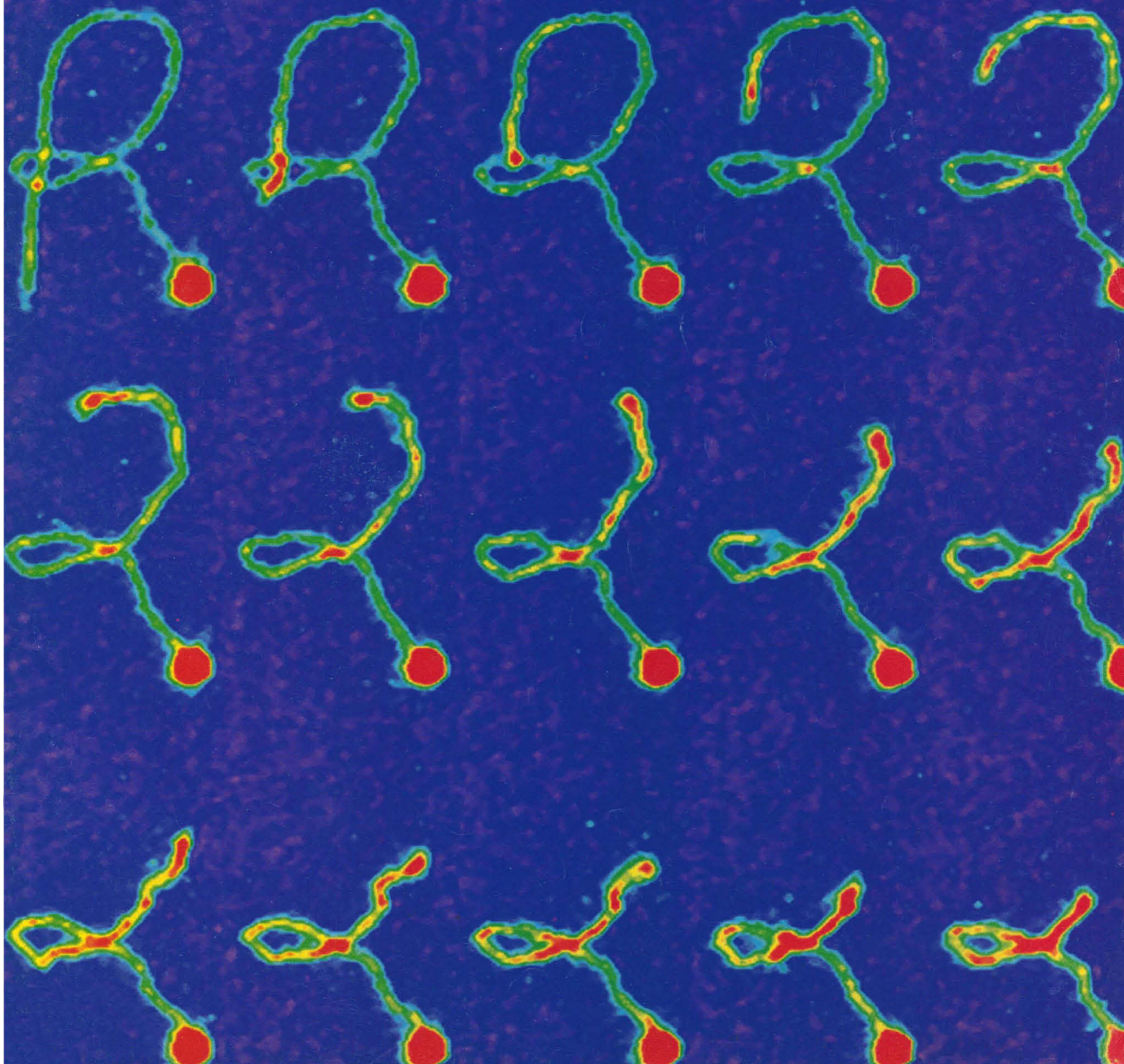


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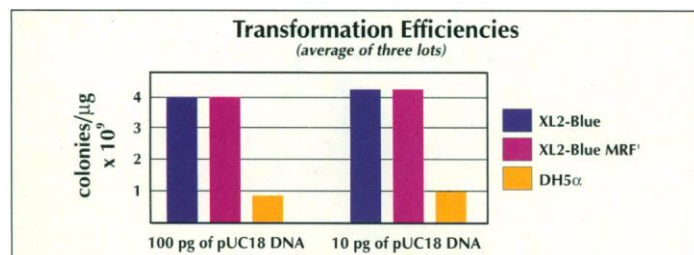
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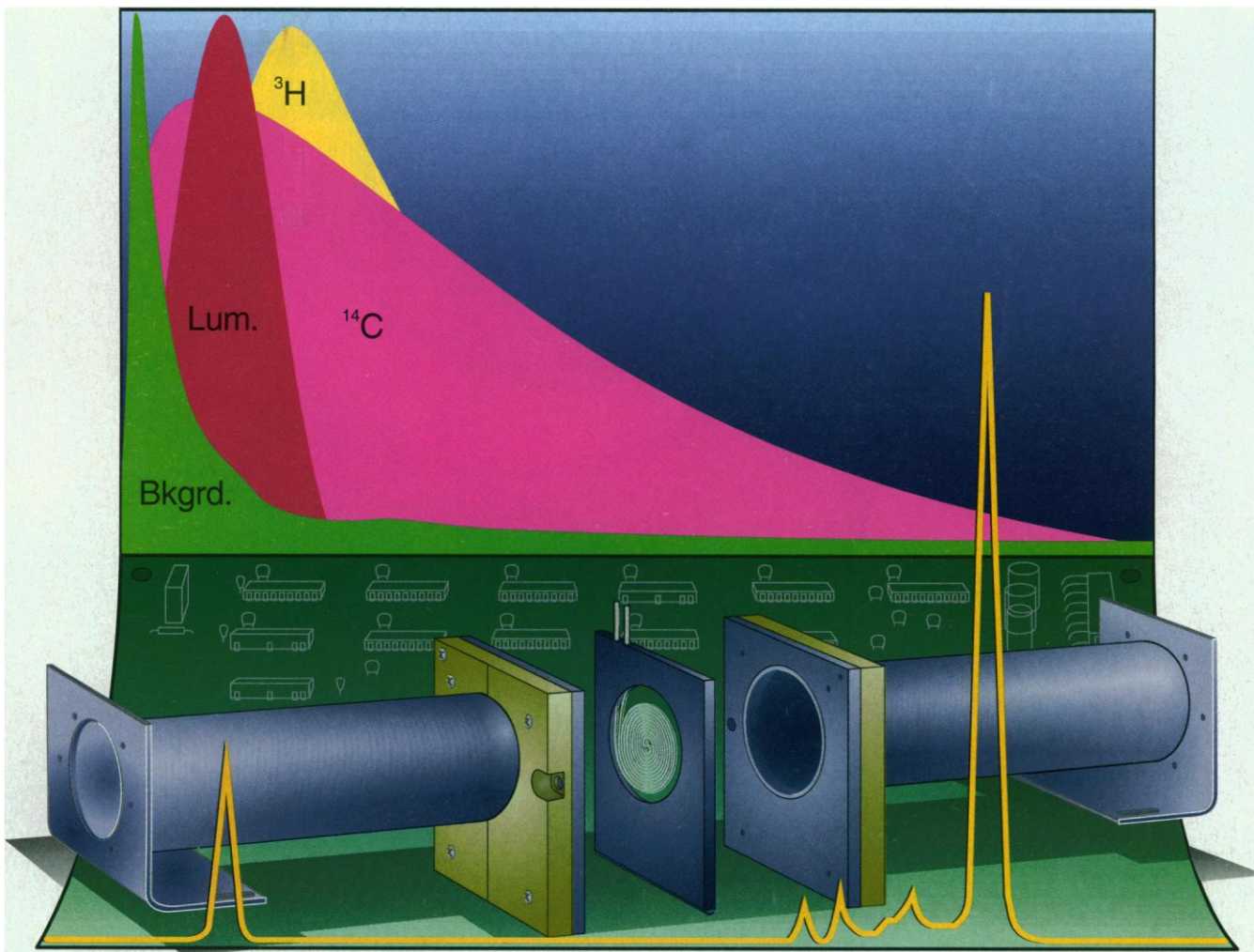


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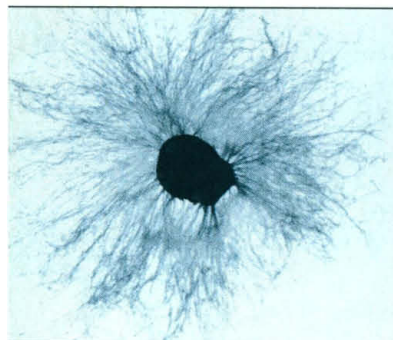
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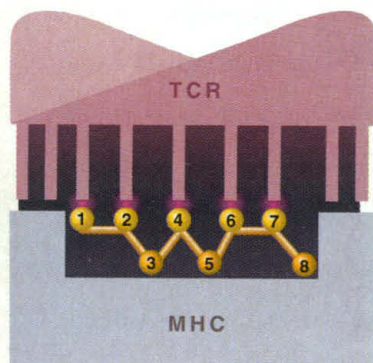
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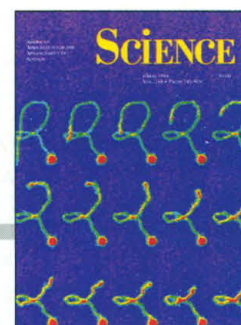
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Images of tube-like motion of a single DNA molecule. A fluorescently stained DNA molecule (60 micrometers long) was attached to a 1-micrometer polystyrene sphere (red) and moved through a background of concentrated, unstained λ -DNA. The DNA was stretched

out in the shape of an "R" by the use of joystick-controlled optical tweezers. The resulting tube-like motion is directly visualized in this series of pseudo-colored images spaced every 8.3 seconds. See pages 819 and 822. [Digital image: Thomas T. Perkins]



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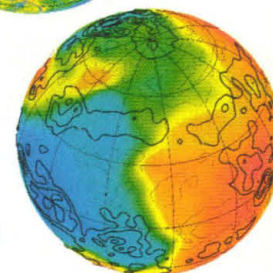
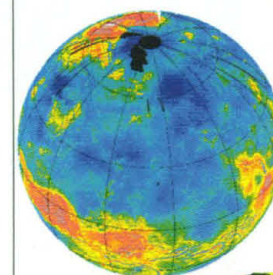
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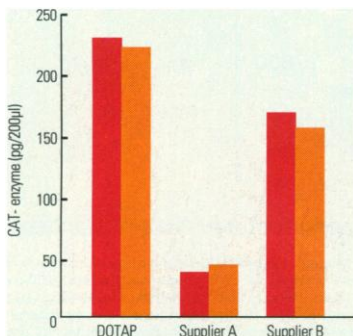
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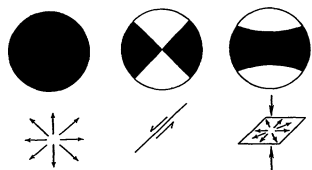
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Off the double

Earthquakes are generally thought to occur by sudden slip along a planar fault at depth in the Earth. Most seismic observations are consistent with this double-couple mechanism, but a growing number of observations imply that more complicated processes can occur.



In an article, Frohlich (p. 804) concludes that many of the observations of non-double-couple mechanisms are not artifacts and seem to be particularly common in shallow volcanic and geothermal areas and deep in subduction zones.

Dielectric dialectic

Electron transfer in the bacterial photosynthetic reaction center (RC) occurs through the cofactors of the functional L side and not through the M side, even though these sides are highly symmetrical and have a high degree of sequence homology. Steffen *et al.* (p. 810) measured absorption and Stark effect spectra for wild-type and β -mutant RCs. Their analysis of these data indicate that the effective dielectric constant of the L side is higher, which would tend to increase electronic coupling.

As the polymer turns

Polymer chains are usually studied in the aggregate: Viscosity and elasticity measurements made with dilute solutions are used to infer the properties of concentrated solutions through

Of sound and silence

In addition to pitch and dynamic range, auditory stimuli can be characterized by parameters such as location and duration. Cats can localize accurately the source of a sound, but neurons that are spatially tuned have not been easy to locate in the cat's auditory cortex. Middlebrooks *et al.* (p. 842) considered the pattern of neuronal firing and found that an artificial neural network could localize sounds more precisely than relying only on the number of spikes fired. The durations of sounds and of the intervening silence influenced their perception. Casseday *et al.* (p. 847) provide evidence suggesting how bats, which vary the lengths of their echolocation signals, use inhibitory and excitatory inputs to create neurons that respond differentially to sounds of different length.

scaling relations. Investigations of scaling laws in which single DNA chains are manipulated with optical tweezers are the subject of two reports (see cover). Perkins *et al.* (p. 822) stretched a DNA strand by pulling it through an aqueous solution. When the motion stopped, the relaxation of the polymer was captured and analyzed with video fluorescence microscopy. These data exhibited a universal shape and were in agreement with theoretical scaling predictions. In another set of experiments, Perkins *et al.* (p. 819) pulled DNA through an entangled solution. The chain displayed snake-like motion in agreement with the reptation model for concentrated polymers.

Water repellent

Why some surfaces are hydrophilic (wetted by water) and others are hydrophobic may relate to the extent that water can form hydrogen bonds. Du *et al.* (p. 826) used sum-frequency generation to obtain infrared spectra of water interfaces with air, hexane, and surfactant-coated quartz. Surface water molecules at hydrophobic interfaces tend not to interact strongly with the surface they contact but instead form a hydrogen-

bonded network that leaves a quarter of the molecules with a dangling OH bond.

Time and tide

Variations of the Earth's rotation rate on daily and subdaily time scales are most plausibly explained as a reaction to tidal variations in the global angular momentum of the oceans. But, the difficulties both of measuring oceanic height and circulation and of calculating the angular momentum from those data have led to discrepancies between tidal models and the observed rotation rate. Ray *et al.* (p. 830) have improved the accounting of tidal heights and show that tides account for essentially all of the measured rotation rate variations.

Cell migrations

A new gene in the snail family of zinc finger proteins, *Slug*, has been isolated from the chick by Nieto *et al.* (p. 835). The *Slug* gene is expressed in the mesodermal cells emerging from the primitive streak and in the neural crest cells. Antisense oligonucleotides to *Slug* prevented cells in the mesoderm and in the neural crest from undergo-

ing a transition from epithelial to a mesenchymal character. Thus, *Slug* may function in the control of de-epithelialization.

Pore relations

Although voltage-dependent K^+ channels and inwardly rectifying K^+ channels (IRKs) appear to have different topologies, they share a segment called H_5 that joins putative transmembrane segments. The H_5 region is thought to line the pore of voltage-dependent K^+ channels, and sequence homology arguments suggested the same for IRKs. Tagliatela *et al.* (p. 844) exchanged the H_5 region between two IRK family members, IRK1 and ROMK1, which differ in their conductance and their sensitivity to blockade by Mg^{2+} ions, and found that little change occurred. However, exchanging both termini or just the carboxyl terminus transferred the K^+ conductance and Mg^{2+} blockade properties of IRK1 to ROMK1. These results may call into question current IRK folding models.

ApoE effects

The E4 isoform of apolipoprotein E4 (apoE4) was recently associated with increased risk for Alzheimer's disease. Nathan *et al.* (p. 850) have compared the effects of two isoforms, apoE4 and apoE3, on the growth of dorsal root ganglion neurons in culture. ApoE4, added to cells in the presence of β -migrating, very low density lipoproteins, decreased neurite extension and branching, while apoE3 increased both of these parameters. Interaction of specific isoforms of apoE with lipoprotein receptors result in opposite effects on neuronal growth.

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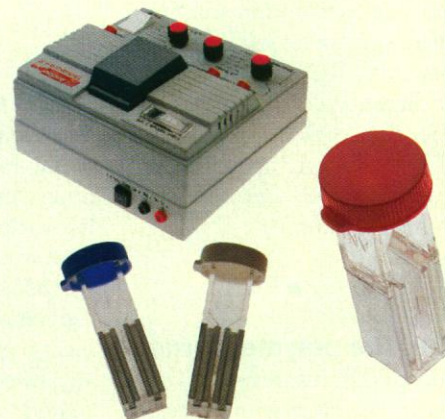
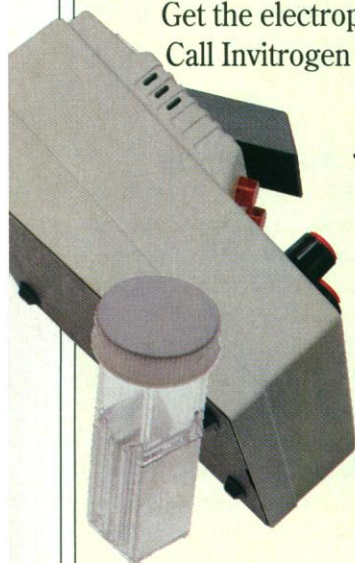
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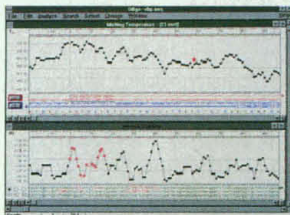
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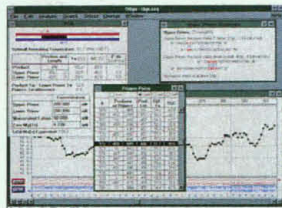


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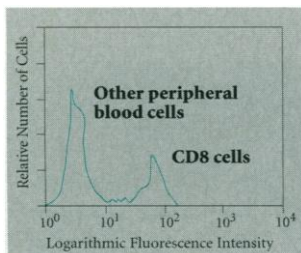
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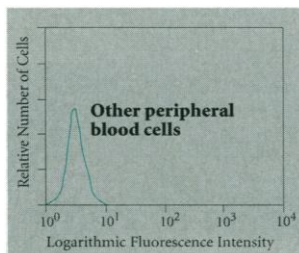
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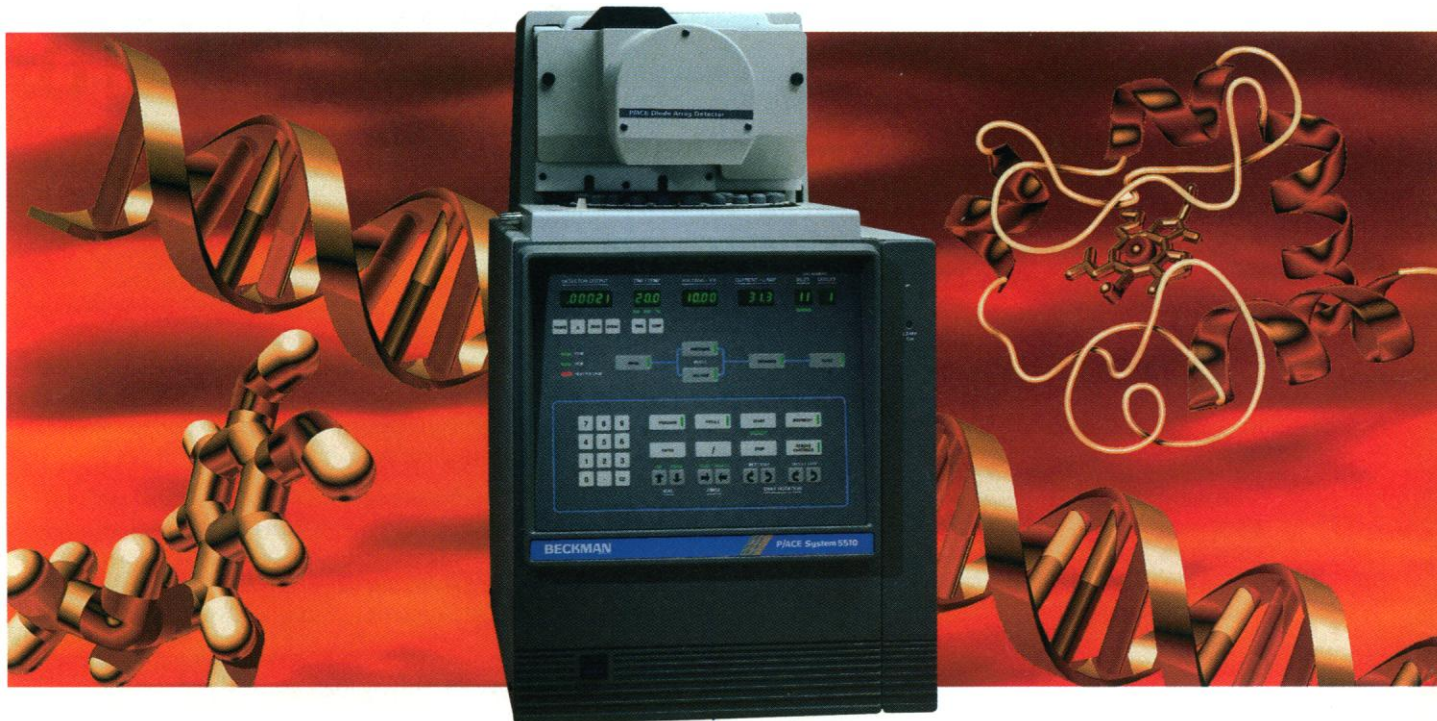
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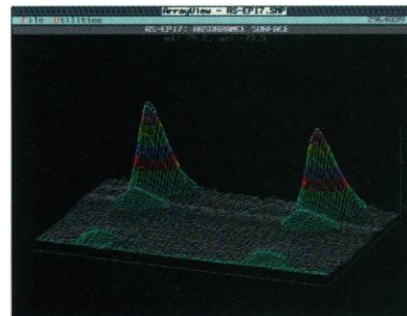
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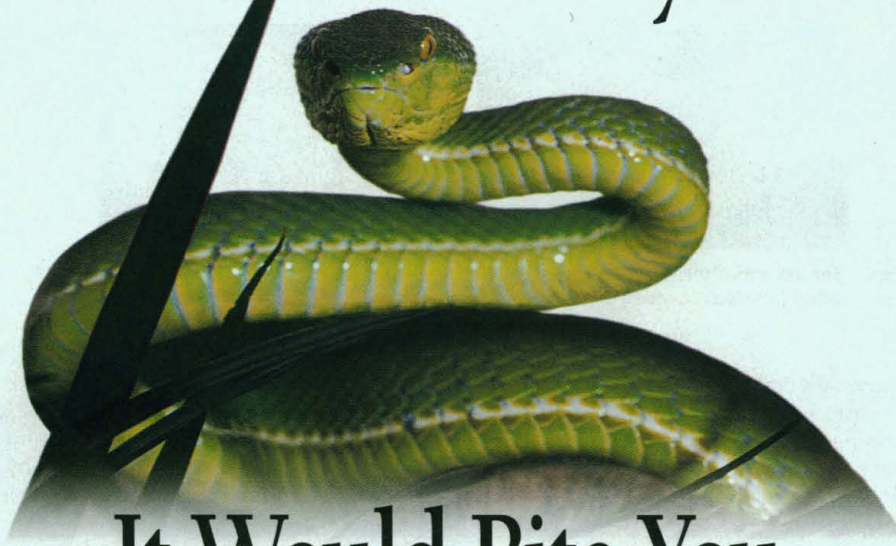
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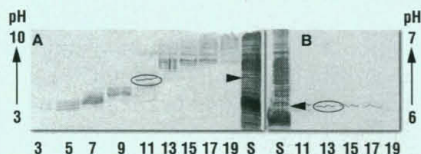
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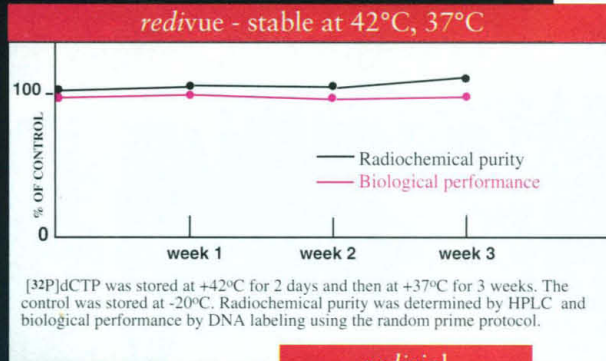
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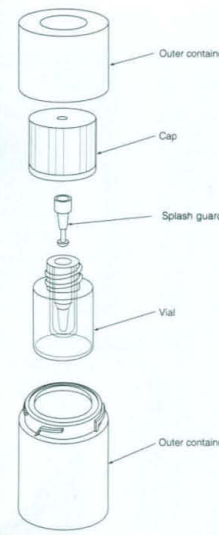
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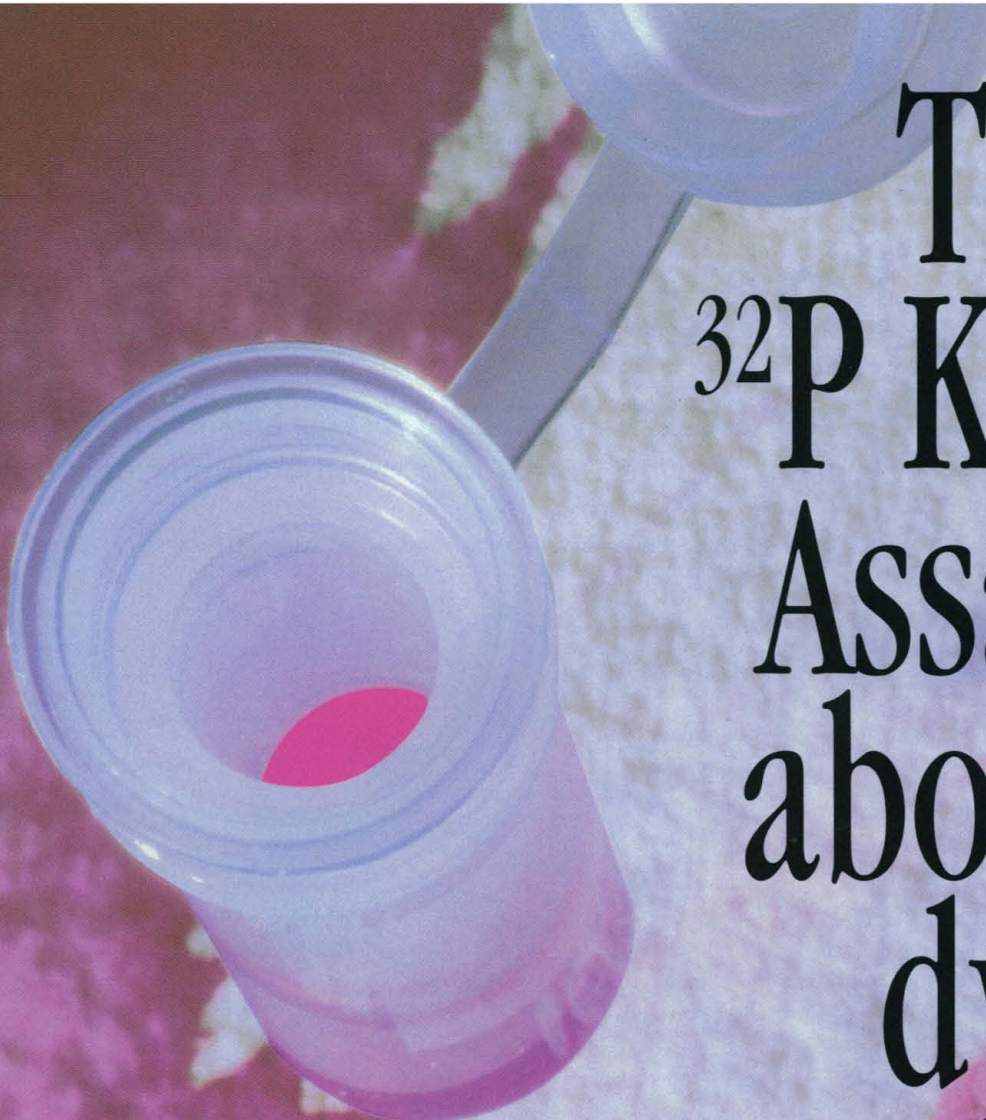
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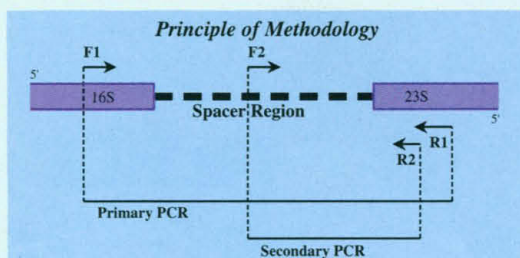
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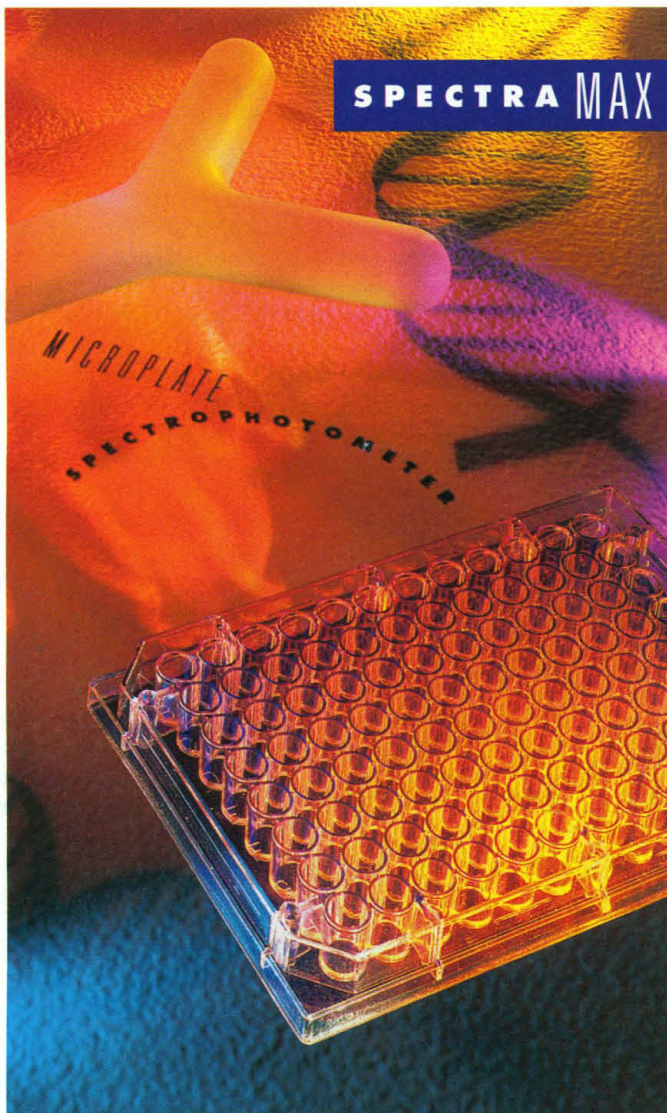
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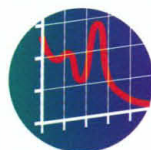
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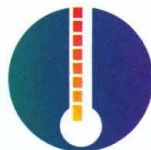
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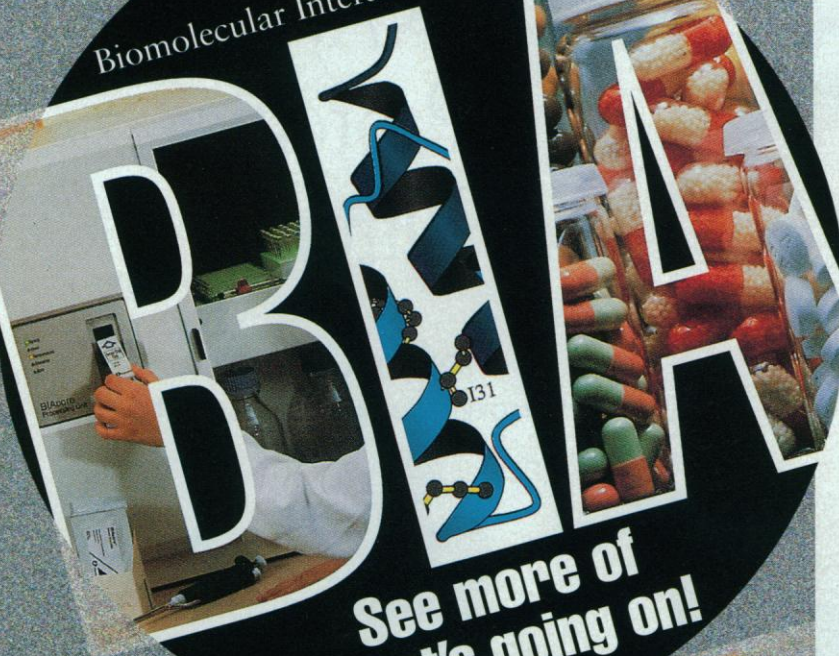
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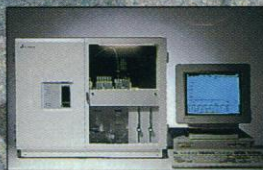
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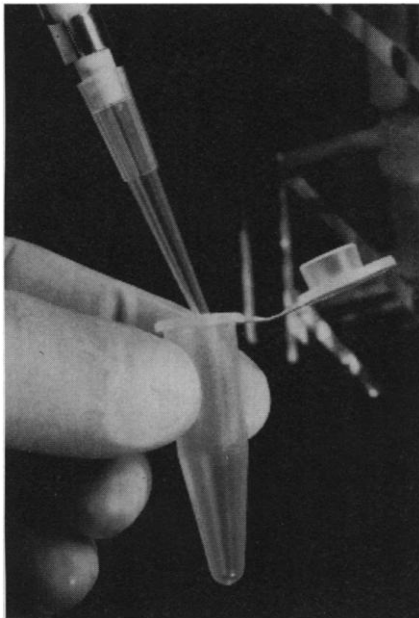
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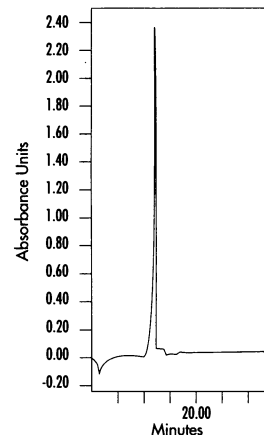
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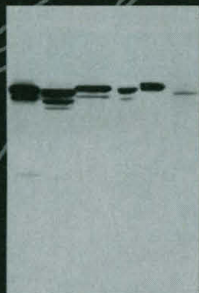
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