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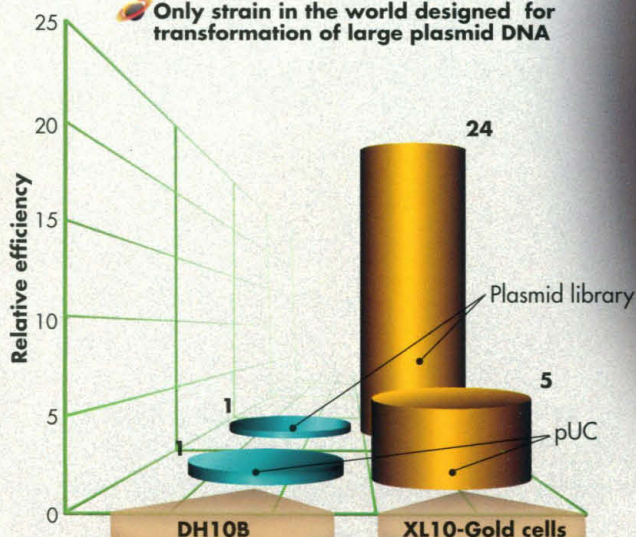
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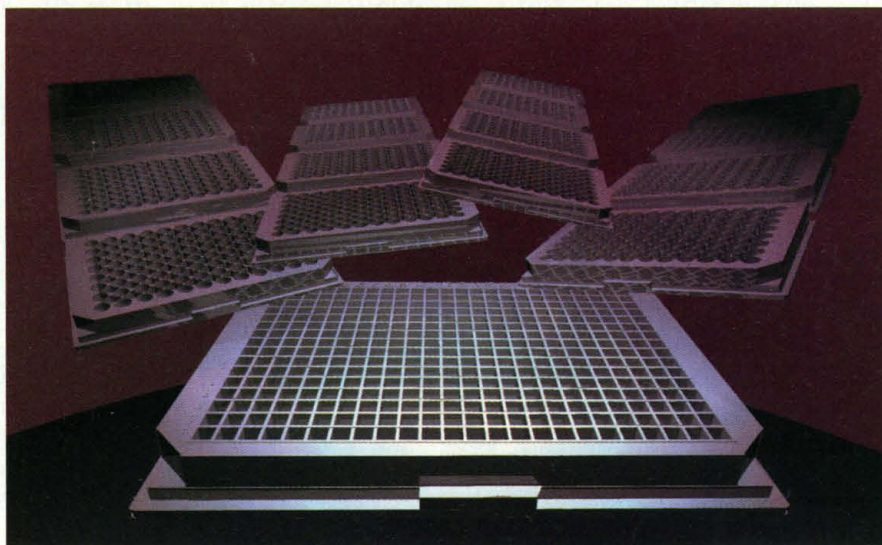


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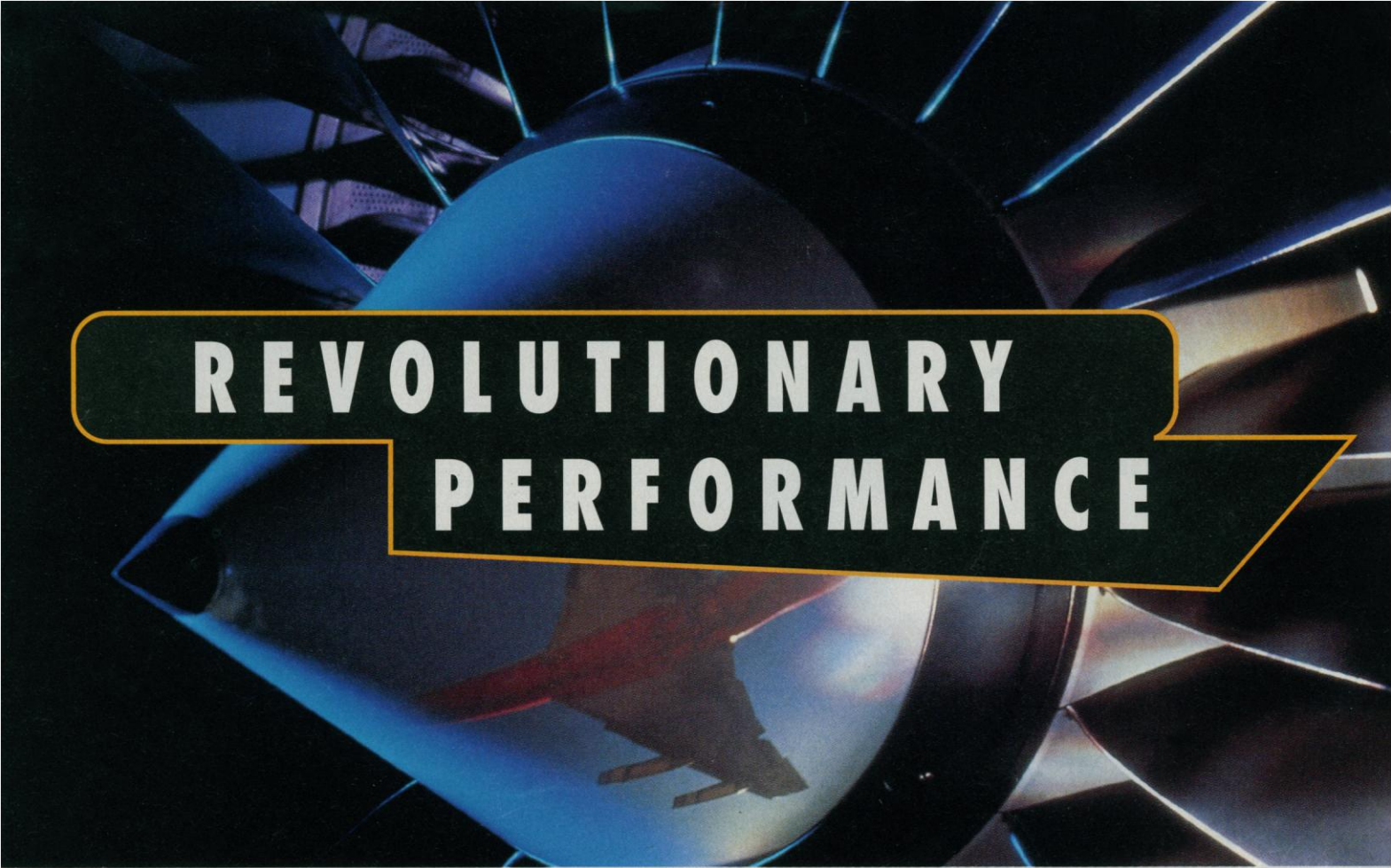
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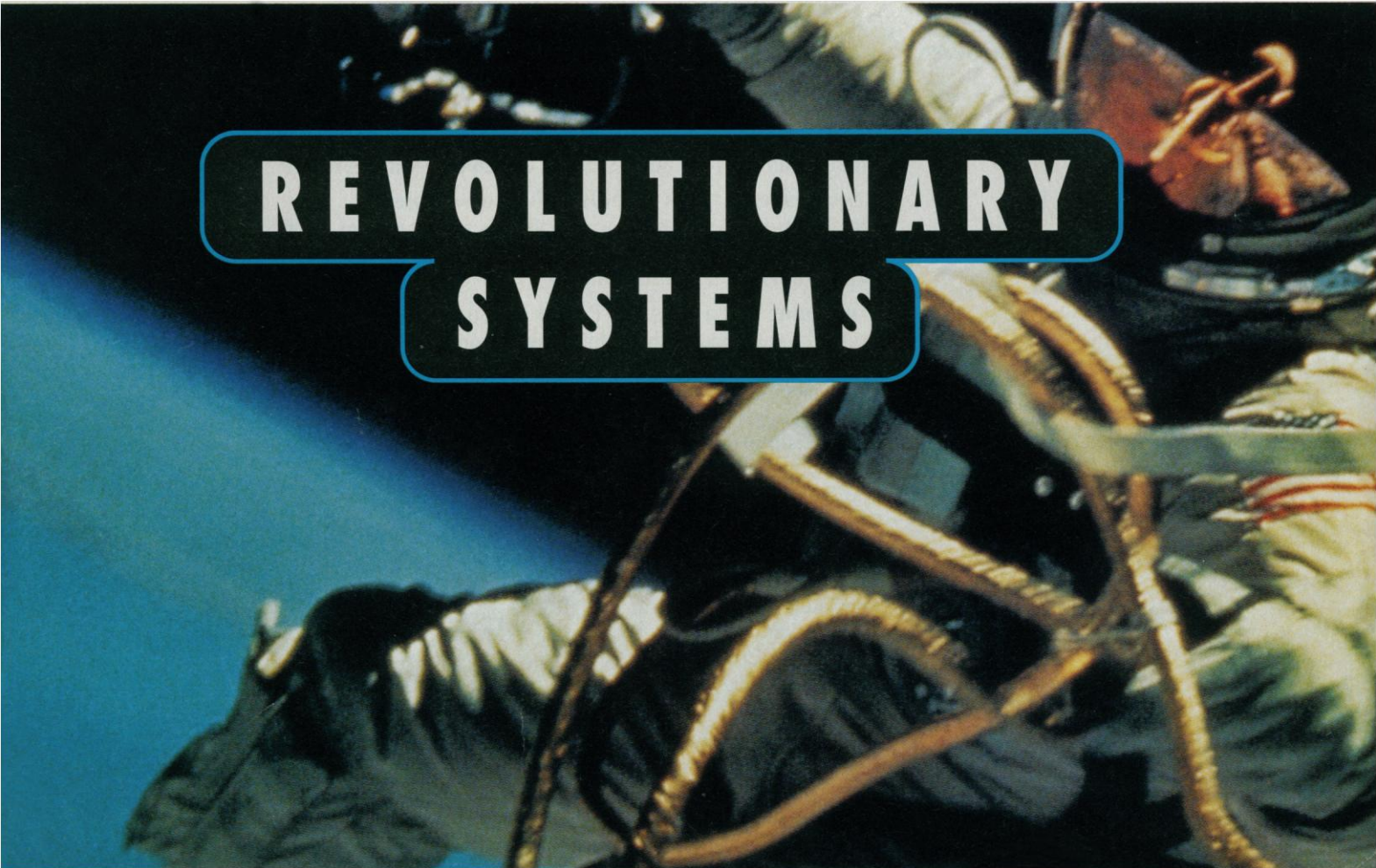
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A close-up, low-angle shot of a jet engine's compressor section. The image shows several curved, metallic blades arranged in a circular pattern, reflecting light. The overall color palette is dominated by dark blues and greys, with some highlights on the metal surfaces.

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A photograph of an astronaut in a white spacesuit floating in space. The astronaut is positioned diagonally across the frame, with their arms extended. The background is a deep blue, suggesting the sky or the void of space. Various mechanical components and cables are visible in the foreground, partially obscuring the astronaut.

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JS 24.15 rotor soaring up to 110,000 × g



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Linking development and evolution

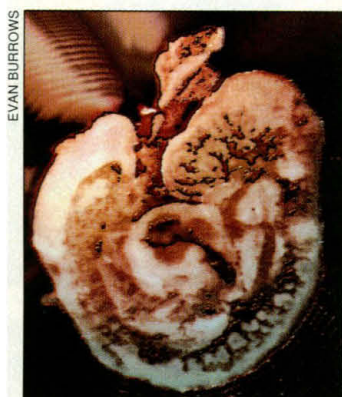
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Angiogenic balancing act

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COVER

Colony of *Candida albicans* carrying a deletion of the *TUP1* gene. This pathogenic yeast normally switches between single-cell and filamentous states, and both forms are found in its infected mammalian hosts. The *tup1* deletion mutant strain grows exclusively as fila-

ments, as seen here on a plate of low-nutrient medium (the width of the field is ~200 micrometers). See page 105 and the related Perspective on page 52. [Image: Burkhard R. Braun and Alexander D. Johnson]



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Evolution of a Strain of CJD That Induces BSE-Like Plaques

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Control of Filament Formation in Candida albicans by the Transcriptional Repressor TUP1

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Positive Effects of Combined Antiretroviral Therapy on CD4⁺ T Cell Homeostasis and Function in Advanced HIV Disease

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Chemical Coupling Between Atmospheric Ozone and Particulate Matter

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Double bonds by bismuth atoms



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In a pickle

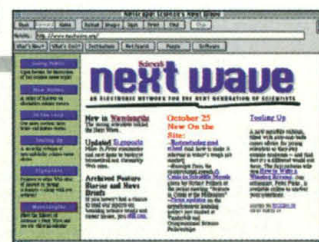
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Covered under U.S. Patent 5,487,993 and corresponding foreign patents. Other patents pending (assigned to Memorial Sloan-Kettering and licensed to Invitrogen).

THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Sister system

Studies of very young stars can provide clues to the origin of our sun and solar system. The closest well-studied region, about 150 parsecs away, contains large dark clouds of cold hydrogen and helium and is an x-ray source. Kastner *et al.* (p. 67) found that a much closer system containing the young sunlike star TW Hya and several other young stars, but lacking dark clouds, is a strong x-ray source and is about 20 million years old. Molecules of CO and HCN orbit the stars in a solar-system-like disk.

Disappearing act

Not all of the current-carrying electrons in a superconductor are in the electron-paired Bose condensate. At finite temperatures, some of these electrons are in quasi-particle (QP) excited states, and their dynamics can reveal much about the superconducting state. Because QPs respond strongly to temperature gradients, Krishana *et al.* (p. 83; see the Perspective by Lee, p. 50) studied the thermal conductivity of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$ using a bridge-balancing method to measure thermal gradients. An anomalous plateau behavior at low temperatures (near 20 kelvin) was found, which they suggest could be an abrupt phase transition of the superconducting condensate to a superconducting state in which the QP heat current vanishes.

Bismuth double bonds

Double bonds between nonmetals are seen for the lighter main group elements of the periodic table, but for heavier elements, overlap between the atomic p -orbitals becomes increasingly difficult and destabilizes the formation of the molecular π orbitals. Tokitoh *et al.* (p. 78) show that a double bond between two bismuth atoms, a sixth row ele-

Ozone versus particulates

Ozone and fine airborne particles are the focus of new standards recently proposed by the United States Environmental Protection Agency, and emissions of volatile organic compounds (VOCs) and nitrogen oxides (NO_x) affect the formation of both pollutants. Meng *et al.* (p. 116) used a three-dimensional model of the metropolitan Los Angeles air basin, which takes into account a large set of gas-phase and aerosol species and their interactions, to study pollution-reduction strategies. Controlling VOC and NO_x emissions reduced ozone formation but had much less effect on particulates because of the effects of chemical coupling with other precursor species.

ment, can be stabilized in a highly sterically crowded compound. Relativistic electronic effects may be important for forming such a bond.

Quantum dot spectra

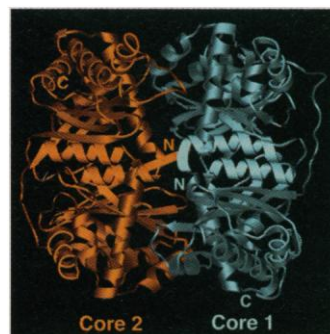
In quantum dots (QDs), small structure sizes or applied potentials or both confine and localize electrons. Gammon *et al.* (p. 85) have developed a technique that allows optical and nuclear magnetic resonance spectra to be recorded from semiconductor QDs with a lateral resolution of 10 nanometers. Such measurements can provide insights into the effects of local strain and composition.

Migration window

The first migration of people to North America from Asia evidently occurred at the end of the last glaciation when sea level was much lower. Accurate local sea-level histories are necessary to track likely migration routes. Josenhans *et al.* (p. 71) used detailed bathymetry, seismic data, cores, and radiocarbon dates to reconstruct the sea-level history of the continental shelf of British Columbia. Sea level rose rapidly by up to 5 centimeters per year during the time of early occupation, and the shelf edge was available for human migration from about 14,500 to 10,000 years ago.

Cytochrome bc_1 complex

An essential part of the respiration chain is the mitochondrial cytochrome bc_1 complex. Xia *et al.* (p. 60) crystallized this complex and were able to construct atomic models of several of its protein components from x-ray



studies. The four iron centers and two inhibitor binding sites were located, and other aspects of the structure could be interpreted with respect to physiological data.

More than just prions at work

The reports of a human variant of bovine spongiform encephalopathy (BSE) has made the understanding of the transmission of these agents even more imperative. Prions are protein agents with a protease-resistant conformation that propagates by inducing abnormal conformational changes in the normal protein and are suspected to cause diseases such as BSE and Creutzfeldt-Jakob disease (CJD).

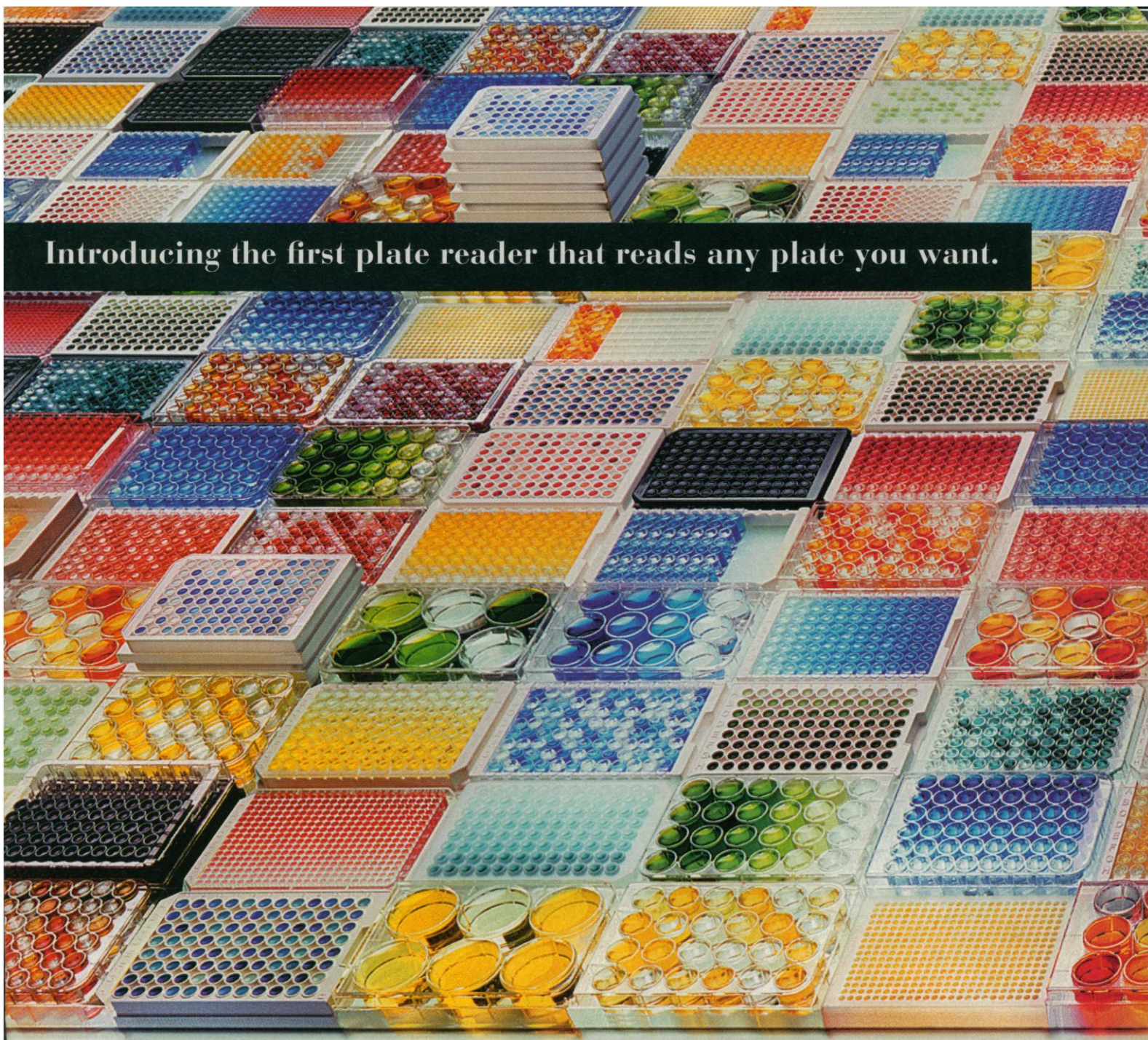
Manuelidis *et al.* (p. 94) found that, after numerous serial passages of a strain of CJD in guinea pigs and Syrian hamsters, a strain capable of inducing a disease in rats similar to BSE was observed. Disease pathology was seen in the absence of the protease-resistant form of the prion protein, which suggests that other features may be important for inducing disease.

Recycling litter

What effect does leaf litter from streamside vegetation have on aquatic ecosystems? Wallace *et al.* (p. 102) excluded detritus for 3 years from a long stretch of a stream and found that for habitats composed of cobble, pebble, and gravel substrate, the effects were dramatic. The abundance and biomass of invertebrates, from detritivores to predators, declined greatly. Removal of detritus had no effect on the inhabitants of moss-covered bedrock, illustrating the use of different energy sources by neighboring in-stream invertebrate assemblages.

Downstream effects of rapamycin

The mammalian target of the immunosuppressant rapamycin (mTOR) is a member of an intriguing group of proteins that function in the cell division cycle and DNA repair. The mTOR molecule and related proteins are similar to phosphoinositide kinases, but whether their physiological targets are phosphoinositides or proteins has been unclear. Brunn *et al.* (p. 99) present evidence that mTOR functions as a protein kinase to phosphorylate the eukaryotic initiation factor (eIF)-4E-binding protein PHAS-1. PHAS-1 inhibits translation initiation by binding to eIF-4E, and this binding is inhibited when PHAS-1 is phosphorylated by mTOR.



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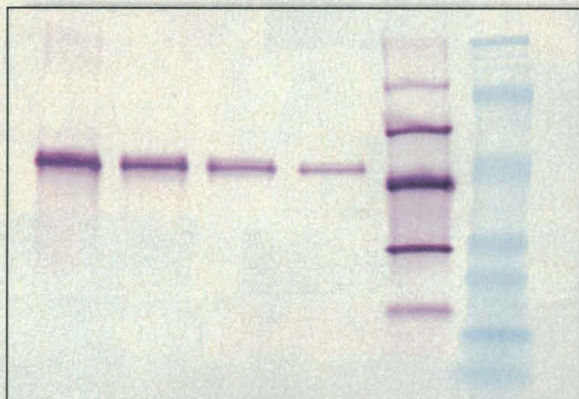
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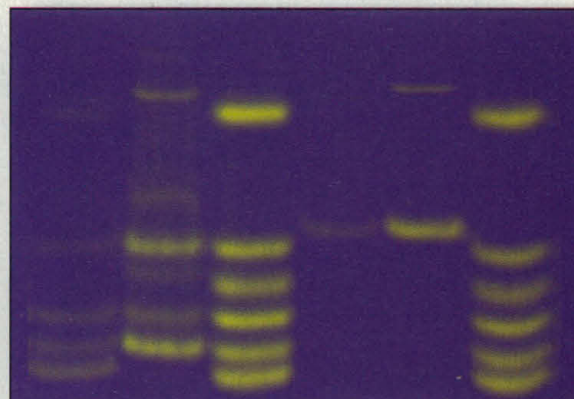


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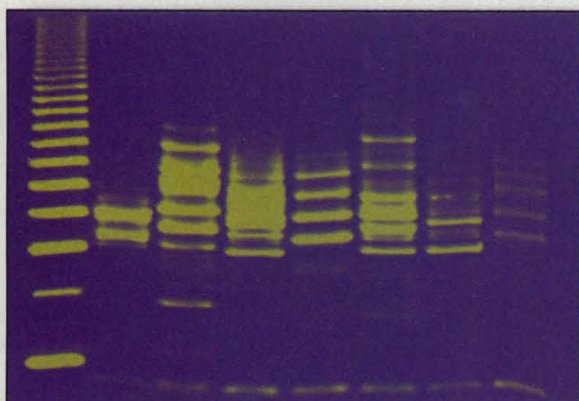
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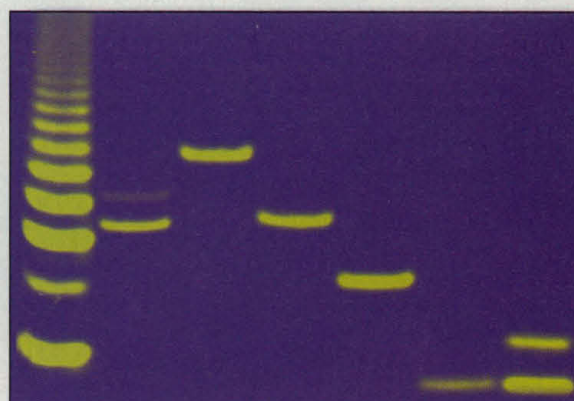
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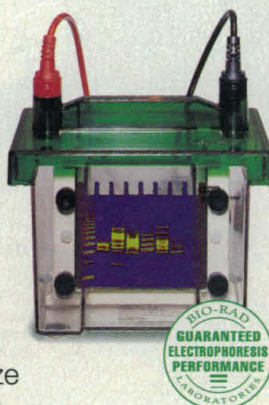


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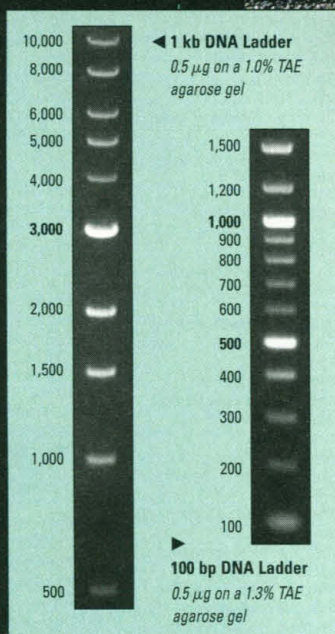
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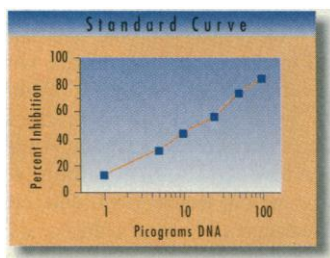
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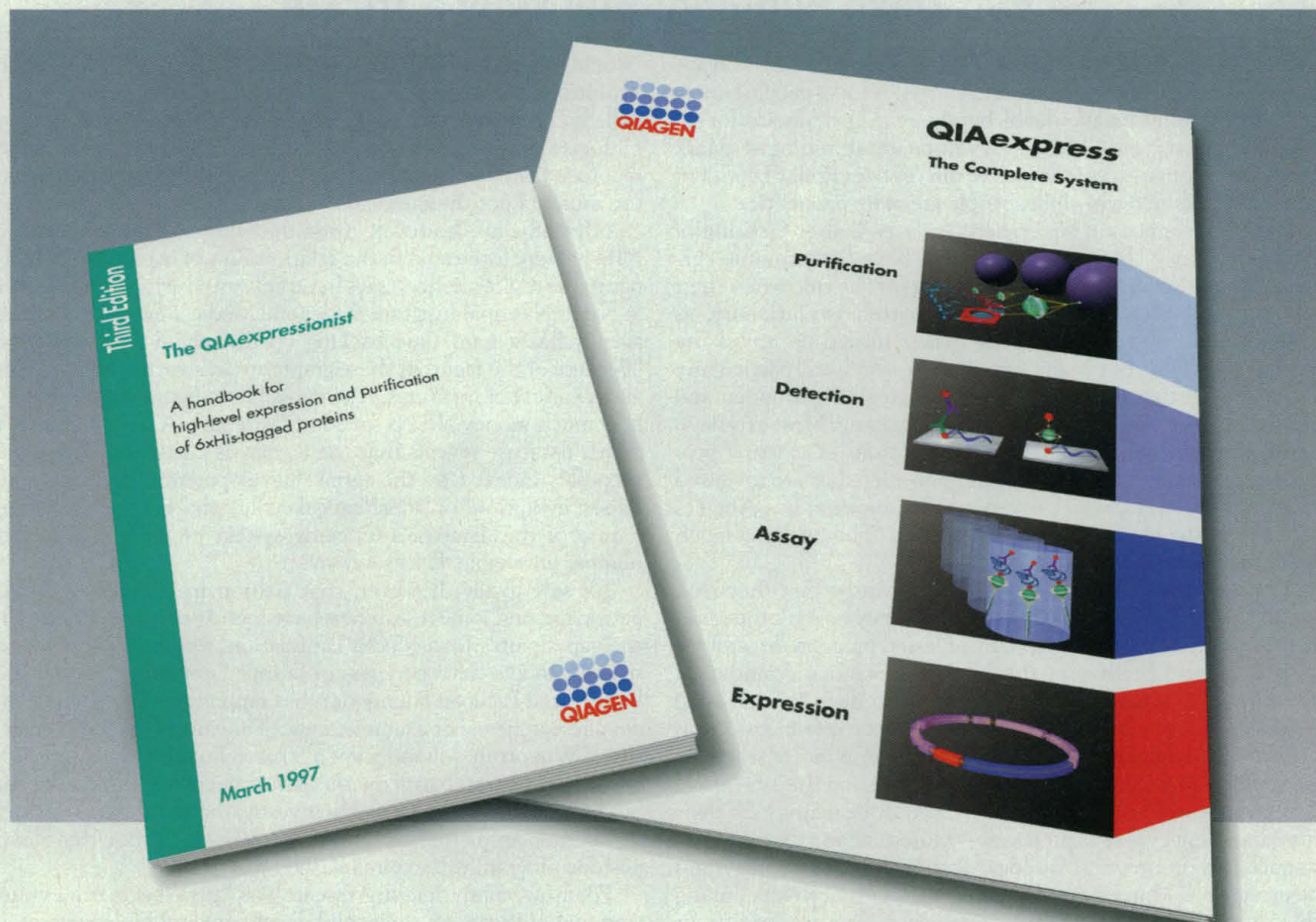
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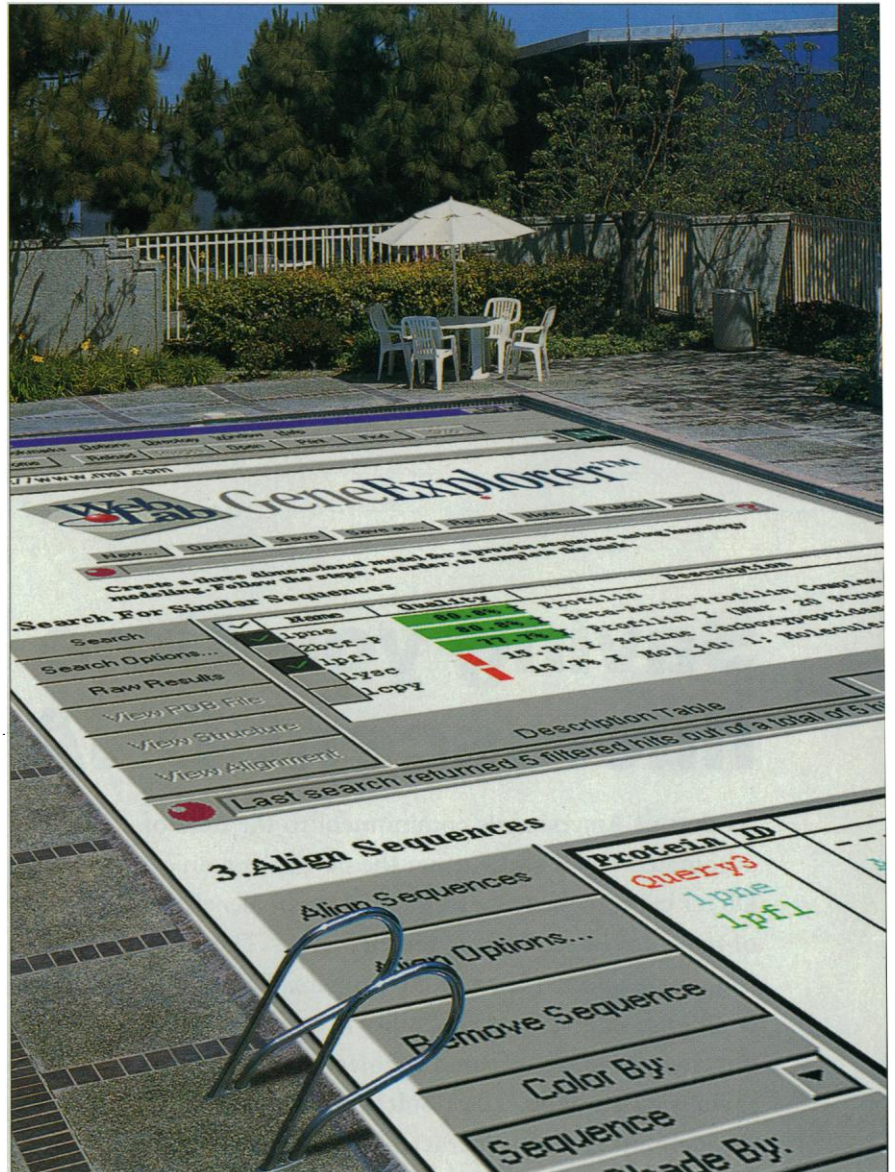
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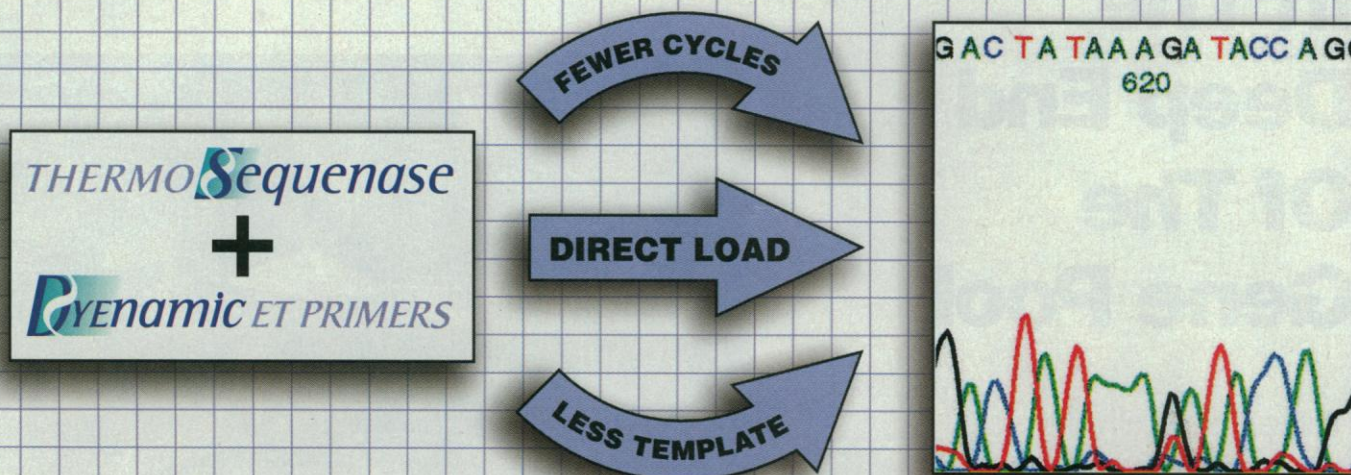
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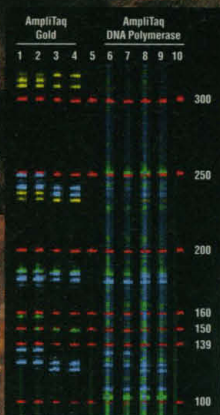
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