American Association for the Advancement of Science

# SCIENCE

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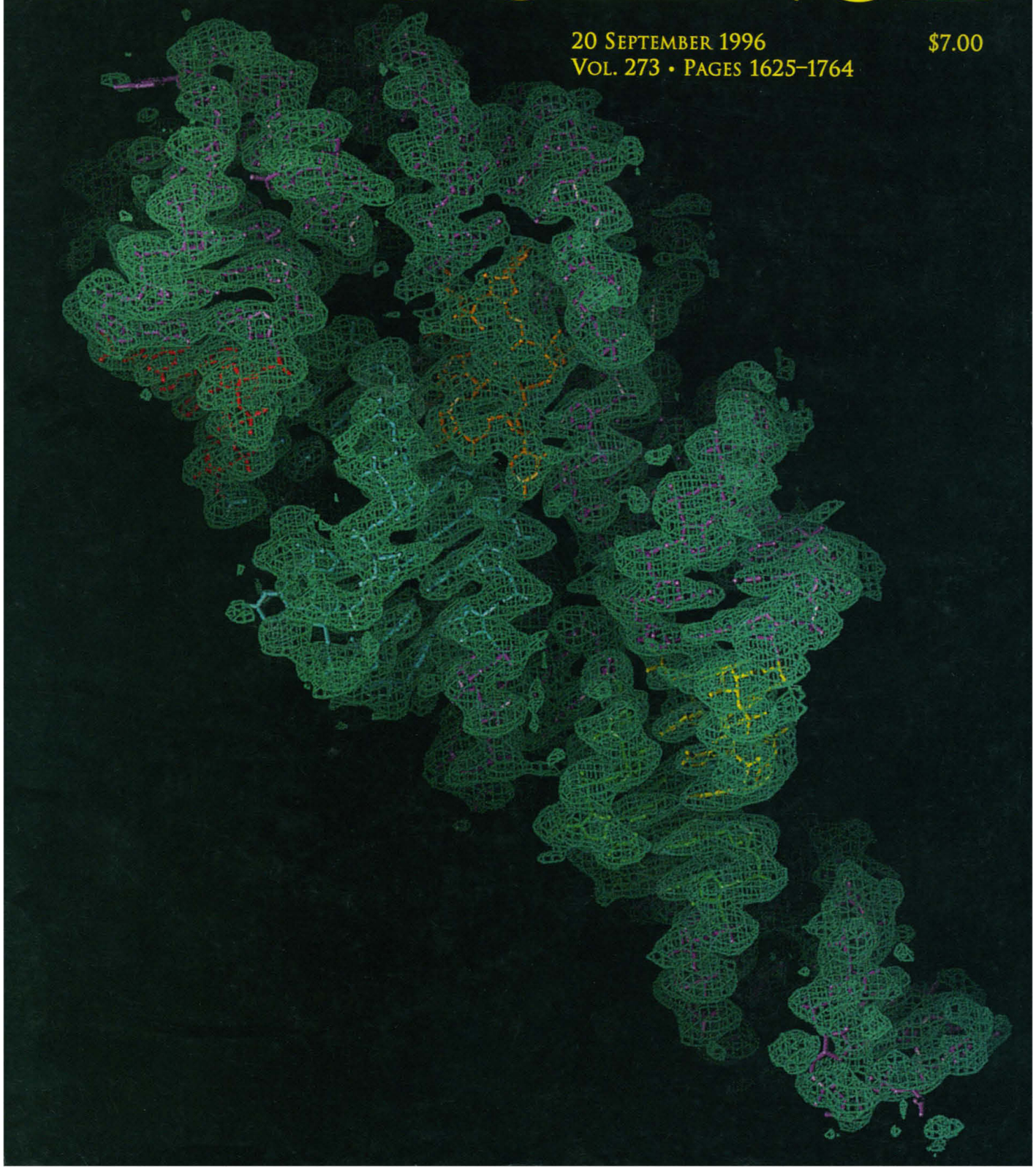

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dis·cov·er\ a. to obtain sight or knowledge of for the first time. dis·cov·er·y line™\: products for gene discovery and analysis > requiring exploration or investigation.

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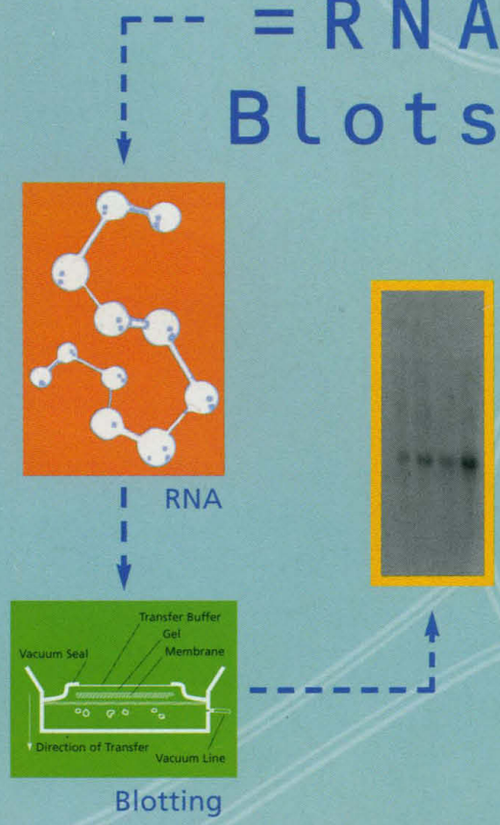


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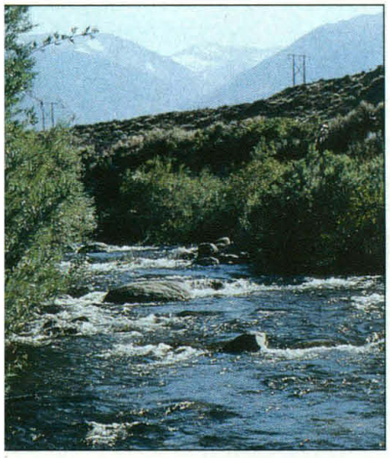
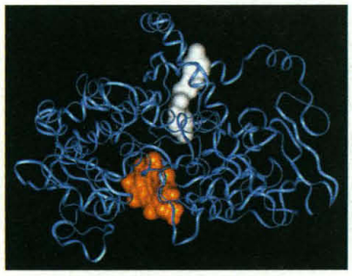


**1648**
Back to nature



**1660**
Superaspirin?

## NEWS & COMMENT



## RESEARCH NEWS



## PERSPECTIVES



## RESEARCH ARTICLE



## REPORTS



## DEPARTMENTS





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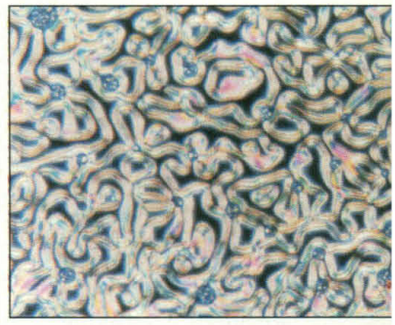
COVER

Experimental electron density map of the P4-P6 domain of the *Tetrahymena thermophila* group I intron contoured at 1.4 standard deviations above the mean. The 2.8 angstrom crystal structure of the 160-nucleotide domain reveals the close packing of RNA helices likely to be a common feature of ribozymes, the ribosome, and the spliceosome. See pages 1678 and 1696 and the related Perspective on page 1676. [Image: J. H. Cate and J. A. Doudna]



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THE MJ RESEARCH NOTEBOOK

*Volume VI...No. 3* *A Bulletin of Technological Advance in Molecular Biology* *Autumn 1996*

# NOVEL DNA TECHNIQUE DOES NOT VIOLATE CITES

## New Interpretation of Treaty Helps Study of Endangered Species

WASHINGTON — The U.S. Fish and Wildlife Service has ruled that wholly synthetic DNA samples created through a special amplification procedure are *not* subject to some of the permitting requirements of the Convention on International Trade in Endangered Species (CITES) or the Endangered Species Act (Jones, M. *Science* 266:1930; Bowen, B. & Avise, J. *Science* 266:713). This ruling should facilitate the scientific study of endangered species of flora and fauna, because enforcement provisions of CITES and ESA prohibit the transportation of any tissue from an endangered species without strict adherence to a tight permitting process. Now, however, DNA can be copied in the field and brought to the U.S. for study without any need to obtain transport permits.

The methodology in question was pioneered by Baker & Palumbi (*Science* 265:1539-1540), and it resulted in great controversy regarding the sale of endangered species of whale meat in Japan and Korea (see correspondence in *Nature* 376:11; 377:10; 377:282; for Korea data see *Molecular Ecology* 5:671-685). It involves the use of a biotin streptavidin system to separate copied DNA from its native template, and the synthetic DNA is then transported. The procedure was developed on a portable MiniCycler.

# *MiniCycler Facilitates Unique Applications of DNA Analysis*

New PTC-150HB MiniCycler™

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The MiniCycler 'HB' actually comes with two lids: a regular lid for use when the instrument is employed as an instant incubator, and a removable heated lid that clamps to the sample block for use when the instrument is employed as an oil-free thermal cycler. Both lids apply pressure to firmly seat the tubes, but the "Baby Bonnet" maintains a temperature of 105°C to prevent water condensation. Versions of the heated lid are available to fit either 0.5 or 0.2ml vessels.

# NEW HEATED LID

## Original "Personal Cycler" Gets Even Better; Existing Machines Can Be Upgraded

WATERTOWN, Mass. — MJ RESEARCH has announced the introduction of a new edition of its portable MiniCycler™ instrument. This trusty personal cycler features a new Hot Bonnet™ heated lid, and the instrument's small size, speedy cycling, and portability are helping scientists forge new applications for DNA analysis.

For example, Marie Connett of the University of Waikato used a rugged MiniCycler powered by a generator beside a glacier in Antarctica, in order to amplify DNA from small snippets taken from native mosses. She showed that the genetic diversity of Antarctic mosses is far greater than previously realized, it's just that convergent evolution has caused everything to look alike. Others have followed Dr. Connett's example, and a number of MiniCyclers are now in use characterizing the unique life found on Antarctica.

Scott Baker of the University of Auckland, Steve Palumbi & Frank Cipriano of the University of Hawaii used a MiniCycler to develop a new technique to copy DNA in the field in order to adhere to the CITES treaty. AB Technology of Pullman, WA integrates a MiniCycler into a mobile molecular laboratory that fits into a single suitcase; this lab performs a quick PCR assay (Roche-licensed*) that enables veterinarians to sex embryos in barns during cattle breeding operations. The Centers for Disease Control (CDC) has adapted this mobile lab to track diseases in the field, including Ebola and plague.

But you do not need an exotic application to enjoy the advantages of a MiniCycler. This 3 kg instrument features a Peltier-Joule heat pump with a range of -9° to 105°C, a speedy ramping rate up to 2.4°/sec, and an interchangeable block format. The new lid can be fit to any Mini ever made, and the instrument is quite economical.

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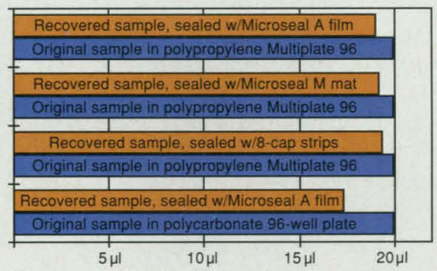


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# THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

## Important steps

The catalytic activity of surfaces is not uniform. Surface defects and steps are sites with low coordination on the surface and are believed to be highly active, but the mechanisms leading to this activity are not fully understood. Zambelli *et al.* (p. 1688) studied the dissociation of NO on a Ru(0001) using scanning tunneling electron microscopy and identified the low-coordinated atoms at the top of atomic steps as the active sites of the reaction. Deactivation of the surface steps depended on the step geometry.

■

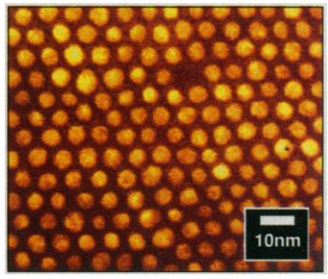
## Hand in the switch

Organic materials whose structures and physical properties can be modulated by light are promising materials for reversible optical data storage and photochemical switches. Huck *et al.* (p. 1686) present a chiroptical molecular switch that can be operated by switching between left- and right-handed circular polarized light of the same wavelength. The switch is based on a helical molecule that changes from one enantiomer to another upon irradiation with circular polarized light. By using the molecule as a dopant in a liquid crystalline phase, the chirality change can be expressed macroscopically.

■

## Stable cluster arrays

A significant challenge in nanotechnology is the assembly of clusters into stable arrays. Andres *et al.* (p. 1690) present a two-step method for self-assembly of gold nanocrystals (with a mean diameter of 3.7 nanometers) into a superlattice. The clusters were synthesized with a surfactant coating (in this case an alkyl thiol) and spin cast into a film. These particles formed fragile arrays that could




be stabilized by replacing the surfactant with "double-ended" dithiol or di-isonitrile organic molecules to form a linker cluster network.

■

## Quality control

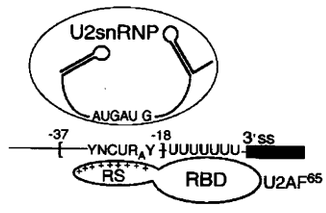
When proteins misfold in the endoplasmic reticulum (ER), they are retained and degraded by a process of quality control. The site of their degradation has been unclear—degradation could occur within the lumen of the ER or elsewhere in the cell. Hiller *et al.* (p. 1725) now show that misfolded proteins in yeast are actually retro-translocated out of the ER for degradation by the cytosolic proteasome-dependent degradative system.

## Fleeting subliminal cues

How might words that appear briefly influence our judgment in the absence of any conscious perception of having seen the word? This phenomenon of subliminal priming, in which the effect of a briefly presented word on a subsequent two-choice task is measured, has been difficult to demonstrate in an unassailable empirical fashion. Greenwald *et al.* (p. 1699) used a response window technique to examine the performance of subjects asked to choose between unpleasant and pleasant words or between male and female names. They find that subliminal priming exists, that the influence of the prime lasts for only 100 milliseconds, and that there is no carry-over from one trial to the next. These findings are interpreted in the context of the flow of information from a sensory buffer to working memory, which leads to perception.

## Basic requirements

Several cofactors are necessary in the splicing of precursor messenger RNA (pre-mRNA), a process that deletes intron sequences. One such factor is $U2AF^{65}$, the 65-kilodalton subunit of U2AF, which consists of an RNA binding domain (RBD) and an arginine-serine–rich (RS) domain that promotes assembly of the U2 small nuclear ribonucleoprotein (U2 snRNP) on the upstream branch point. Valcárcel *et al.* (p. 1706) prepared RS domain mutants and found that RS function requires only a small number of basic amino acids and is not sequence specific. Other proteins were not required for the RS domain to promote base pairing between U2 snRNA and the branch point. The basic residues of the RS domain likely promote U2 snRNA binding by neutralizing the negative charge on approaching phosphates on the RNA strands.




## Self-splicing intron structure

The self-splicing of RNA introns seen in *Tetrahymena* is catalyzed by a complex three-dimensional structure that has been understood so far in terms of modeling. In a research article and a report, Cate *et al.* (pp. 1678 and 1696; see the cover and the Perspective by Michel and Westhof, p. 1676) present the x-ray structure of the 160-nucleotide P4-P6 domain of the *Tetrahymena* group I intron. A distinctive motif is the formation of pseudo–base pairs by adjacent adenosines within a helix.

■

## Brain chemistry

The role of anandamide, a recently discovered endogenous ligand for the cannabinoid receptor, in brain function has remained elusive. Derkinderen *et al.* (p. 1719) have elucidated a signal transduction pathway after anandamide binding that could lead to changes in the neuronal cytoskeleton and thus influence synaptic plasticity.

■

## Transport into the nucleus

Cells must transport proteins and RNAs into and out of the nucleus continuously in order to maintain essential functions. The nucleus is surrounded by a double membrane, the nuclear envelope, which is punctuated by pores through which import and export occurs. Panté and Abei (p. 1729) examined the way that proteins being imported into the nucleus interact with filaments that protrude from nuclear pores into the cytosol and how the filaments appear to usher incoming proteins toward the pore itself.

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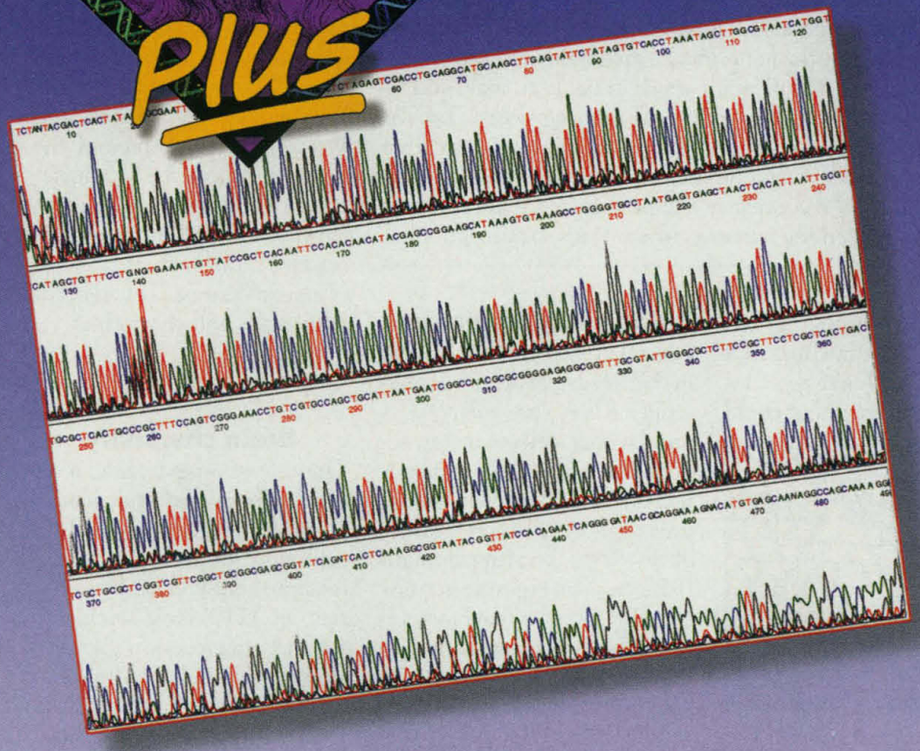


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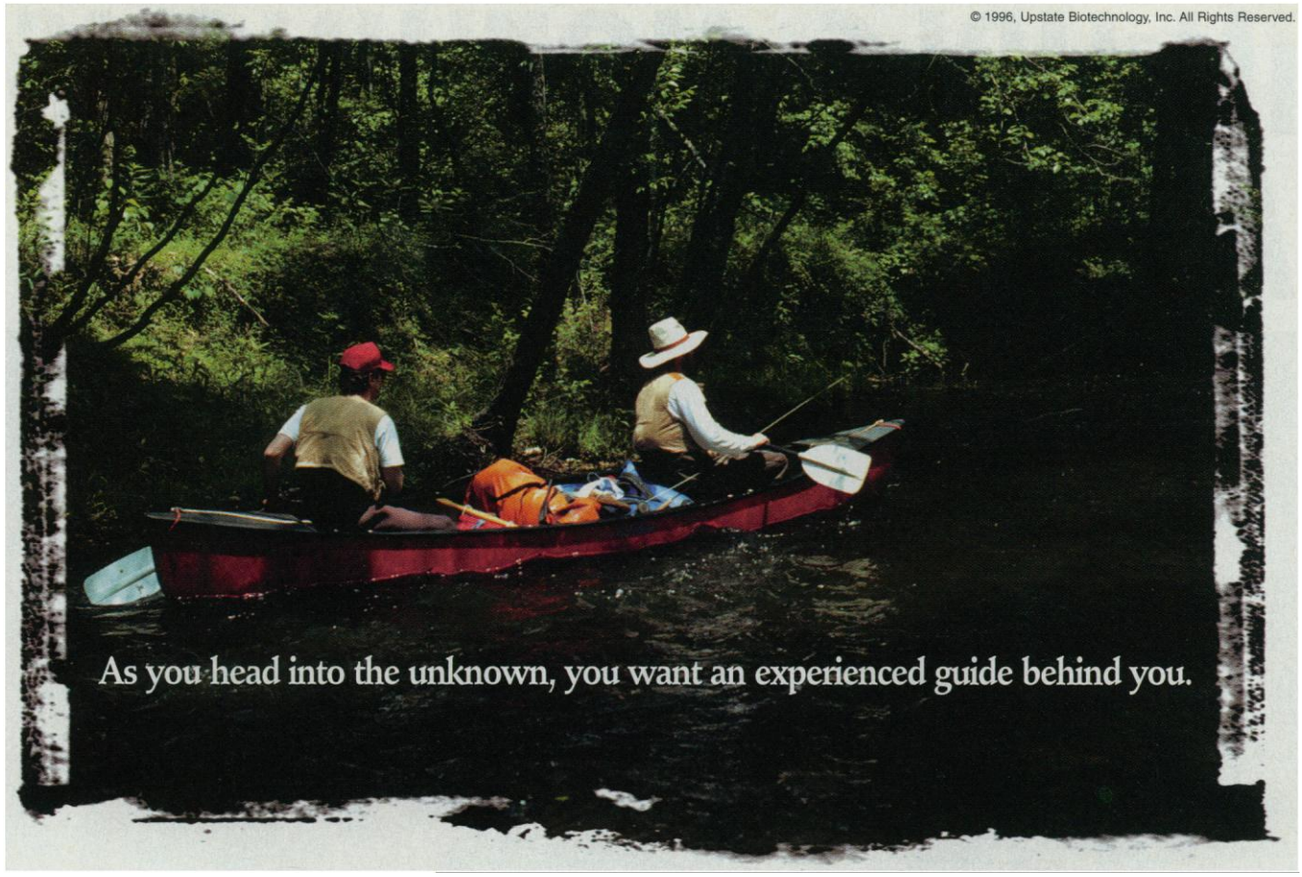


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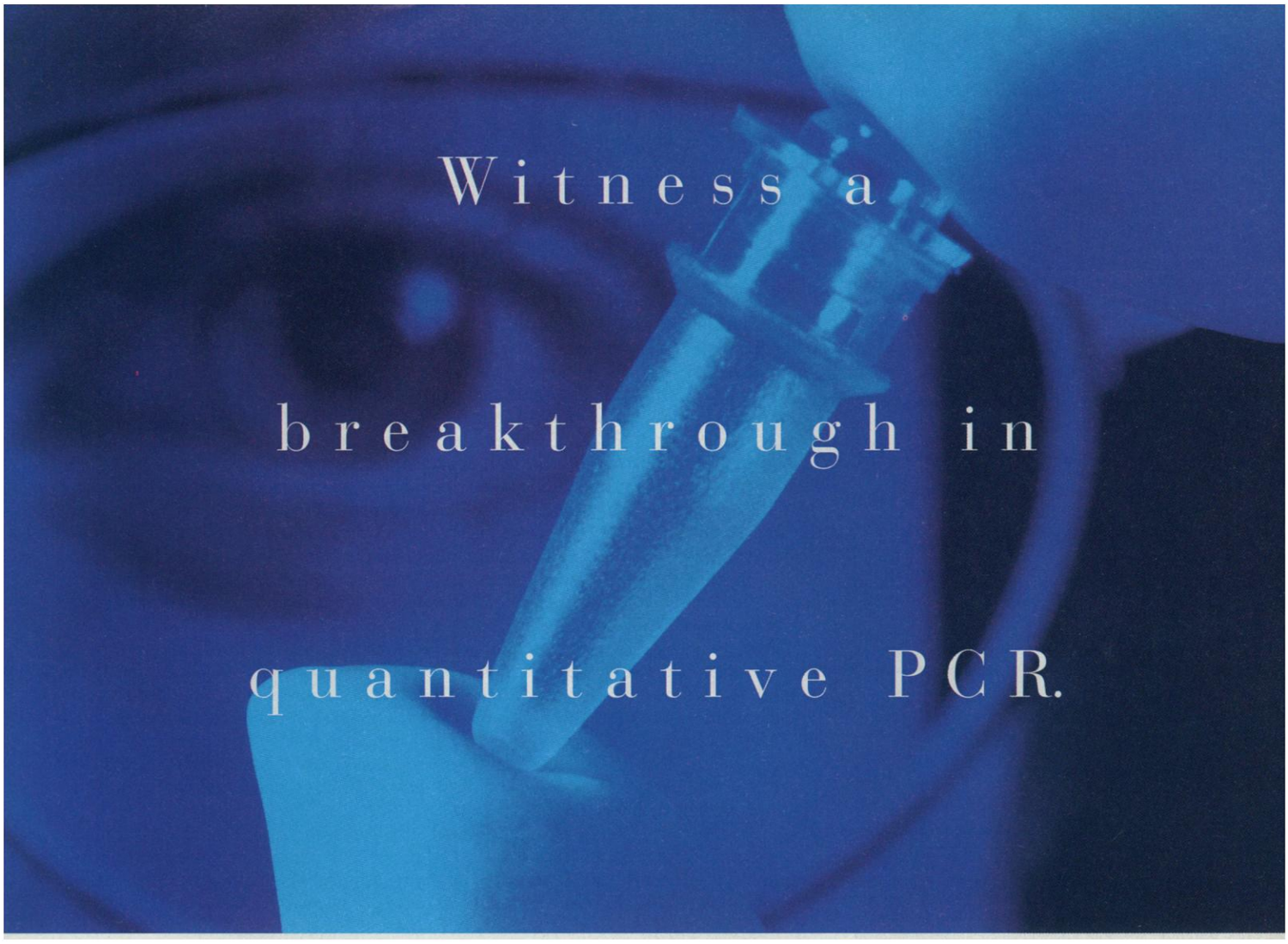


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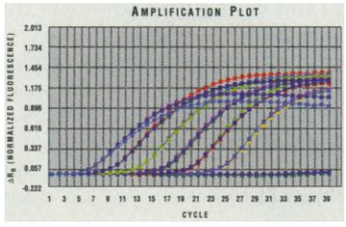


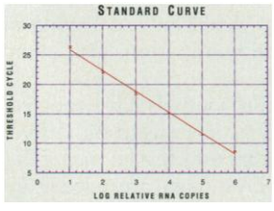


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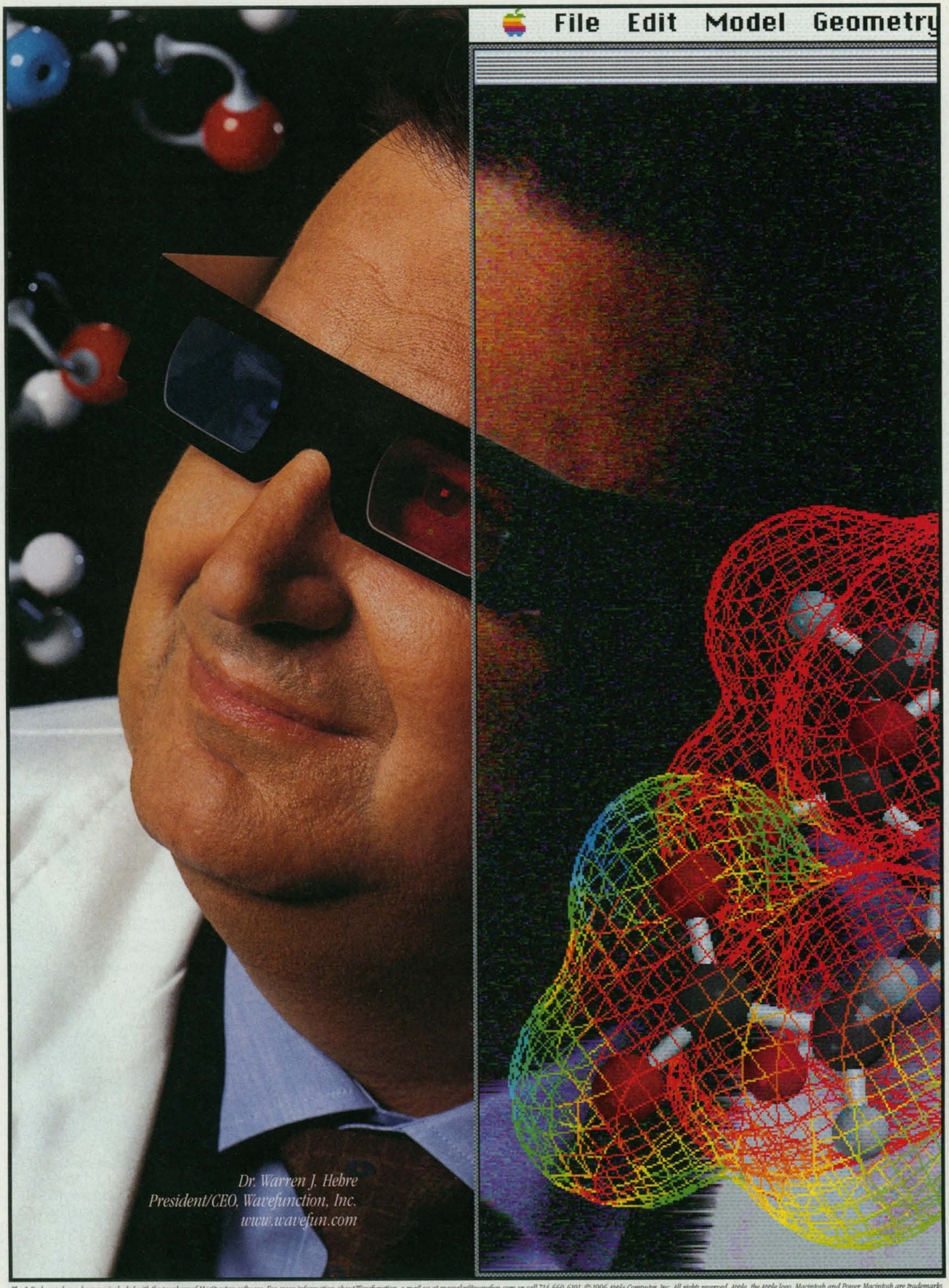

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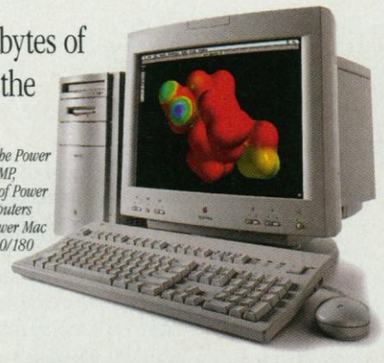

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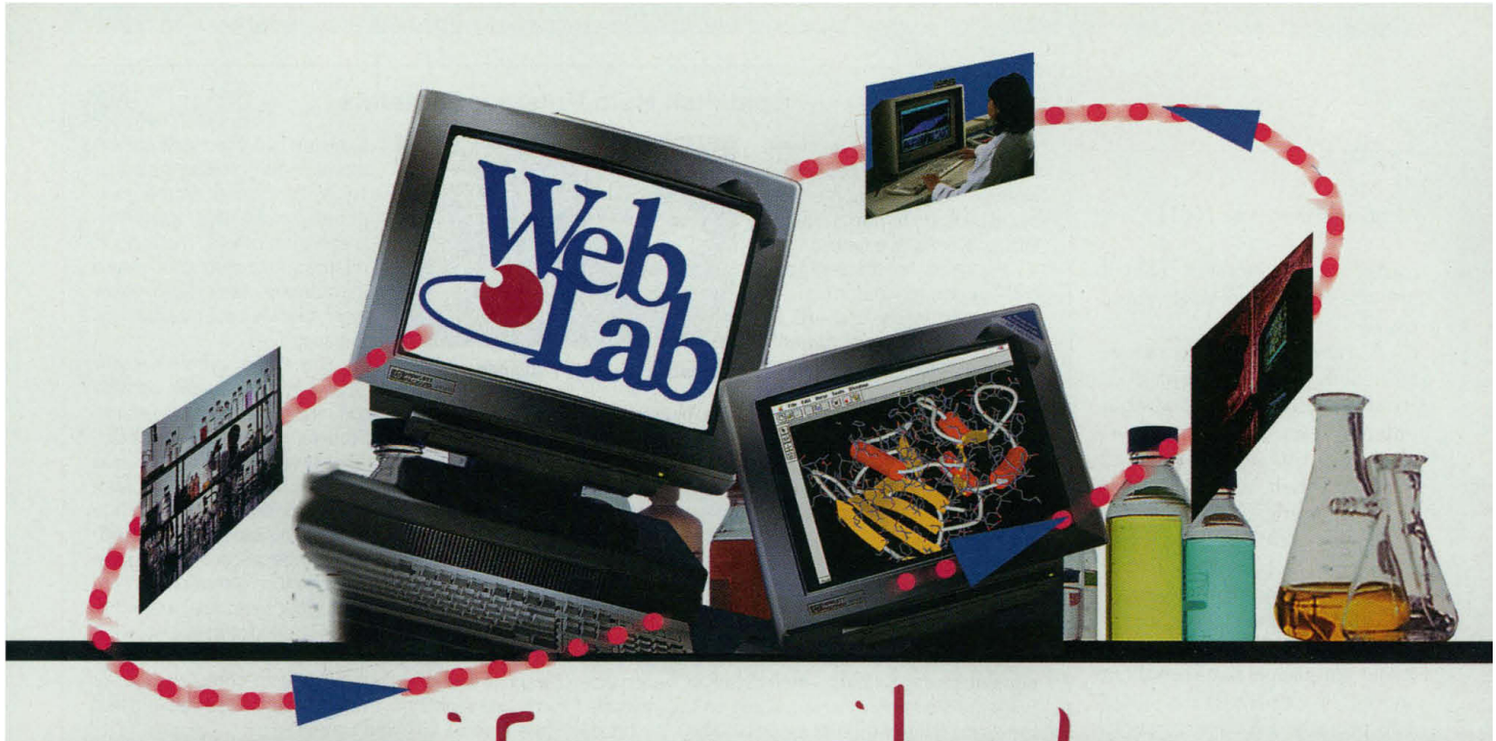


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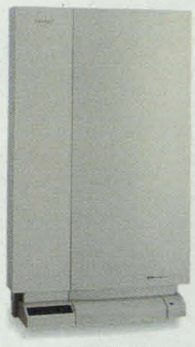

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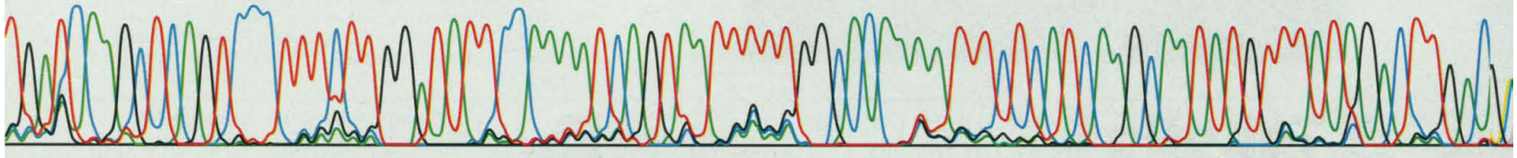

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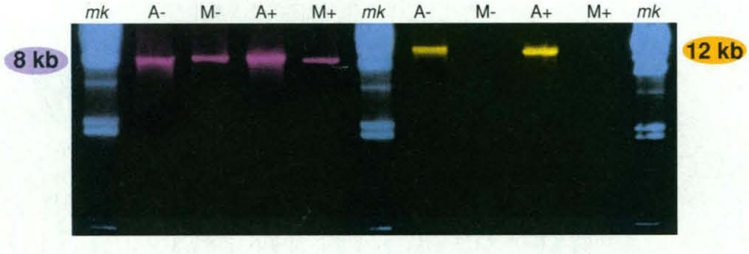
### Comparison for Long RT-PCR: cDNA Amplification from Dystrophin mRNA




RT reactions were carried out under optimum conditions for each enzyme, AMV RTase and MMLV RTase, in duplicate. One sample from each pair was followed by RNase H treatment. Then using two different primer pairs for 8 kb and 12 kb amplification, PCR was performed with *TaKaRa LA Taq* for AMV RTase products and Long distance DNA polymerase for MMLV RTase products respectively. No full length cDNA of 12 kb was detected with MMLV RTase.

| | |
|---|---|
| *mk* | λ *Hin*d III marker |
| A+ | AMV RTase reaction followed by RNase H treatment |
| M+ | MMLV RTase reaction followed by RNase H treatment |
| A- | AMV RTase reaction without following RNase H treatment |
| M- | MMLV RTase reaction without following RNase H treatment |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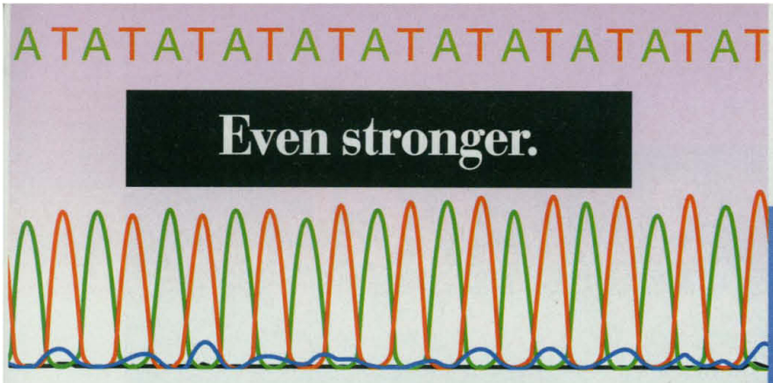


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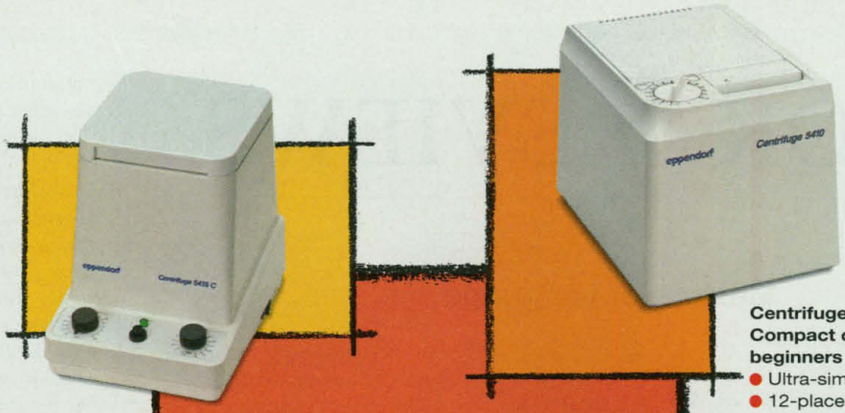


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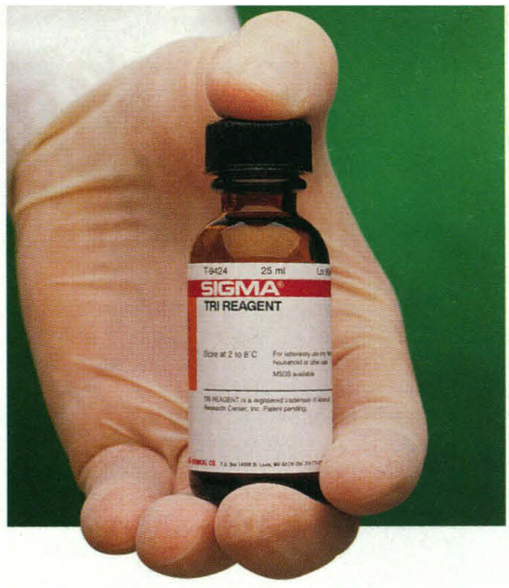


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