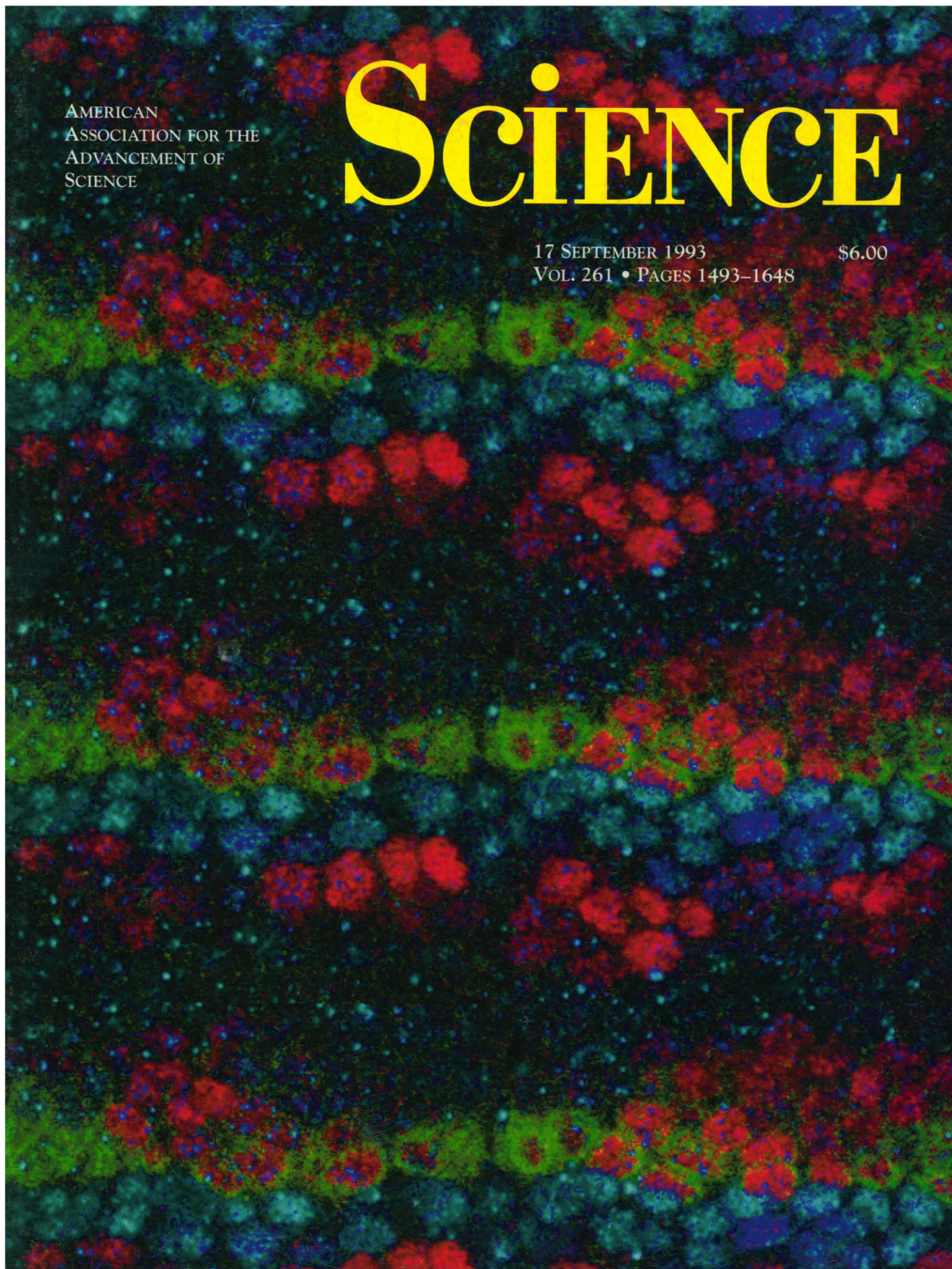


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Breaking the Mold



In Thermostable Enzyme Research

The Commitment to Discovery

Stratagene is committed to thermostable enzyme research. We literally go to the ends of the earth looking for novel microorganisms which may contain useful thermostable enzymes. Our goal is to make recombinant DNA methodologies more efficient and less time-consuming by exploiting these newly discovered enzymes that excel at elevated temperatures.

The Results of Our Search

Stratagene's search has been quite fruitful. We have broken new ground with thermostable enzymes isolated from the hyperthermophilic marine archaeon, *Pyrococcus furiosus* (*Pfu*)¹. This extremely thermophilic microorganism grows optimally at 100°C and as may be expected, possesses a host of exceptionally thermostable enzymes.

Scientists at Stratagene have recently cloned *Pfu* DNA ligase^{2,3}, which remains active following one hour incubation at 95°C and functions superbly in the ligase chain reaction (LCR)^{4,5}. Cloned *Pfu* DNA polymerase* exhibits 12-fold higher fidelity than *Taq* polymerase^{6,7}. The exonuclease-deficient mutant of *Pfu* DNA polymerase can be used to directly sequence PCR** products with ³⁵S-dATP⁸.

This is just the beginning of Stratagene's commitment to explore thermophilic enzymes and their applications. Just the beginning of the already unmatched line of Stratagene enzymes that can take the heat.

Products

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Extremely thermostable. Exhibits higher specificity with substantially less blunt-ended activity than *Tth* DNA ligase, making it ideal for use in LCR. Cat# 600191

Cloned *Tth* DNA ligase

Until now, the only commercially available thermostable DNA ligase. The original LCR technique employs this enzyme. Cat# 600193

LCR Kit

Includes *Pfu* DNA ligase, reaction buffer, positive and negative control oligonucleotides, control plasmid template and a detailed LCR protocol complete with experimental design and troubleshooting section. Cat# 200520

Cloned *Pfu* DNA Polymerase

Extremely thermostable. Exhibits 3' to 5' exonuclease-dependent proofreading activity and the highest fidelity of any thermostable DNA polymerase. Cat#'s 600153, 600154, 600159

Native *Pfu* DNA polymerase

The original high-fidelity *Pfu* polymerase isolated from the hyperthermophilic archaeobacterium, *Pyrococcus furiosus*. Cat#'s 600135, 600136

Exo-minus *Pfu* DNA polymerase

The genetically engineered mutant of *Pfu* polymerase possesses no detectable exonuclease activity. Ideal for cycle sequencing PCR products with ³⁵S nucleotide analogs and for other high-temperature primer extension reactions that do not require high-fidelity DNA synthesis. Cat# 600163

Cyclist™ Exo-minus *Pfu* DNA sequencing kit

Contains all the reagents required for cycle sequencing with Exo-minus *Pfu*. Designed for direct sequencing of PCR products or purified plasmid templates, labeled with ³⁵S-dATP. Cat# 200326

Native *Taq* DNA polymerase

Traditionally used for high-temperature primer extension reactions. Stratagene's *Taq* DNA polymerase is purified using a proprietary technique that makes the enzyme extremely thermostable. Cat#'s 600131, 600132

Cyclist™ *Taq* DNA sequencing kit

Contains all the reagents required for cycle sequencing with *Taq* polymerase. Designed for direct sequencing of PCR products, plasmids from colonies or phage from plaques, using ³²P- or ³³P-dATP. Cat# 200325

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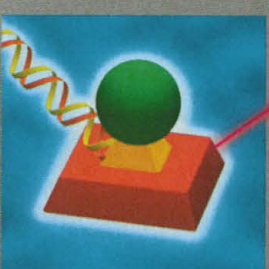
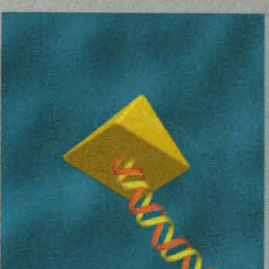
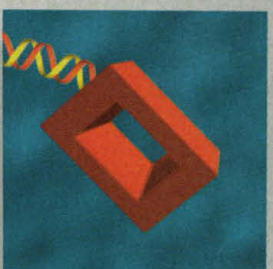
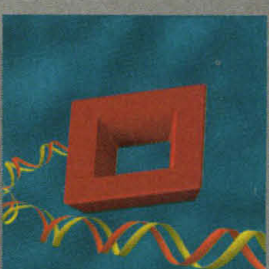
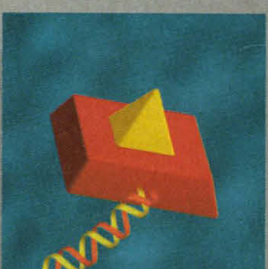
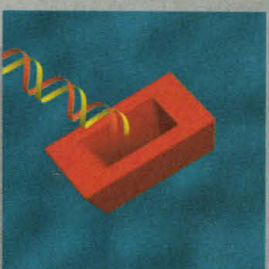
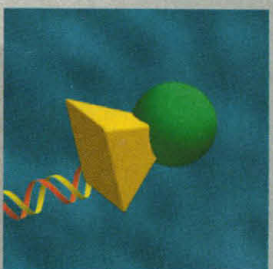
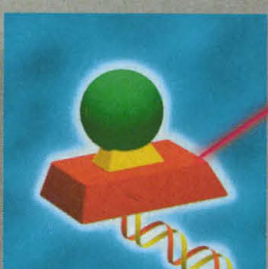
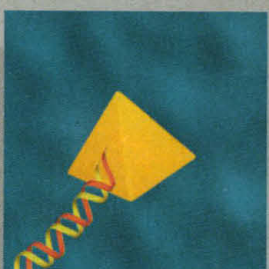
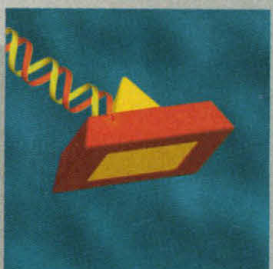
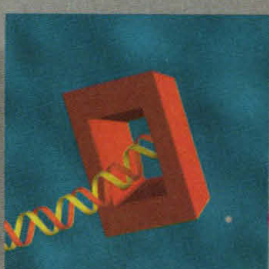
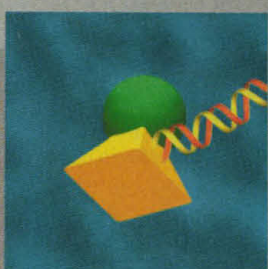
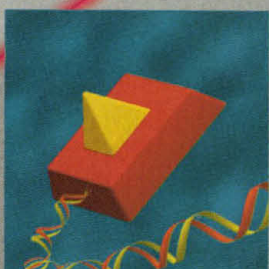
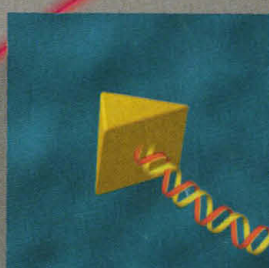
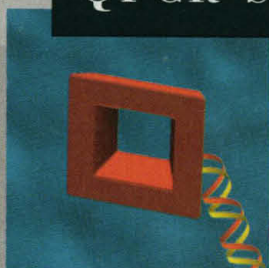
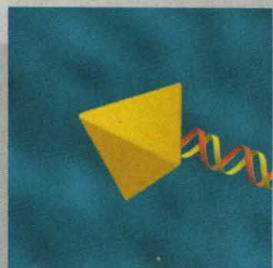
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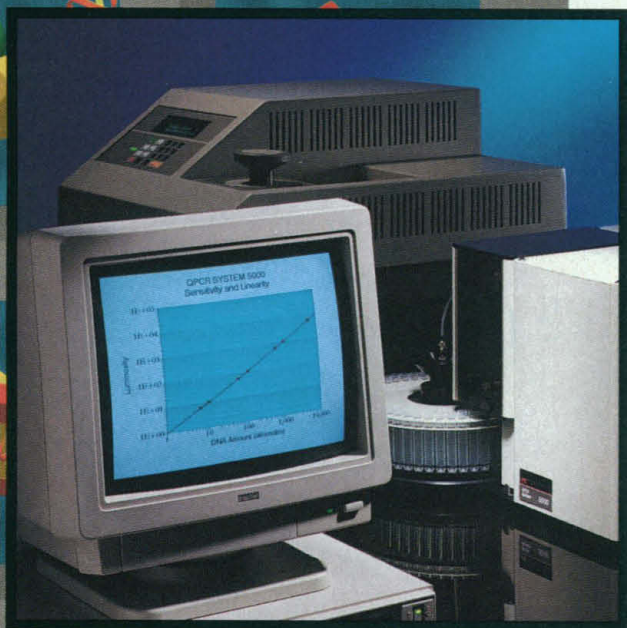
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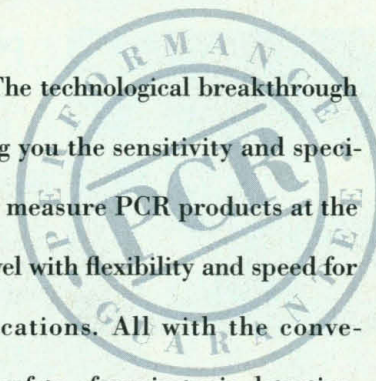
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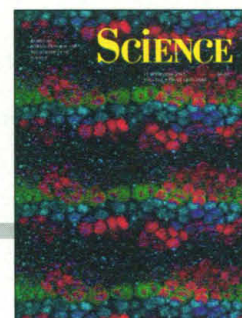
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Confocal immunofluorescent detection of wingless protein (green), engrailed protein (blue), and enhancer trap 5953 (red) in a reiterated segment of embryonic *Drosophila* neuroectoderm (ventral midline, center; anterior, top). The wingless protein nonautonomously

activates 5953 expression, maintains expression of the engrailed protein, and controls the formation and specification of central nervous system precursors. See page 1594. [Photo: Chris Q. Doe]



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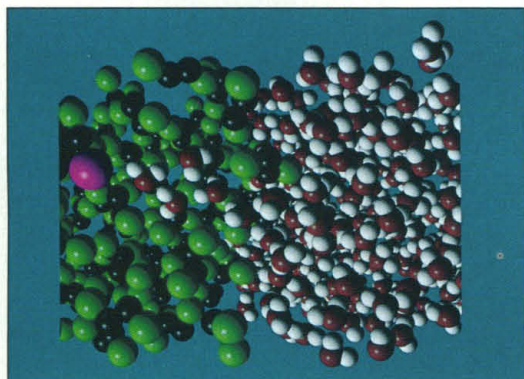
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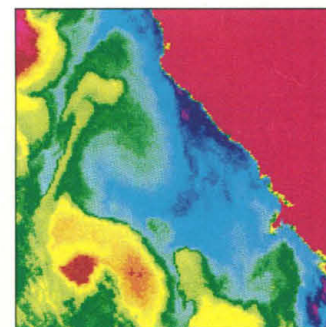
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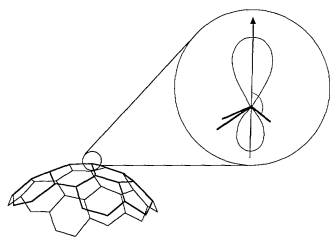
Tackling toxic torts

The U.S. Supreme Court recently decided a case—*Daubert v. Morrell Dow Pharmaceuticals*—with broad implications for the admissibility of scientific evidence in the courts. In a Policy Forum, Foster *et al.* (p. 1509) discuss the decision with respect to toxic tort cases and suggest several directions for judges, lawyers, scientists, and scientific societies to take in response to the decision.



Stressing strain in fullerene chemistry

What drives the chemical reactivity of fullerenes such as C_{60} ? Haddon (p. 1545) argues that the fullerenes can be best described as aromatic molecules that undergo reactions which relieve the strain inherent in their closed, nonplanar structures. The author uses π -orbital axis vector analysis to charac-



terize the energetic penalties of fullerene geometries, which force carbon-carbon σ bonds together and which inhibit resonance in the π -orbital network. The formation of organometallic derivatives of C_{60} and C_{70} can be understood in terms of relieving local and global strain.



Across the great divide

The transfer of ions across an interface between two immiscible liquids is a fundamental process, but one which has been difficult to simulate with mo-

Transcription and the cell cycle transition in yeast

Late in the G1 phase of budding yeast, transcriptional factors are activated for the cyclin genes and for proteins that synthesize DNA. The SBF transcription factor, which acts on certain cyclin genes, is known to be a heterodimer consisting of a DNA binding domain (Swi4) and a regulatory element (Swi6). Koch *et al.* (p. 1551) have purified and cloned the p120 protein of the MBF transcription factor complex that activates the genes encoding B-type cyclins and genes involved in DNA synthesis. This protein, Mbp1, binds DNA and like Swi4 forms a complex with Swi6. Swi4 and Mbp1 also show a number of structural similarities. Deletion mutants for *MBP1* were viable but genes normally transcribed periodically in response to the MBF target, the MCB element, were expressed at a low, constant rate. The *SWI4* and *MBP1* genes have an essential, overlapping function; mutants in which both of these genes are deleted failed to synthesize G1 cyclins and were not viable. In a Perspective, Andrews and Mason (p. 1543) discuss the role of gene expression in the cell cycle.

lecular dynamics methods without ad hoc assumptions and conditions. Benjamin (p. 1558) used only the basic known properties of water and dichloroethane to construct a convincing simulation of the interface between the two liquids and of the movement of simple ions across it. Fingers of water constantly protrude into and retreat from the organic layer across a boundary that remained stable throughout the simulation. Ions did not simply diffuse across the barrier but crossed it through a process characterized by an activation energy.



A greater crater

Evidence has recently accumulated that the long-sought crater formed by the impact of a large asteroid at the Cretaceous-Tertiary (K-T) boundary is the Chicxulub structure in Yucatán, Mexico. One problem both in its initial identification and subsequent study is that it is buried by hundreds of meters of younger rocks. Sharpton *et al.* (p. 1564; see news story by Kerr, p. 1518) present an analysis of recent

gravity data and suggest that the crater may be nearly 300 kilometers across, considerably larger than initially assumed. The key evidence is in the interpretation of a fragmentary fourth ring in the gravity data. If it is this large, the Chicxulub crater would likely mark one of the largest impacts since life began on Earth. In a related news story, Morell (p. 1518) discusses some of the paleontological puzzles posed by the impact theory of the K-T extinction event.



Bit by bit

All digital computers encode information as strings of zeros and ones, but in a quantum computer the zeros and ones are supposed to be represented by two states of a quantum mechanical system, and superpositions of different states can be incorporated into calculational procedures. Lloyd *et al.* (p. 1569) bring the hypothetical quantum computer a step closer to feasibility by showing how a coupled system of quantum states—for example, a polymeric chain in

which each unit has an electron that can be switched from the ground state to the excited state by a photon of the right energy—can be loaded with a specified series of zeros and ones. Laser light pulses of the appropriate frequency and duration would move bits up and down the register and perform logical operations in a molecular-level computer.

In the major groove

In RNA duplexes, the major groove provides a more extensive array of hydrogen bond donors and acceptors than the minor groove does, which would facilitate sequence recognition, yet the major groove appears less accessible because it is deep and narrow. Weeks and Crothers (p. 1574) found that the major groove is accessible at duplex termini and that availability could be enhanced by asymmetric and large loops between helices.



Stem cell fates

The identity of the genes that control the assignment of cell identity to the stem cells of the developing neuroblasts in the central nervous system (CNS) is unknown. Chu-LaGriffa and Doe (p. 1594; cover) studied the role of the *wingless* gene in neuroblast determination in the *Drosophila* CNS. With the use of a conditional mutant, they demonstrate that the function of *wingless* in segmentation can be separated from the requirement for *wingless* in the CNS. Expression of *wingless* is necessary for the determination and formation of neuroblast cells adjacent to those expressing the wingless protein, which is a secreted glycoprotein.

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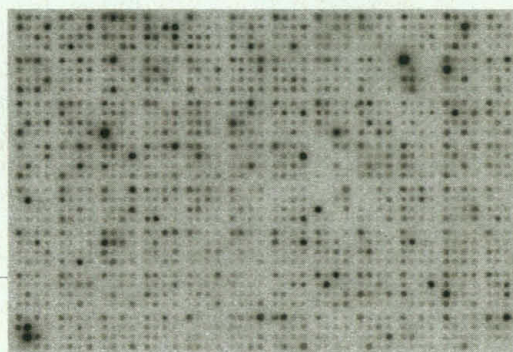
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The PhosphorImager SF is also economical and easy to use. You don't need -70° freezers, darkrooms, or film process-

ing chemicals. Plus, storage phosphor screens can be erased and re-used indefinitely.

For analysis, the compact PhosphorImager SF includes Molecular Dynamics' powerful ImageQuant™ software.

High-density gene mapping hybridizations such as this 4 x 4 x 8 x 12 array can be imaged on the PhosphorImager SF. Courtesy of Dr. G. Lennon, Human Genome Center.



ImageQuant allows you to quantify images directly – and without scintillation counting. Files are formatted for easy transfer to your favorite PC and Macintosh programs. Built-in Ethernet capability lets you send data and images to other computers.

So, if you've been waiting for a PhosphorImager that fits your budget, size up the PhosphorImager SF. Call today for a free copy of our new PhosphorImager brochure.

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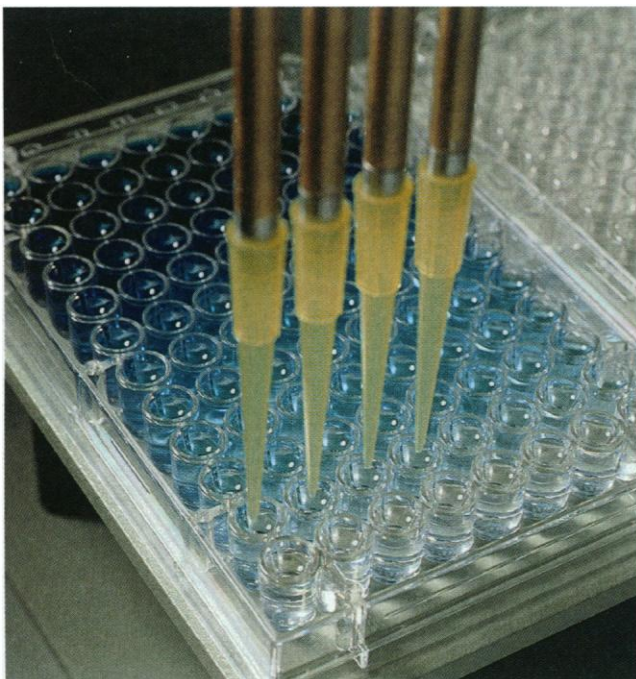
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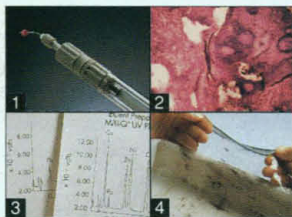


There Are Places You Expect To Find Water Hazards. Your Lab Shouldn't Be One Of Them.

Water hazards on a golf course can cost you a couple of strokes. In a lab, however, water hazards in the form of ions, pyrogens and organics can cost you months of research work.

That's why it's critical for you to have a water purification system that removes contamination instead of one that contributes to it. If you don't, you could end up like one of these facilities:

1. A lab doing protein purification with HPLC found that endotoxins in its water system contaminated proteins.
2. Organics in another facility's water system kept mammalian cells from growing in defined medium.
3. A semiconductor plant testing for copper had its chromatographic results ruined by contamination in their water system.
4. In yet another lab, phosphates



being used to clean the water system got into the water used for polyacrylamide gels, rendering them useless.

In each of these cases, when the lab switched to a Milli-Q® Plus Water Purification System, all their problems disappeared.

That's because the Milli-Q Plus system delivers the highest quality water available: 1.5 liters per minute at 18 megohm and < 10ppb TOC (with RO pretreatment).

To ensure you're always getting high quality water, the system tells you when the filter module needs changing.

And unlike other systems, changing our module is easy. Instead of separate bowls, our QPAK™ purification module has an all-in-one design that takes hardly any time to

change out and prevents you from ever having to come in contact with wetted surfaces.

Also, because we don't use separate bowls, the system has virtually no hold-up volume. This results in faster flush-ups, along with reduced extractables and bacterial growth.

To further prevent water degradation, the system even recirculates water automatically every hour for approximately five minutes.

So beware of less expensive water purification systems that claim to do as good a job as the Milli-Q Plus system: They may prove hazardous to your work.

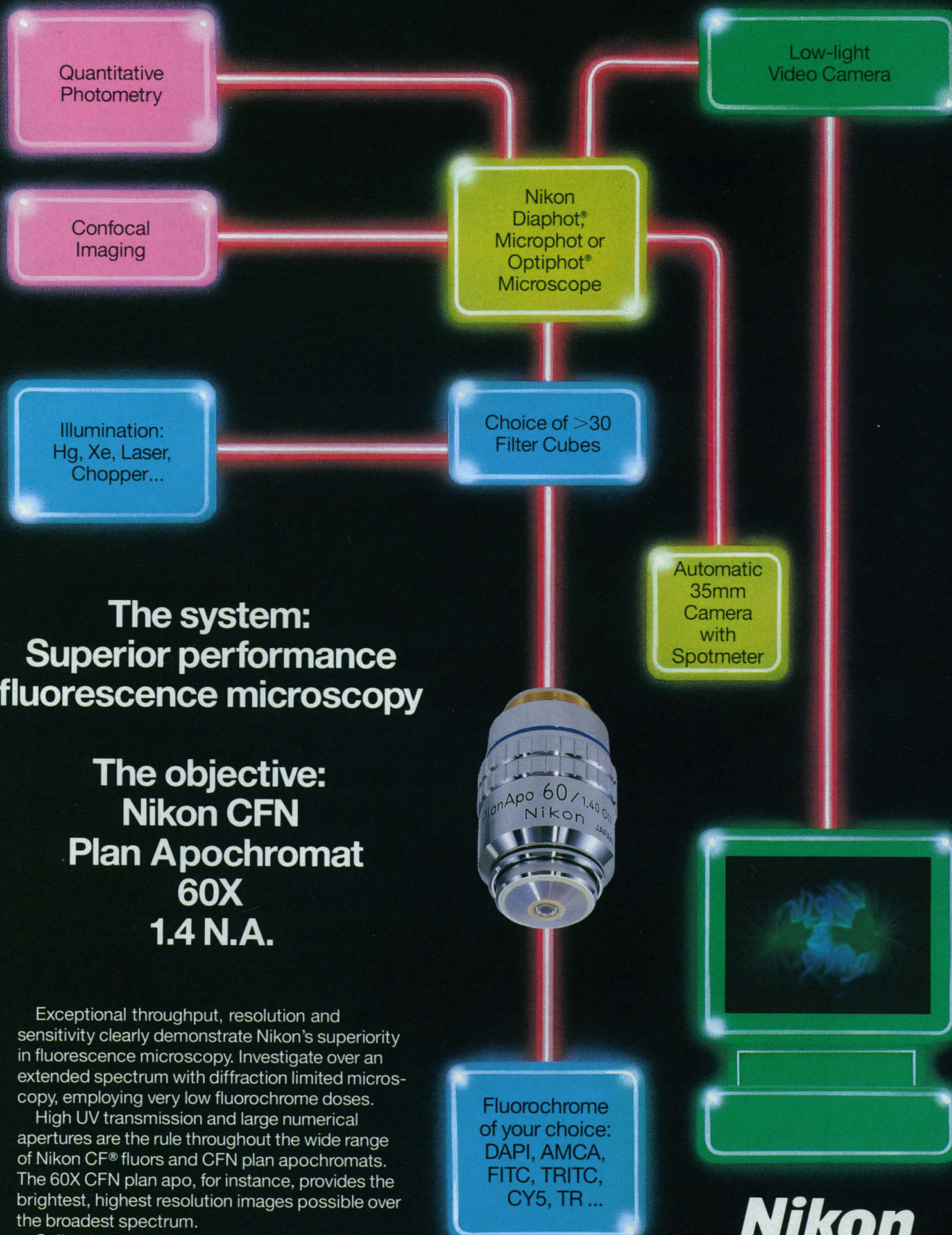
For additional information about the Milli-Q Plus system, including a brochure, technical bulletins and data sheet, call 1-800-225-1380.



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*OligoPilot™ Large Scale Oligo Synthesizer is
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high load support).*

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DISPOSAL COST

OligoPilot™ utilizes an innovative pump driven flow-through column design and a new polymer support matrix, Primer Support. The flow-through design gives you the following benefits:

- Significant reductions in amidite usage, 1.5 molar equivalents
- Fast detritylation, 2 min. at 200 μ M scale
- Short cycle times, 7 hours at 200 μ M for a 20-mer
- Reduced waste volume, 415 ml at 200 μ M scale
- Average yield per cycle of over 99%
- 12 amidite ports for DNA, RNA or modified amidites

The pump driven flow-through design ensures the active phosphoramidite concentrations remain high even at small molar excesses. This design also makes the most efficient use of other reagents and allows for rapid reagent change at up to 75 ml per minute.

Primer Support contributes to the overall performance due to its hydrophobic nature. Its hydrophobicity ensures that any water introduced with the oxidation step does not remain in the system, reducing coupling efficiency in later steps. The lack of labile sites also minimizes spontaneous chain elongation off the support which is sited for silica based supports.

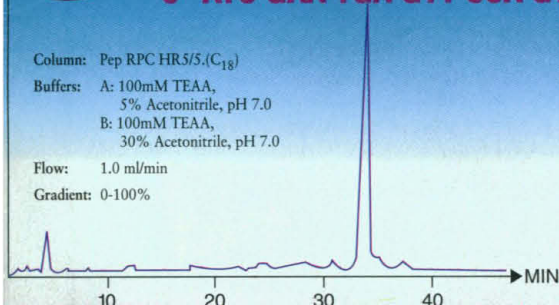
OligoPilot is fully programmable via an external computer. In addition, the computer tracks reagent usage and identifies the batch numbers for each reagent used for each oligo synthesis.

The on-line trityl monitor provides continuous display of coupling efficiency of each step. In the event of a poor coupling, the monitor can stop the synthesis before additional reagents are wasted.

Lab scale synthesis users can enjoy similar benefits of Primer Support and the pump driven flow-through design with the Gene Assembler® DNA/RNA Synthesizer.

5'-ATC GAA TGA GTT CCA GTT-3'


Column: Pep RPC HR5/5.(C₁₈)
Buffers: A: 100mM TEAA,
5% Acetonitrile, pH 7.0
B: 100mM TEAA,
30% Acetonitrile, pH 7.0
Flow: 1.0 ml/min
Gradient: 0-100%



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Don't be fooled by the modest appearance of the new DNA DipStick™ Kit from Invitrogen. It's nothing short of a revolution in the quantitation of DNA, RNA and oligonucleotides.

The DNA DipStick™ is the economical solution for quantifying amplification products, mRNA, total RNA, cDNA or plasmid DNA.

WE'RE SENSITIVE *to* YOUR NEEDS.

The easy-to-use DNA DipStick™ is so sensitive, it quantitates nucleic acid at concentrations as low as 0.1 ng/μl. That's a big advantage over conventional techniques like ethidium bromide staining or spectrophotometry, which are less sensitive and require ~~≥0.1 ng/μl~~



HOW FAST *is* FAST?

With the DNA DipStick™, you'll get results in less than 10 minutes. It's as easy as spotting 1 μl of sample on the DipStick and placing it in three solutions.

The DNA DipStick™ makes quantification of single- or double-stranded DNA, RNA or oligonucleotides fast, accurate and economical. Plus, it provides a permanent record of results.

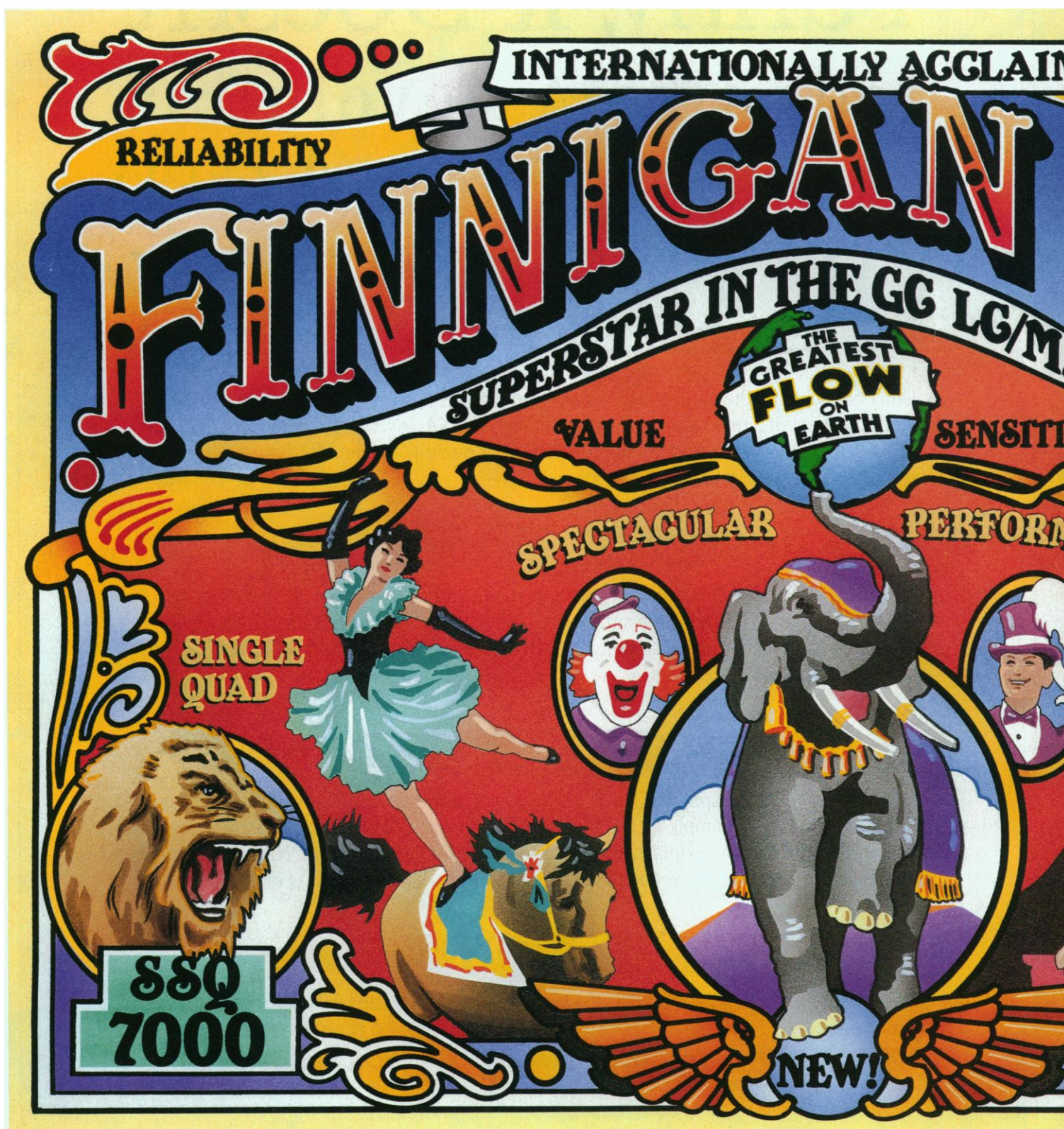
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Customer Service Representatives are standing by! To order the DNA DipStick™ Kit, call and ask for catalog no. K5632-01.

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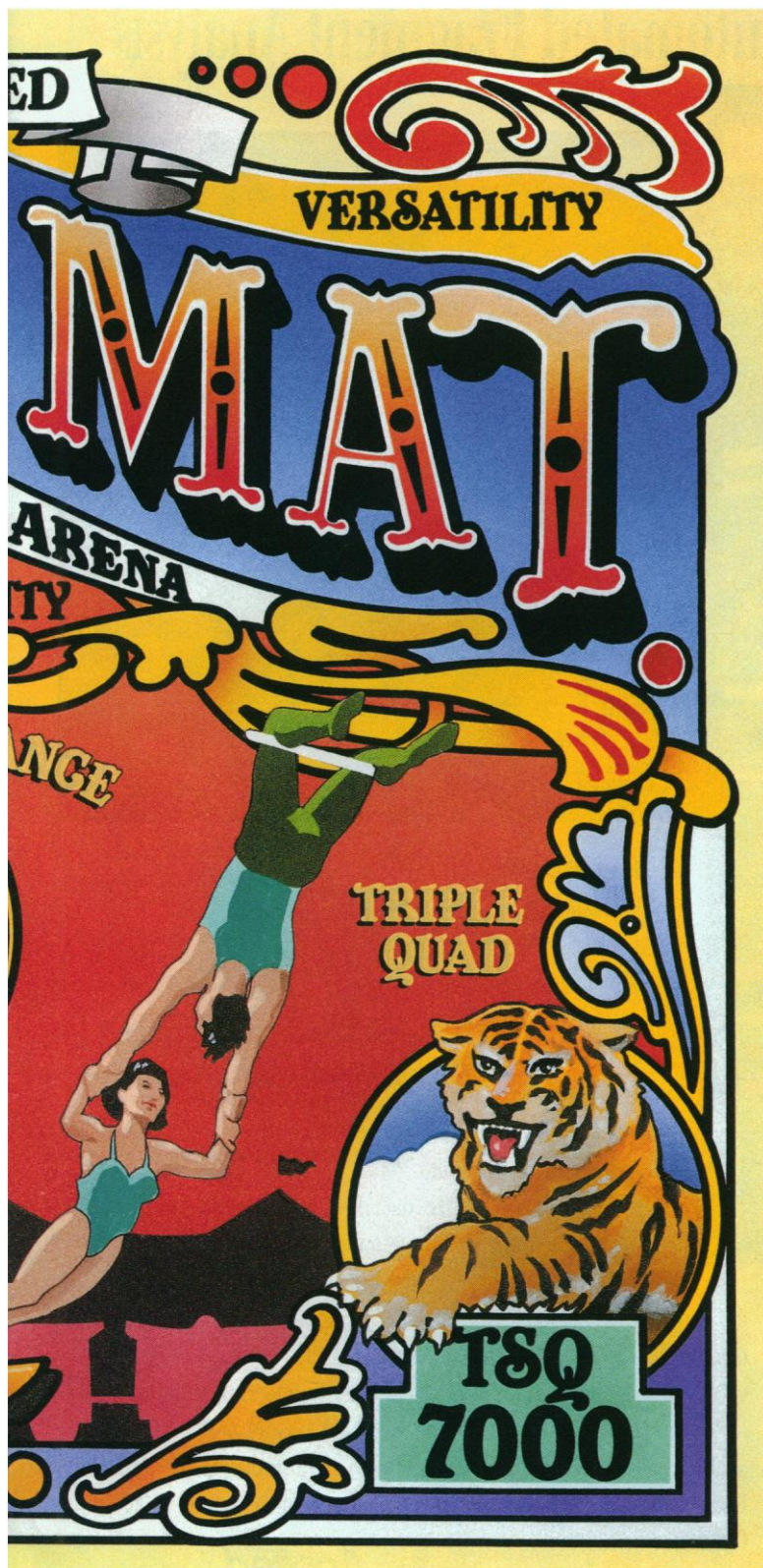


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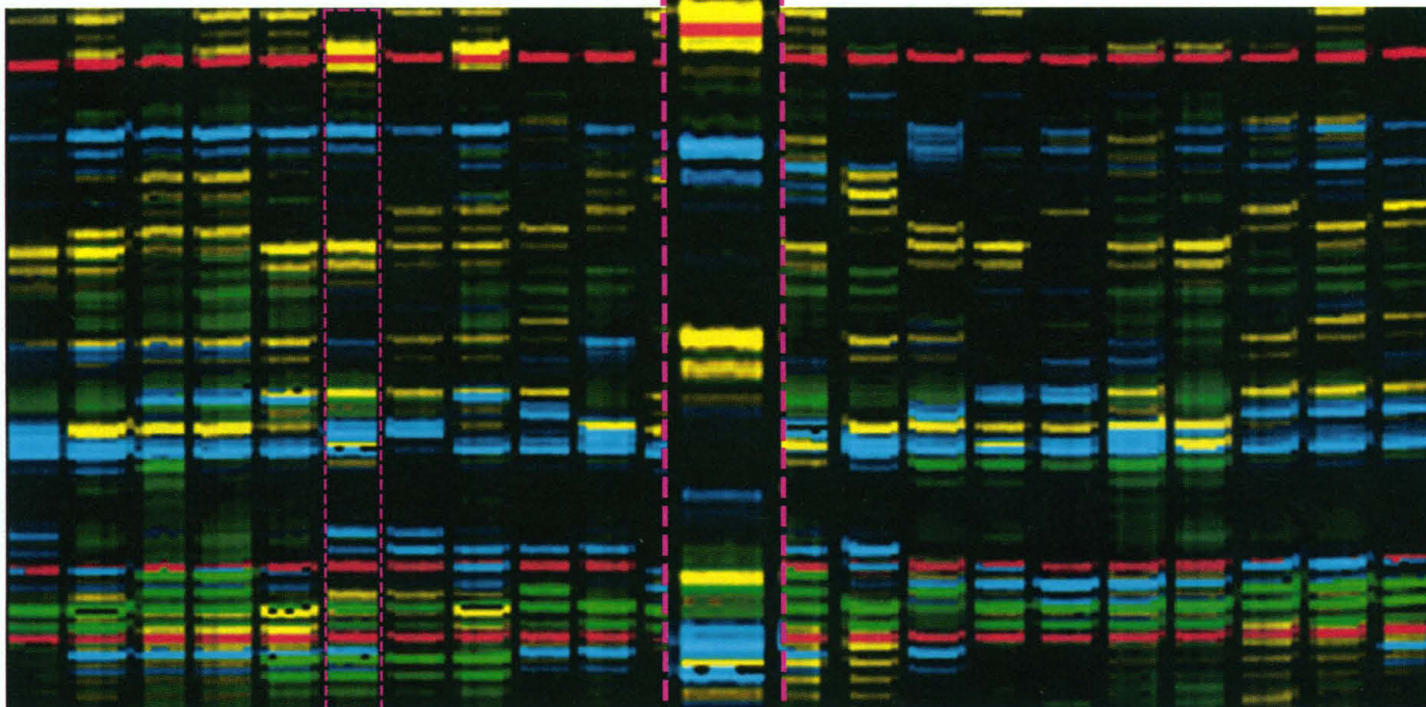
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PCR Sizing

The Complete Solution For Automated Fragment Analysis



In the race to identify genes of interest, you need a reliable way to screen samples rapidly and accurately. The model approach combines PCR-based markers such as microsatellites with Applied Biosystems' four-color fluorescent dye technology. Our easy-to-use Model 373 DNA Analysis System and GENESCAN™ 672 fragment analysis software provide accurate, automated sizing of microsatellites, including the widely used two-base repeats.

In-Lane Controls For Precise Sizing

Only our proven four-dye, one-lane method gives you the precision necessary to score small differences in PCR fragment sizes. You simply run our prelabeled size control in the same lanes with samples. Our GENESCAN software compares sample bands against this in-lane control to size PCR fragments precisely. This in-lane standard automatically controls for lane-to-lane and gel-to-gel variation.

High Throughput Accelerates Research

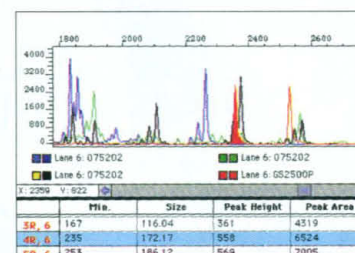
Our multicolor labeling technology also lets you combine samples to investigate many loci per lane. This unprecedented throughput can dramatically advance your research. According to one researcher, "A single project with at least 500 individuals would take years to analyze by radioactive methods, but with ...the ability to multiplex, we can do the same project in a matter of three to four months."*

Streamlined Data Handling

When you start generating 10 to 20 times more data per gel, you'll appreciate GENESCAN's unequalled analytical performance and ease of use. This Macintosh-based program automatically collects, reports and analyzes data directly from the Model 373. The digitized information is easily transferred for further analysis.

Our versatile technology also brings unsurpassed precision to fragment quantitation and sequencing. At Applied Biosystems, we're committed to providing fundamental technologies to support a full spectrum of applications for genetic analysis—now and in the future.

To receive literature on the Model 373, GENESCAN, and linkage analysis applications, call Applied Biosystems at: **Australia** (03) 808-7777, **Benelux** (0) 3465-74868, **Canada** (800) 668-6913, **France** (1) 49 90 18 00, **Germany** (0) 6150/101-0, **Italy** (02) 8912 6011, **Japan** (03) 3699-0700, **U.K.** (0925) 825650, **U.S.** (800) 345-5224.

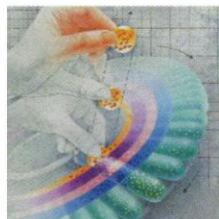


No other system offers so many options for viewing and evaluating data.

Applied Biosystems

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CENTRIFUGATION

Introducing the GS-15... a microcentrifuge with macro capabilities

A truly multipurpose centrifuge, the GS-15 combines the capabilities of a refrigerated microcentrifuge, microplate centrifuge, and general purpose centrifuge. Offering a top speed of 14,000 rpm and centrifugal force of 17,530, the new GS-15 centrifuge dramatically expands the researcher's range of applications with one compact, versatile unit.

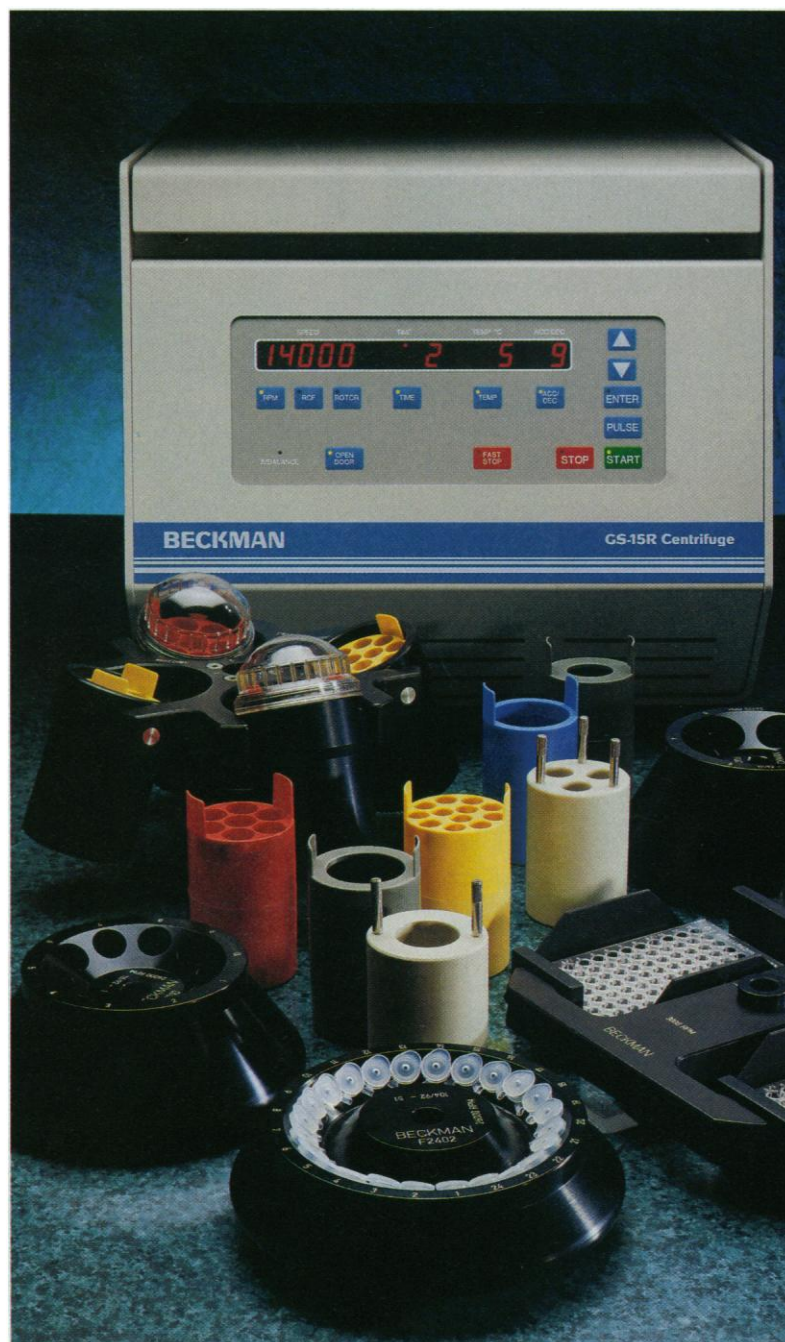
MICRO TO MACRO APPLICATIONS

You can rely on the GS-15 for microvolume separations such as pelleting, binding studies, nucleic acid work, immunoassays, protein extractions, and subcellular fractionation. Use the larger volume, multi-adapter swinging bucket rotor and the GS-15 doubles as a general purpose centrifuge. It accommodates virtually every popular tube — microvolume, 50 mL conical, 100 mL tubes, up to 180 mL bottles — expanding the centrifuge capabilities to allow pelleting cells and bacteria, clearing cell lysates and homogenates, performing gradients, cell separations in gradients, phase separations, binding studies, and filtration.

RUN PLATES, RACKS, AND MICROPLATES

A unique microplate carrier allows the GS-15 to accommodate Deep-Well plates, MiniTube racks, and up to six microplates, making this the perfect centrifuge for pelleting, immunoassays, and DNA sequencing.

The versatility of the GS-15 centrifuge is one more example of how The Beckman Plus dramatically enhances the range of your research applications. For more information about applications of centrifugation or about the GS-15, contact one of our local sales and service offices worldwide. Additionally, VWR Scientific is an authorized distributor in the U.S.



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- Optional digital display of temperature under the lid

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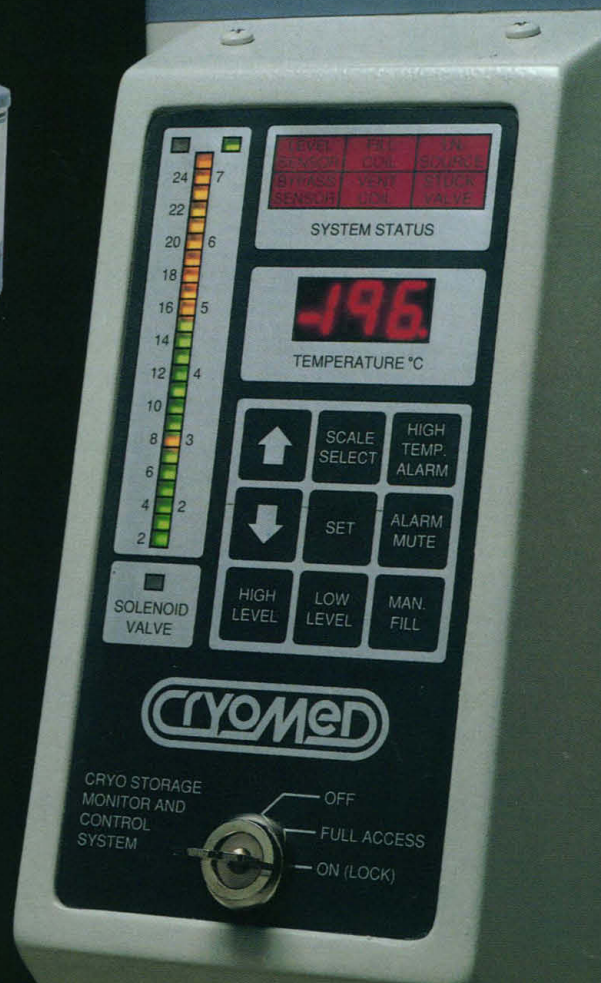
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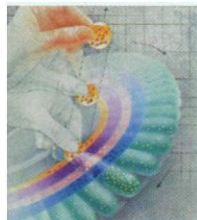


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CENTRIFUGATION

The new J2-HC stretches the limits of high-speed centrifugation

In today's environment of shrinking budgets and lab space, the new J2-HC centrifuge is an ideal fit. It generates up to 18,000 rpm and 47,900 $\times g$ for high-speed separations, but it also has a full three-liter capacity for large-volume and multiple-sample processing. Plus, the J2-HC can even perform the functions of a refrigerated microcentrifuge and a microplate centrifuge. This versatile instrument, currently unlike any other instrument on the market, performs like four centrifuges, in one.



FOUR CENTRIFUGES IN ONE

HIGH SPEED: The new J2-HC accommodates Beckman's complete line of high-speed rotors including the new unique JA-12 fixed angle, which runs 12 common 50 mL conical tubes without adapters.

HIGH CAPACITY: The new JS-4.3 swinging bucket rotor adds a new dimension to floor model capabilities. Run a range of labware, from 1.5 mL tubes to 750 mL bottles, with incredible versatility...you can choose to run 148 3 or 5 mL tubes, or three liters.

MICROCENTRIFUGE: The J2-HC is ideal for efficient processing of plasmid mini-preps. With the JA-18.1 rotor, it can spin 1.5 mL tubes at 33,260 $\times g$.

MICROPLATE: From cytotoxicity studies to cloning, the J2-HC can handle your microplate applications, accommodating up to 12 microplates or four Deep-Well plates per run.

YOUR MOST EFFICIENT CHOICE

The J2-HC produces less heat and noise, while consuming less energy, than any other manufacturer's floor model centrifuge due to its unique Friction Reduction System (FRS), which is built into all Beckman J2 Series centrifuges.

Dr. R. Rott, from the Institute of Virology at the University of Giessen, Germany, comments on the benefits of FRS: *"Beckman's FRS...considerably decreases energy requirements, positively affecting ambient temperature and supporting a concern for all of us, efficient use of energy."*



The high-speed, high-capacity J2-HC centrifuge is one more example of how The Beckman Plus adds speed, efficiency, and versatility to your research applications. For more information about applications of high-speed centrifugation or about the J2-HC, contact one of our local sales and service offices worldwide.

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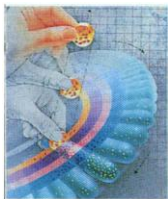
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AVANTI.™ TAKE IT FOR A SPIN AT 30,000 RPM ON YOUR LAB BENCH.



High performance, easy handling, and versatility in a compact centrifuge. That's the Avanti advantage.

The new Avanti 30 from Beckman is the ultimate centrifuge for samples in the 100 μ L to 85 mL range. With a top speed of 30,000 rpm and g -force of over $64,000 \times g$ — the highest performance numbers in its class — the Avanti 30 powers like a floor model. It handles easily through a simple control panel. And a small footprint and quiet induction drive let you park a "personal" Avanti right on the lab bench where you work, not down the hall.

SHIFT TO A HIGHER GEAR IN CENTRIFUGATION

The Avanti 30 gives you more versatility than you've ever had in a benchtop centrifuge. A choice of 13 rotors accommodates a wide range of tubes, including conical plastic tubes. The Avanti also performs as a refrigerated microfuge.

SAFETY FEATURES KEEP YOU BETWEEN THE LINES

Manufactured in an ISO 9001 environment, the Avanti 30 features a unique, flexible drive shaft that compensates for imbalances. Special diagnostics preclude operation in cases of gross imbalance and alert you of overspeed and overtemperature conditions. The Avanti's unique Bowl Rotor, tested and approved by Public Health Laboratory, Porton Down, UK, accommodates 72 microfuge tubes of various sizes and contains hazardous aerosols and breakages.

Beckman's proven record of continual innovation in centrifugation is another way the Beckman Plus helps laboratories perform more efficiently. For more information about the Avanti 30 — our latest offering in high-speed centrifugation — or the Beckman Plus, contact one of our local sales offices worldwide.

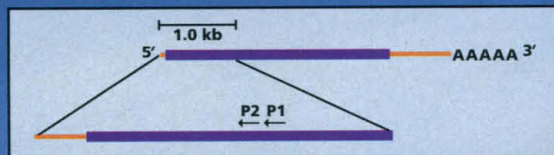
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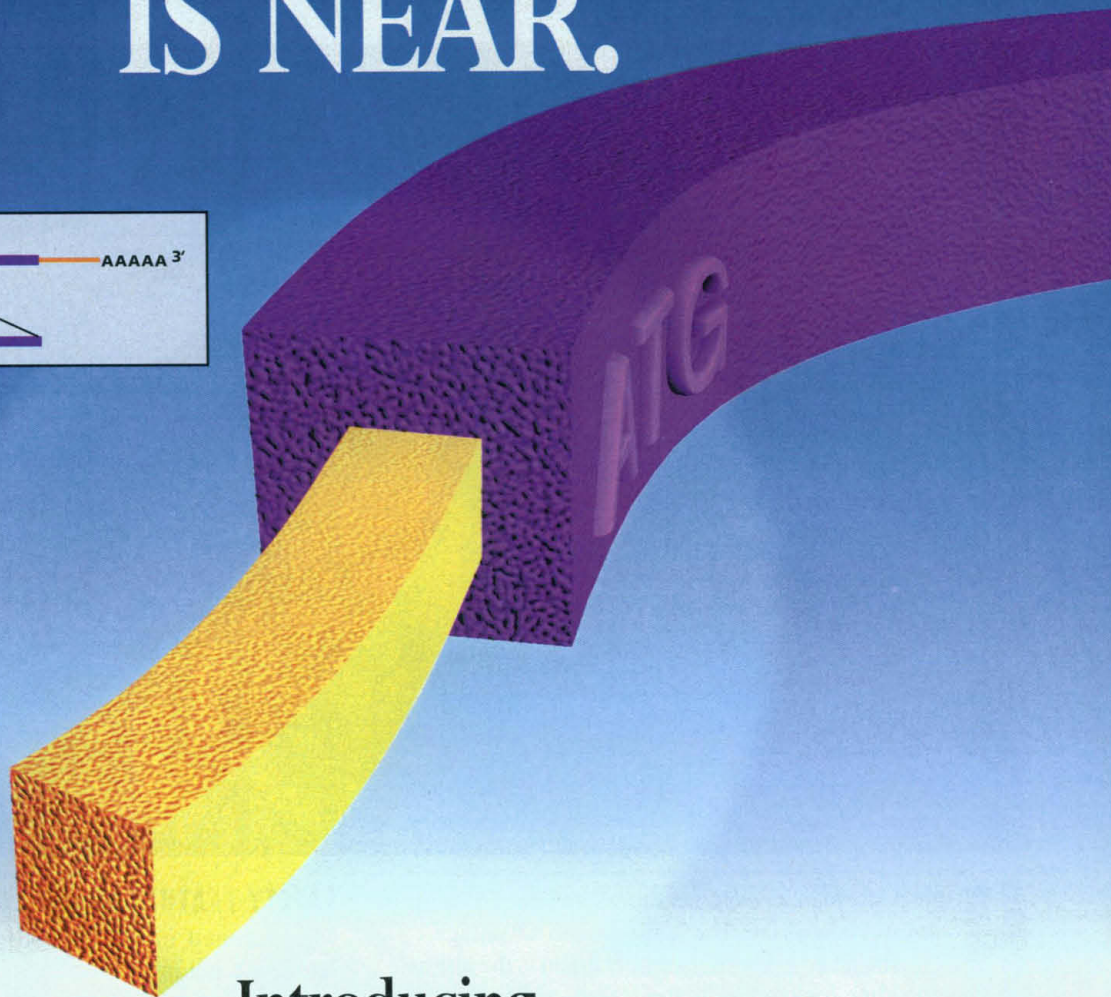
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THE 5' END IS NEAR.



Schematic diagram of the 4.7-kb human transferrin receptor gene transcript. The locations of the nested gene-specific primers, P1 and P2, are indicated.



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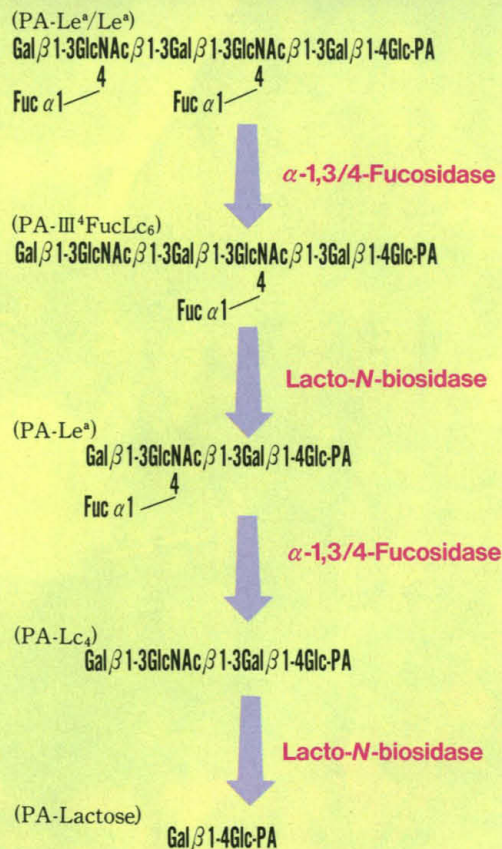
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1) Sano, M. *et al.* (1992) *Proc. Natl. Acad. Sci. USA* **89**, 8512-8516.



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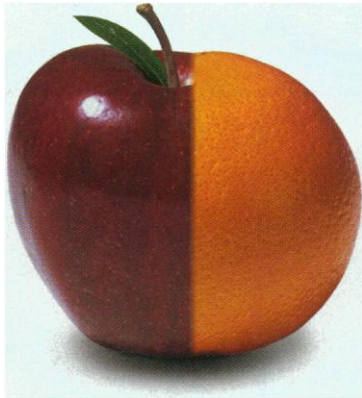


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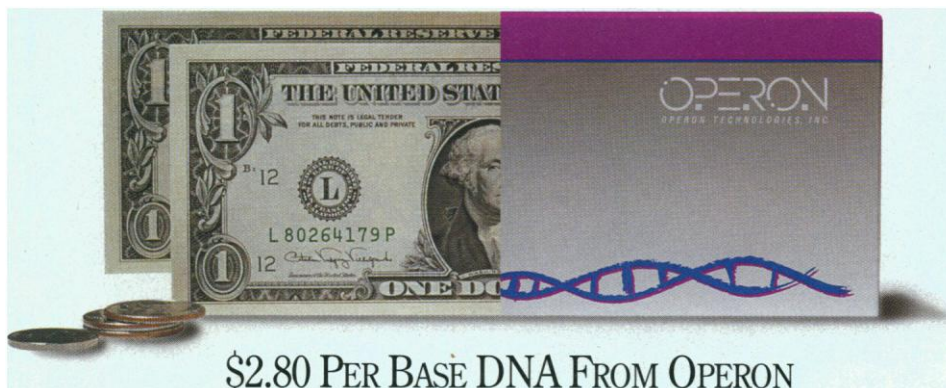
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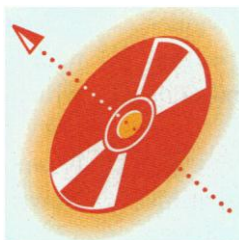
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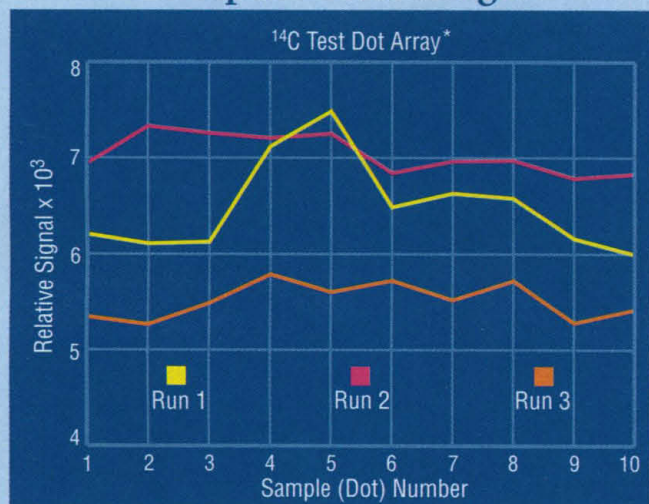
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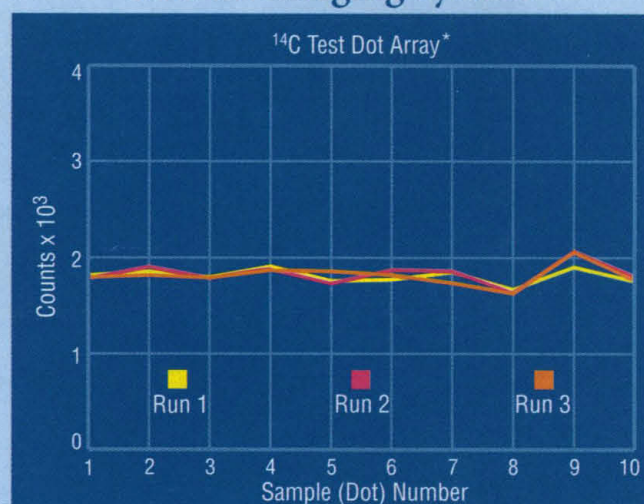
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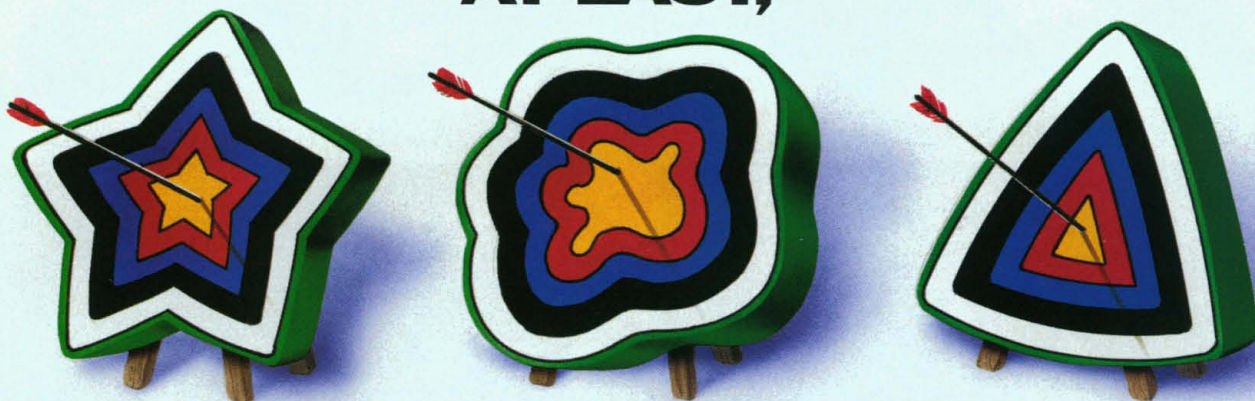
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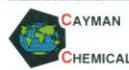
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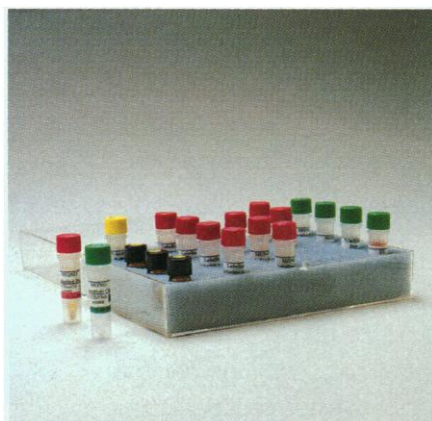


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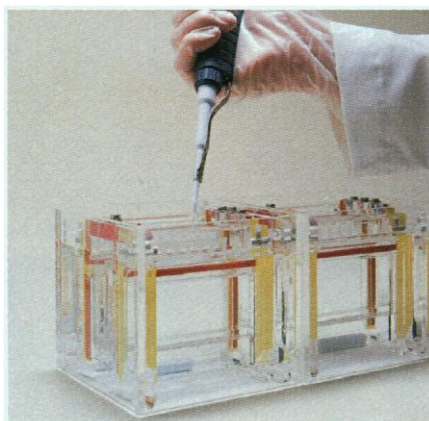
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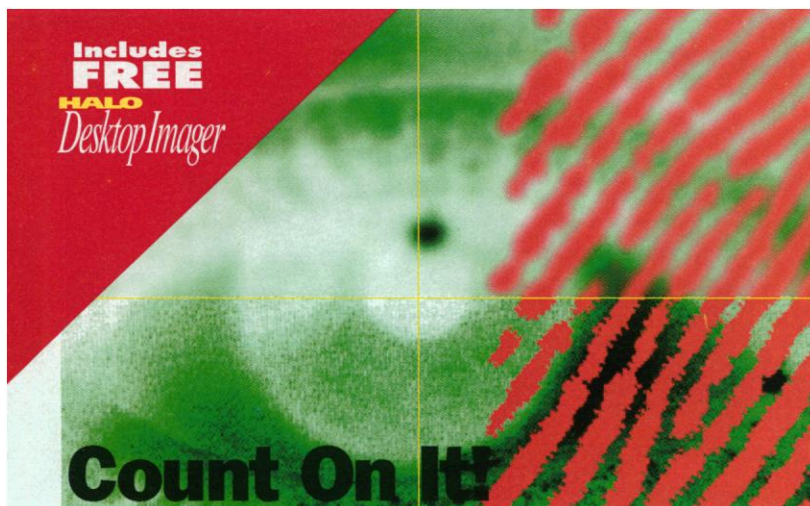


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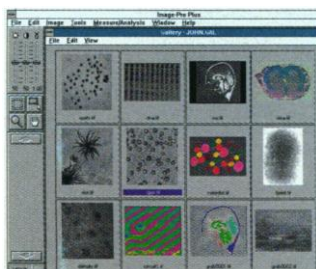


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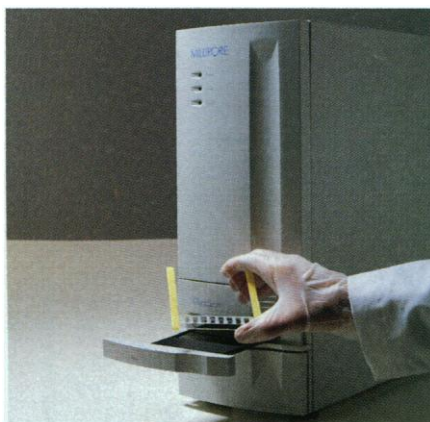
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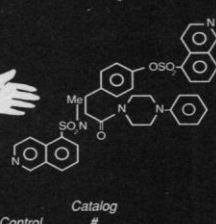
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ARCD-101	Farnesyl-PP, "cold"	100μg	----	----	109
ART-324	Farnesyl-PP, [1- ³ H]	250μCi	610	650	305
ARCD-102	Geranylgeranyl-PP, "cold"	100μg	----	----	109
ART-348	Geranylgeranyl-PP, [1- ³ H]	250μCi	910	630	315
ARC-541	Isopentenyl-PP, [1- ¹⁴ C]	50μCi	905	----	452
ARCD-104	Isopentenyl-PP, "cold"	100μg	----	----	109
ART-377	Isopentenyl-PP, [1- ³ H]	50μCi	----	----	439
ART-427	Mevalonic acid, R-[5- ³ H]	1mCi	----	950	475
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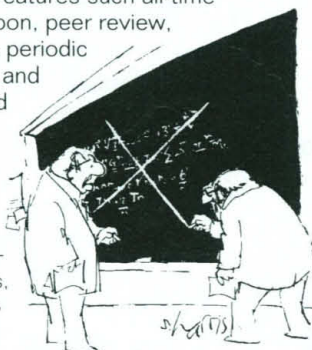
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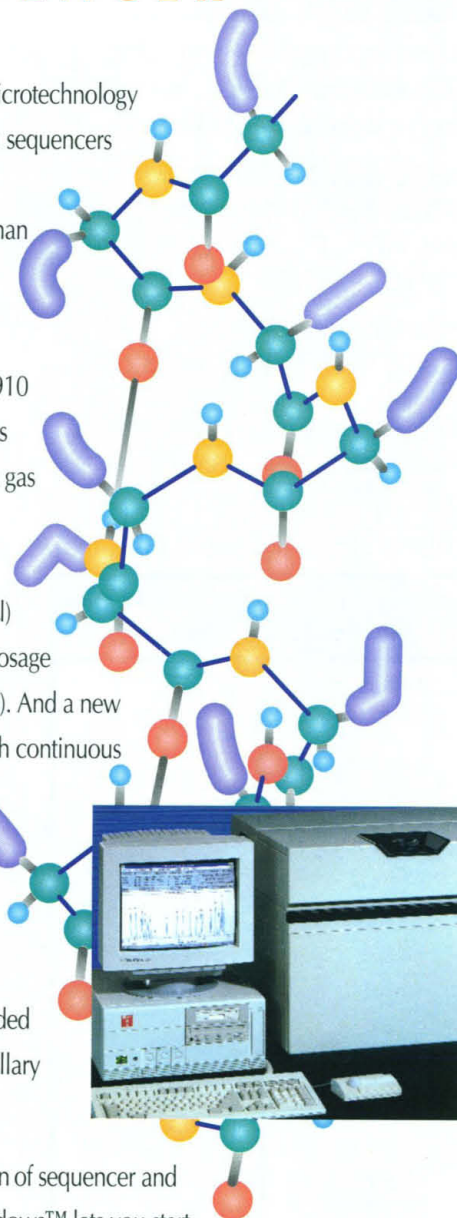
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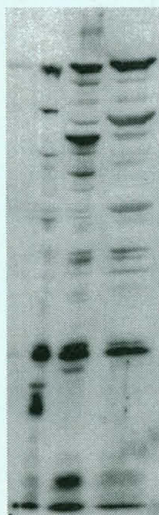
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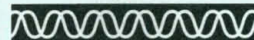
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