

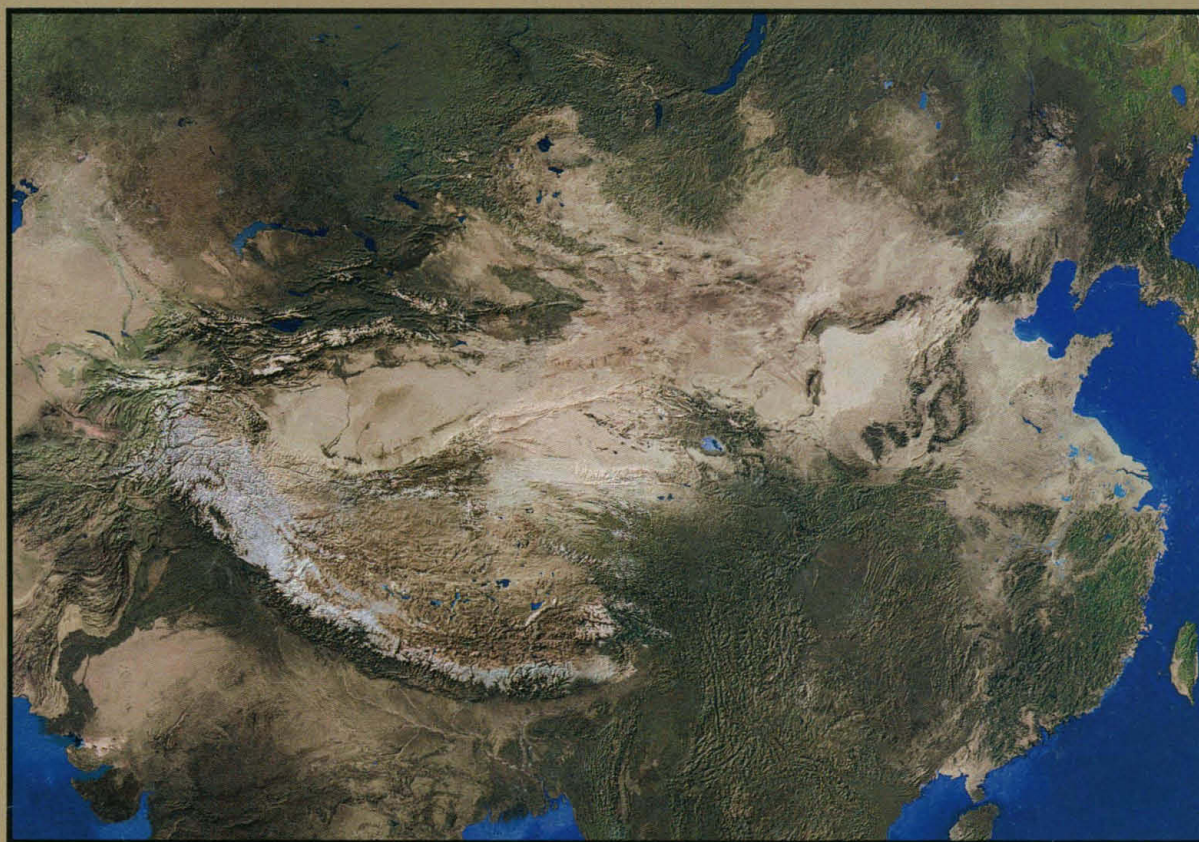


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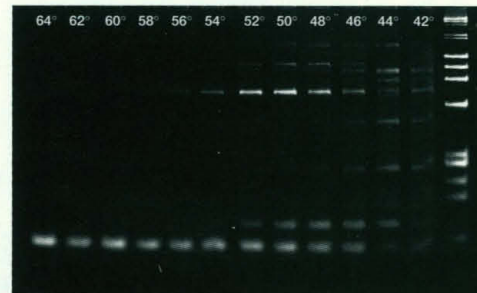
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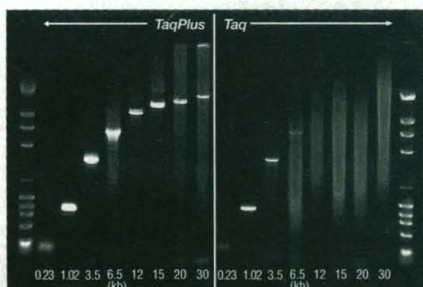


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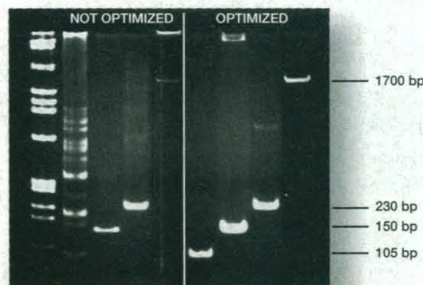
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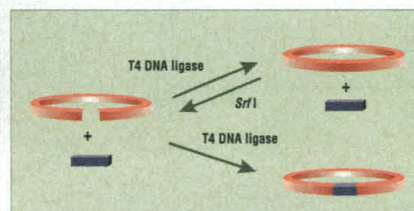
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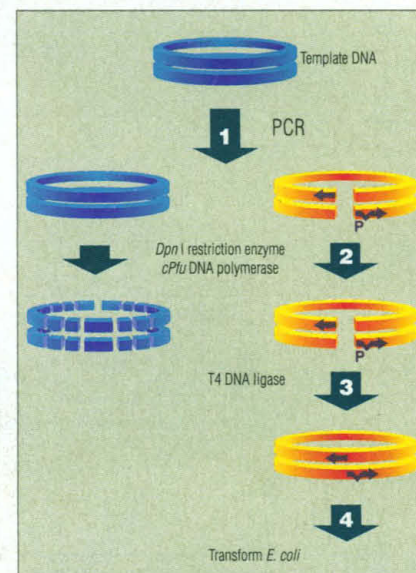
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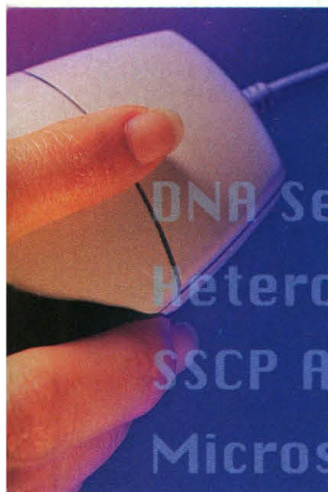


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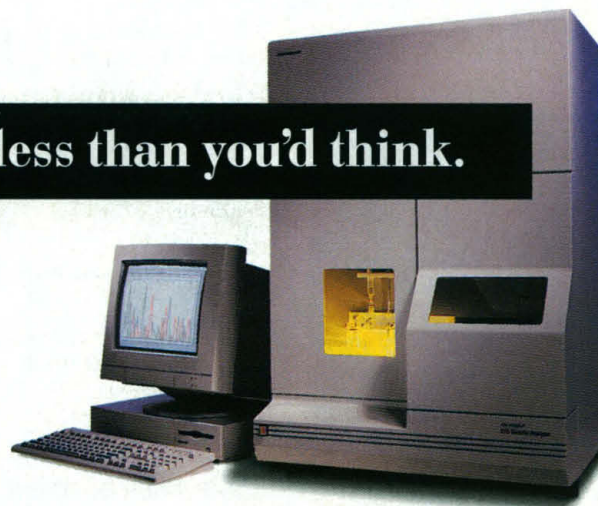




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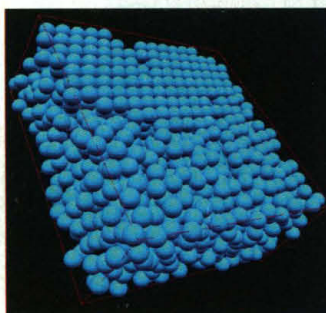
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Human origins and  
origins of thought



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Cuts through glass

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## COVER

This view of China, compiled from hundreds of images from satellites controlled by the U.S. National Oceanic and Atmospheric Administration, reveals the country's geographic prominence in Asia. Beginning on page 1131, News stories and Policy Forums explore the

Chinese government's attempt at scientific prominence—including a growing investment in research and efforts to lure young talent back home and increase international ties—as well as the remaining obstacles to progress. [Photo: WorldSat International, Canada]



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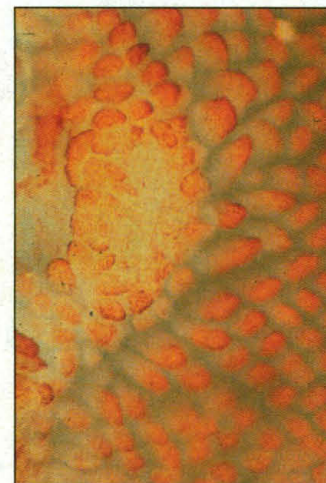
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**Tales from the crypts**

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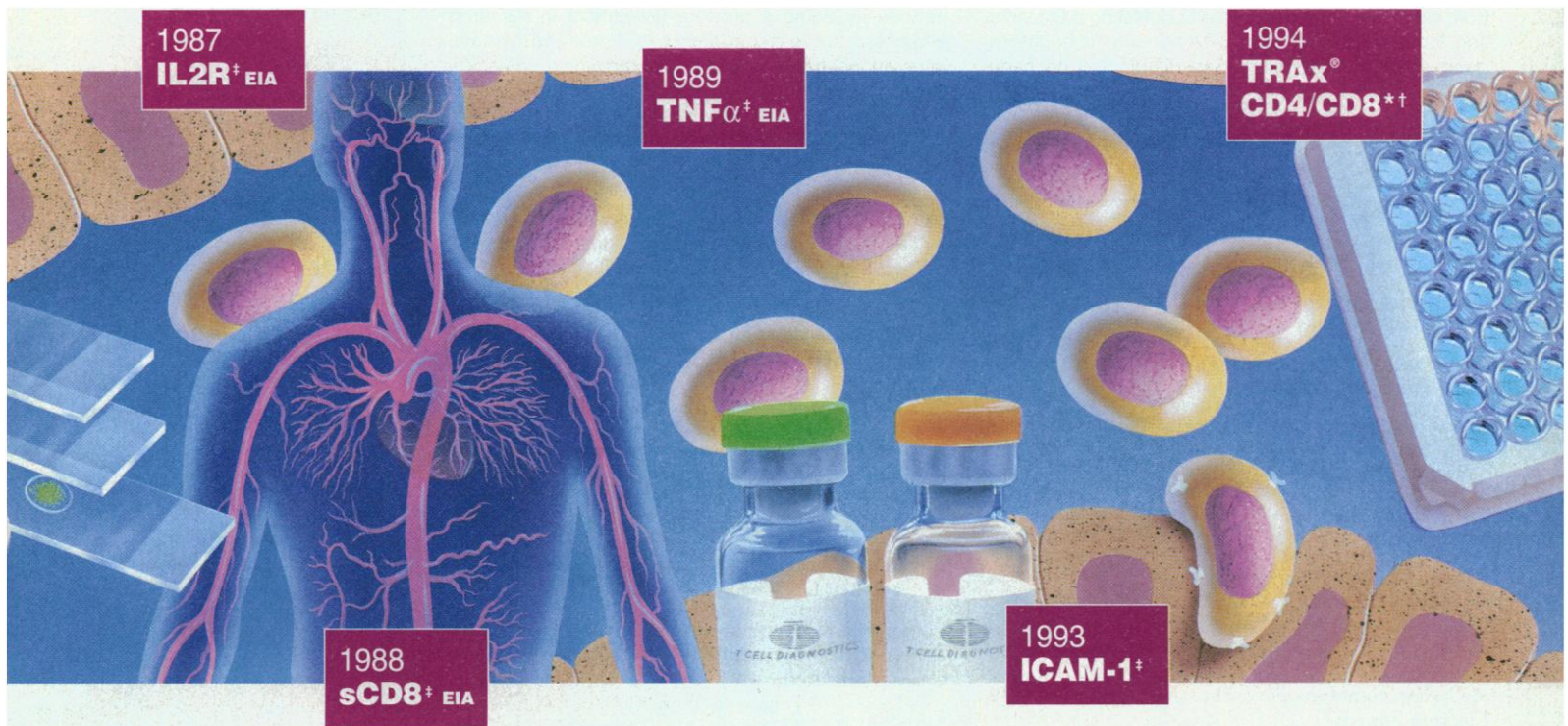
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## Through a glass directly

Glasses are amorphous, so determination of their atomic positions by scattering techniques yields radially averaged distances; thus macroscopic models or computer simulations have been used to obtain structures. Van Blaaderen and Wiltzius (p. 1177) prepared fluorescent silica colloids that were quenched to form a glass and then determined their structure by using the sectioning capabilities of confocal optical microscopy. The structures are in good agreement with previous theoretical models, and there was no evidence for a divergent correlation length.

■

## Nanotube electron gun

Films of carbon nanotubes aligned normal to the surface have been used to make a thin electron source (less than 1 millimeter thick) that could find application in flat panel displays. De Heer *et al.* (p. 1179; see news story by Service, p. 1119) placed a thin copper grid as an anode over an aligned nanotube film and found that electron emission currents from 0.1 to 100 milliamperes could be obtained for biases in the range of hundreds of volts. The device is air stable and in principle could be scaled up to large areas.

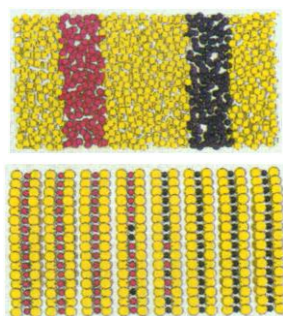
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## Superlattice trap

Layer-by-layer epitaxial growth is often used to control the deposition, one layer at a time, of the heterostructures that make up complex electronic devices. Noh *et al.* (p. 1181; see the Perspective by Parkinson, p. 1157) describe another approach to layer growth. Elemental layers are deposited at low temperatures and then react at higher temperatures to form super-

## Recovering a rectifying current

Adenosine triphosphate (ATP)-sensitive  $K^+$  currents couple the metabolic activity of cells to the electrical potential maintained across the membrane. In pancreatic  $\beta$  cells, ATP-sensitive  $K^+$  channels help control insulin secretion and are the target of sulfonylurea, a drug used to treat non-insulin-dependent diabetes. Inagaki *et al.* (p. 1166; see the Perspective by Phillipson, p. 1159) cloned a member of the inward rectifying  $K^+$  channel family that with the sulfonylurea receptor can reconstitute in transfected cells an ATP-sensitive  $K^+$  current similar to that in native  $\beta$  cells.



lattices of the reaction products. They trapped layered structures of  $NbSe_2$  and  $TiSe_2$  in a kinetically controlled process. The high-temperature annealing inherent in this process can reduce defects, which could improve device quality.

■

## Metal-loving mantle

Estimates of the amount of many siderophiles (metal-loving elements) in the upper mantle suggest an overabundance, which requires either more complicated Earth evolution models or a recalculation of partition coefficients under different experimental conditions. Walter and Thibault (p. 1186) have done such a recalculation for two moderate siderophiles,  $Mo^{6+}$  and  $W^{6+}$ , by considering the effects of variable silicate composition at constant pressure, temperature, and oxygen fugacity in their experiments. It appears that a more depolymerized silicate melt with a low Si to Mg ratio is far more capable

of retaining  $Mo^{6+}$  and  $W^{6+}$ , providing a partial answer for the apparent overabundance of Mo and W in the upper mantle.

■

## Bowel disease

Cadherins are transmembrane glycoproteins that are key mediators of cell adhesion. To investigate the role of cadherin in the small intestine, Hermiston and Gordon (p. 1203) studied mice expressing a dominant negative cadherin mutant in a fraction of their intestinal epithelial cells. The mice developed an inflammatory bowel disease (IBD) resembling Crohn's disease, as well as intestinal adenomas. These results underscore the importance of a functional epithelial barrier in intestinal health and may offer clues to the etiology of IBD.

■

## Firing unwanted help

Certain organs such as the eye would be rendered useless by the inflammatory response of the immune system. Griffith *et al.* (p. 1189; see the Perspective by Streilein, p. 1158) show that the eye makes use of Fas (CD95)-Fas ligand (FasL) interactions to eliminate infiltrating immune cells. Expression of FasL in the eye induces apoptosis through the Fas receptor, expressed on immune system cells.

## Drugs for HIV and SIV disease

Two reports focus on drugs to combat the replication of the human and simian immunodeficiency viruses. Rice *et al.* (p. 1194) have targeted a highly conserved structural motif of HIV-1, the zinc fingers of the nucleocapsid protein. Disulfide-substituted benzamides can modify the cysteine thiolates such that zinc no longer binds and the resulting virus is no longer infective. They identified non-toxic compounds that work well with other antiviral drugs in a cellular assay and that did not appear to induce resistant mutants. Tsai *et al.* (p. 1197; see the news story by Cohen, p. 1121) identified a drug that prevented SIV infection in macaques. An acyclic nucleoside phosphonate, PMPA, was given 2 days before or within 1 day after SIV exposure and then daily for 4 weeks. Unlike the control macaques, no infection was established.

■

## Signal shutoff

The two subsets of T cell helper cells,  $T_H1$  and  $T_H2$ , differ in that they respond only to interleukin-12 or interferon- $\gamma$  (IFN- $\gamma$ ), respectively, but not to the other cytokine. Bach *et al.* (p. 1215) show that this unresponsiveness is not intrinsically linked to differentiation but is rather a response of the cells to the cytokine. During  $T_H1$  generation, IFN- $\gamma$  is produced that halts the expression of the IFN- $\gamma$  receptor  $\beta$  subunit used in signaling. However, such  $\beta$  subunit loss also occurred in  $T_H2$  cells treated with IFN- $\gamma$ . Both subsets retained the ligand-binding  $\alpha$  chain. Down-regulation of the signaling component of a receptor by its cytokine produced the unresponsive state.



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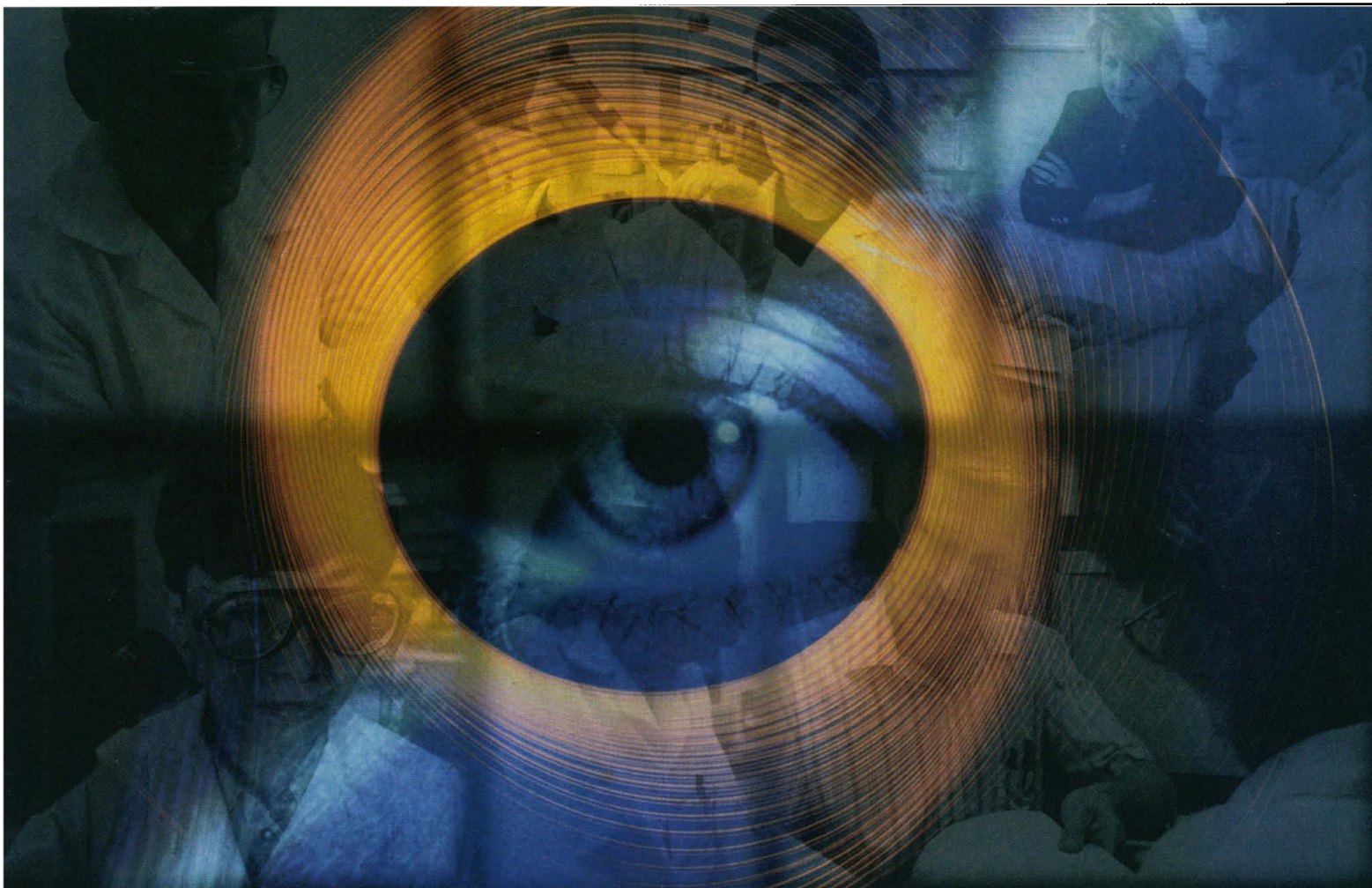
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### Cooperative Protein-DNA binding studies

van Dijk, M.A. and Murre, C. (1994) *Cell*, **78**, 1.

### DNA-Protein complex formation, immunoprecipitation

Sif, S. and Gilmore, T.D. (1993) *J. Virol.* **67**, 7612.

### Protein-RNA binding assays

Lutz, C.S. and Alwine, J.C. (1994) *Gen. Devel.* **8**, 576.

### DNA binding

Loh, L.C. et al. (1994) *Virology* **200**, 413.

### Protein-protein interaction, Mapping protein binding sites

Patrick, D.R. et al. (1994) *J. Biol. Chem.* **269**, 6842.

### Fusion protein binding assays

Lukac, D.M. et al. (1994) *J. Virol.* **68**, 5184.

### Analysis of truncation mutations in MDS

Screening for translation-terminating mutations in MDS  
Roest, P.A. et al. (1993) *Human Mol. Gen.* **2**, 1719.

## Mutational analysis

### Easy, rapid method of screening large number of mutants. Safety assessment prior to large scale culture of toxins

Johnson, V.G. and Nicholls, P.J. (1994) *J Biol Chem.* **269**, 4349.

### Confirmation of ligand-binding region, analysis of mutants

Kallio, P.K. et al. (1994) *Endocrinology* **134**, 998.

### Gel shift analysis of deletion mutants

Palvimo, J.J. et al. (1993), *Mol. Endo.* **7**, 1399.

### Verification of cloned genes

### Verification that clone expressed a protein of the predicted size

Daigle, I. and Li, C. (1993) *Proc. Natl. Acad. Sci. USA*, **90**, 12045.

### Verification of clone and immunoprecipitation

Greig, A. et al. (1994) *Circulation Research*, **74**, 41.

### In vitro evolution studies

Joyce, G.F. (1993) *Pure & Appl. Chem.* **65**, 1205.

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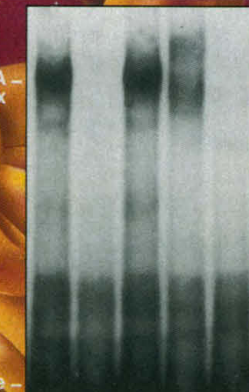


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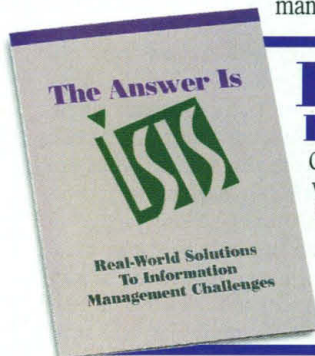
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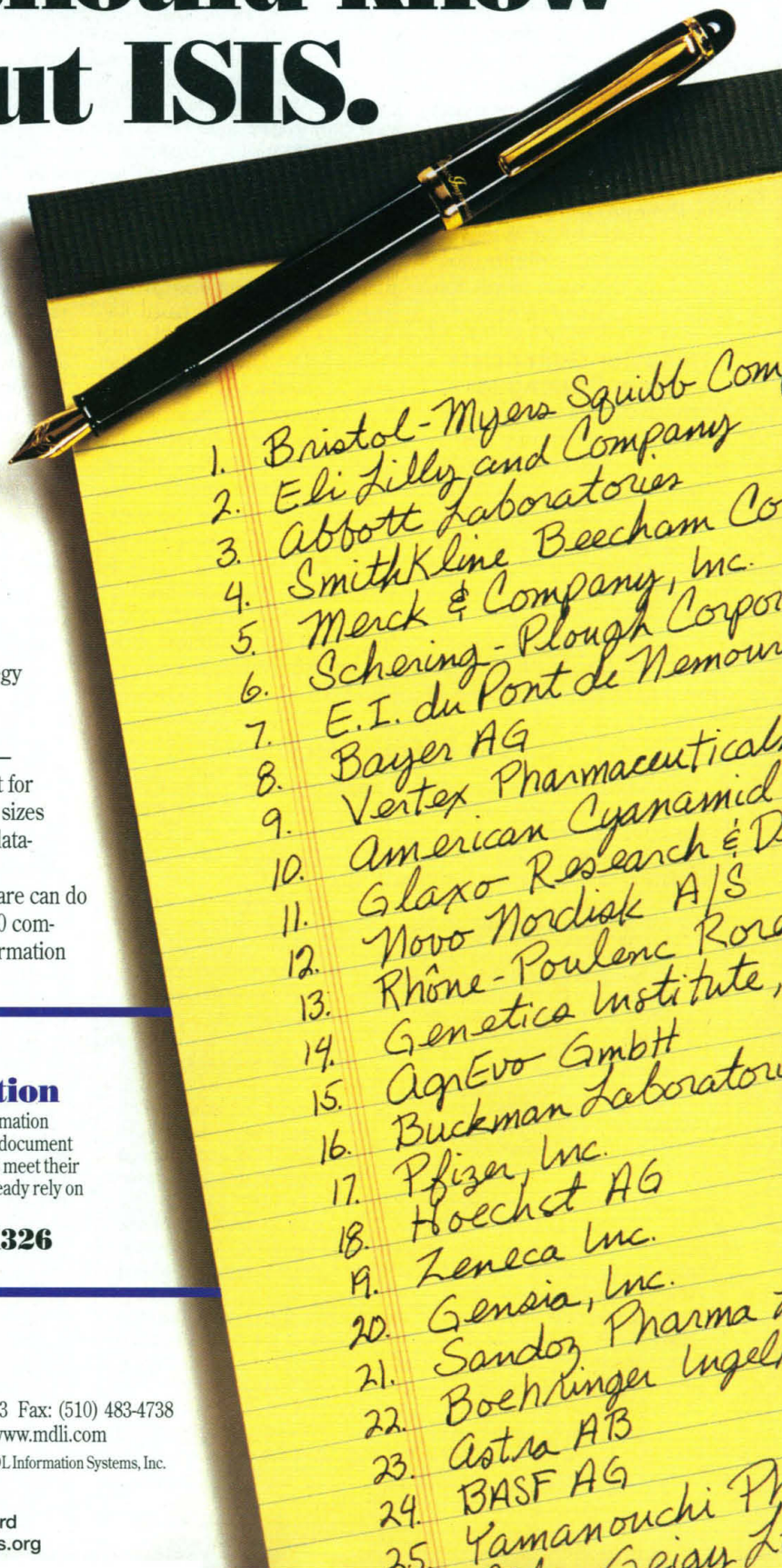
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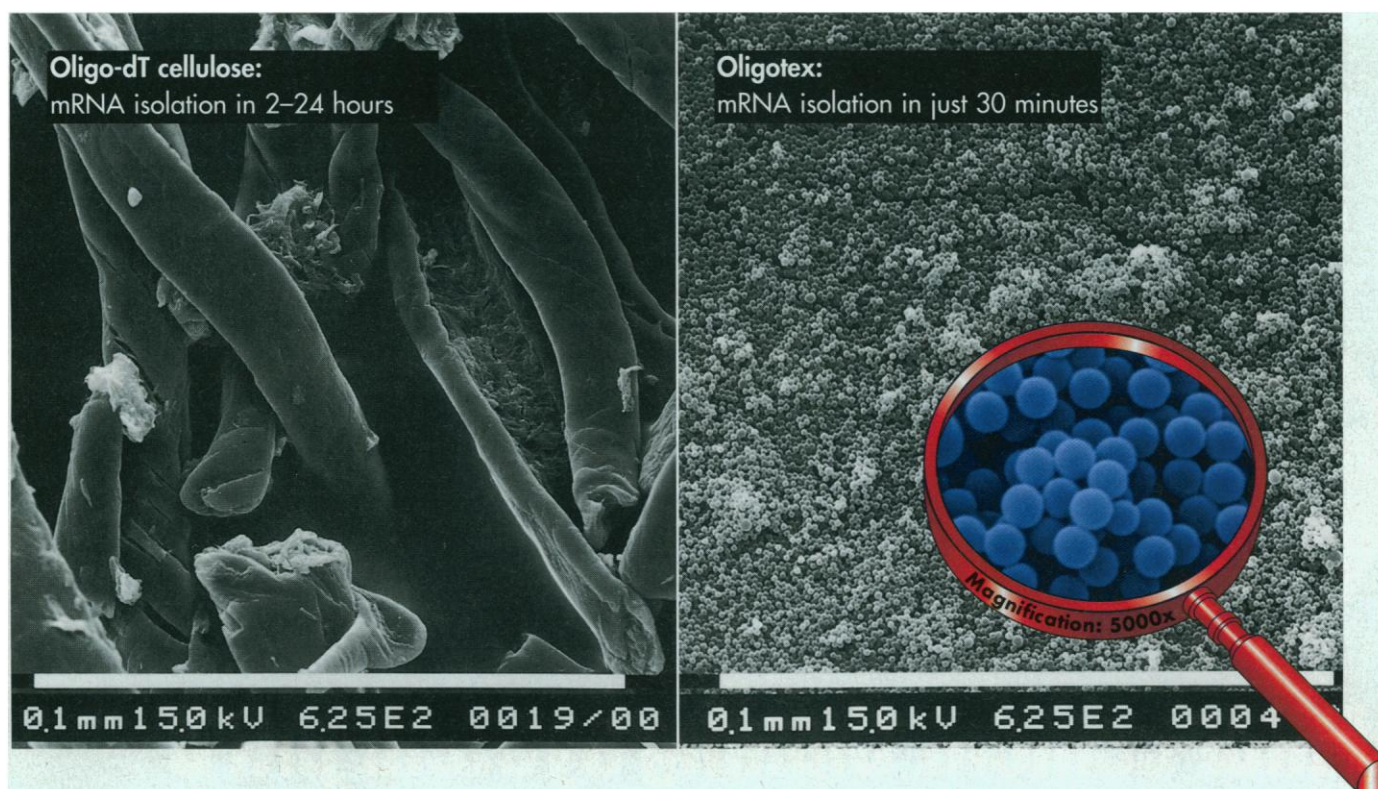
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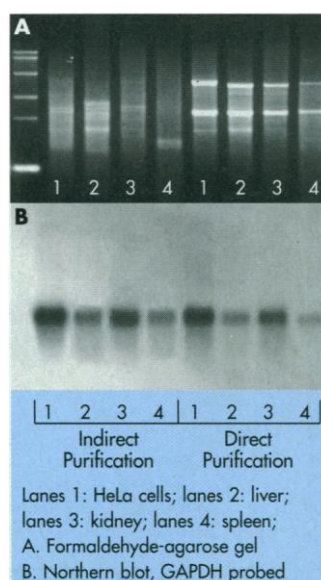
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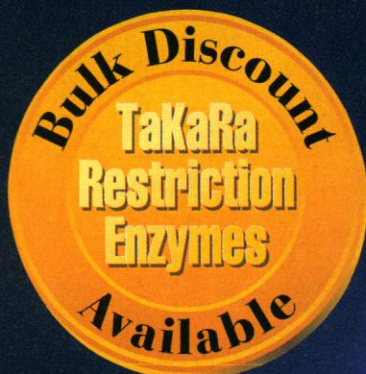


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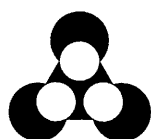
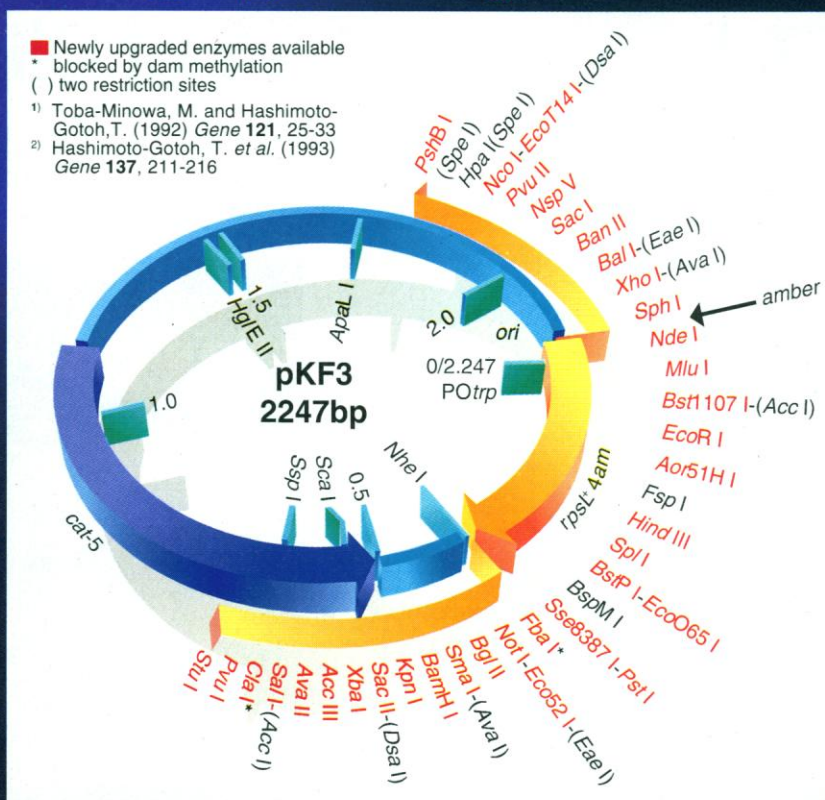
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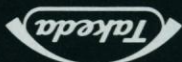


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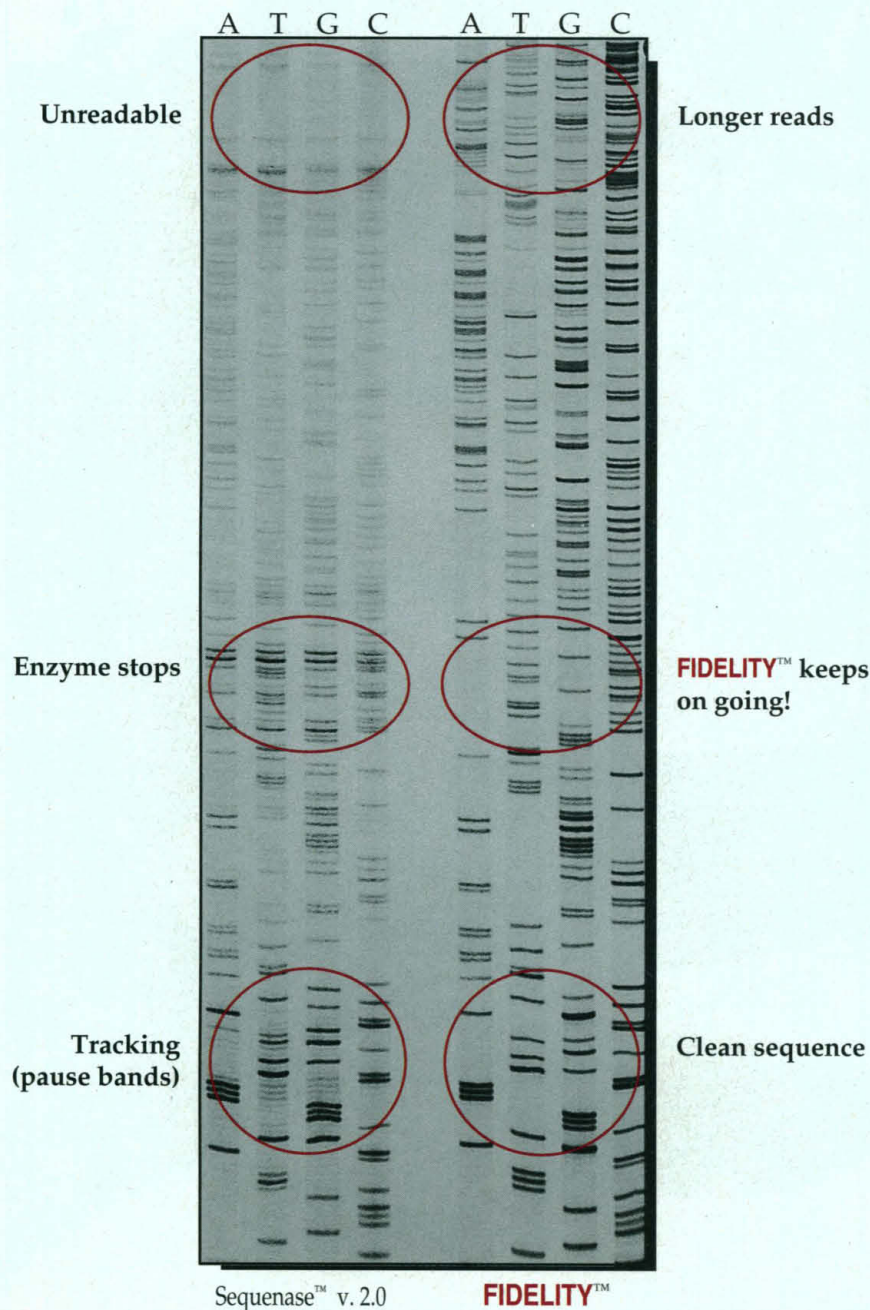




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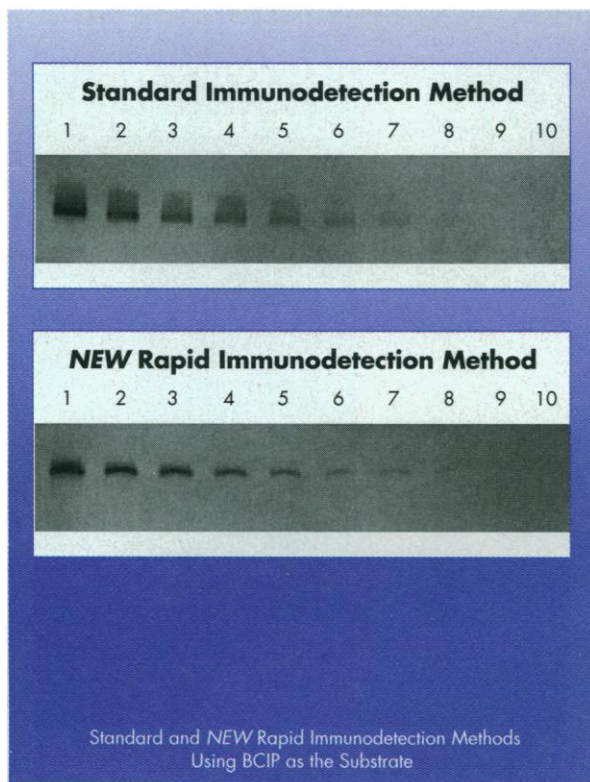
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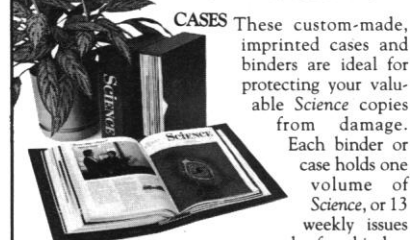
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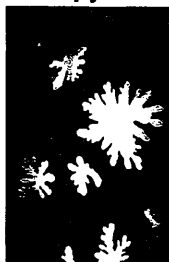


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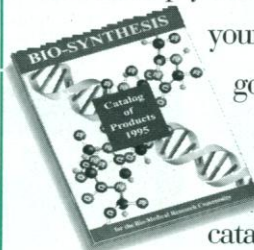
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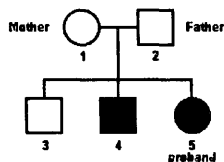
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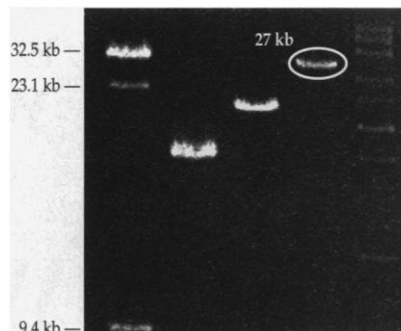
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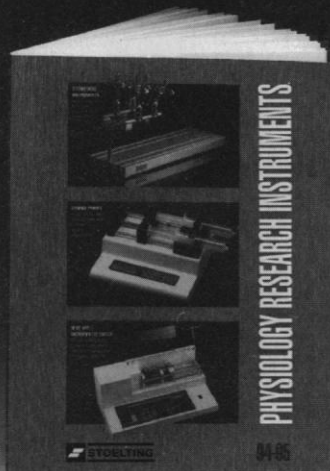
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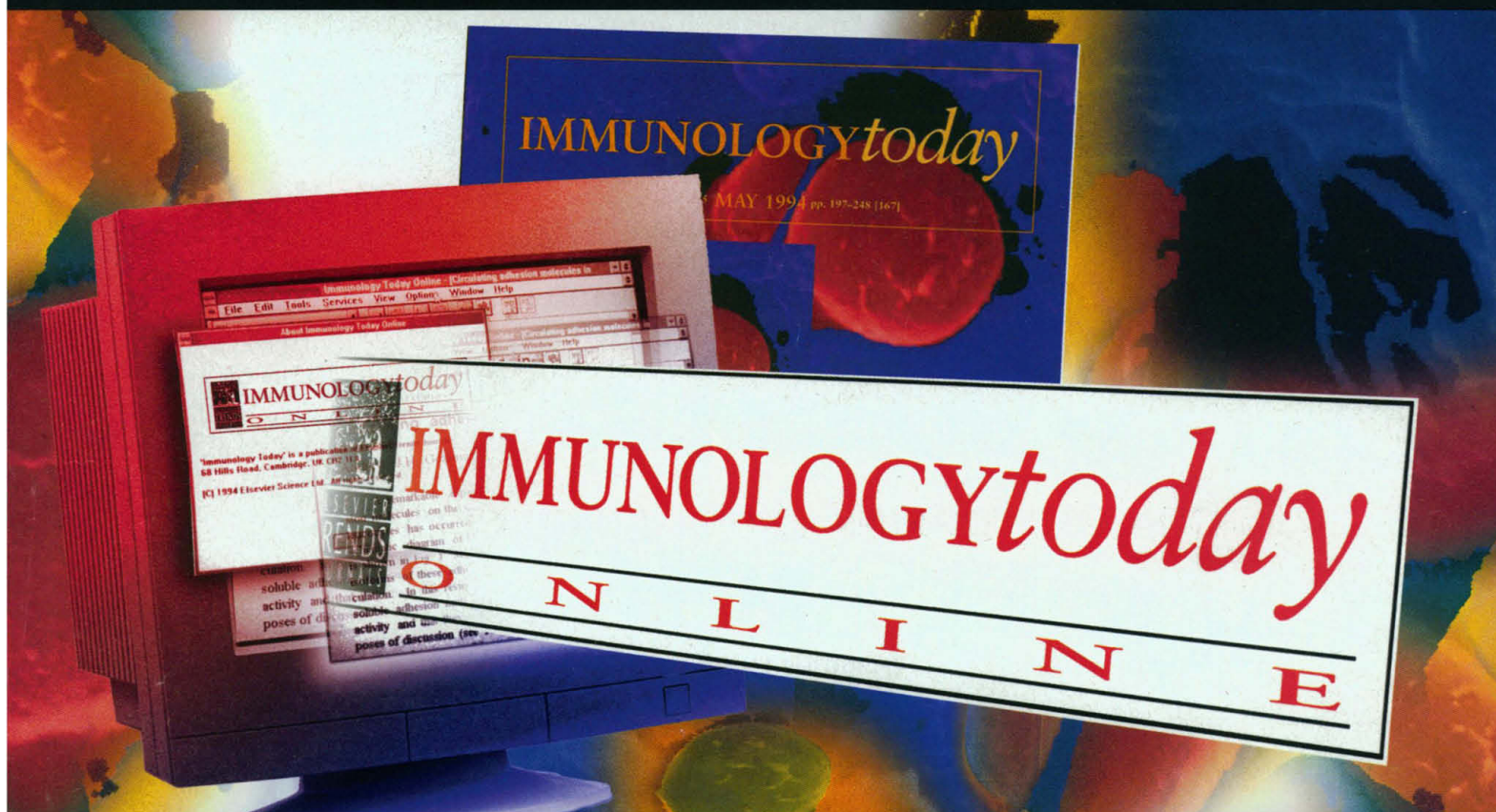
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