AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SCIENCE

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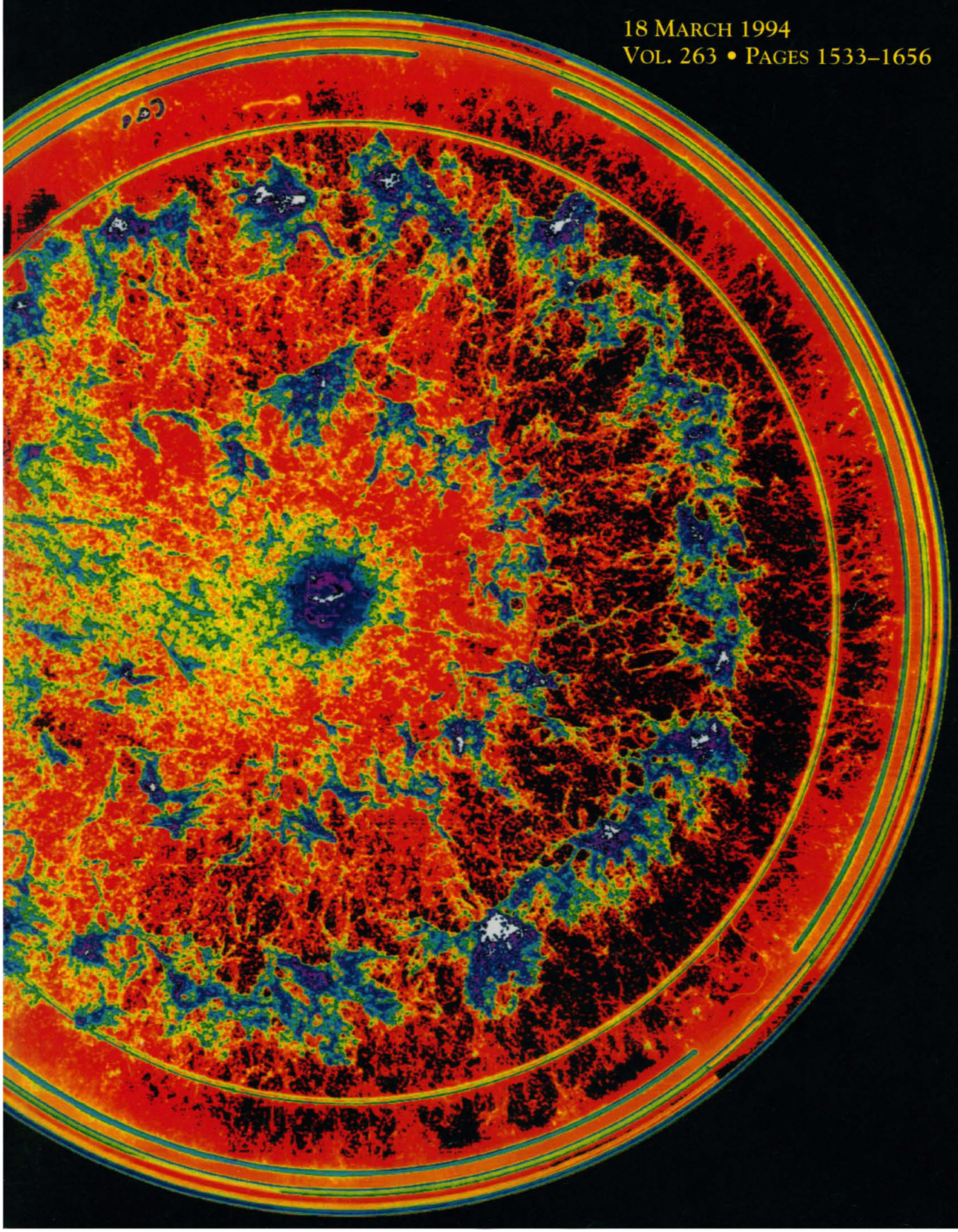
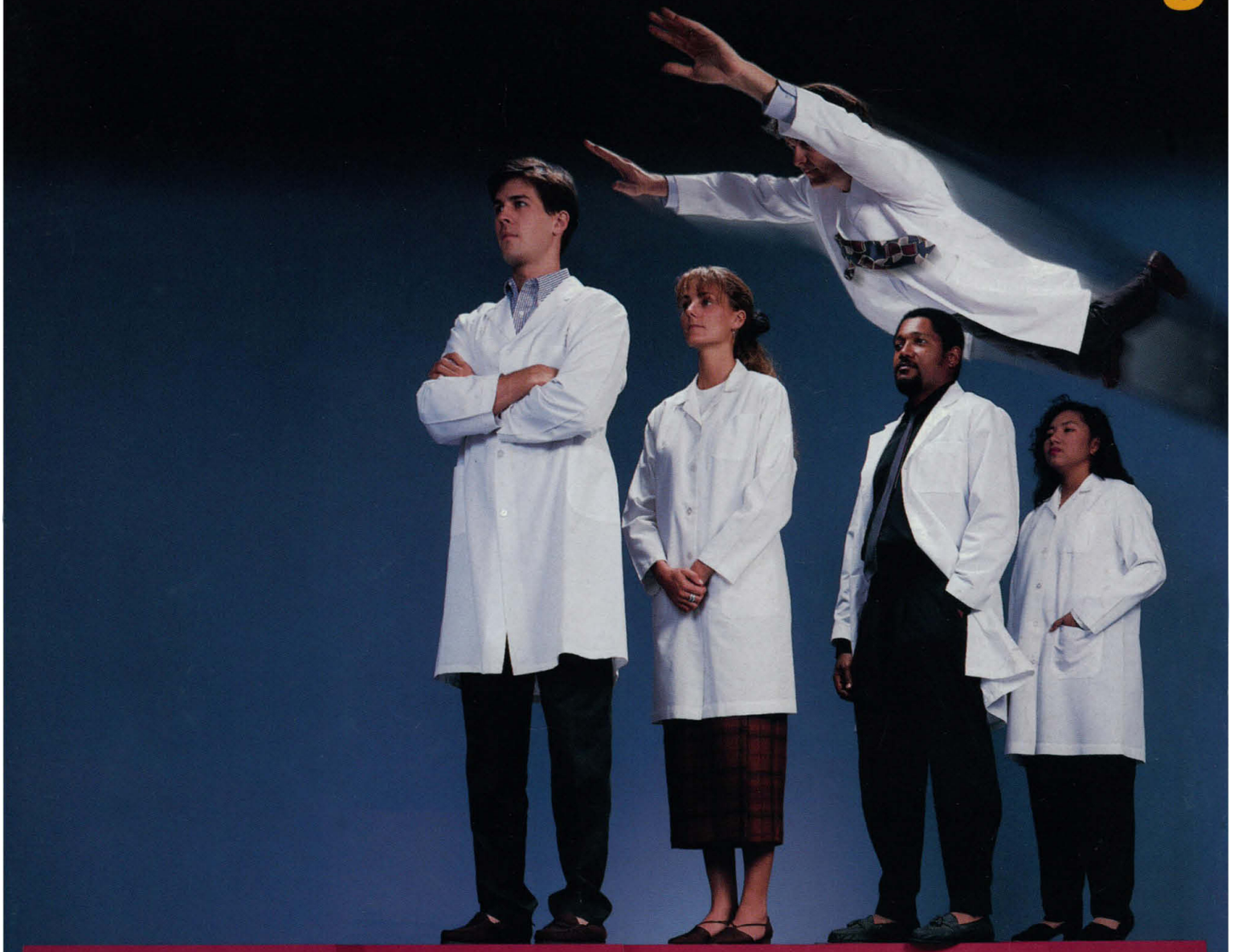


A BOLD LEAP in Cloning



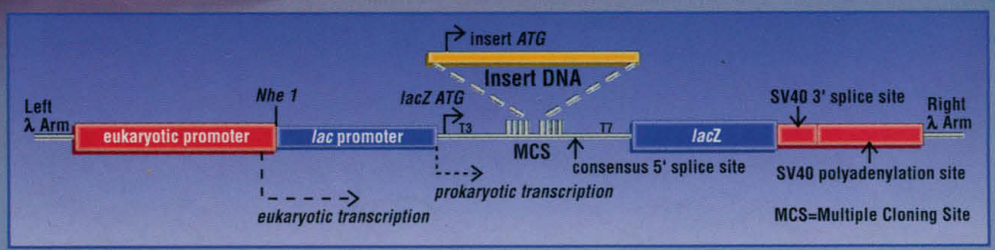
lambda ZAP Express/pBK

lambda ZAP/pBluescript

lambda phage

filamentous phage

plasmids



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* U.S. Patent No. 5,128,256

References:
1. Alting-Mees, M.A., et al. (1992) *Strategies.* Volume 5, Number 3.
2. Alting-Mees, M.A., Vaillancourt, P., and Short, J.M. (1993) "Phagemids and Other Hybrid Vectors" in *Plasmids A Practical Approach* (K.G. Hardy, ed.) pp 197-223.
3. Short, J.M., et al. (1988) *Nucleic Acids Res.* 16: 7583-7600.
4. Short, J.M., and Sorge, J.A. (1992) *Methods Enzymol.* 216: 495-508.

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*Eco*R I/*Xho* I/CIAP-Treated	Catalog # 239213
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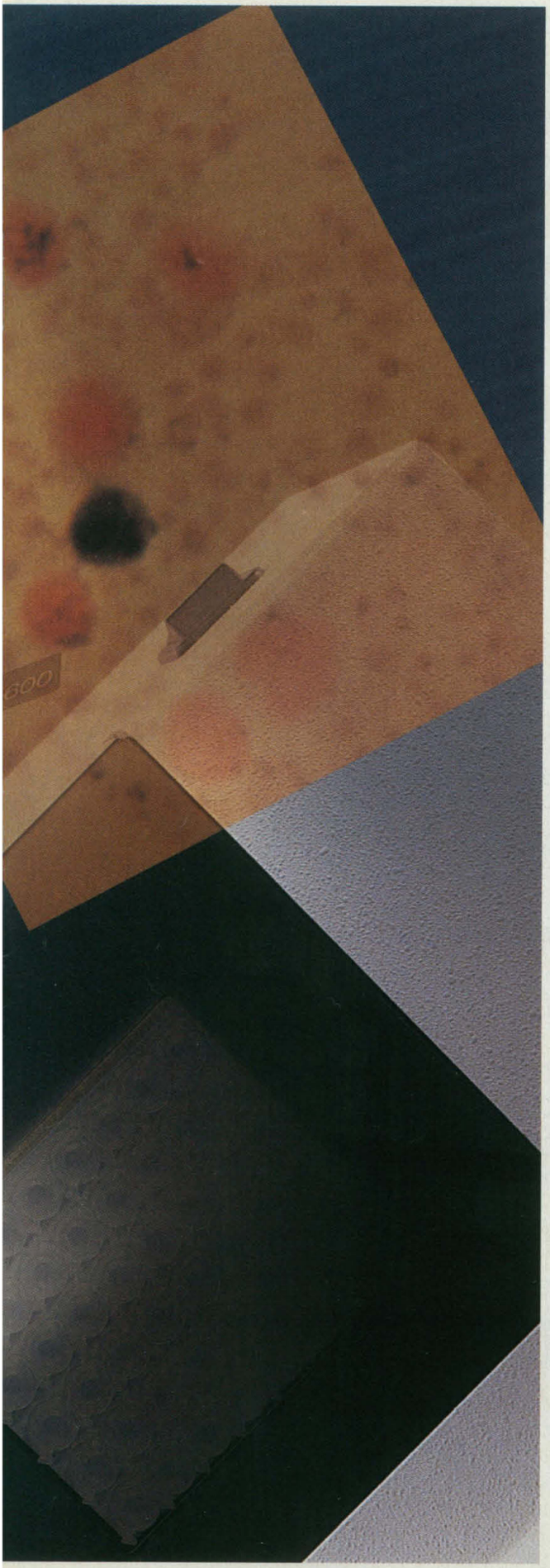

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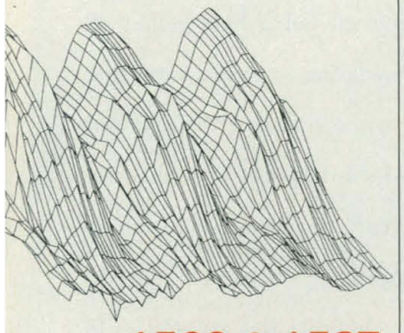


1562 & 1587

A puzzling trend in atmospheric chemistry

1569

Chaos in space and time

NEWS & COMMENT

RESEARCH NEWS

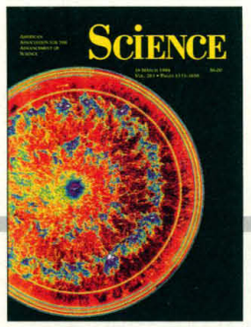
PERSPECTIVES

ARTICLE

RESEARCH ARTICLE

DEPARTMENTS

COVER



The circadian rhythm in asexual reproduction in the bread mold *Neurospora crassa* is illustrated by alternating growth rings of surface mycelia (red) and aerial hyphae (blue and yellow). Aerial hyphae extend above the growth surface to produce asexual spores. Studies of this rhythm have authenticated an initial gear in a circadian clock and suggest the algorithm by which such clocks may be assembled. See page 1578; related Reports on pages 1603 and 1606 and Perspective on page 1570. [Image: Reed Detar. Colorization: Jay C. Dunlap]

REPORTS

1559 & 1625
Colon cancer gene

◩ Indicates accompanying feature

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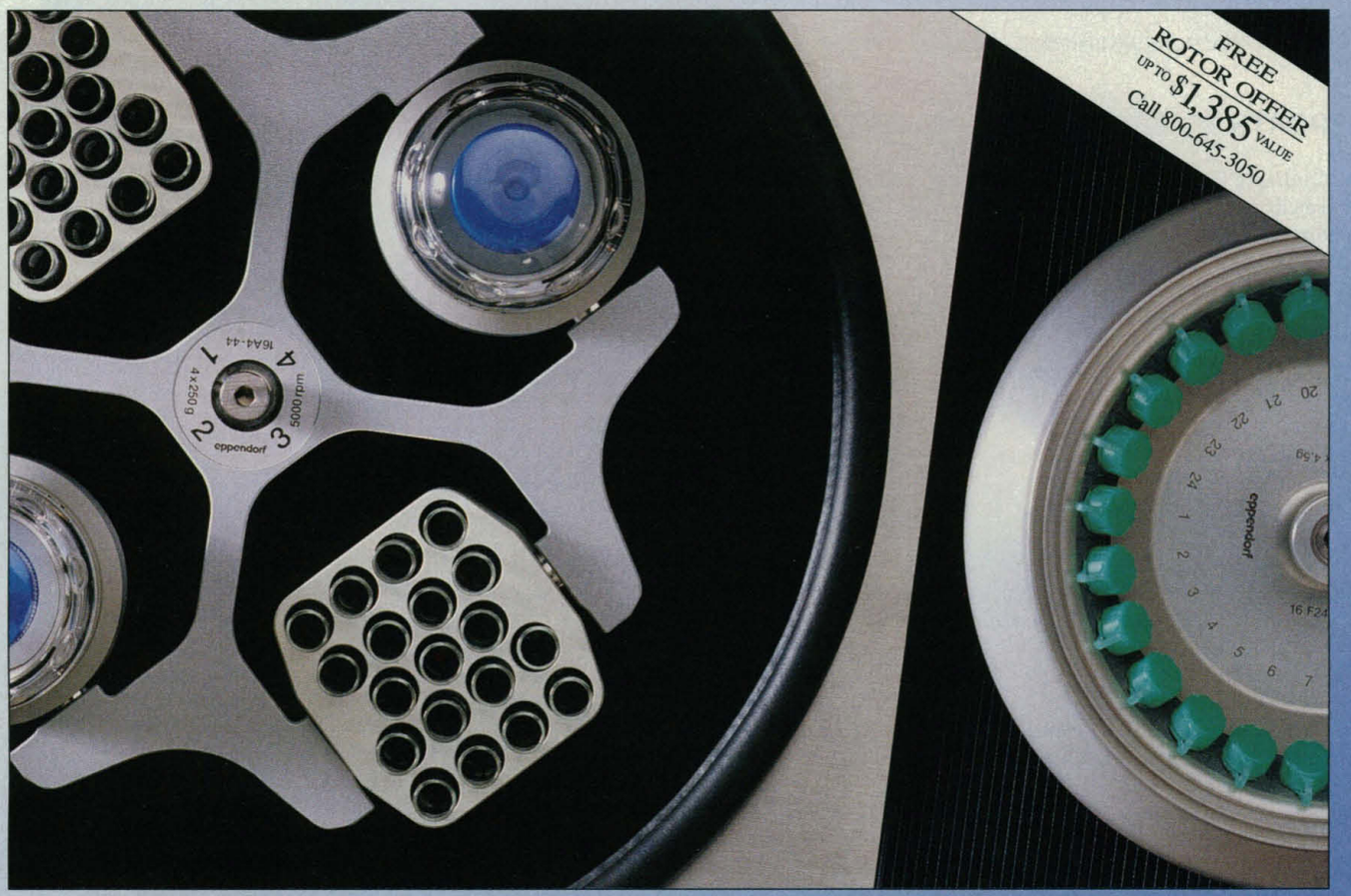

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For a demonstration circle reader service number 13

edited by PHIL SZUROMI

Everyday genetics

Such diverse biological processes as wake-sleep cycles, reproduction, growth, and motor activity run on cycles of approximately 24 hours called circadian rhythms. This week, three papers shed light on our understanding of the underlying cellular machinery that is responsible for the working of the biological clock. Aronson *et al.* (p.1578) have demonstrated that the *frequency* (*frq*) gene of the fungus *Neurospora crassa* has properties that allow it to be a central component of a cellular circadian oscillator. The *frq* gene product inhibits its own

transcript as part of a negative feedback loop, which results in a daily oscillation in the production of the *frq* transcript. Working on a different system, Sehgal *et al.* (p.1603) and Vosshall *et al.* (p.1606) have isolated and characterized *timeless* (*tim*), a mutation in *Drosophila* that abolishes circadian rhythms. Mutations in *tim* affect the oscillation of mRNA from another gene that is required for circadian rhythmicity, *period* (*per*), and also block the nuclear localization of the PER protein.

■

Si five

Chemical reaction intermediates are often species with unusual coordination numbers. Silicon is normally found in 4- or 6-coordinated forms, but Herreros *et al.* (p. 1585) find evidence from nuclear magnetic resonance and powder x-ray diffraction that synthesis of sodalite, a zeolite, proceeds through a 5-coordinated silicon intermediate.

■

Too much of a good thing

T cell maturation requires positive selection, but it has been a puzzle how the interaction of the T cell receptor (TCR) with a combination of a major histocompatibility complex molecule and a peptide can lead to both positive and negative selection. Sebzda *et al.* (p. 1615) followed selection in thymic organ culture containing T cells that expressed transgenic TCRs. Exposure of the cultures to low concentrations of a peptide recognized by the TCR induced positive selection, but higher concentrations led to deletion, a result that supports the affinity-avidity model for T cell selection.

Volcanic reduction

Carbon monoxide, a trace atmospheric gas, comes from anthropogenic sources, biomass burning, and oxidation of natural and anthropogenic hydrocarbons; it is lost mainly by reaction with OH, an important atmospheric oxidant. Global CO levels, a sensitive indicator of the oxidative capacity of the atmosphere, have generally increased during the past 30 years, but Novelli *et al.* (p. 1587) present recent measurements indicating a decrease over the past 2 to 5 years. This may be a response to production of tropospheric OH following the Mount Pinatubo eruption. Recent deviations from long-term trends are also being seen in levels of other gases, as discussed in a news story by Kerr (p. 1562).

■

A pressing question

Laboratory measurements of the equation of state of hydrogen at high pressure cannot reach conditions appropriate to giant planet interiors, so planetary modeling demands theoretical extrapolation. Recent observations of global oscillations of Jupiter, which measure its internal sound-speed, hint at a discrepancy with the current models. Duffy *et al.* (p. 1590) have compressed hydrogen to 24 gigapascals in the laboratory, and use their data to refine predictions of the Jovian interior. The discrepancy is reduced, but does not go away; the observations and the extrapolations cannot both be right.

■

Mixed well and baked

If, as is likely, the Earth's interior was considerably hotter in the Archean, the mantle would have convected more vigorously and be more thoroughly mixed. Blichert-Toft and Albarède (p. 1593) found that the range of neodymium isotopic compositions in basalts erupted from the mantle about 2.7 billion years ago is smaller than in modern basalts, and conclude that the mantle was convecting 10 times more vigorously then as now.

■

Fertilizing plants

In vitro fertilization of animal eggs has provided insights into the processes of fertilization and offers a degree of control over the early stages of development, but in higher plants the fertilization process has long been inaccessible to experimenters. Faure *et al.* (p. 1598) have identified culture conditions that permit adhesion and fusion of maize sperm and egg cells. Fusion was mostly restricted to sperm and egg cell pairs, suggesting that the processes of gamete-specific recognition and blocks to polyspermy may remain intact.

■

Colon cancer genes

Defective DNA repair has been implicated as a critical step in the etiology of hereditary nonpolyposis colorectal cancer (HNPCC). Tumor cell extracts from most HNPCC patients show aberrant mismatch repair, and a subset of these patients carries mutations in *hMSH2*, a mismatch repair gene on chromosome 2p. By searching a database of expressed human genes, Papadopoulos *et al.* (p. 1625 and news story by Service, p. 1559) have identified three new DNA repair genes, one of which, *hMLH1* (on chromosome 3p), was found to be mutated in a colon cancer cell line and in newly studied HNPCC families. Most HNPCC cases, it now appears, can be attributed to mutations in DNA repair genes.

■

Activity aids longevity

Why neuronal survival should depend on neuronal activity has been unclear. Ghosh *et al.* (p. 1618) show that survival of rat cortical neurons in culture is enhanced by activation of voltage-sensitive calcium channels (VSCCs) but reduced by activation of *N*-methyl-D-aspartate (NMDA) receptors, although both serve to increase calcium influx. The difference seems to be that expression of brain-derived neurotropic factor (BDNF), which protects neurons, is more strongly stimulated by activation of VSCCs than by activation of NMDA receptors.

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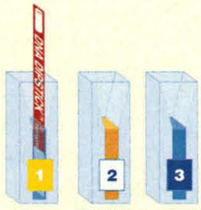
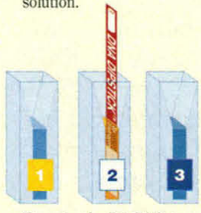


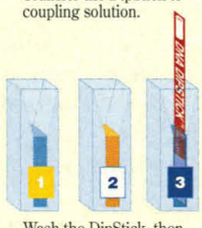
1 Min.

Prepare DipStick for coupling by incubating in wash solution.



6 Min.

Transfer the DipStick to coupling solution.



10 Min.

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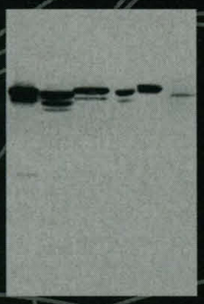

Anti-ISGF3, Western blot.

Anti-inducible Nitric oxide synthase (NOS), Immunofluorescence.

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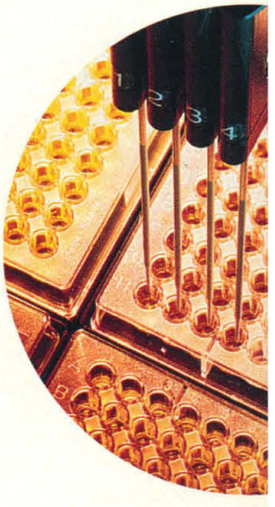

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