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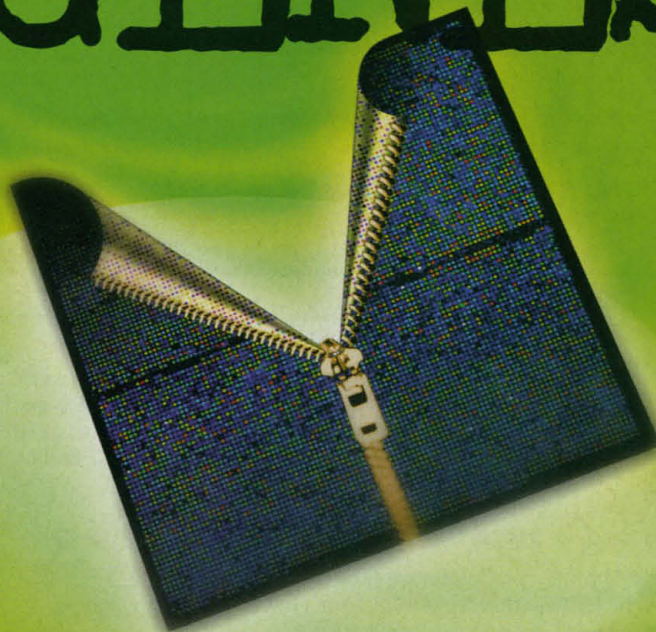
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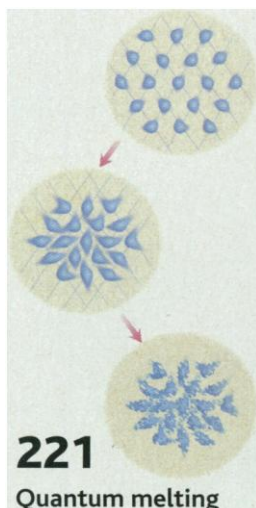
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COVER The 1999 AAAS Annual Meeting and Science Innovation Exposition, 21 through 26 January in Anaheim, California, promises a rich array of symposia and lectures covering the spectrum of science, engineering, education, and policy. Two special seminars will examine science education and research on microbial genomes. See pages 301 to 325 for details and advanced registration rates. [Image: Steven Hunt/ The Image Bank/PNI]



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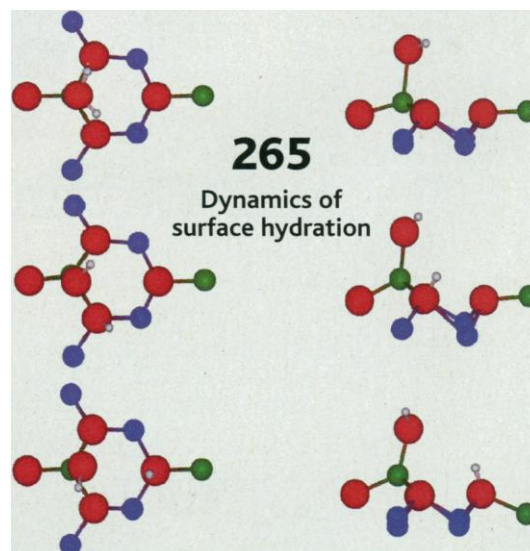
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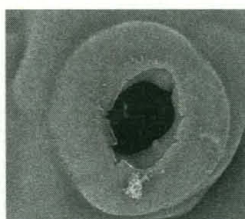
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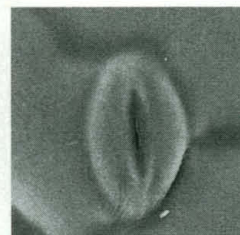
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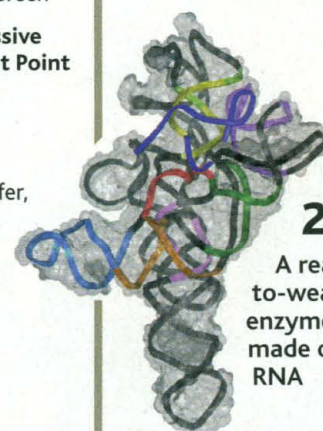
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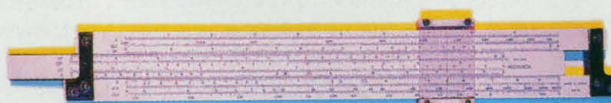
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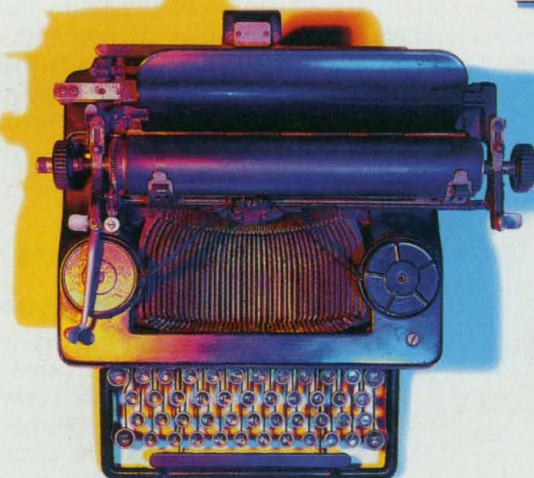
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A CLOSE LOOK AT HYDRATION

The hydration of aluminum oxide surfaces is of significance in areas ranging from catalysis to the weathering of rocks. Detailed understanding of these hydration processes is hampered by experimental difficulties in preparing reproducible, well-characterized surfaces and in interpreting the relative impact of hydration on their properties. Theoretical studies, however, have often used small systems as more realistic scenarios were not computationally tractable. Hass *et al.* (p. 265) use *ab initio* molecular dynamics calculations with relatively large unit cells to study the complex dynamics of water adsorbed on aluminum oxide. They show that the water readily dissociates and that at higher surface coverage, collective effects such as proton transfer reactions are observed.

TRACING A TRACER

Osmium in the ocean and ocean sediments has the potential to become an important tracer of continental weathering, but first its behavior in the ocean needs to be better understood. One problem is that it is present in trace amounts (parts per trillion in sea water) so it has been difficult to measure its concentration and isotopic ratios. By achieving very low blank levels, Levasseur *et al.* (p. 272) have now measured osmium concentrations and isotopic ratios directly in two depth profiles in the Indian Ocean. Osmium concentrations are constant with depth, in contrast to some prior work, and imply that the stable osmium species in the ocean may be an organic phase.

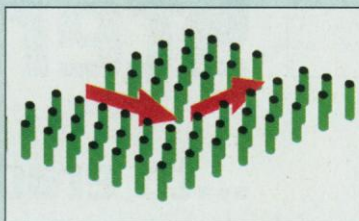
CLIMATE CHANGE FROM THE BOTTOM UP

Typically, a change in stable isotopes, abundance of trace elements, or the distribution pollen are used to infer past temperature changes in a climate record. Two reports use the planet itself to infer past temperatures. Dahl-Jensen *et al.* (p. 268) report results from measurement of actual temperatures in the thermally equilibrated GRIP and Dye 3 ice cores in Greenland several years after drilling ceased. They fit the temperature record by using Monte Carlo methods to simulate how the accumulation and flow of the ice sheet and thermal diffusion modified the temperature profile through time. Analysis of the GRIP record, which extends to about 50,000 years ago, suggests that temperatures at the Last Glacial Maximum in Greenland were about 23 Celsius

degrees cooler than the present average. Changes in the Holocene of several Celsius degrees, including two cool events during the Little Ice Age, are evident in both records. Globally distributed instrumental records show that land air temperatures have generally increased by about half a Celsius degree since the turn of the century. Pollack *et al.* (p. 279) analyzed borehole temperature estimates that covered a large geographic area in the Northern and Southern Hemispheres. The borehole data are consistent with air temperature records and show that the 20th century has been the warmest globally of the last five.

AROUND THE BEND

Photonic crystals, in which a periodic arrangement of materials with different dielectric constants creates wavelength ranges where no light will propagate, have been used to guide millimeter-wave emissions around a sharp corner. Lin *et al.* (p. 274; see the news story by



Watson) constructed two-dimensional photonic crystals from square arrays of thin rods made of high dielectric material. They achieved zero-loss transmission around a 90 degrees bend that was sharper than one wavelength of light, a result difficult to achieve with conventional dielectric waveguides.

THE OCEAN PLAYS OPOSSUM

The end-Cretaceous extinction, thought to be caused by the impact of a large asteroid into Earth, devastated productivity in the oceans; the normal transfer of photosynthetically produced carbon between shallow and deep layers ceased. Such a dead ocean, known as a "Strangelove" ocean, is recorded by the homogenization of carbon isotopes with depth in the ocean. D'Hondt *et al.* (p. 276) show that the carbon isotope record seems to imply that a Strangelove ocean persisted for 3 million years after the extinction, even though the fossil record shows that many phytoplankton in the oceans recovered

rapidly (within a few hundred thousand years). One way to explain the records is if mostly small plankton recovered much more rapidly than grazers from the extinction. Most of the carbon production was recycled at shallow levels and not processed through the food chain, which would have transferred it to deep levels.

PREORGANIZED RNA ENZYME

The existence of biologic RNA molecules that catalyze reactions, the almost exclusive purview of proteins in present-day biology, has lent credence to the idea that metabolic pathways in early life were regulated by RNA enzymes. Golden *et al.* (p. 259; see the Perspective by Westhof and Michel) present the three-dimensional structure of such an extant enzyme, the group I intron from *Tetrahymena*, which excises itself during the maturation of the parent RNA molecule. They describe the binding site used to hold the attacking nucleophile, a free guanosine nucleoside, and the substrate containing the phosphodiester bond that is broken in the first step of the reaction. This RNA enzyme bears a remarkable resemblance to present-day protein enzymes in exhibiting an organized active site, already structured to accommodate substrate and guanosine.

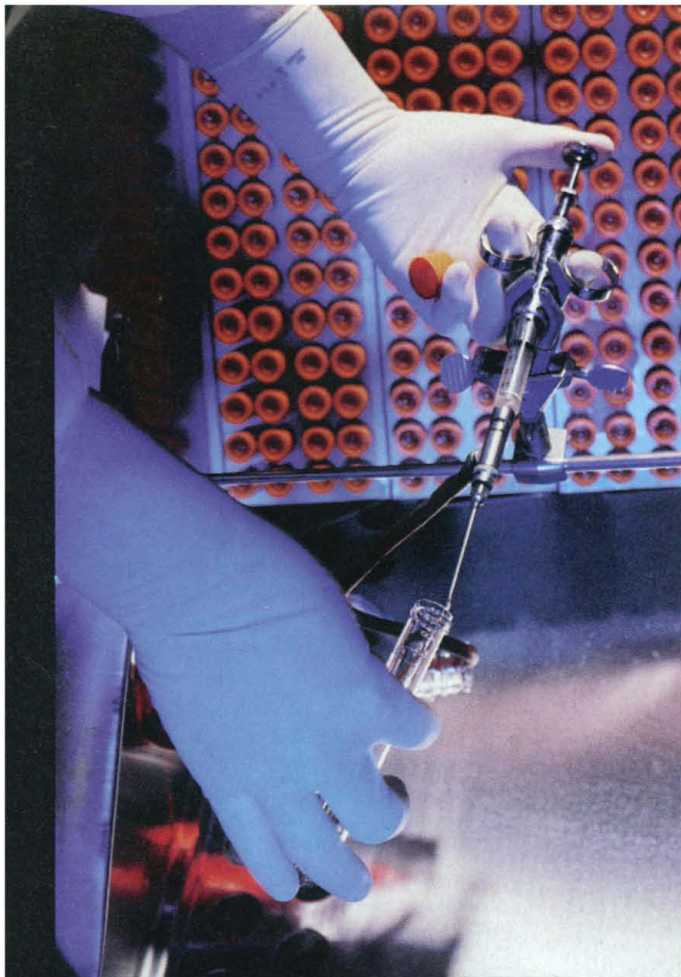
MINIMIZING METHANE

Northern wetlands are a major source of atmospheric methane, a greenhouse gas. Net production from the wetlands is known to be modulated by bacteria that are capable of methane oxidation, but these methanotrophs have proven difficult to track down. Dedysh *et al.* (p. 281) now report on the isolation of methane-oxidizing bacteria from the peat bogs of West Siberia. These isolates, which have a moderately acidic pH optimum, comprise a novel phylogenetic group of methanotrophs.

ON GUARD

In plant guard cells, as in many cells, cellular signaling molecules mediate responses to hormones and environmental influences. Pei *et al.* (p. 287; see the Perspective by Grill and Ziegler) show that farnesylation, or attachment of a lipid moiety to a target protein, is critical in regulating the response of ion channels in the guard cells to the hormone abscisic acid. Abscisic acid directs the guard cells to close stomata on the surface of the leaf, thus responding to drought conditions.

CONTINUED ON PAGE 199



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CANDIDATE TUMOR SUPPRESSOR GENE

A significant number of human cancers show allelic loss at chromosome 11q22-24, suggesting that this genomic region encompasses a tumor suppressor gene. Wang *et al.* (p. 284) found that one of the genes mapping to this region, *PPP2R1B*, contains sequence alterations—some of which are predicted to disrupt function—in a subset of lung and colon tumors. The *PPP2R1B* gene encodes a subunit of the serine-threonine protein phosphatase 2A, a key signaling protein that has already been linked to cell growth control.

HOLDING DEATH IN CHECK

The tumor suppressor p53 can induce cell death through its activity as a transcription factor or by transcription-independent mechanisms. Bennett *et al.* (p. 290) found that in vascular smooth muscle, fibroblast, and mesangial cell lines, p53 recruited a preformed pool of death receptors (Fas or tumor necrosis factor receptor type 1) to the surface, where they are activated. Inhibition of the Fas pathway prevented p53-induced cell death. This Golgi-localized pool may explain why many tumor cells that are resistant to p53-induced cell death are also resistant to Fas-induced cell death—the death receptor may be held prisoner in an intracellular store, no longer able to get to the surface to initiate death.

THE MAKING OF DRUG ADDICTION

It is not clear why some individuals seem to use drugs in a controlled way over long periods of time while others become addicts, that is, uncontrolled drug users. Ahmed and Koob (p. 298) show that rats allowed to take as much cocaine as they want for only 1 hour a day develop a long-lasting, low and stable drug intake

pattern. However, if they have access to the drug for 6 hours, they tend to take more and more of the substance over time. In addition, they have a tendency to take large quantities of the drug right from the start. The authors describe this apparent change in brain chemistry as a change in "hedonic set point."

SELECTIVE GENE EXPRESSION

Methods to control the expression of genes can be important after gene therapy, for example, or in transgenic systems. Werstuck and Green (p. 296) describe a new technique based on the application of engineered RNA molecules. Short RNA aptamers can bind to drugs and to DNA in such a way as to control expression from selected genes.

DOUBLE DUTY

Phosphoinositide 3-kinases function in the control of numerous cell processes including proliferation and protection of cells from apoptosis. Despite its name, phosphoinositide 3-kinase γ (PI3K γ) can catalyze phosphorylation of proteins as well as phosphoinositides, but the biological consequences of the two activities has been unclear. Bondeva *et al.* (p. 293) prepared chimeric molecules in which the catalytic core of PI3K γ was replaced with corresponding sequences from other PI3K family members. Some of the resulting molecules had exclusively protein kinase or phospholipid kinase activity. Analysis of the chimeras indicated that whereas lipid phosphorylation is required for one biological action of PI3K γ —the activation of protein kinase B—the protein kinase activity of PI3K γ appears to couple it to activation of the mitogen-activated protein (MAP) kinase Erk2. Thus, the two enzymatic activities of PI3K γ may allow it to distribute activation signals to distinct targets.

TECHNICAL COMMENT SUMMARIES

IGF-I and Prostate Cancer

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/282/5387/199a

In a prospective study (Reports, 23 Jan., p. 563), J. M. Chan *et al.* investigated the relation between concentrations of insulin-like growth factor-I (IGF-I) in the blood and prostate cancer risk in a sample of 152 patients with prostate cancer and 152 healthy men. "A strong positive association was observed."

C. Schaefer *et al.* also "conducted a prospective study of IGF-I and several aging-related disorders." Data from their sample of 45 patients indicated "that there was no association between rates of prostate cancer and serum concentrations of IGF-I."

In response, Chan *et al.* state that the discrepancy in findings "could be the result of several differences in methods between the two studies." They note that two other studies have found a link between IGF-I and prostate cancer, but agree that "the findings of Schaefer *et al.* underscore the need for further prospective studies."

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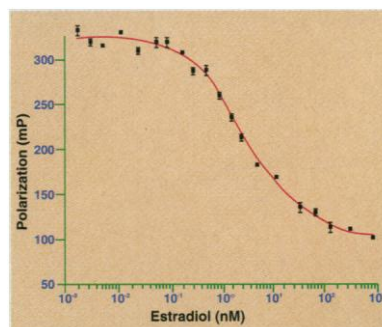
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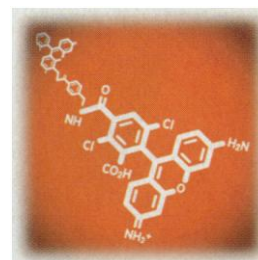
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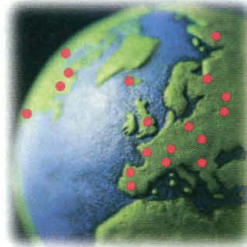


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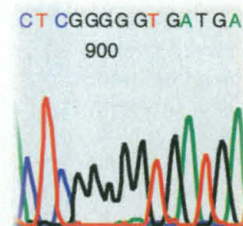


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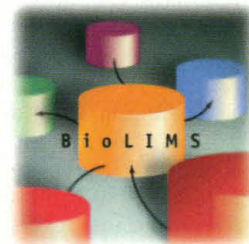
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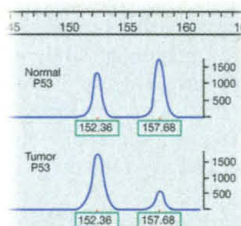
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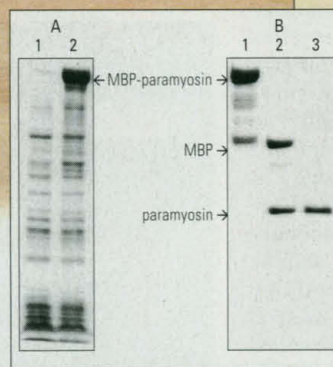
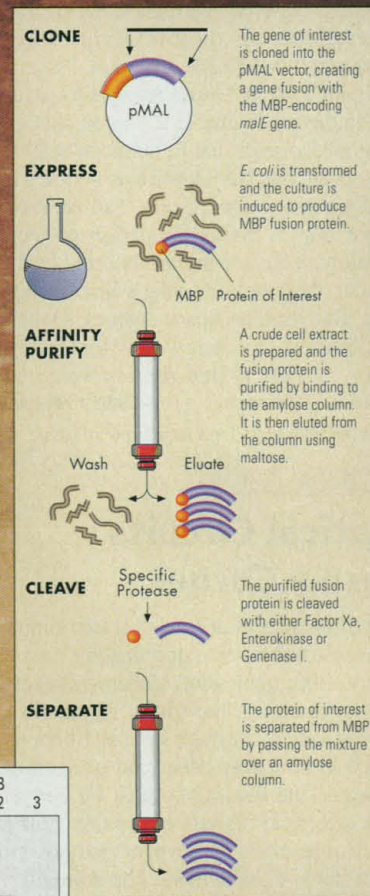
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Background picture: Insuline, computer generated molecular model

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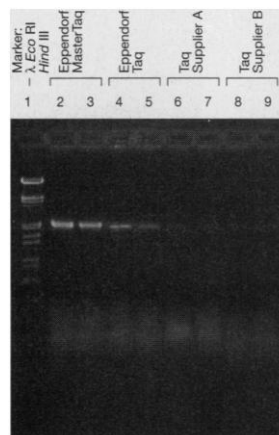
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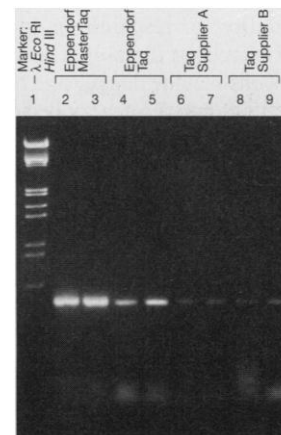
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The Eppendorf MasterTaq Kit includes the TaqMaster (5x PCR Enhancer), Eppendorf Taq DNA Polymerase, Reaction Buffer (10x) and $MgCl_2$ Solution.



● **Fig. 1: Amplification of a SSU rRNA gene from total genomic algae DNA**
PCR was performed from genomic algae using different Taq DNA Polymerases. Equal volumes of the PCR reactions were analyzed by gel electrophoresis.



● **Fig. 2: Amplification of a GAPDH specific DNA fragment from genomic blood DNA**
PCR was performed from human genomic blood with different Taq DNA Polymerases. Equal volumes of the PCR reactions were analyzed by gel electrophoresis.

The Polymerase Chain Reaction (PCR) is protected by patent. The patent is held by Hoffmann-La Roche. Products marked "licensed for PCR" are sold under licensing arrangements with F. Hoffmann-La Roche Ltd., Roche Molecular Systems, Inc. and The Perkin-Elmer Corporation.

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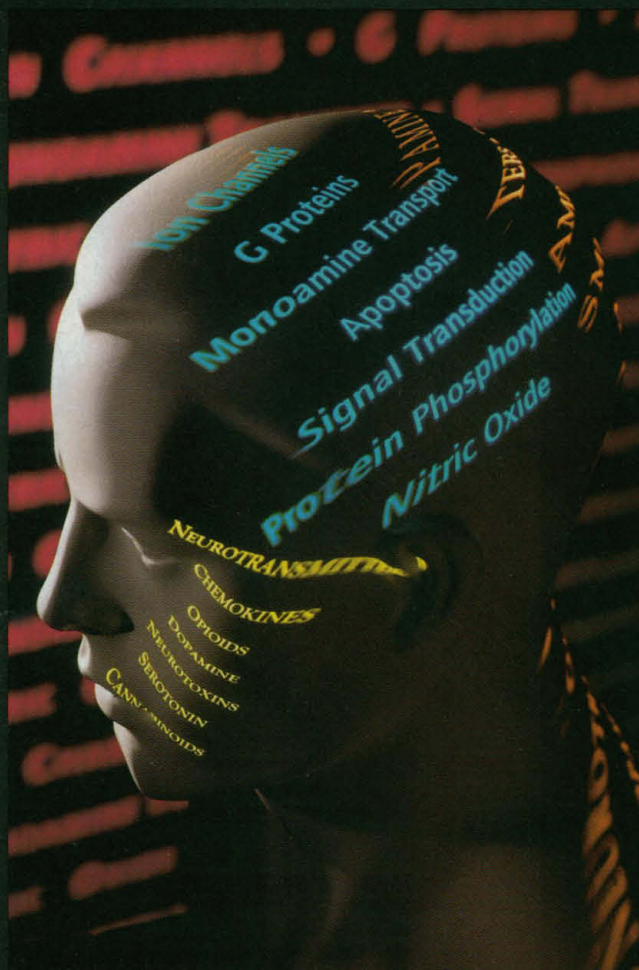
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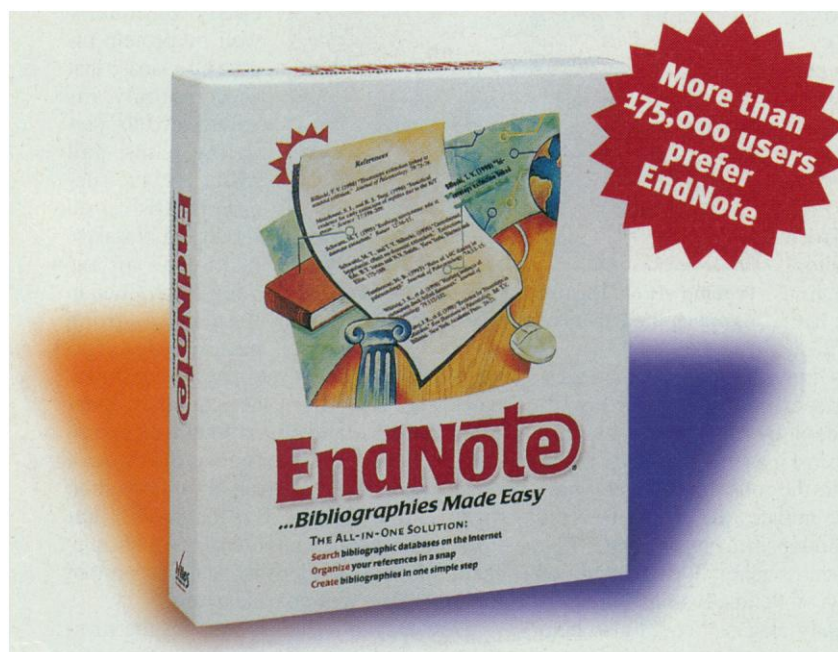
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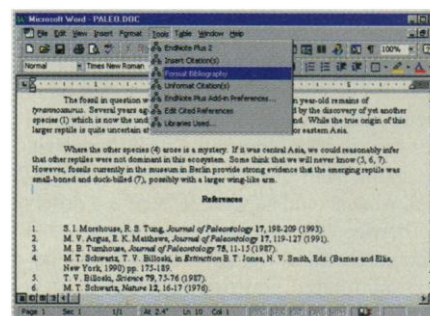


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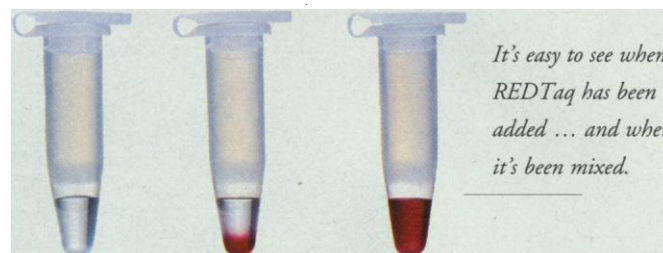
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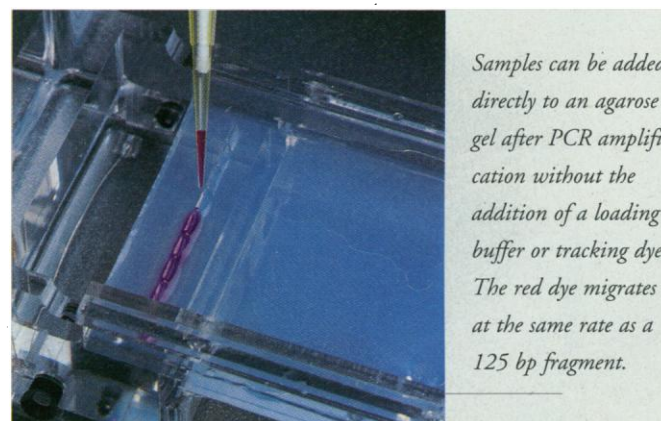
Because new REDTaq is formulated at one unit per μl , it's easier to pipette accurately. A uniform amount of enzyme added ensures consistency in the amount of end product.

[†] Patent pending.

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it's been mixed.*



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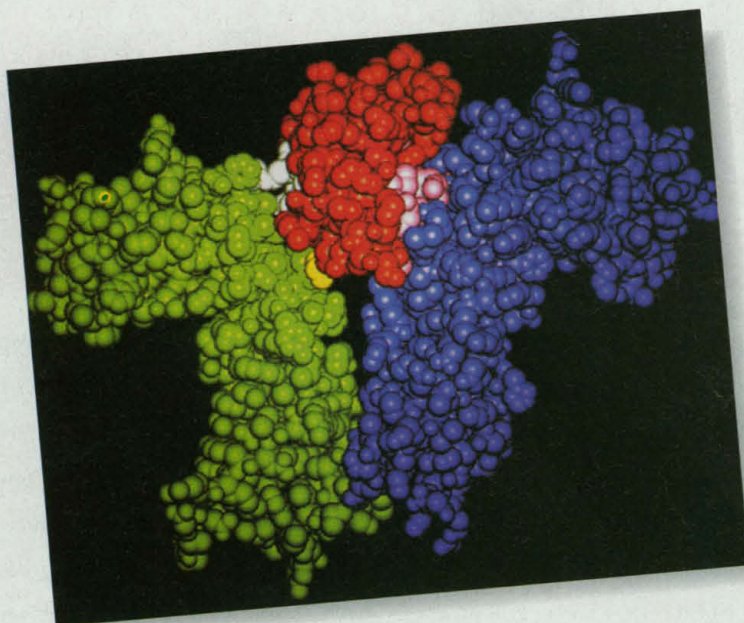
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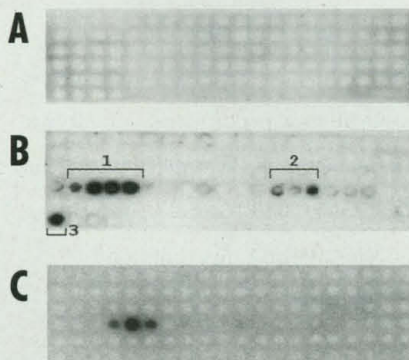
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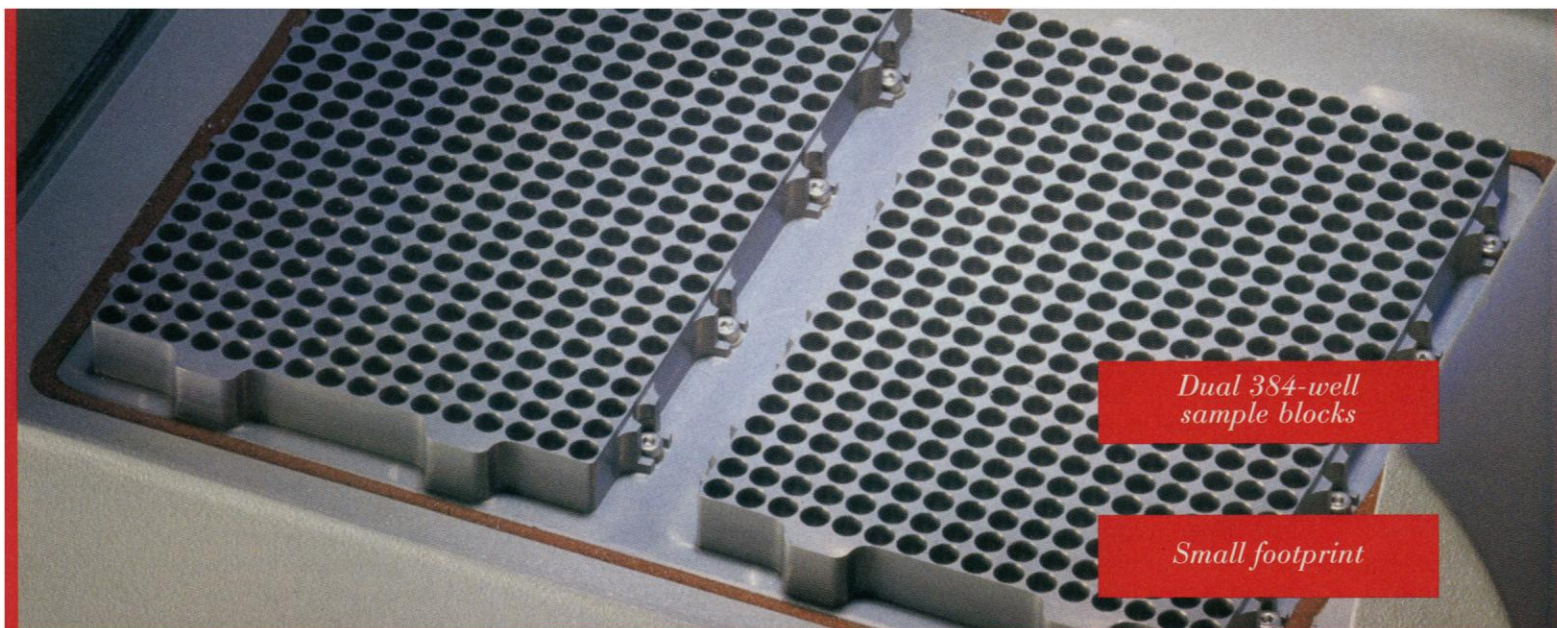
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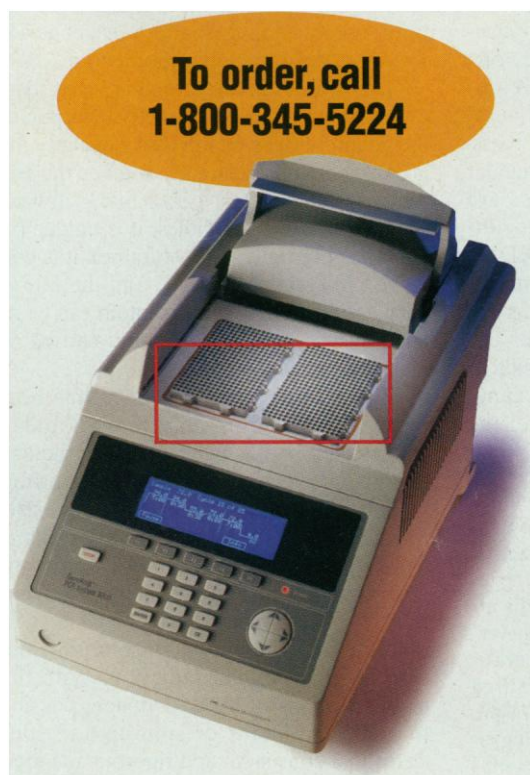
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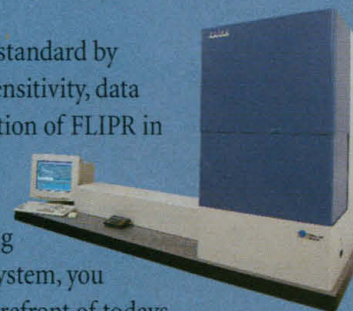
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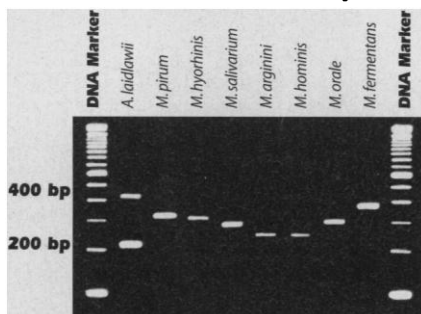
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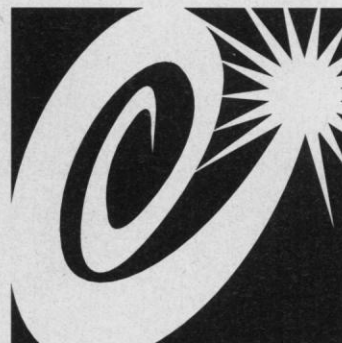
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