American Association for the Advancement of Science

SCIENCE

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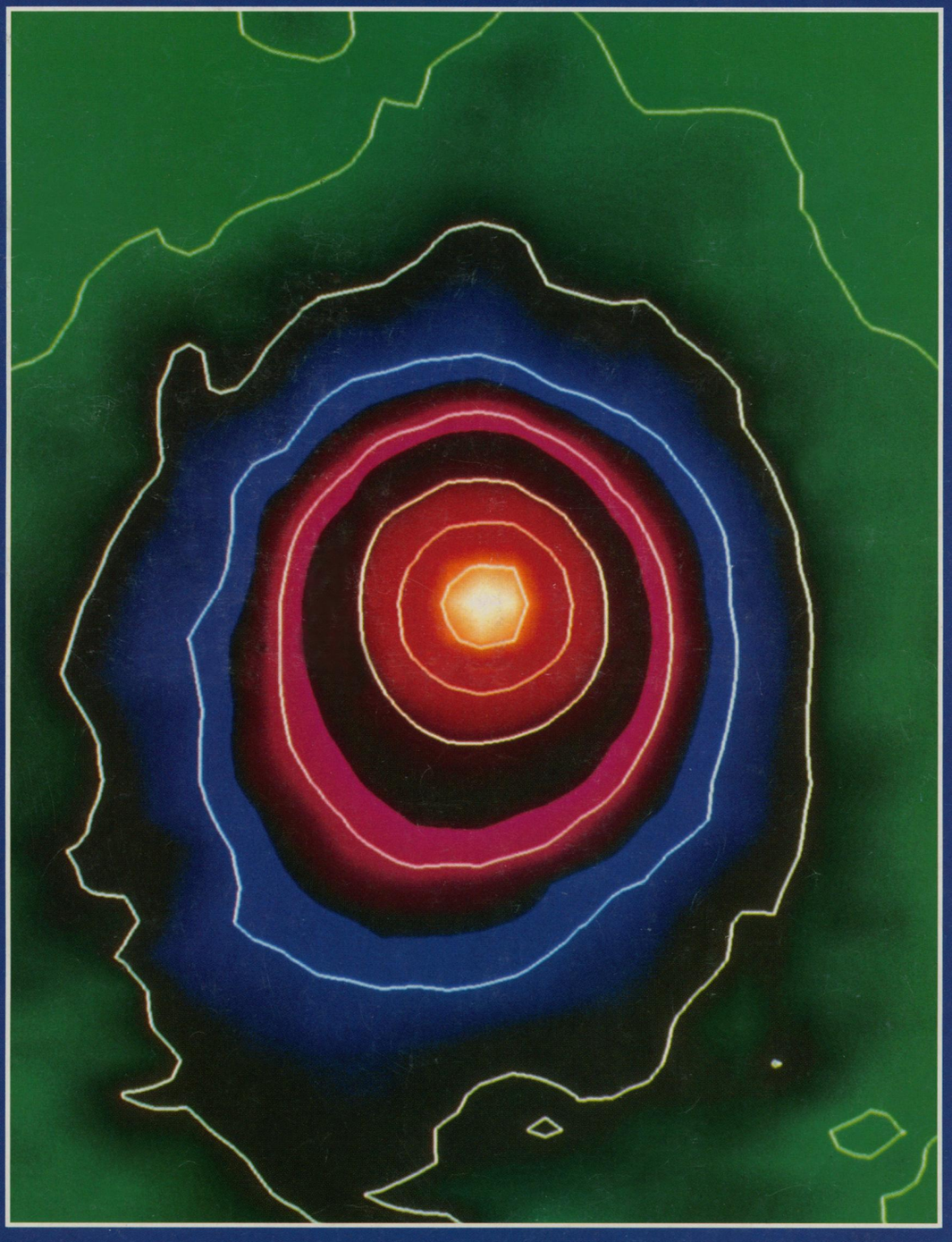
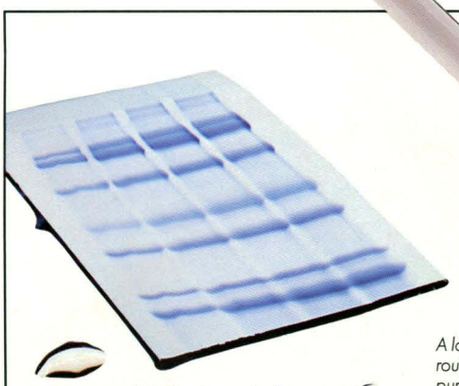
Vol. 253 ■ Pages 941–1064

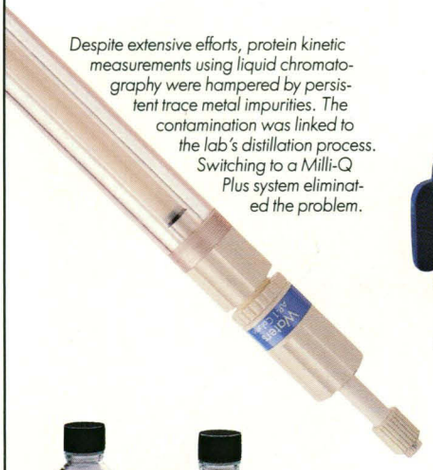


Relying On Distillation Could Leave Your Research Dead In The Water.

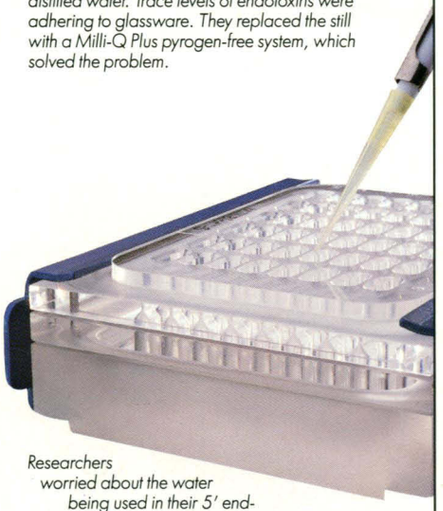


In one research facility, house distillation lines suffered from lime build-up. Phosphates were used to clean the system and got into the water used to make polyacrylamide gels, preventing the gels from running. The problem was alleviated when the lab switched to a Milli-Q Plus system.

A lab doing routine protein purification for HPLC couldn't account for protein contamination until they checked their double-distilled water. Trace levels of endotoxins were adhering to glassware. They replaced the still with a Milli-Q Plus pyrogen-free system, which solved the problem.

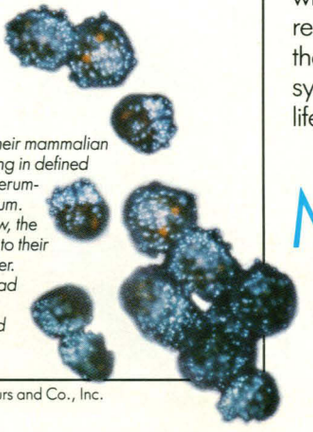


Despite extensive efforts, protein kinetic measurements using liquid chromatography were hampered by persistent trace metal impurities. The contamination was linked to the lab's distillation process. Switching to a Milli-Q Plus system eliminated the problem.



Researchers worried about the water being used in their 5' end-labelling protocols. Any contamination in the buffer, when diluting the DNA, or from freeze-dried Gamma^{32}P ATP could kill active enzymes in the T4 polynucleotide. A Milli-Q Plus system increased the viability of these enzymes.

Waterborne endotoxins and pyrogens were contaminating reagents manufactured by an in-house supplier. The contaminated reagents, in turn, delayed the work of four research groups who relied on the supplier for reagents and pre-cast gels. A pyrogen-free Milli-Q Plus system got things back on schedule.



Researchers found their mammalian cells stopped growing in defined medium, but not in serum-supplemented medium. After thorough review, the problem was linked to their double-distilled water. Milli-Q Plus water had been used for the serum-supplemented medium.

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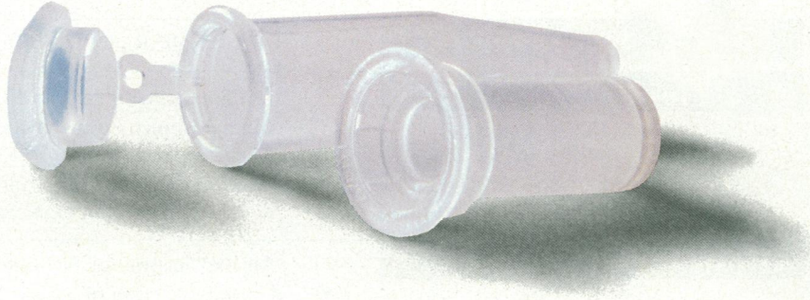

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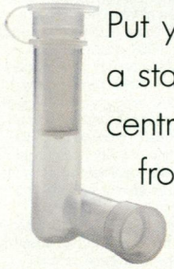

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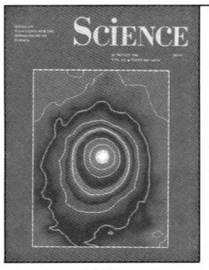
■ The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objectives are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, to advance education in science, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.



COVER This image of the enormous hydrogen coma surrounding Comet Halley was obtained by the Pioneer Venus Orbiter over a 5-day period in early February 1986. The image was constructed from over 9000 data points that were obtained as the spin axis of the rotating spacecraft was held fixed and the comet drifted across the instrument field of view. The false-color image, embellished by white constant-brightness contours, shows the Lyman-α brightness distribution at 1216 angstroms. The spacecraft is now headed toward a fiery death in the upper atmosphere of Venus in the fall of 1992. See page 1008. [Image processing by A. I. F. Stewart and M. R. Combi]

Reports

Technical Comments

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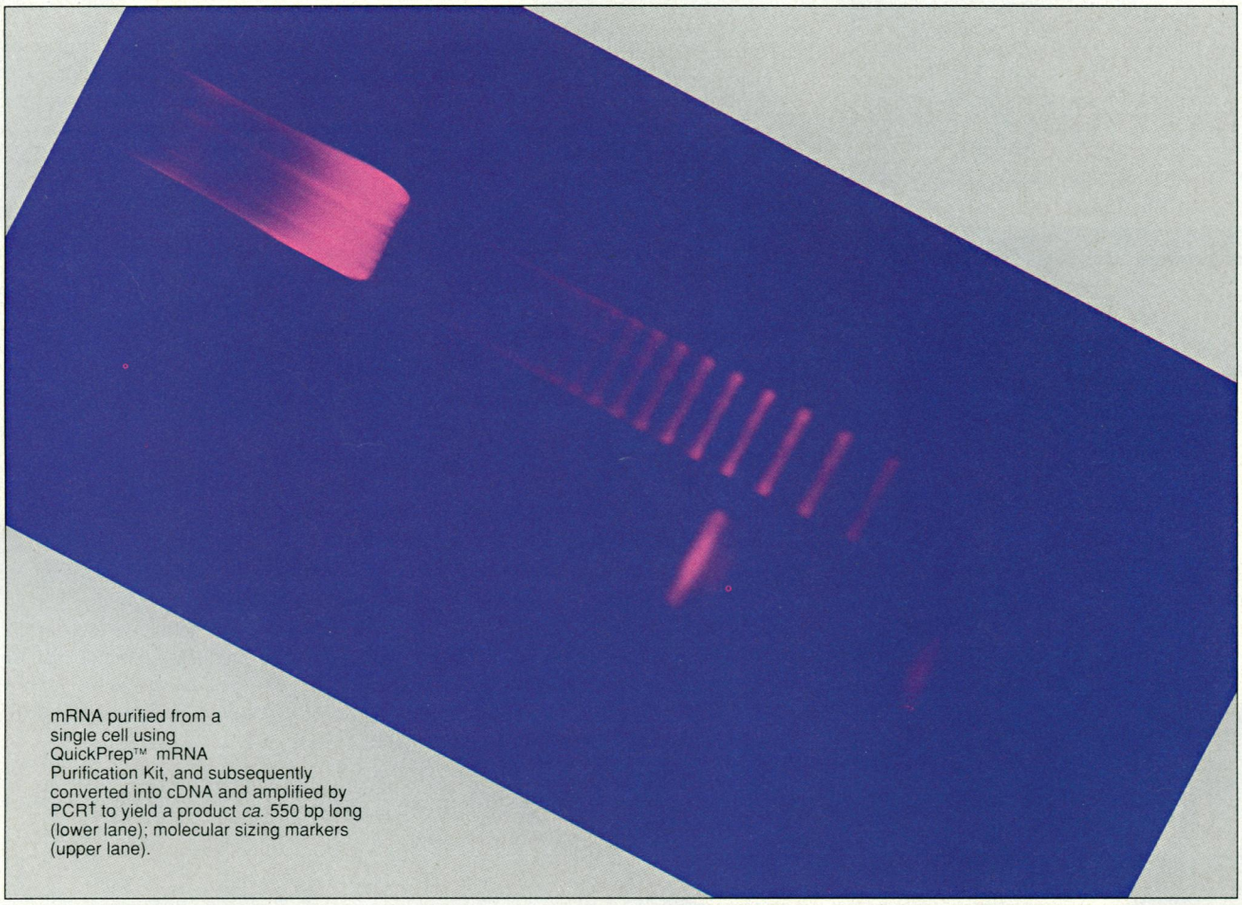
Book Reviews

P H A R M A C I A L K B B I O T E C H N O L O G Y



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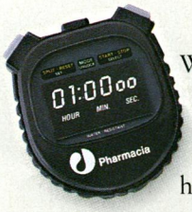

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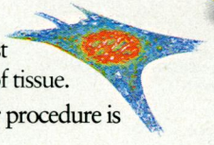

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This Week in
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Fractured sea floor

The longest chain of mountains and the most active network of volcanoes in the solar system are found beneath the sea on the ridges that separate Earth's crustal plates. Geologic observations reviewed by Macdonald *et al.* (p. 986) reveal a hierarchy of segmentation and cracking along the ridges, from large long-lasting fractures to small transient discontinuities. Molten rock rising along the ridge system creates new ocean floor and promotes the formation of cracks and segments. The cracks, in turn, influence undersea volcanic activity. Although the data are from diverse sources, researchers are beginning to reach agreement on a unified picture of the life cycle of these mid-ocean ridges.

Gravity's ring arcs

Among the more striking images returned by the Voyager spacecraft were those of Neptune's ring arcs. How these objects formed has been a puzzle, with many theories offered but none chosen. In a re-analysis of the Voyager data (p. 995), Porco finds that Neptune's innermost moon Galatea may act as a shepherd to sequester the ring particles into arcs. The model provides an explanation for several of the arcs' properties; moreover, re-examination of the data revealed new arcs that lend support to Porco's explanation.

Right-angle DNA bend

The catabolite gene activator protein, or CAP, bends DNA by 90°. Schultz *et al.* (p. 1001) report the results of a high-resolution crystal structure of CAP complexed with a 30–base pair DNA sequence. The bend results from two 40° kinks, one on each side of the dyad axis. The authors propose a possible mechanism in which CAP may activate transcription by producing upstream contacts with RNA polymerase.

Halley hydrogen

During its last visit, Comet Halley came close enough to Venus to have its picture taken in ultraviolet light by instruments aboard the Pioneer-Venus spacecraft (cover). Energetic hydrogen atoms, produced by dissociation of water vapor from Halley's nucleus, emit light at the Lyman alpha wavelength of 1216 ångstroms. Smyth *et al.* took more than 9000 data points from the Pioneer spectra and constructed an image of Halley's hydrogen coma (p. 1008). The image was compared with a physical model of the comet's hydrogen cloud, from which the authors conclude that emission of water vapor from the core may be 30% higher than previously thought.

Midge thermometer

The distributions of fossil midges has been used to investigate the course of climatic events at the end of the last deglaciation in Atlantic Canada. The relatively warm Allerød event (before 11,000 years ago) was interrupted for about 1,000 years by the cooler Younger Dryas event. This climatic reversion is well documented in Europe, but more evidence has been needed to verify whether these events occurred in Atlantic Canada. The temperature record constructed by Walker *et al.* (p. 1010) based on the distribution of cold-water and temperate-water midges confirms the inference from pollen studies that these paleoclimate events occurred on both sides of the Atlantic.

Text retrieval

Electronic versions of large texts such as encyclopedias, newspapers, and instruction manuals are of little use without efficient ways to search and retrieve them. Salton (p. 974) reviews the technology of automatic text storage, manipulation, and retrieval. In addition to advances in text-matching methods, the author discusses new approaches to automatic indexing and text analysis as well as methods drawn from linguistics and artificial intelligence. In a companion report, Salton and Buckley (p. 1012) consider the performance of "flexible text matching" for searching large text collections.

The Wright shift

One of the most comprehensive theories of adaptive evolution, Wright's shifting balance theory, has been demonstrated experimentally. In the early 1930s Wright proposed how a well-adapted species could move to an even better adapted state even if that process required passing through a less fit intermediate. He argued that when partially isolated subpopulations are present, favorable gene combinations may arise in one of them that could then spread through the entire population. Wade and Goodnight (p. 1015) used the number of progeny as a measure of average fitness in subpopulations of flour beetles; the more fit progeny contributed more members to the next breeding generation. After 24 generations, mean productivity had increased significantly compared with control populations. Crow (p. 973) discusses the implications of this demonstration that the Wright process can indeed work.

Calcium control

A single amino acid site in subunits of glutamate receptors can control the flow of calcium ions through the receptor. Hume *et al.* (p. 1028) cloned a family of genes encoding the non-NMDA (*N*-methyl-D-aspartate) glutamate receptors. Some combinations of subunits showed high calcium permeability while others did not. Mutation of a particular glutamine to arginine, or vice versa, altered the rectifying properties and calcium permeability of these receptors.

■ PHILLIP SZUROMI AND DAVID VOSS

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PROGRAM
Monday, October 28, 1991

SESSION I
E. J. COREY, Presiding Scientific Advisory Board Member

E. L. WEHNER, Welcoming of Guests
E. J. COREY, Introductory Remarks

ARACHIDONIC ACID METABOLISM: FROM CHEMISTRY TO HEALTH CARE
BENGT SAMUELSSON

NEW OPPORTUNITIES AT THE INTERFACE OF CHEMISTRY AND BIOLOGY
PETER G. SCHULTZ

SESSION II
WILLIAM N. LIPSCOMB, Presiding Chairman

INTUITIVE AND COMPUTER-ASSISTED APPROACHES TO THE DESIGN OF CONFORMATIONALLY RESTRAINED PEPTIDES AND THEIR MIMICS
PAUL A. BARTLETT

INHIBITOR COMPLEXES OF HIV PROTEASE-TARGET FOR DRUG DESIGN
ALEXANDER WLODAWER

IMMUNOPHILIN-LIGAND COMPLEXES AS PROBES OF THE BLACK BOX OF SIGNAL TRANSDUCTION
STUART L. SCHREIBER

Tuesday, October 29, 1991

SESSION III
PETER G. SCHULTZ, Presiding Chairman

THE PHOSPHORYLATION AND DEPHOSPHORYLATION OF PROTEINS: A KEY PROCESS IN BIOLOGICAL SIGNALING
EDWIN G. KREBS

MAN-DESIGNED BLEOMYCINS BASED ON THE ANTICANCER MECHANISM OF NATURAL BLEOMYCINS
MASAJI OHNO

DESIGN, SYNTHESIS AND EVALUATION OF FUNCTIONAL ANALOGS OF CC-1065 AND DUOCARMYCIN A
DALE L. BOGER

SESSION IV
PAUL A. BARTLETT, Presiding Chairman

PRINCIPLES OF ENZYME REGULATION DERIVED FROM STUDIES ON GLUTAMINE SYNTHETASE
EARL R. STADTMAN

STUDIES ON CARBOHYDRATE METABOLISM: A MULTIDISCIPLINARY APPROACH
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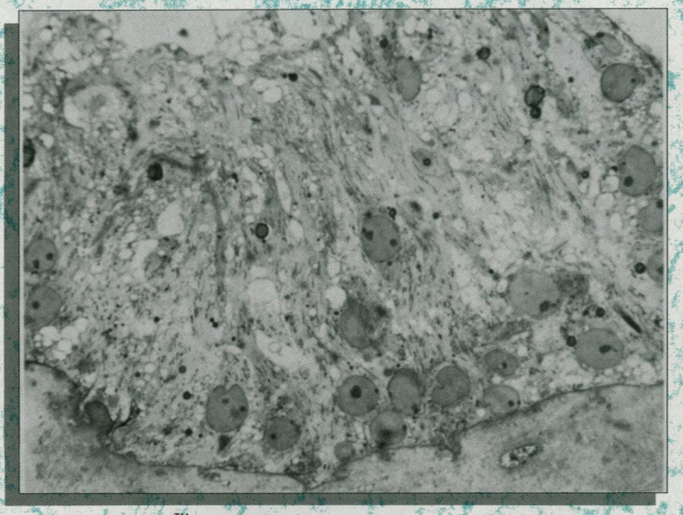

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