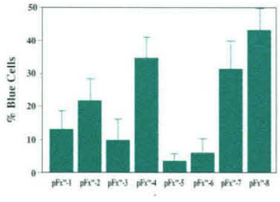


*Figure 1: Percent blue cells produced by transfection of CHO cells with a lacZ control vector using PerFect Lipids™ (pFx™1 - pFx™8).*

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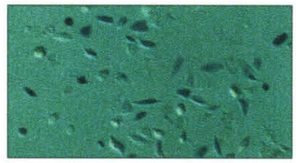

*Figure 2: Transfected CHO cells expressing β-galactosidase, stained with X-gal.*

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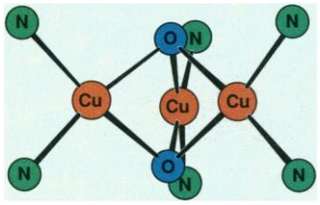
# THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

## Copper(III) chemistry

Several enzymes that can reduce $O_2$ to $H_2O$ contain a trinuclear copper core. Cole *et al.* (p. 1848) have synthesized a small trinuclear copper com-




plex that breaks the O–O bond and does so with this unusual 3:1 Cu:$O_2$ stoichiometry. The four-electron oxidation produces a bridging copper atom in its unusual trivalent state.

■

## Deliberate defects

High-temperature superconductors (HTSCs) can carry high current densities only if the crystalline grains are well aligned and if flux lines are pinned by defects with the material. Often such defects are introduced after the material has been grown, but Yang and Lieber (p. 1836) report a method for incorporating nanometer-scale magnesium oxide columns in the bismuth HTSCs. High critical current densities comparable to those seen for the best polycrystalline thick films were observed in materials where the rods were oriented perpendicular to the copper oxide planes.

■

## Methane hydrates

Abundant methane is stored as a solid hydrate on continental shelves and also may also be present in icy moons. On Earth, the phase transition between the hydrate and free methane plus water is a prominent seismic reflector. Estimation of the abundance of trapped methane requires knowledge of the meaning of the seismic signal and the phase relations. Experiments by Stern *et al.* (p. 1843; see cover) that examined the phase relations of methane clathrate hydrate and suggest that superheating of the solid may be possible. Holbrook *et al.* (p. 1840) compared drill core records and seismic images through the methane hydrate layer off of South Carolina and conclude that less methane hydrate may be there than previously thought.

■

## Receptor mutations and HIV disease progression

Chemokines receptors such as CKR5 have recently been identified that act as co-receptors with CD4 for the entry of HIV-1 (human immunodeficiency virus–type 1) into human cells, and defects in these receptors could lead to resistance against viral infection and disease progression. Dean *et al.* (p. 1856; see the news story by Cohen, p. 1797) mapped the *CKR5* structural gene to human chromosome 3 and identified a 32–base pair deletion that occurs in 10% of the Caucasian population. In examining 1955 individuals at high risk for HIV-1 infection, they found that 17 individuals homozygous for this allele were HIV-1 negative, and that disease progression is slower in individuals heterozygous for this allele than in individuals who lack this allele.

## Formative stages

A simple two-stage model of Earth's formation may explain how the Earth can presently have an oxidized mantle that is not in equilibrium with its reduced iron-rich core. Harper and Jacobsen (p. 1814) used noble gas isotopic compositions of basalts and primitive meteorites to develop an accretion model for the Earth. They suggest that the mantle and core were initially equilibrated under the reducing conditions of a massive hydrogen-rich proto-atmosphere that blanketed the proto-Earth's magma ocean and allowed the incorporation of the light noble gases. During and after the removal of the proto-atmosphere by the sun, the heavier noble gases and other components continued to accrete and oxidize the mantle.

■

## Amber range of age

Amber from the Dominican Republic and related sites in the Caribbean has provided key specimens for studying the evolution of many trapped plant and animal species and may be the only viable source for extraction of very ancient DNA, but interpretations have been hampered because the age of the amber has been poorly known; estimates range back to more than 65 million years ago. Iturralde-Vinent and MacPhee (p. 1850) reconstructed the stratigraphy of the region and conclude that all of the key amber-bearing rocks were deposited in a single sedimentary basin 15 to 20 million years ago.

■

## Overkill in plants

Plant cells can resist pathogens by inducing cell death locally around a site of infection, but in certain mutants cell death is unchecked and can engulf an entire leaf. Jabs *et al.* (p. 1853) studied such mutants in *Arabidopsis* and found that superoxide, a reactive oxygen intermediate, alone could initiate this process. Signals that normally would suppress superoxide production appear to blocked, which then leads to amplification of the superoxide signal.

■

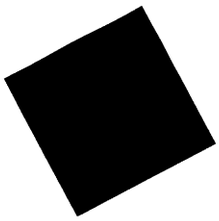
## Effects of CD40L

Two reports illustrate the important role of the ligand to CD40 (CD40L) in stimulating the immune response. Grewal *et al.* (p. 1864) show that induction of an autoimmune disease, experimental allergic encephalomyelitis, could not be induced by antigen injection if they had no CD40L. Yang and Wilson (p. 1862) show that CD40L-deficient mice also did not have the expected adverse reaction to a gene therapy vector. These two different approaches show that CD40L works through induction of B7 on antigen-presenting cells, which increases the costimulation signal that the T cells need to increase their response.

■

## Nuclear pore control

Nuclear pores punctuate the nuclear envelope and contain a channel through which molecules enter and leave the nucleus. When the nuclear envelope is depleted of calcium, nuclear import is inhibited. Perez-Terzic *et al.* (p. 1875) have visualized conformational changes in the structure of the nuclear pore itself which explain why, when calcium is depleted from the nuclear envelope, the diameter of the channel through the pore shrinks.



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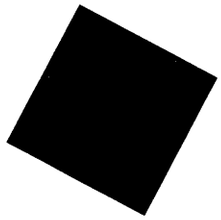

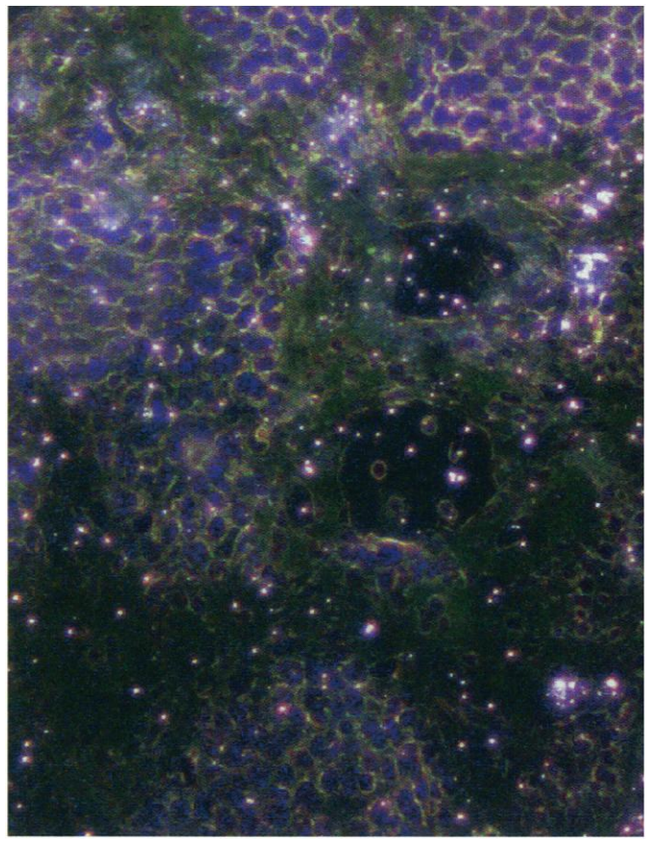

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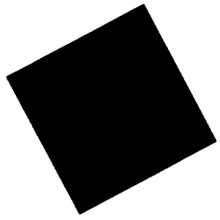

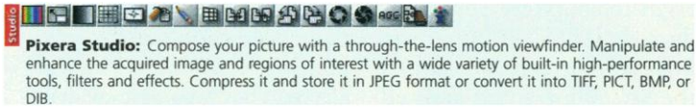


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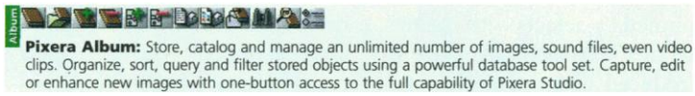


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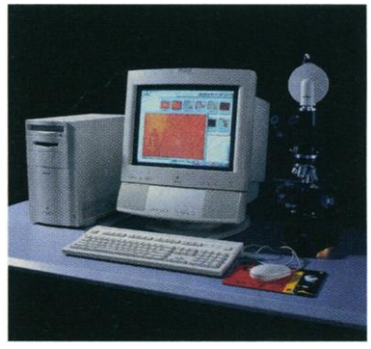

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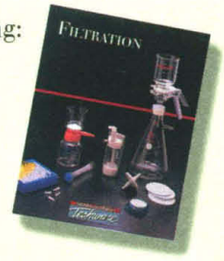


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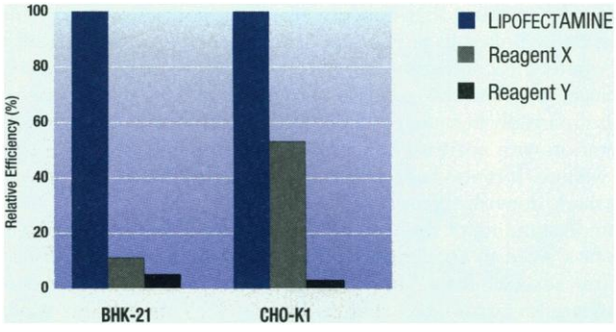


***FIGURE 1.*** *Relative transfection efficiencies of LIPOFECTAMINE Reagent and two cationic lipid reagents from other suppliers. The amount of reagent and DNA were optimized according to manufacturers' recommended conditions. Peak activities are shown normalized relative to LIPOFECTAMINE Reagent.*

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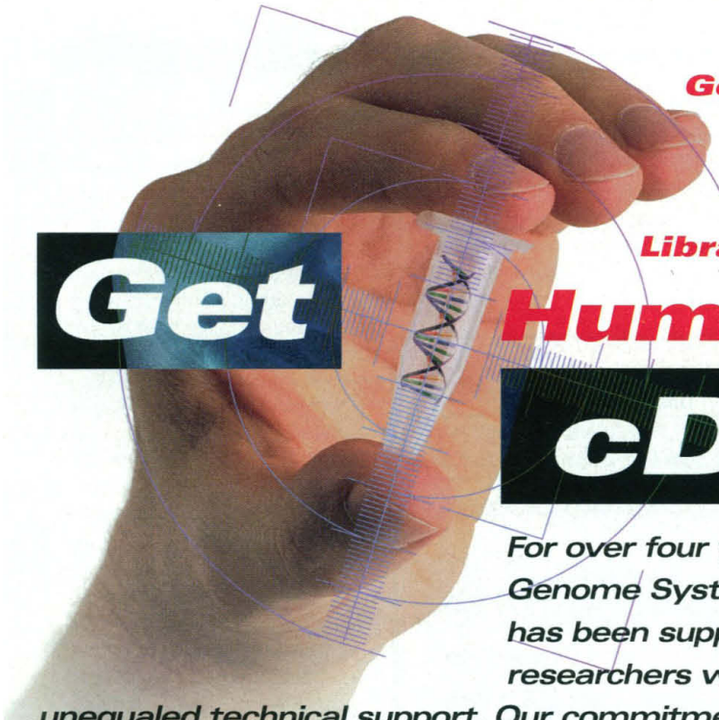

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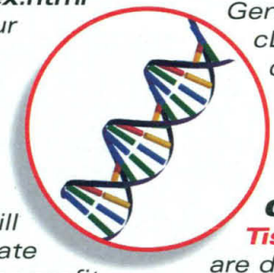

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1. *"The I.M.A.G.E. Consortium: An Integrated Molecular Analysis of Genomes and their Expression", Lennon, G.G., Auffray, C., Polymeropoulos, M., and Soares, M. B. [1995] Genomics.*

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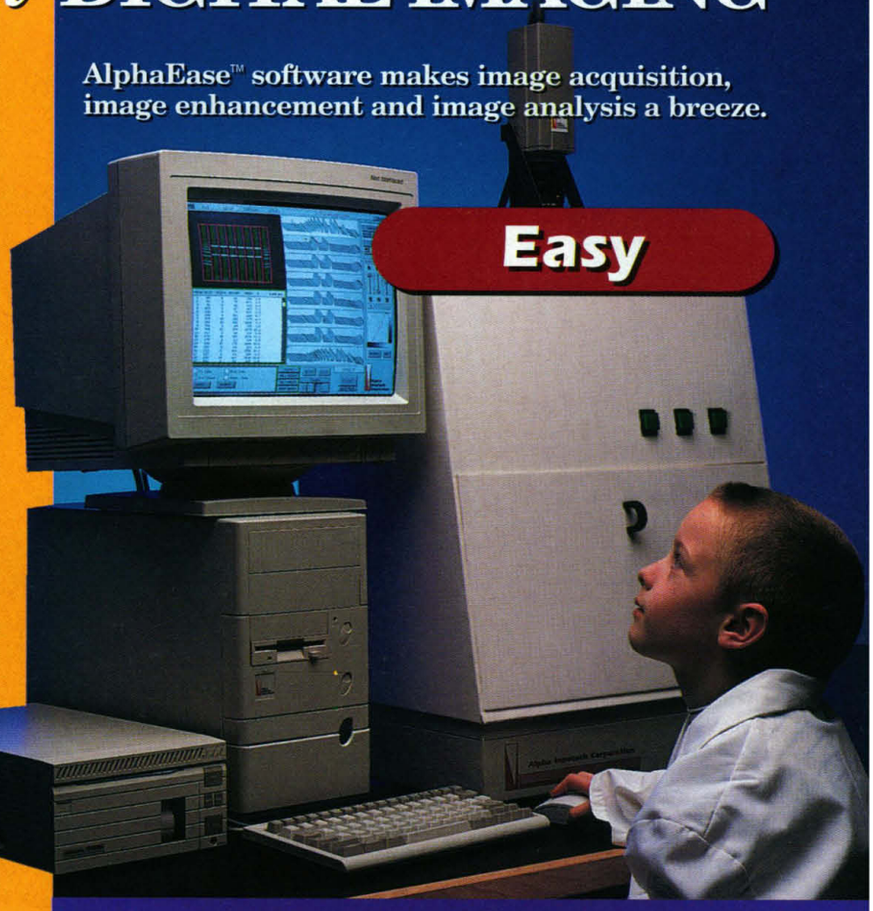

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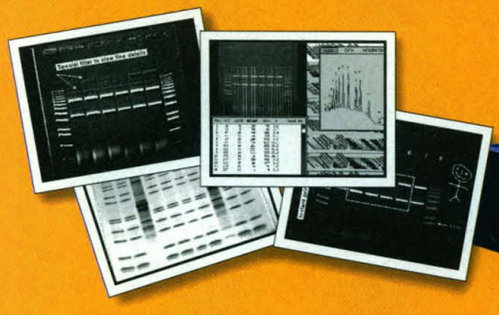

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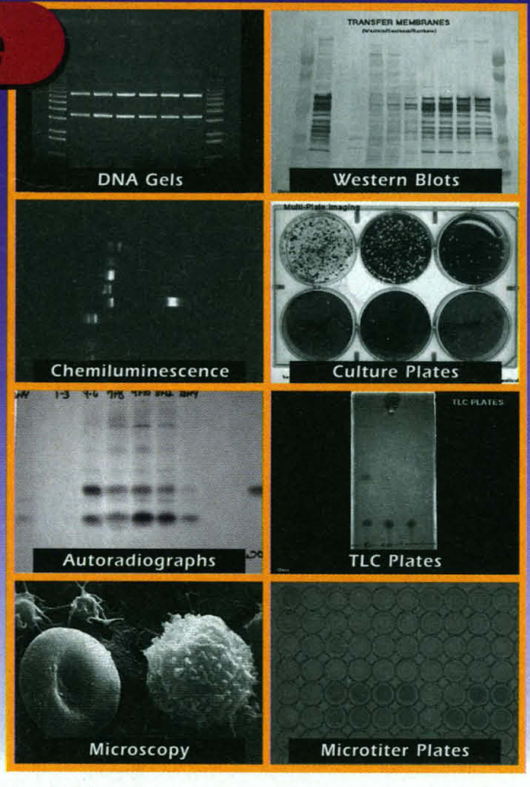


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