

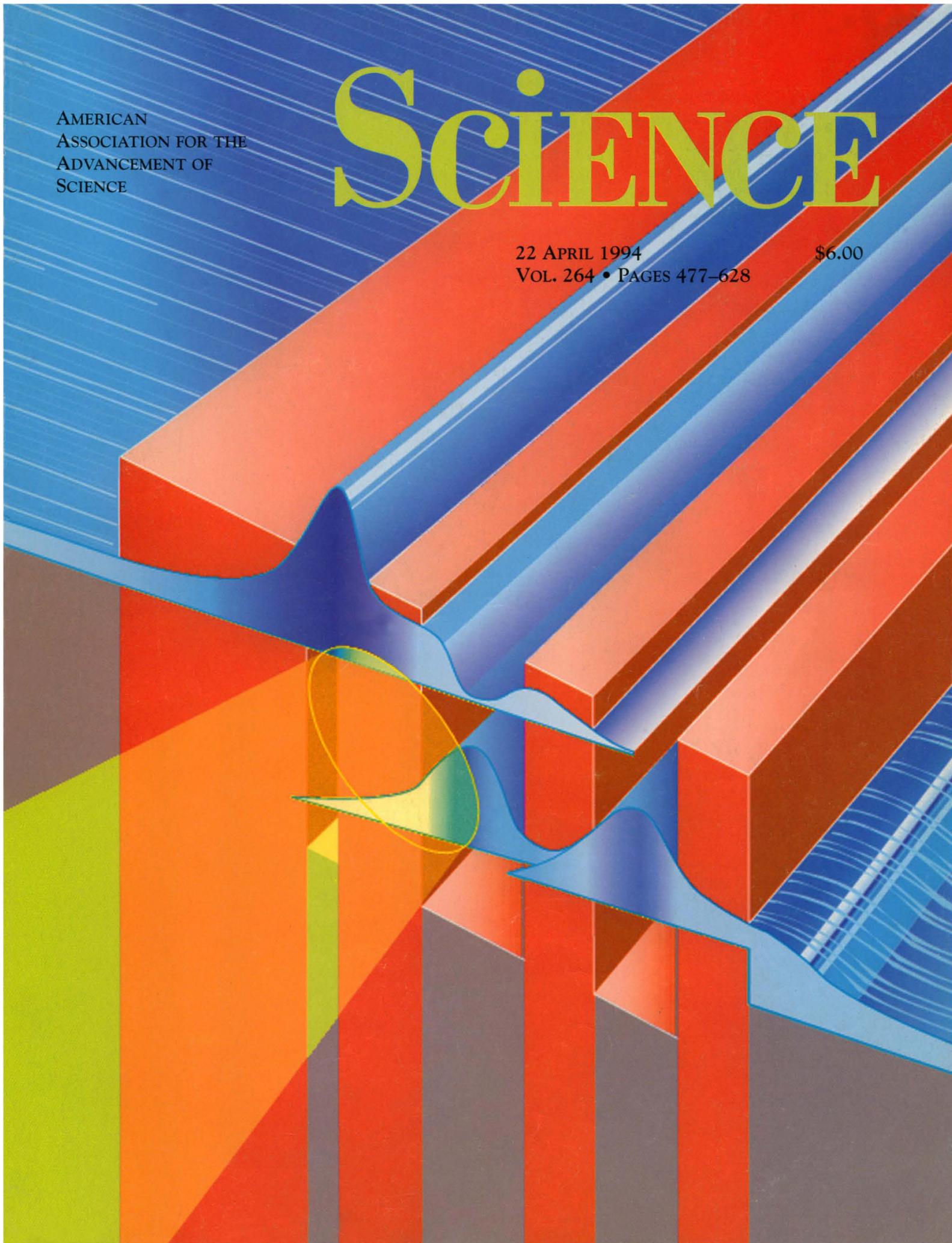
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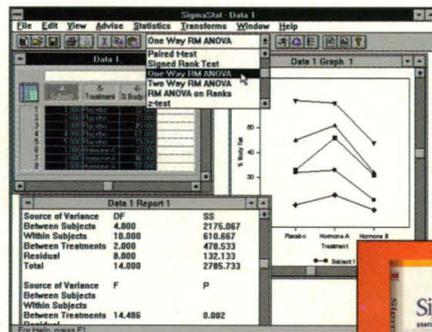
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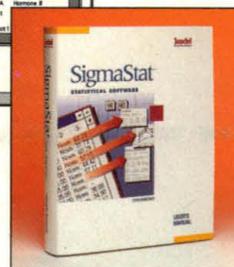
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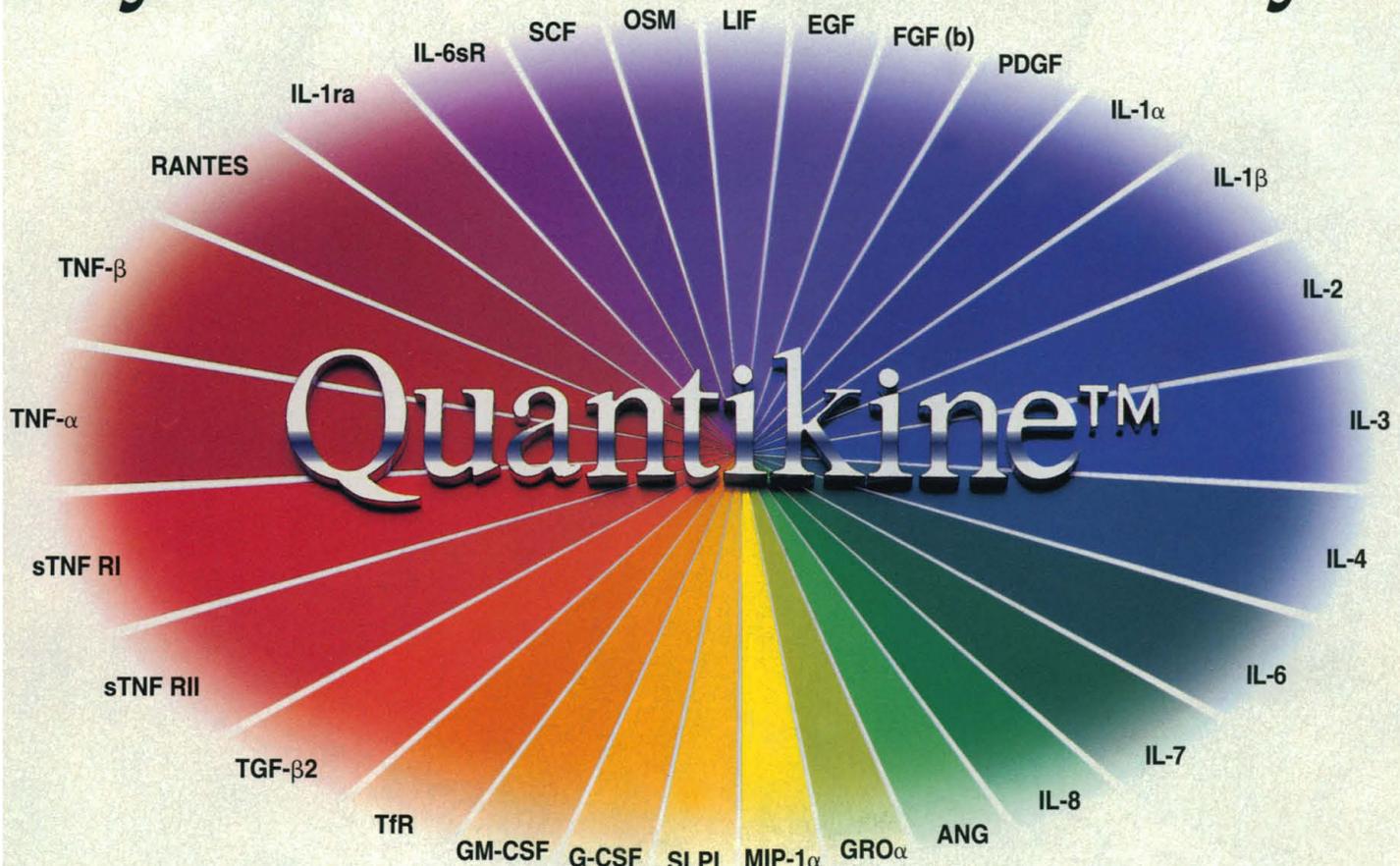
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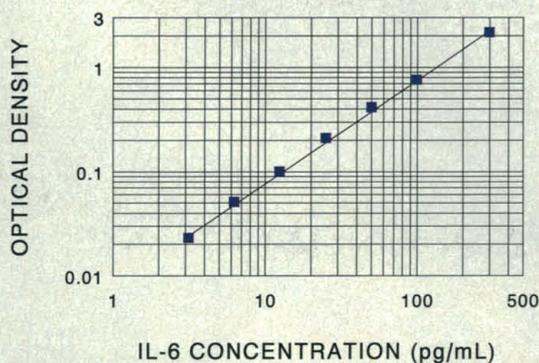
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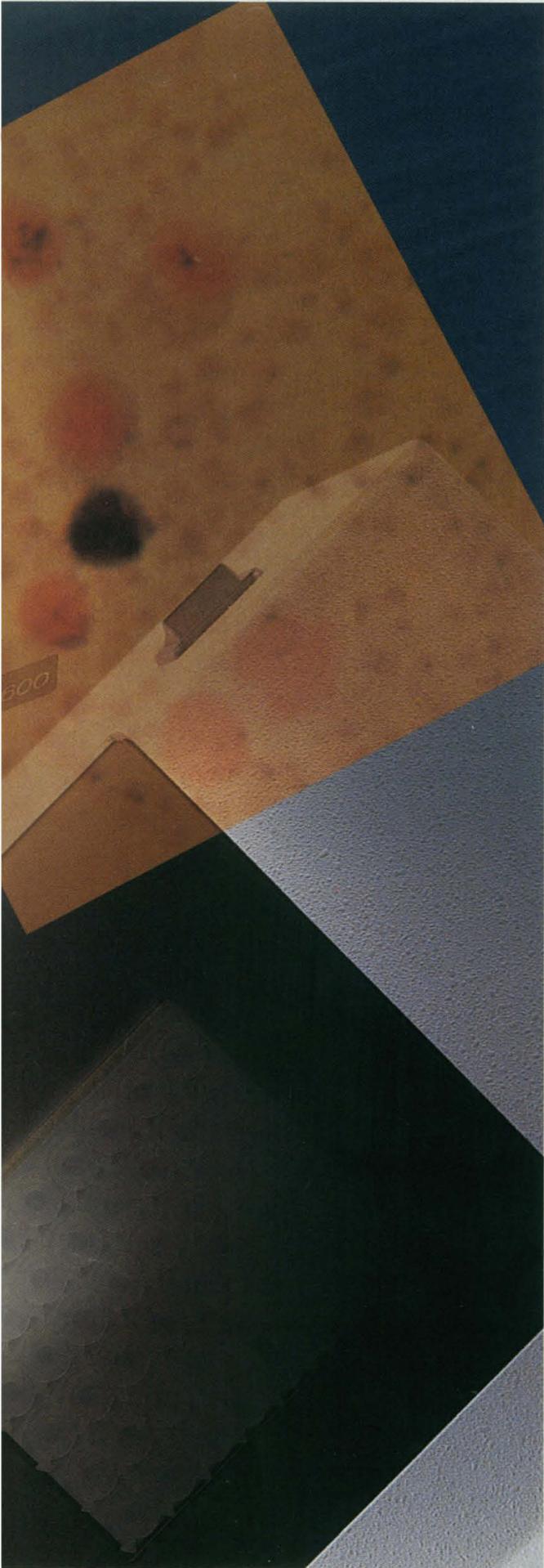
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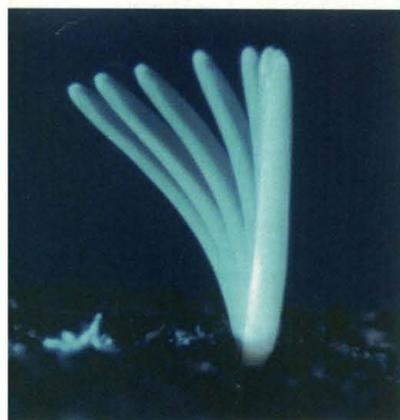


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## COVER

In the quantum cascade laser, alternating semiconductor layers (red and gray) create quantum wells for electrons. As electrons (light blue streaks) cascade from well to well (left to right), they jump from a higher to a lower energy level, emitting light (yellow band).

The straight blue lines in the well regions represent the energy levels, and the bell-shaped curves, the probability distributions for occupation of that level. See page 553 and the news story on page 508. [Illustration: Keith D. Drake and Frank A. Antalec, AT&T Bell Labs]



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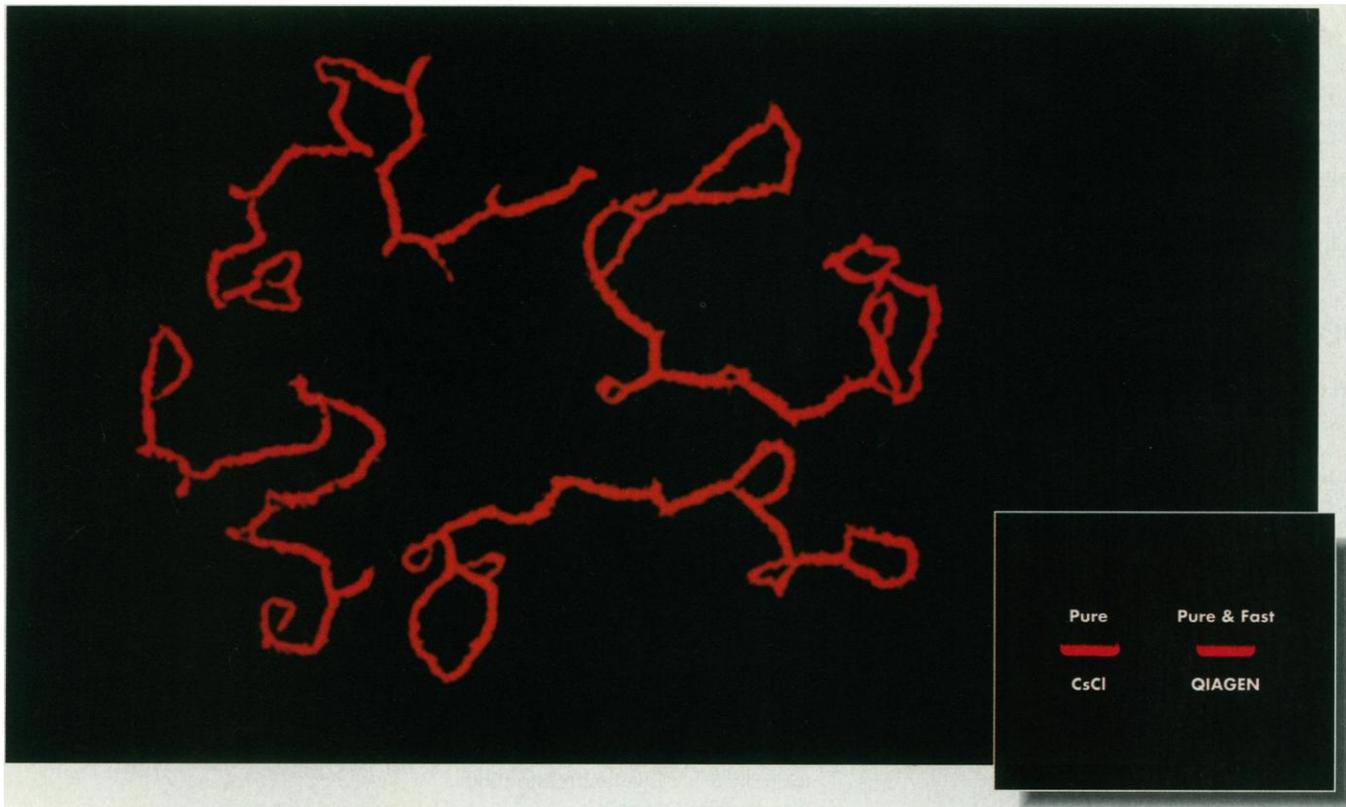
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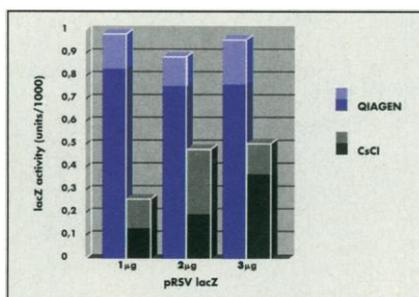


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## Telltale teeth

The strontium isotopic composition of seawater reflects the interaction of several processes, including continental weathering and hydrothermal circulation through ocean crust. The Cretaceous was a time of rapid formation of oceanic crust, but finding fossils that faithfully record seawater Sr compositions despite burial and diagenesis has been difficult. Ingram *et al.* (p. 546) show that fossil fish teeth provide such a record. The overall Sr isotopic variation in the fish teeth accounts for the volume of large Cretaceous oceanic plateaus but is inconsistent with high crustal production rates that have been proposed.



## Cascade laser

In conventional semiconductor lasers, such as those found in compact disc players, the emitted light is produced as a result of electron-hole recombination across a band gap. Faist *et al.* (p. 553; see cover and news story by Taubes, p. 508) report a quantum well laser that operates on a different principle: the laser action occurs between quantum-confined conduction-band states in a semiconductor heterostructure. The lasers are grown by molecular beam epitaxy, so the dimensions of the quantum structures can be tailored to yield different lasing wavelengths. Lasing occurs at about 4.2 micrometers, a wavelength of interest to molecular spectroscopists and one that is difficult to obtain by other means.



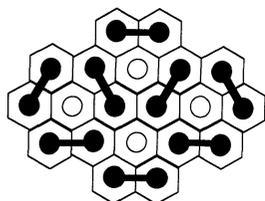
## Extra lithium

Atomic intercalation of metals into carbon solids, such as lithium intercalation into graphite and alkali metal insertion into

## Distant pulsar planets

Two years ago, timing variations were found in the radio signals from the isolated 6-millisecond pulsar PSR B1257+12 that suggested the existence of at least two orbiting planets. That discovery has now been confirmed. Wolszczan (p. 538; see news story by Travis, p. 506) explains how a total of 3 years of data show additional systematic variations in the pulse arrival times due to orbital changes caused by the gravitational interaction of the two Earth-mass planets. There is also a third inner planet which has a mass about that of the moon.

fullerenes, is well known. Sato *et al.* (p. 556) use nuclear magnetic resonance and electron microscopy to show that in a disordered carbonaceous material, which was made by pyrolyzing polyphenylene, lithium could be introduced electrochemically not only in an atomic form but also as discrete  $\text{Li}_2$  dimers. The identification of this covalent



site for lithium storage could lead to higher energy densities for batteries; the measured discharge capacity is about double that found for  $\text{C}_6\text{Li}$  electrodes.



## Defense secretions

A first line of defense against the entry of pathogens through the mucosal linings of the body is the secretion of immunoglobulin A (IgA) antibodies from antibody-containing cells. Ramsay *et al.* (p. 561) show that interleukin-6 (IL-6) is critical for the development of such immunity. Disrupting the IL-6 gene in mice greatly diminished IgA responses in the gut to viral challenges. Normal responses could be restored in the lungs of mice by infection with a recombinant vaccinia virus that carried the IL-6 gene.

## Sensing blue light

Blue light affects plants in a variety of ways. Some of the plant's responses to blue light can include developing new chloroplasts, opening stomata, and phototropism, or growth toward the source of the light. The receptor for the various blue light responses has, however, remained elusive. Quiñones and Zeiger (p. 558) manipulated the amount of the carotenoid zeaxanthin in maize coleoptiles and showed that the amount of zeaxanthin correlates with the phototropic response of coleoptiles to blue light. As zeaxanthin is present in very small concentrations, it may be a candidate for a blue light receptor.



## Unevenly divided

When the bacterium *Bacillus subtilis* is starved, an asymmetric division is initiated, and transcription of certain genes is confined to one or the other of the daughter cells. Wu and Errington (p. 572) analyzed this process and found that the SpoIIIE protein is apparently required for movement of the chromosome into the smaller spore cell, a process that remains incomplete in SpoIIIE mutants. It may be the incomplete segregation of the chromosome in SpoIIIE mutants that leads to some of the normal sporulation—specific genes being transcribed, and others not, depending upon their location on the chromosome.

## Shouts and whispers

That the intensity of visual and auditory events varies over many orders of magnitude does not prevent humans from accurately sensing these stimuli. The relation between sensation and intensity is a power function, which reduces the dynamic range to a physiologically acceptable window. Zeng and Shannon (p. 564) used auditory prostheses that had been implanted in the cochlea or brainstem of deaf patients to examine where such transformations might occur between the periphery—the cochlea—and the central nervous system. They suggest that high-frequency stimuli undergo a logarithmic transformation in the cochlea, whereas low-frequency sounds are transmitted linearly until a logarithmic transformation occurs in the cochlear nucleus of the central nervous system.



## Prying into prions

Prions are infectious proteins that cause diseases of the central nervous system—scrapie in sheep and Creutzfeldt-Jakob disease in humans. How prions infect cells without the involvement of nucleic acids has been puzzling, but in a Perspective, Cohen *et al.* (p. 530) discuss how an abnormal prion protein may act directly on normal host proteins to change their conformation to an abnormal, disease-causing one. In a related report, Wickner (p. 566; see accompanying Perspective by Weissmann, p. 528) discusses how yeast get into the prion business. An obscure yeast mutant, URE, seems to owe its unusual phenotype to a protein, Ure2p, with many of the same properties as prion proteins. This yeast "prion" could prove more amenable to genetic and biochemical analysis.

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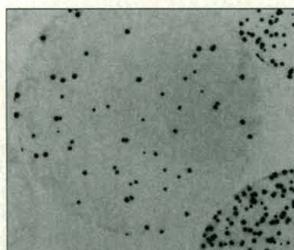
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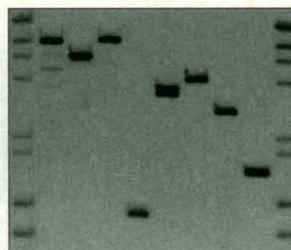
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Southern Blot using NEBlot Phototope Kit. Exposure time: 10 minutes.

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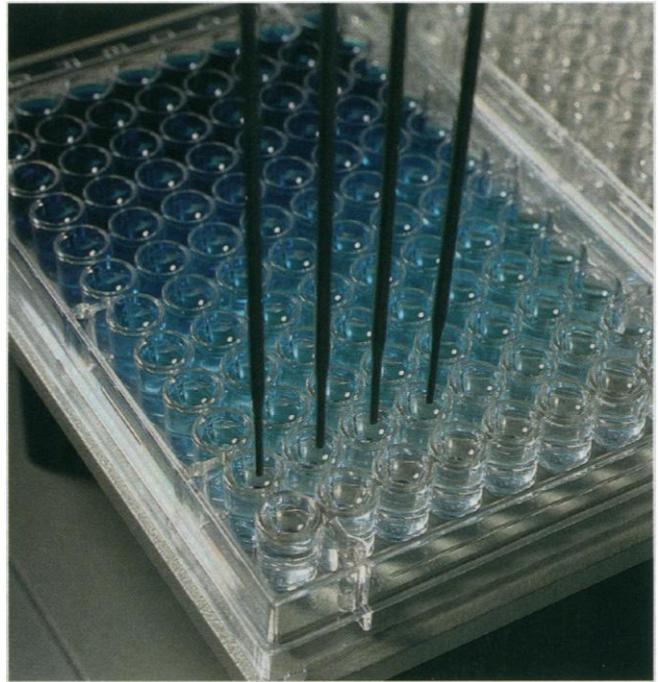
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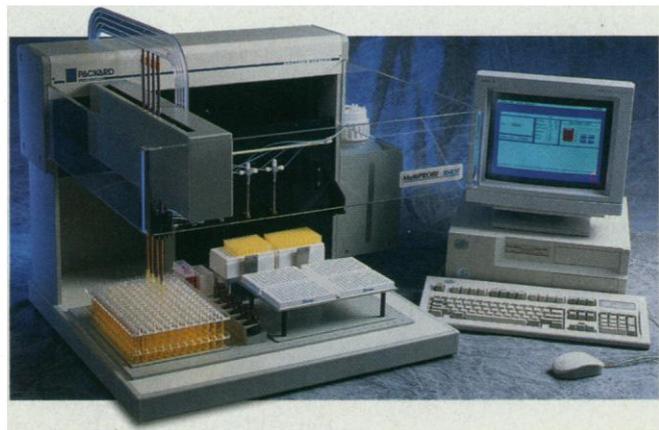
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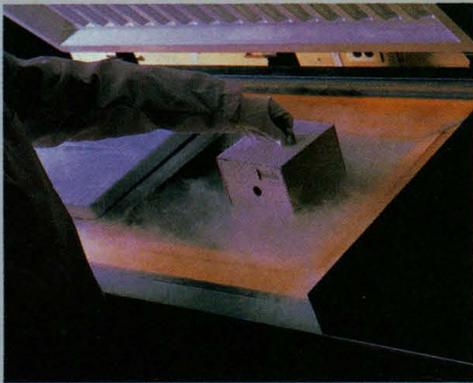
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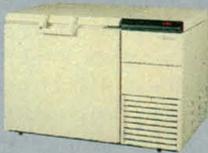
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Assay Performed	GIBCO BRL	Company A	Company B	Company C
DNA Endonuclease Assay	All Pass	 	All Pass	
DNA Exonuclease Assay	All Pass	All Pass	 	
DNA Ligation/Recut Assay	All Pass	 	 	All Pass
Nicking Assay	All Pass		 	 
Unit Assay	All Pass	    	  	   

 = One Failure

**Summary: Seven out of ten restriction endonucleases from each competitor failed one or more of our quality tests.**

<sup>†</sup>Enzymes tested in the manufacturers' recommended buffers: *Bam*H I, *Bgl* I, *Cla* I, *Eco*R I, *Hind* III, *Kpn* I, *Not* I, *Pst* I, *Sal* I, and *Sst* I (*Sac* I)

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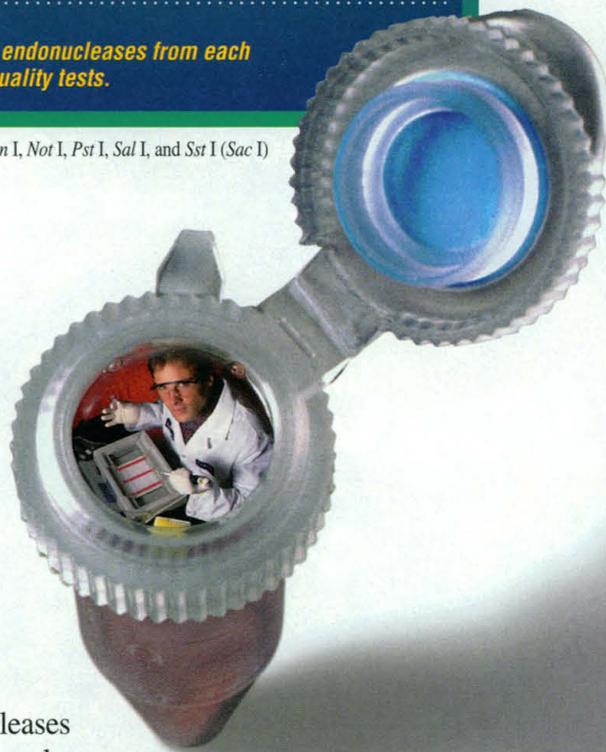
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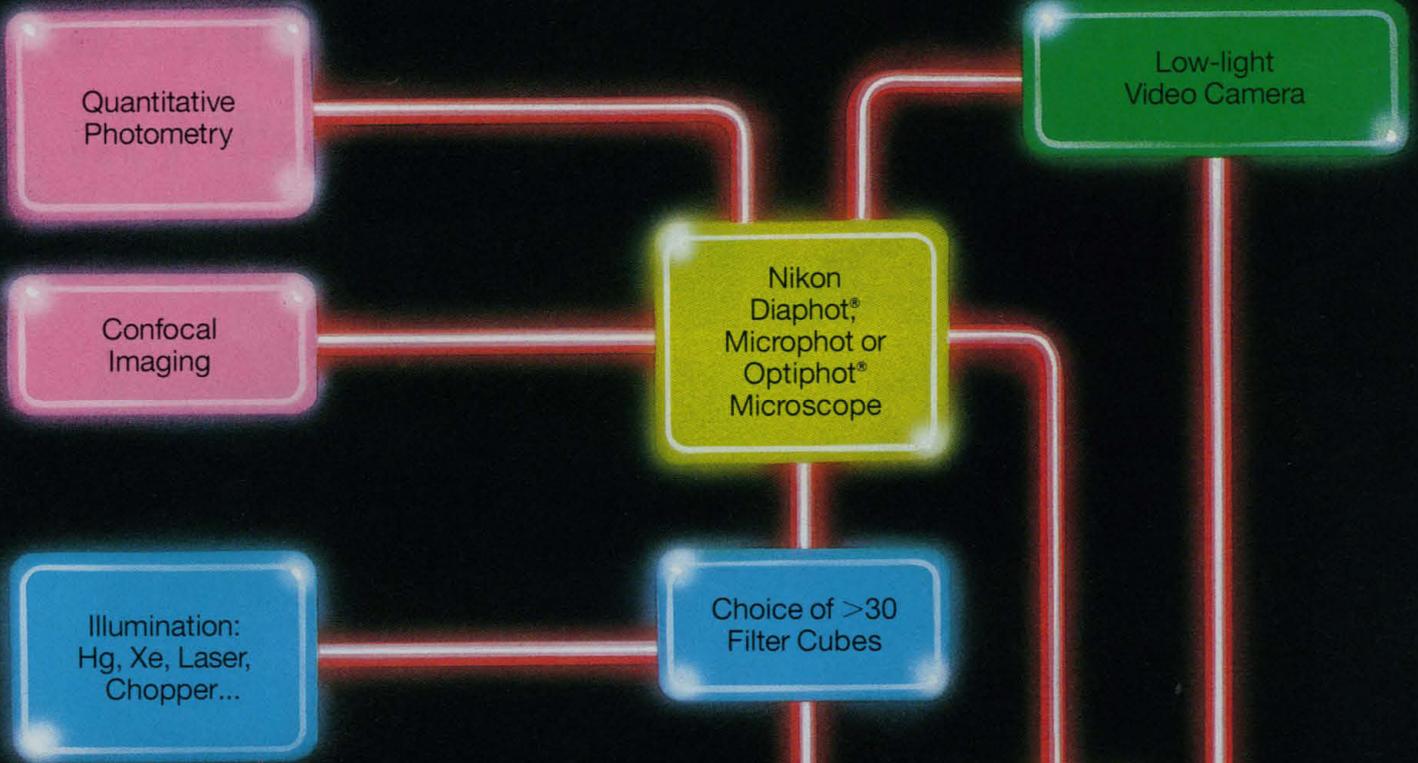
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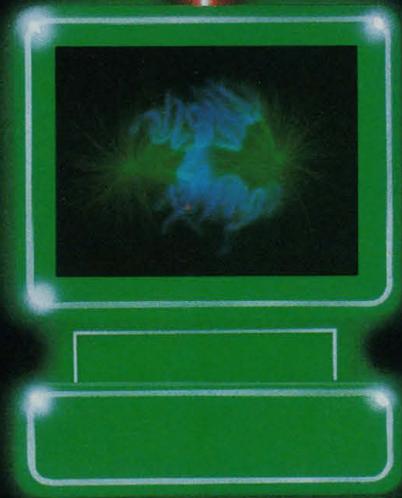


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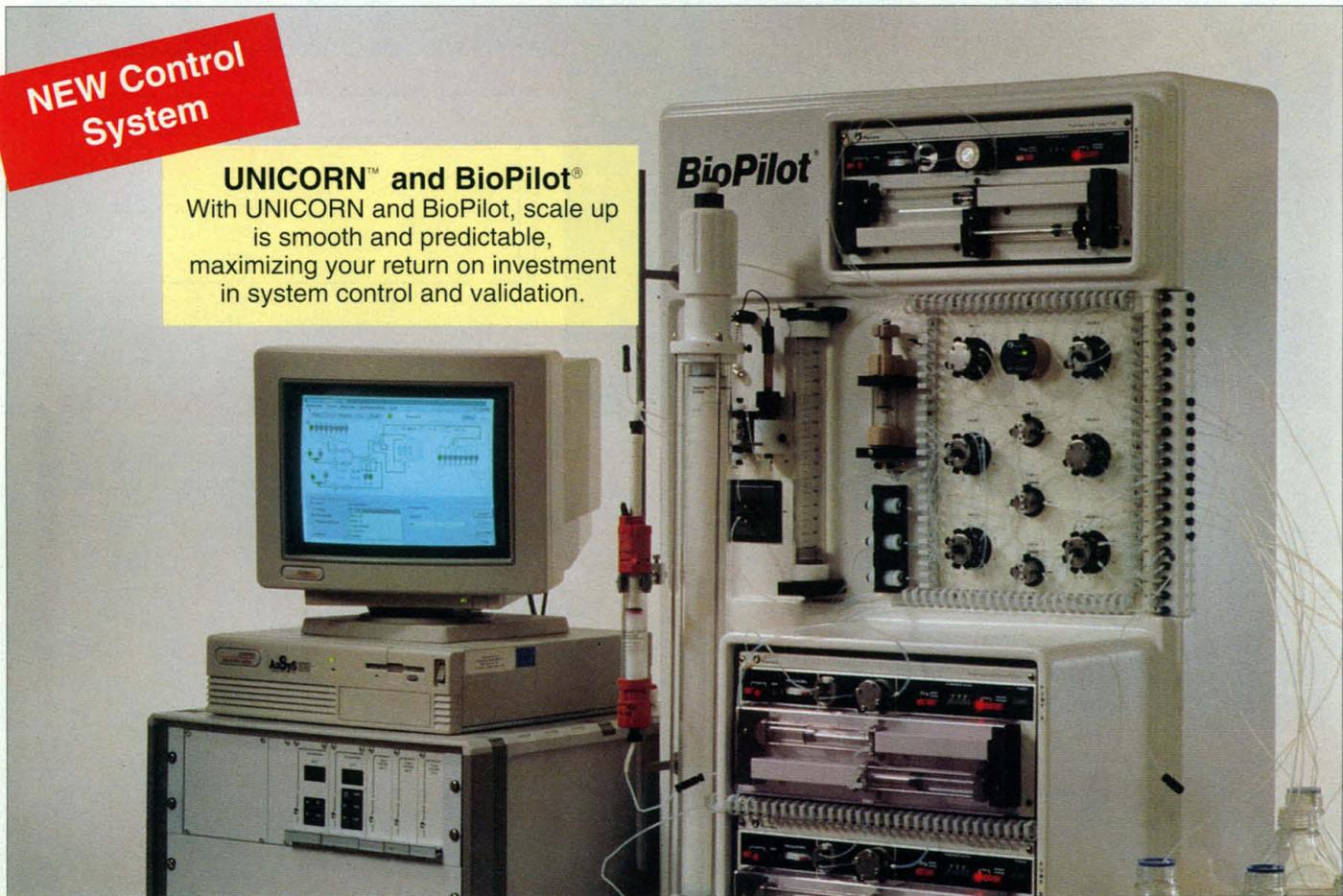
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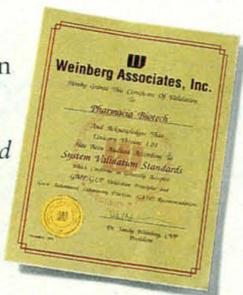


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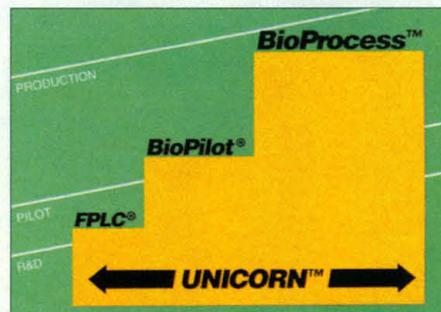
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*UNICORN control system is scaleable. It supervises BioPilot and BioProcess systems keeping documentation and user interface constant.*

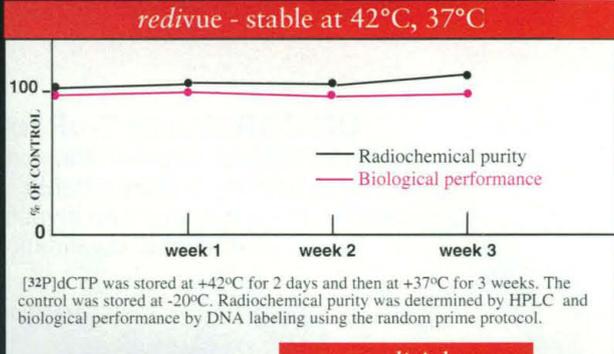
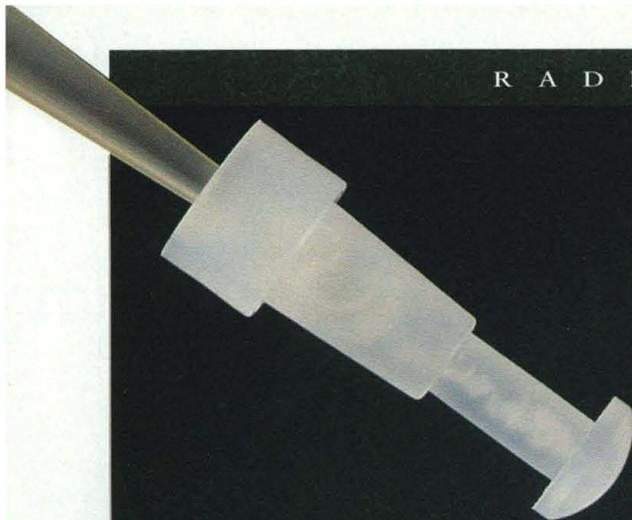
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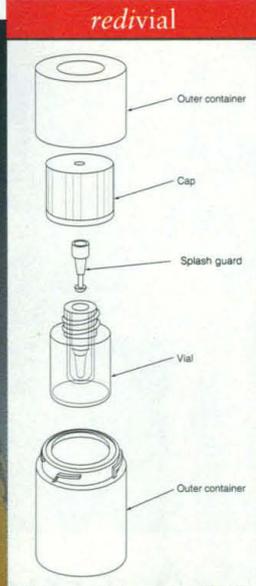
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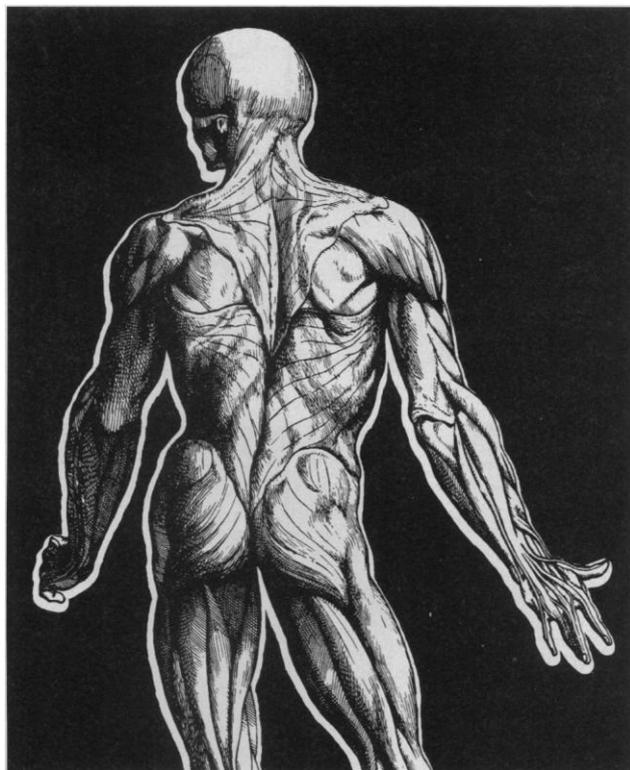
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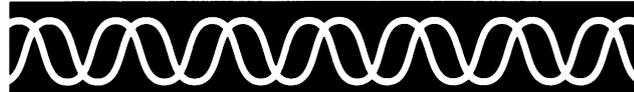
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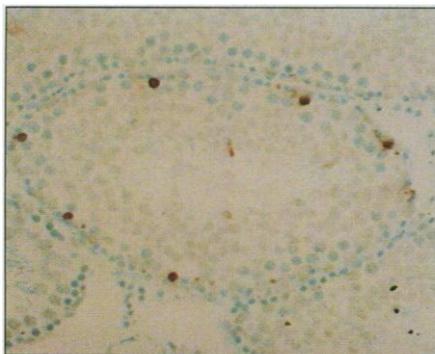
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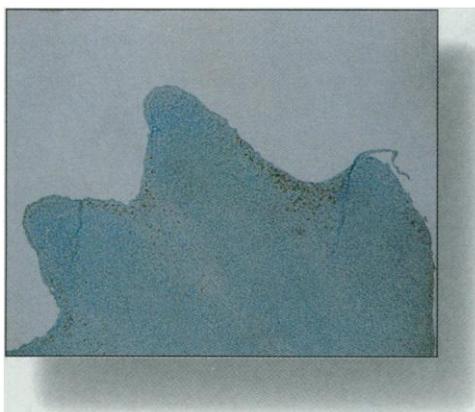
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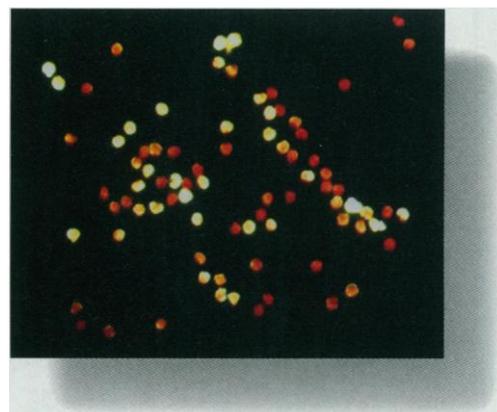
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<sup>1</sup> DJ Allan, BV Harmon & SA Roberts, (1992) *Cell Proliferation*; 25:241-250.

<sup>2</sup> JFR Kerr, J Searle, BV Harmon & CJ Bishop, in: Potten, CS (ed) (1987) *Perspectives in mammalian cell death*.

Oxford U. Press, pp. 93-128. Z Zakeri, D Quaglino, T Latham & R Lockshin, (1993) *FASEB Journal*; 7:470-478; and manuscripts submitted.

<sup>3</sup> X Li, W James, F Traganos & Z Darzynkiewicz, (1993) manuscript submitted.



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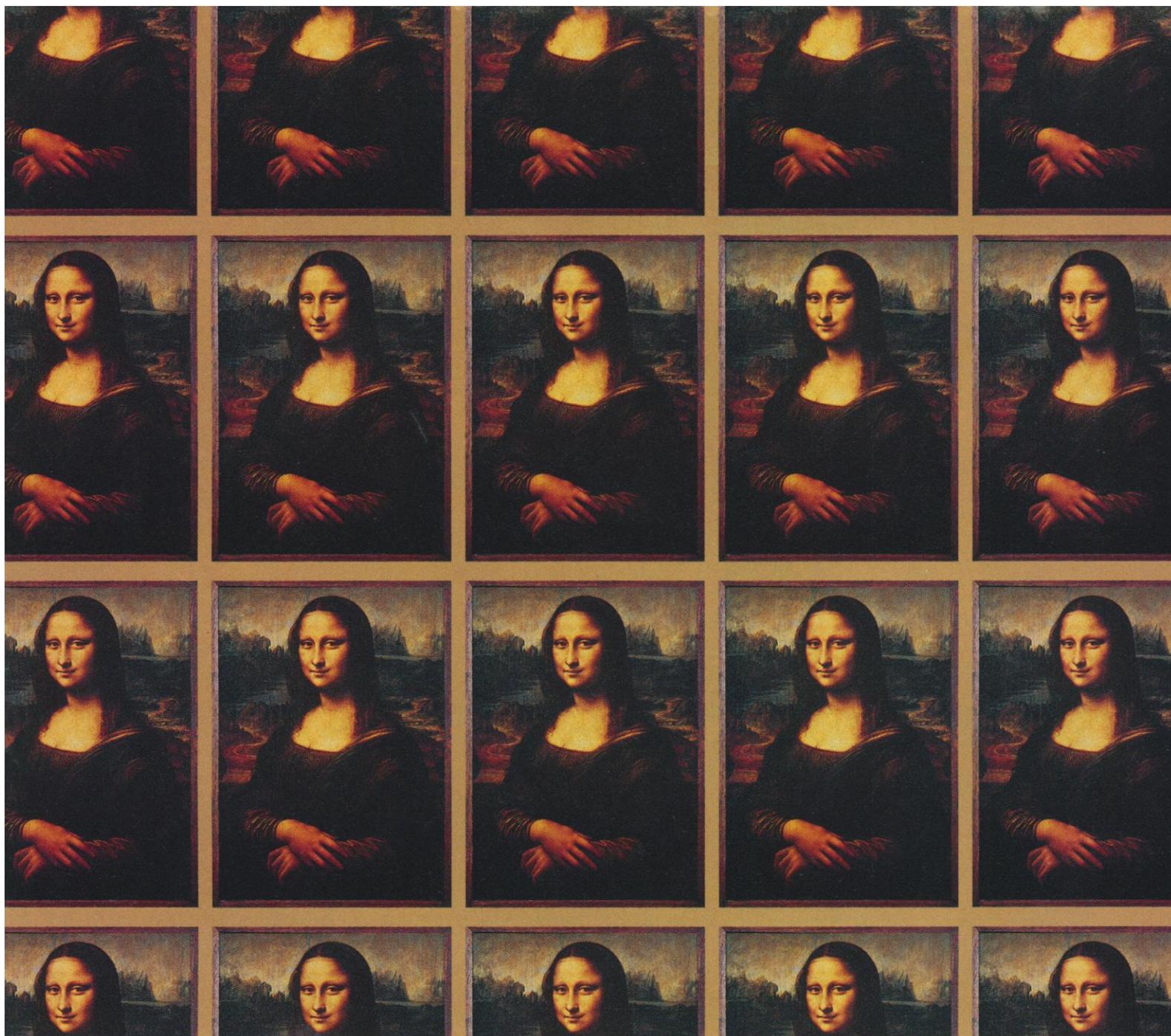
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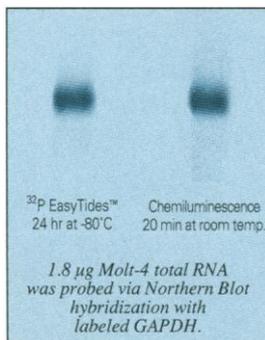
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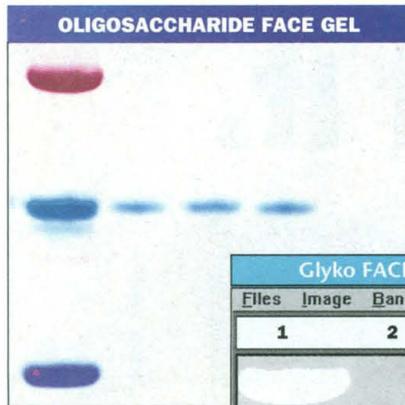
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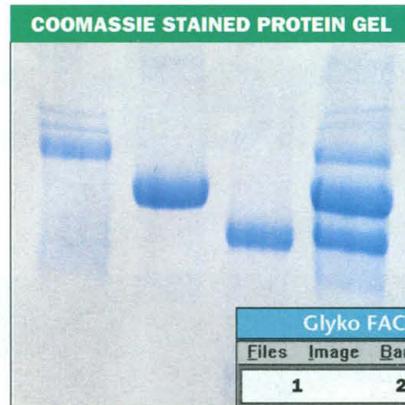


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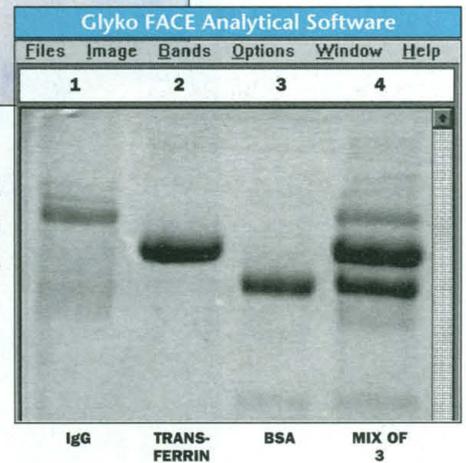


PHOTOGRAPH OF COOMASSIE STAINED PROTEIN GEL

IMAGE OF FACE GEL SHOWING FLUORESCENT OLIGOSACCHARIDES RELEASED FROM GLYCOPROTEINS



IMAGE OF COOMASSIE STAINED PROTEIN GEL

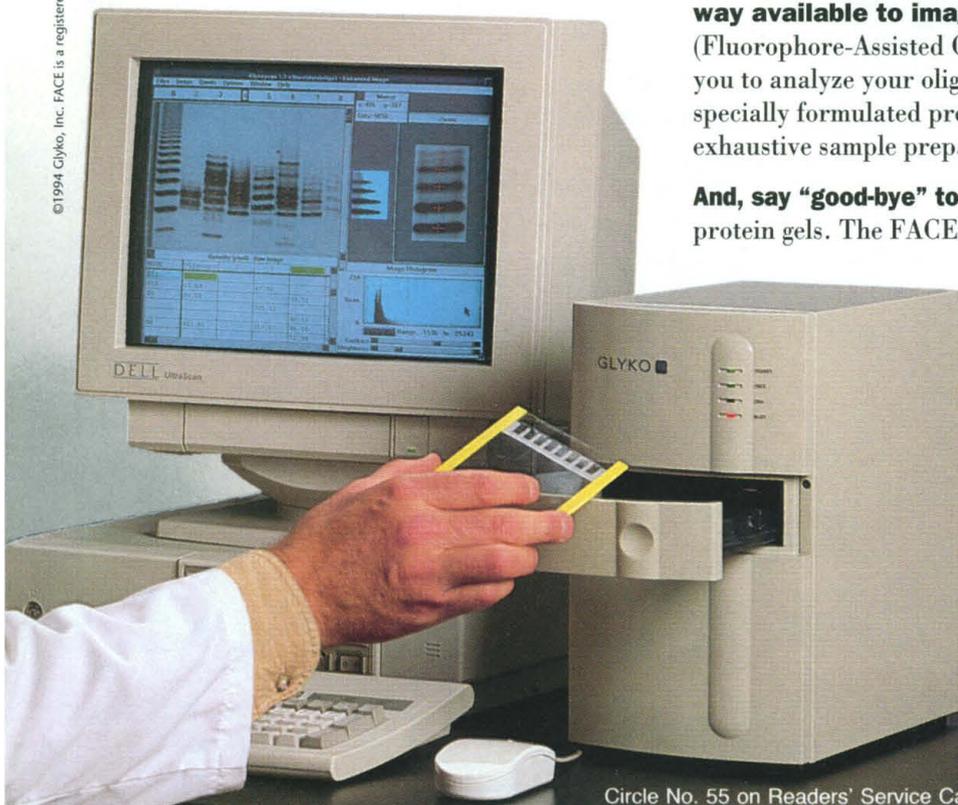


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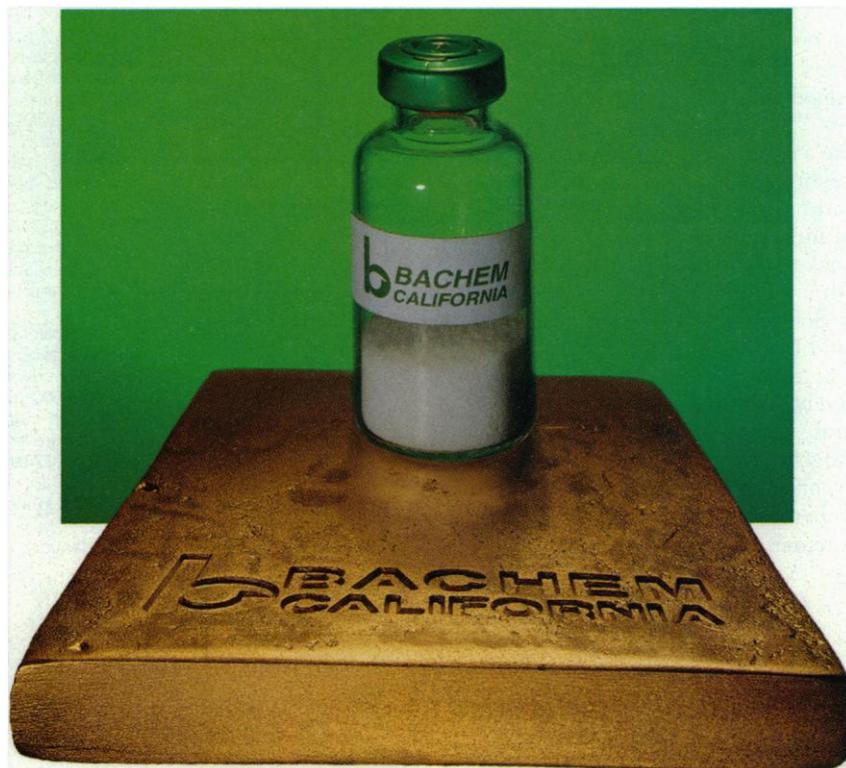
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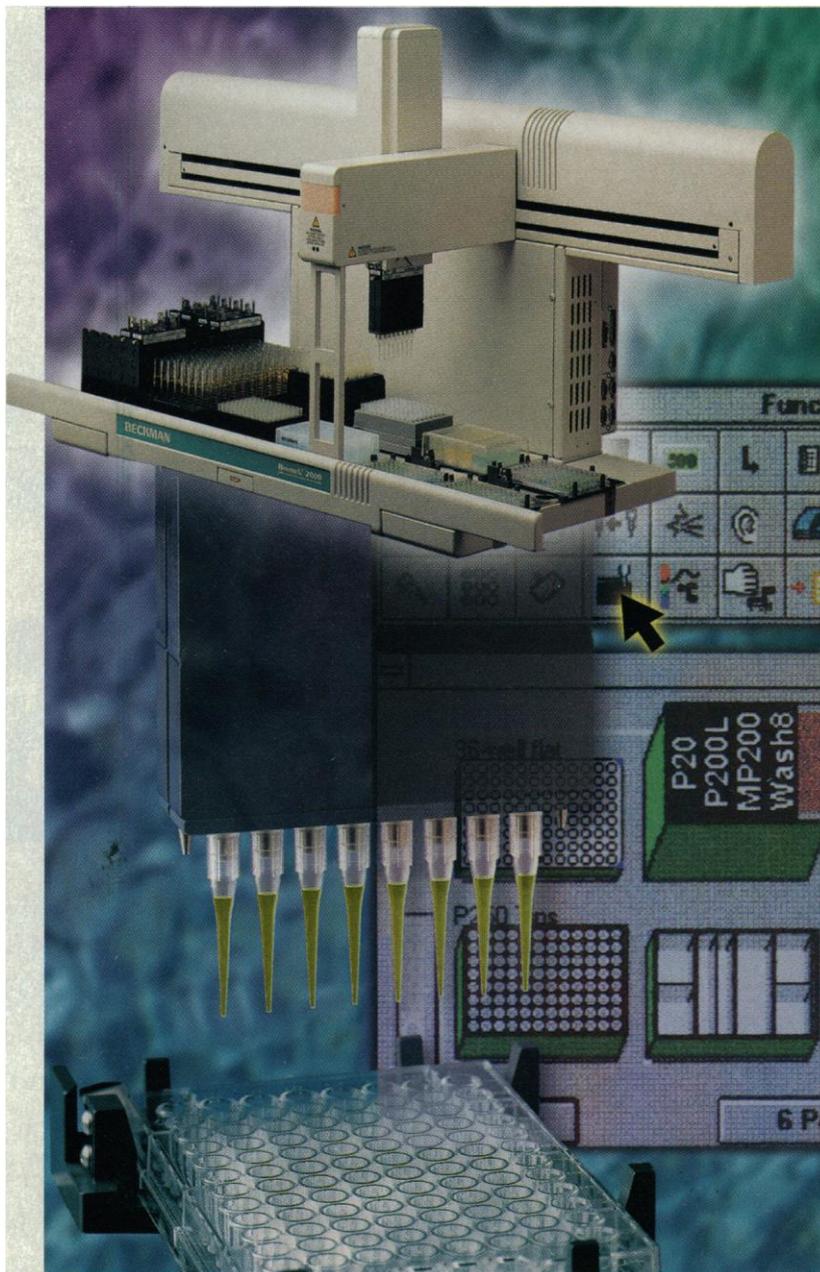
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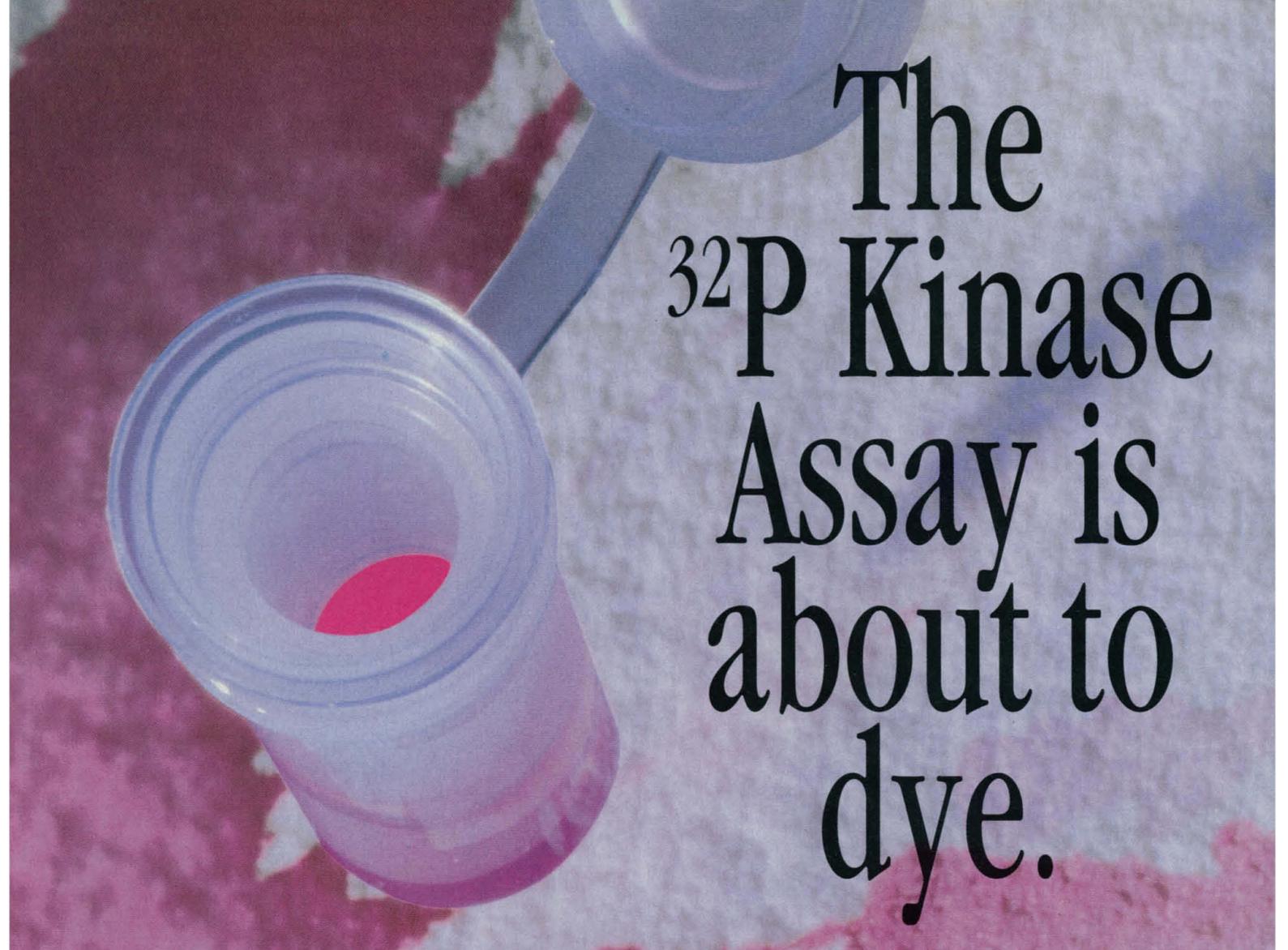
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# The $^{32}\text{P}$ Kinase Assay is about to dye.

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**Specific.** Unlike the  $^{32}\text{P}$  assay, the SpinZyme™ Non-Radioactive PKA Assay

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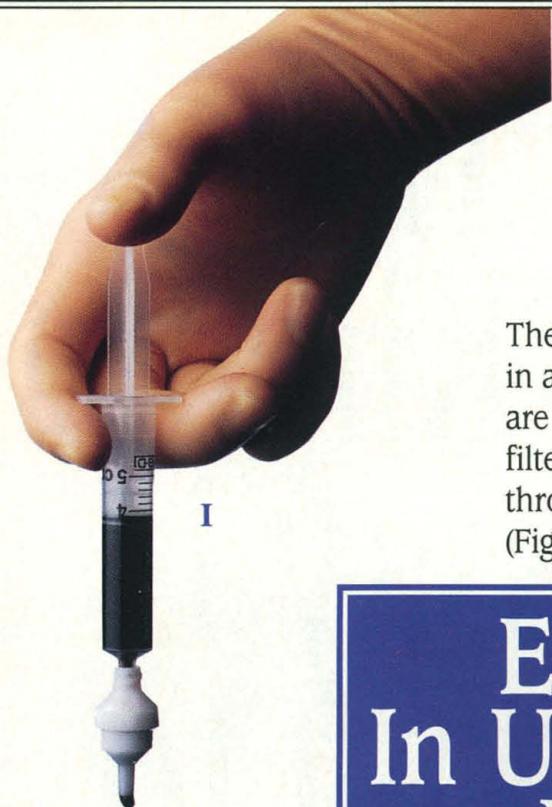
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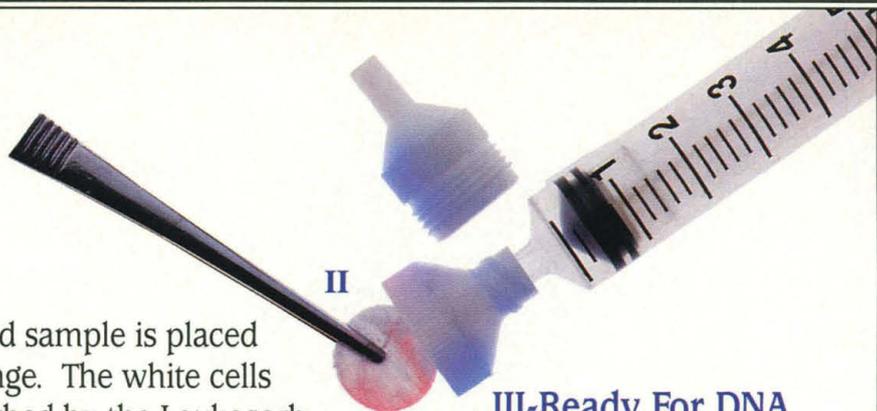


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I

The blood sample is placed in a syringe. The white cells are adsorbed by the Leukosorb filter as the blood passes through the fibrous matrix (Figure I).



II

### III-Ready For DNA Analysis.

The process is now completed. The resulting DNA

lysates can be used directly for hybridization or for PCR amplification (Figure III). Total time from start to finish is less than one hour. For a free sample pack, contact Pall at one of the locations listed below.

## Extract DNA In Under An Hour Without A Centrifuge.



### Leukosorb™. A New Filtration Medium.

Leukosorb is a new filtration medium from Pall which is designed to immobilize white cells from whole blood or packed red cells. The process eliminates all tedious centrifugation steps, and can be completed in less than one hour.

### I-Blood Volumes As Little As 50 $\mu$ l.

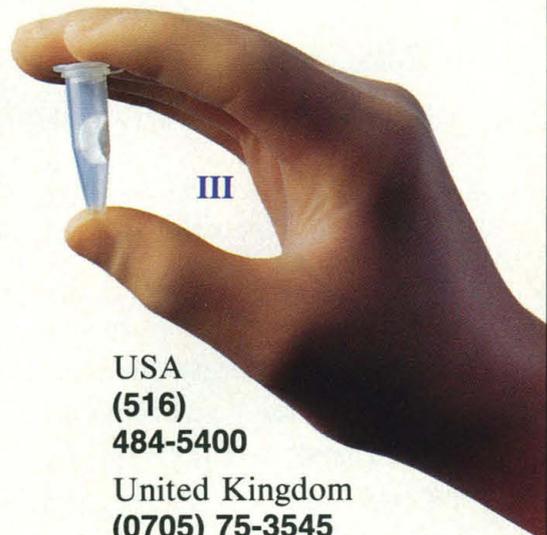
A wide range of blood volume can easily be processed from as little as 50 $\mu$ l to as much as 50ml.



After adsorption of the white cells, the filter medium is washed in a hypotonic saline solution. After the wash, no red cells remain on the Leukosorb medium.

### II-Extract DNA.

Now, the Leukosorb filter disks are placed in a microfuge tube with proteinase enzyme to free the DNA from the immobilized white blood cells.



III

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**Fast.** In less than 5 minutes, the SpinZyme™ Basic Separation Units will separate excess [ $\gamma$ - $^{32}\text{P}$ ]ATP from the phosphorylated peptide. These exclusive Pierce units feature a phosphocellulose membrane in a spin column format, which eliminates the tedious wash steps of the standard procedure.

**Low Background.** Researchers who have tested these separation units report significantly lower background levels compared with standard assay methods using phosphocellulose squares.

**Convenient Handling, Easy Disposal.** The sample buckets containing the phosphocellulose membrane and bound phosphorylated peptide

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Basic Separation Units and 100 Additional Receptacles. Suitable for use in kinase assay protocols using peptide substrates that will bind to phosphocellulose.

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TOOLS FOR EXPLORING CELLULAR INTERACTIONS AT THE MOLECULAR LEVEL

### CELL ADHESION RESEARCH: EXPERIMENTAL CONSIDERATIONS

Cell Adhesion Molecule	Gene Symbol	Gene Structure	Cellular Distribution	Structure	Function	Experimental Considerations	References
ICAM-1	CD54	3 exons, 2 introns	Endothelial cells, leukocytes	120 kDa glycoprotein	Leukocyte adhesion	Use anti-ICAM-1 antibodies to block adhesion	1-10
VCAM-1	CD58	3 exons, 2 introns	Endothelial cells, leukocytes	130 kDa glycoprotein	Leukocyte adhesion	Use anti-VCAM-1 antibodies to block adhesion	1-10
E-selectin	CD62E	3 exons, 2 introns	Endothelial cells	190 kDa glycoprotein	Leukocyte adhesion	Use anti-E-selectin antibodies to block adhesion	1-10
P-selectin	CD62P	3 exons, 2 introns	Platelet endothelial cells	140 kDa glycoprotein	Leukocyte adhesion	Use anti-P-selectin antibodies to block adhesion	1-10
L-selectin	CD62L	3 exons, 2 introns	Leukocytes	140 kDa glycoprotein	Leukocyte adhesion	Use anti-L-selectin antibodies to block adhesion	1-10
ICAM-2	CD50	3 exons, 2 introns	Endothelial cells, leukocytes	120 kDa glycoprotein	Leukocyte adhesion	Use anti-ICAM-2 antibodies to block adhesion	1-10
CD44	CD44	10 exons, 9 introns	Widespread	120 kDa glycoprotein	Cell adhesion, migration	Use anti-CD44 antibodies to block adhesion	1-10
CD49	CD49	3 exons, 2 introns	Widespread	140 kDa glycoprotein	Cell adhesion	Use anti-CD49 antibodies to block adhesion	1-10
CD51	CD51	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD51 antibodies to block adhesion	1-10
CD52	CD52	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD52 antibodies to block adhesion	1-10
CD53	CD53	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD53 antibodies to block adhesion	1-10
CD54	CD54	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD54 antibodies to block adhesion	1-10
CD55	CD55	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD55 antibodies to block adhesion	1-10
CD56	CD56	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD56 antibodies to block adhesion	1-10
CD57	CD57	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD57 antibodies to block adhesion	1-10
CD58	CD58	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD58 antibodies to block adhesion	1-10
CD59	CD59	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD59 antibodies to block adhesion	1-10
CD60	CD60	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD60 antibodies to block adhesion	1-10
CD61	CD61	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD61 antibodies to block adhesion	1-10
CD62	CD62	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD62 antibodies to block adhesion	1-10
CD63	CD63	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD63 antibodies to block adhesion	1-10
CD64	CD64	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD64 antibodies to block adhesion	1-10
CD65	CD65	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD65 antibodies to block adhesion	1-10
CD66	CD66	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD66 antibodies to block adhesion	1-10
CD67	CD67	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD67 antibodies to block adhesion	1-10
CD68	CD68	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD68 antibodies to block adhesion	1-10
CD69	CD69	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD69 antibodies to block adhesion	1-10
CD70	CD70	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD70 antibodies to block adhesion	1-10
CD71	CD71	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD71 antibodies to block adhesion	1-10
CD72	CD72	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD72 antibodies to block adhesion	1-10
CD73	CD73	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD73 antibodies to block adhesion	1-10
CD74	CD74	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD74 antibodies to block adhesion	1-10
CD75	CD75	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD75 antibodies to block adhesion	1-10
CD76	CD76	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD76 antibodies to block adhesion	1-10
CD77	CD77	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD77 antibodies to block adhesion	1-10
CD78	CD78	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD78 antibodies to block adhesion	1-10
CD79	CD79	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD79 antibodies to block adhesion	1-10
CD80	CD80	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD80 antibodies to block adhesion	1-10
CD81	CD81	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD81 antibodies to block adhesion	1-10
CD82	CD82	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD82 antibodies to block adhesion	1-10
CD83	CD83	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD83 antibodies to block adhesion	1-10
CD84	CD84	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD84 antibodies to block adhesion	1-10
CD85	CD85	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD85 antibodies to block adhesion	1-10
CD86	CD86	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD86 antibodies to block adhesion	1-10
CD87	CD87	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD87 antibodies to block adhesion	1-10
CD88	CD88	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD88 antibodies to block adhesion	1-10
CD89	CD89	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD89 antibodies to block adhesion	1-10
CD90	CD90	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD90 antibodies to block adhesion	1-10
CD91	CD91	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD91 antibodies to block adhesion	1-10
CD92	CD92	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD92 antibodies to block adhesion	1-10
CD93	CD93	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD93 antibodies to block adhesion	1-10
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CD95	CD95	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD95 antibodies to block adhesion	1-10
CD96	CD96	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD96 antibodies to block adhesion	1-10
CD97	CD97	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD97 antibodies to block adhesion	1-10
CD98	CD98	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD98 antibodies to block adhesion	1-10
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CD100	CD100	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD100 antibodies to block adhesion	1-10
CD101	CD101	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD101 antibodies to block adhesion	1-10
CD102	CD102	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD102 antibodies to block adhesion	1-10
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CD104	CD104	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD104 antibodies to block adhesion	1-10
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CD106	CD106	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD106 antibodies to block adhesion	1-10
CD107	CD107	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD107 antibodies to block adhesion	1-10
CD108	CD108	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD108 antibodies to block adhesion	1-10
CD109	CD109	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD109 antibodies to block adhesion	1-10
CD110	CD110	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD110 antibodies to block adhesion	1-10
CD111	CD111	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD111 antibodies to block adhesion	1-10
CD112	CD112	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD112 antibodies to block adhesion	1-10
CD113	CD113	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD113 antibodies to block adhesion	1-10
CD114	CD114	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD114 antibodies to block adhesion	1-10
CD115	CD115	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD115 antibodies to block adhesion	1-10
CD116	CD116	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD116 antibodies to block adhesion	1-10
CD117	CD117	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD117 antibodies to block adhesion	1-10
CD118	CD118	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD118 antibodies to block adhesion	1-10
CD119	CD119	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD119 antibodies to block adhesion	1-10
CD120	CD120	3 exons, 2 introns	Widespread	120 kDa glycoprotein	Cell adhesion	Use anti-CD120 antibodies to block adhesion	1-10

**Commonly Used Techniques**

**ELISA**  
Enzyme-linked immunosorbent assay (ELISA) is a common technique for measuring the concentration of a specific protein or antibody in a sample. It involves the use of a solid support (usually a microtiter plate) to which the antigen or antibody is immobilized. The sample is then added, and the binding is detected by a colorimetric reaction.

**Flow Cytometry**  
Flow cytometry is a technique for measuring the physical and chemical characteristics of individual cells in a fluid stream. It involves the use of a laser to excite fluorescently labeled cells, and the detection of the emitted light by photomultiplier tubes. The data is then analyzed using a computer.

**Immunoprecipitation**  
Immunoprecipitation (IP) is a technique for isolating a specific protein or complex of proteins from a mixture. It involves the use of an antibody that binds to the target protein, and the precipitation of the complex using a protein A or G coupled to a solid support.

**Western Blotting**  
Western blotting is a technique for detecting a specific protein in a mixture. It involves the use of an antibody that binds to the target protein, and the detection of the bound antibody using a colorimetric reaction.

**Cell Adhesion Assays**  
Cell adhesion assays are used to measure the strength of cell-cell or cell-matrix interactions. They involve the use of a solid support to which one cell type is attached, and the measurement of the number of cells that adhere to it.

**Immunofluorescence**  
Immunofluorescence is a technique for visualizing the localization of a specific protein or antibody in a cell or tissue. It involves the use of a fluorescently labeled antibody that binds to the target protein, and the detection of the fluorescence using a microscope.

**Other Techniques**  
Other techniques used in cell adhesion research include electron microscopy, X-ray crystallography, and surface plasmon resonance (SPR).

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Cloned in either pUC18/118, pUC19/119, or their Derivatives.

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### TaKaRa PCR *in vitro* Mutagenesis Kit

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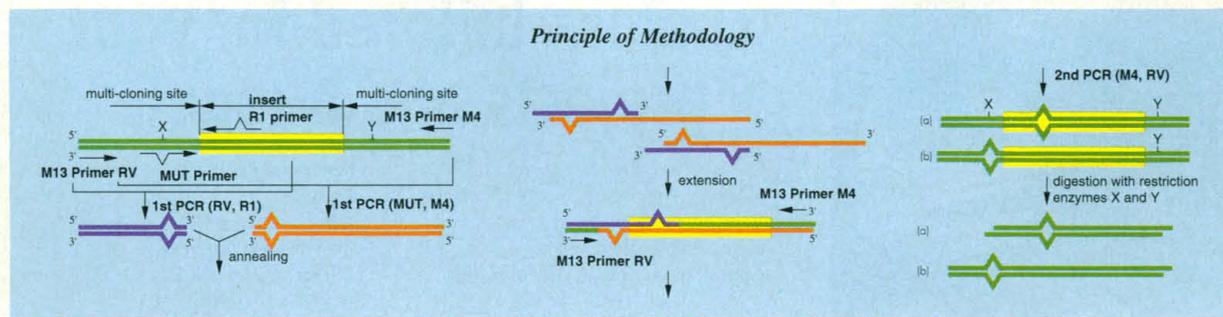
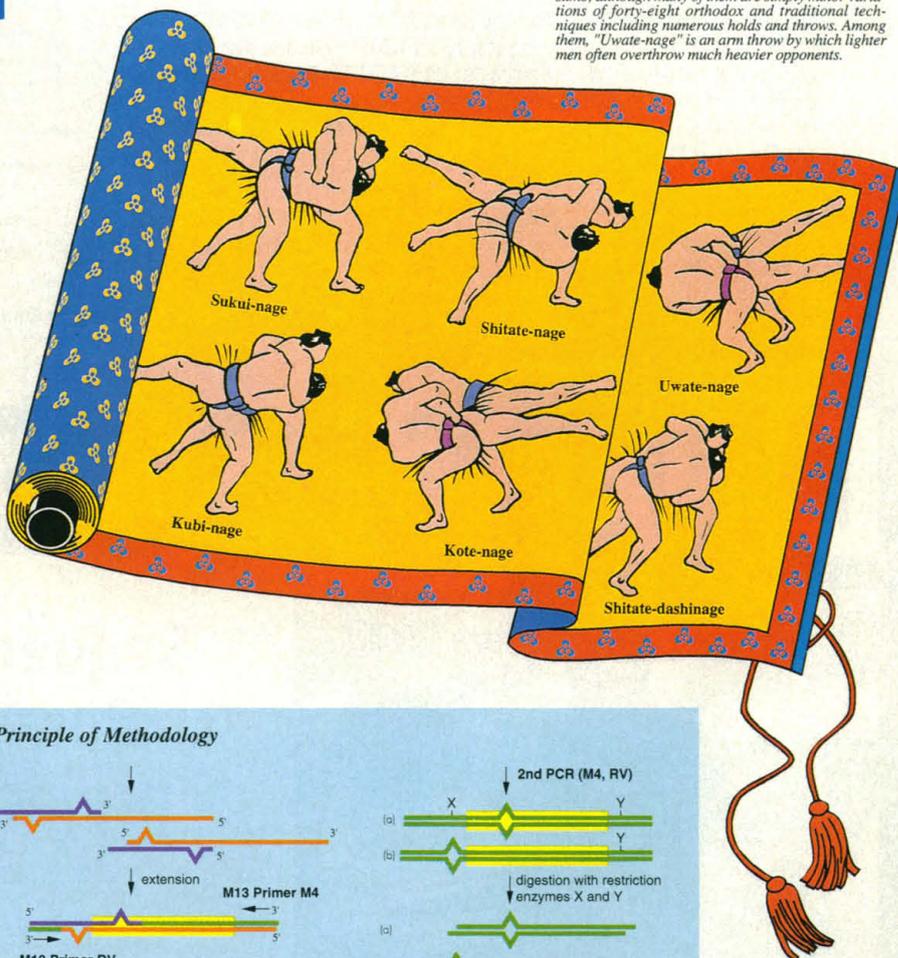
**An Assortment of Six Primers for Mutagenesis:** Provides a wide selection of pre-made mutagenesis primers for introducing sequence alterations into DNA cloned at any position in a vector, as well as an operational convenience that reduces user preparation of mutant induction primers from two to one for each mutagenesis.

**Generalized Mutagenesis via PCR:** Facilitates the introduction of mutations to such an extent that multiple mutations can be easily and rapidly achieved, which may enhance systematic studies on the structure-function relationship of enzymes, proteins and so on.

**Automatic Mutant Selection:** Eliminates *in vivo* selection for a mutant strand through transformation. In this procedure only the mutant strand is cut for recloning, and clearly distinguished from the non-mutant strand. Mutagenic primers are designed to eliminate a restriction enzyme site by causing a single-base change in one of the following sites; *EcoR* I, *SacI*, *BamH* I, *Xba* I, *Sal* I, *Acc* I, *Hinc* II, *Sph* I, or *Hind* III.

**A Control Set Included in the Kit:** Composed of Control Template, Control Primer, and Restriction Enzyme *EcoR* I, verifies and assures kit performance.

There are seventy-odd variant winning techniques in sumo, although many of them are simply minor variations of forty-eight orthodox and traditional techniques including numerous holds and throws. Among them, "Uwate-nage" is an arm throw by which lighter men often overthrow much heavier opponents.



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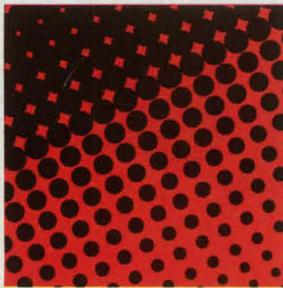
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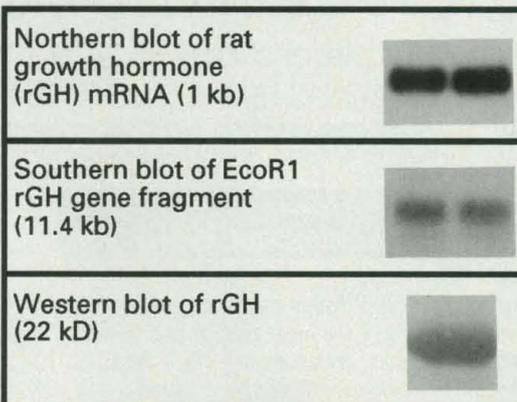
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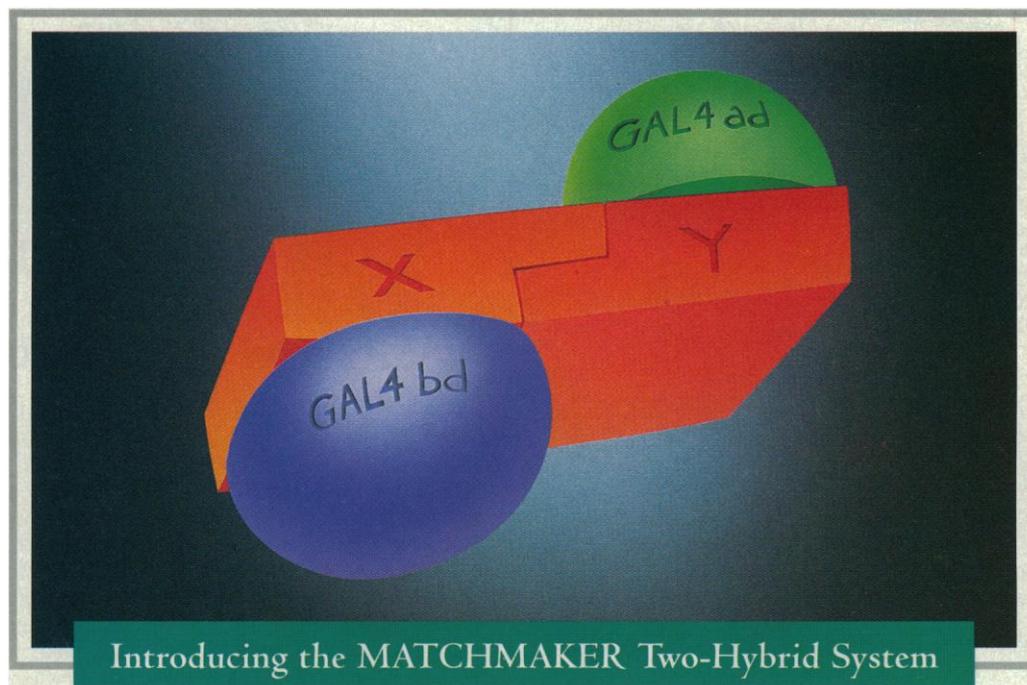


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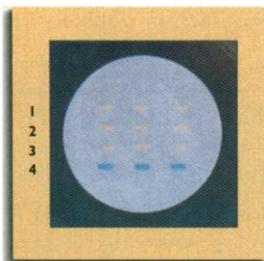
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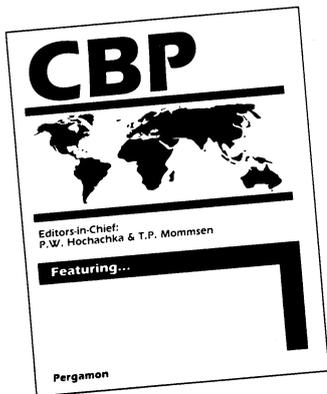
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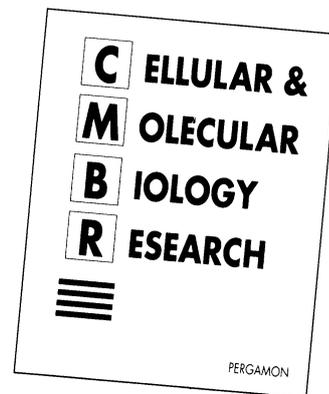
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