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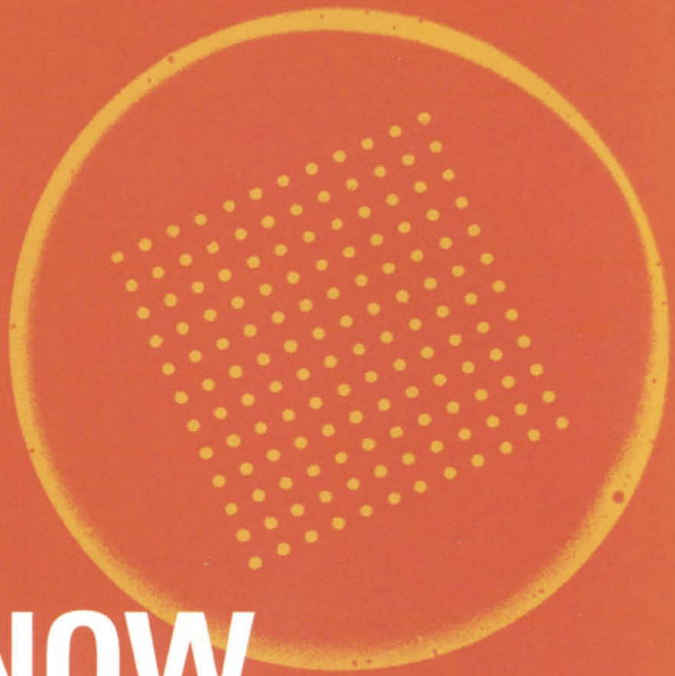

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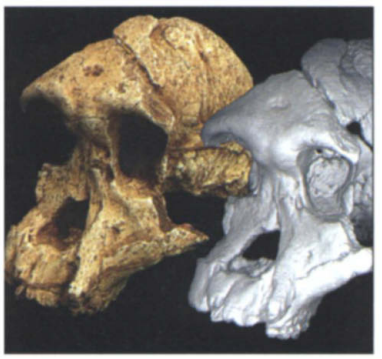

NEWS OF THE WEEK

NEWS FOCUS

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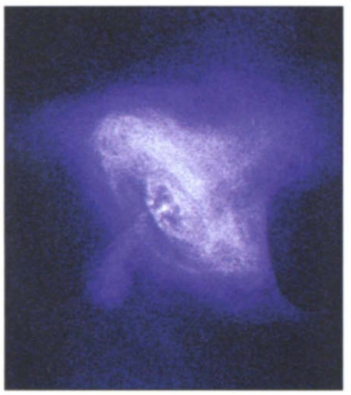

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BOOKS *ET AL.*

PERSPECTIVES

RESEARCH

BREVIA

RESEARCH ARTICLES

REPORTS

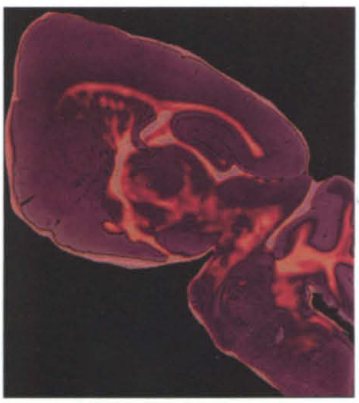
POLAR SCIENCE

NEWS

REVIEWS

COVER 1489

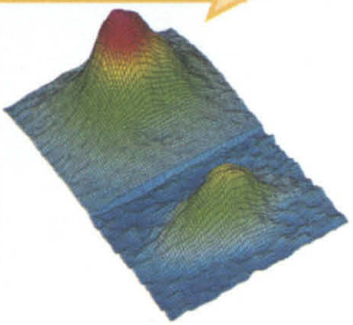
Sea ice along the Antarctic coast provides a habitat for sea birds, krill, and other organisms. The scene may appear pristine, but the polar regions are not exempt from global climate change. The special section in this issue looks at how the Arctic and Antarctic have fared in recent decades and how they may be affected by future climate changes. [Photo: Chris Gilbert, British Antarctic Survey]



1525

A key to synapse formation

New on *Science* Express A Fermi gas meets a Bose gas



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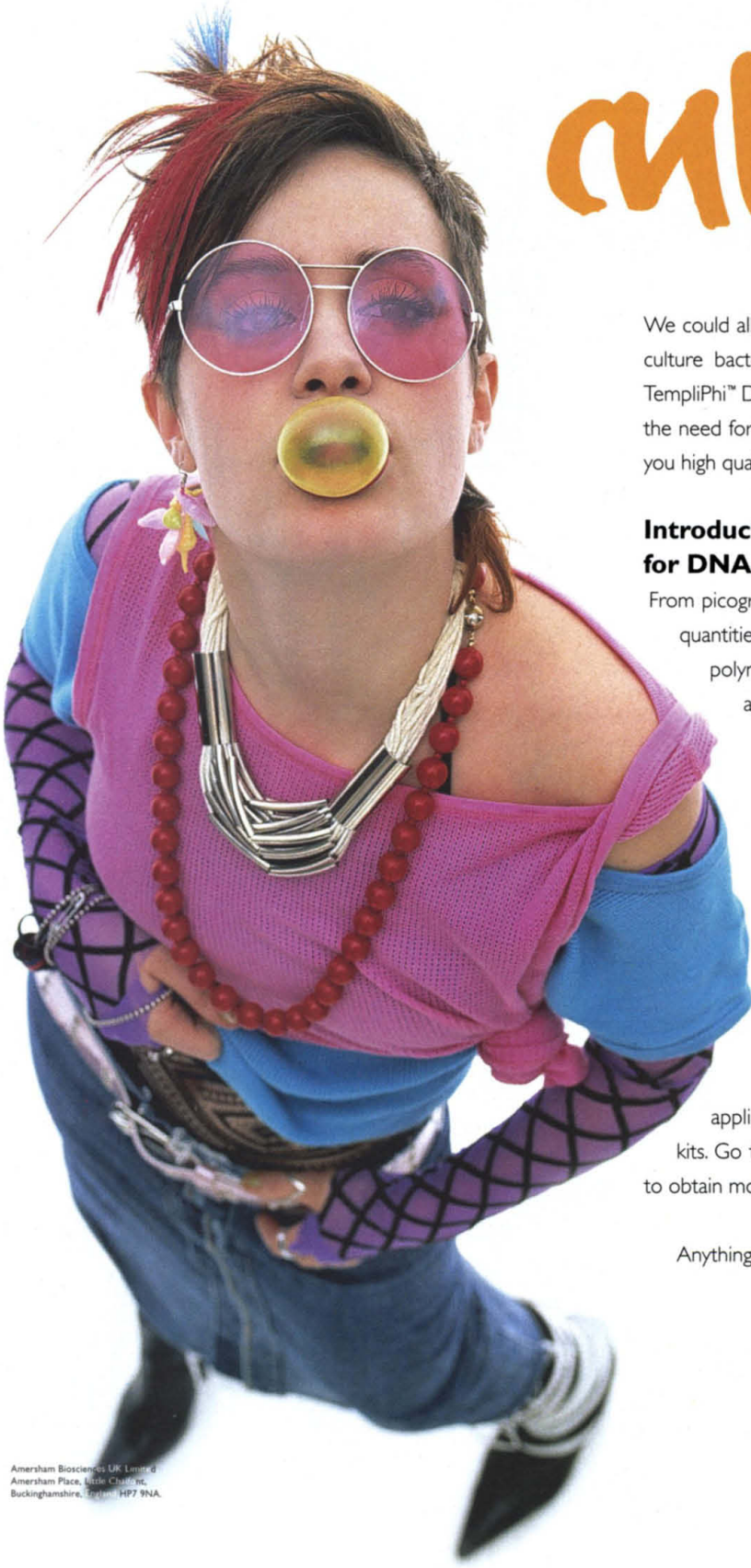

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CONTENT HIGHLIGHTS AS OF 30 AUGUST 2002

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SCIENCE EXPRESS

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Collapse of a Degenerate Fermi Gas G. Modugno *et al.*

The sudden collapse of a Fermi gas of potassium atoms was produced through its interactions with rubidium atoms undergoing Bose-Einstein condensation.

Macrophage Apoptosis by Anthrax Lethal Factor Through p38 MAP Kinase Inhibition J. M. Park, F. R. Greten, Z.-W. Li, M. Karin

Virulence of *Bacillus anthracis* depends on both the activation and death of macrophages.

Signal-Driven Computations in Speech Processing M. Peña, L. L. Bonatti, M. Nespor, J. Mehler

A brief pause makes all the difference in the world between words and syllables.

TECHNICAL COMMENTS

Beta-Diversity in Tropical Forests

Condit *et al.* (Reports, 25 Jan. 2002, p. 666) found that beta-diversity—how species composition changes with distance—is higher in Panama forests than in western Amazonia and that these patterns "cannot be explained by limited dispersal and speciation alone." Duivenvoorden *et al.* (Perspective, 25 Jan. 2002, p. 636) further analyzed the Panama data set. Ruokolainen and Tuomisto comment that variations in climate, geology, and forest age in the Panama plots make comparisons with the Amazonian plots inappropriate and that the Duivenvoorden *et al.* analysis is uninformative. Chave *et al.* respond that the comment ignores the main point of the original study—"to explore the joint influence of limited dispersal and speciation on species turnover, via peripheral isolates." In a separate response, Duivenvoorden *et al.* defend their methods and maintain that dispersal "may have a rather small effect on beta-diversity in tropical forests."

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/297/5586/1439a

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GLOBAL: The Postdoc Production Policy Debate Edited by K. Cottingham

Academic, industry, government, and funding-agency leaders tackle a perennial question: Are there too many postdocs, or too few?

SINGAPORE: Regional News Bytes J. Wong

Snippets of job market and sci-tech news from the Pacific Rim.

UK: Becoming Part of the Scientific Community P. H. Dee

In a reflective mood, our *Yours Transferredly* columnist steps back to gain perspective on his path into science.

NETHERLANDS: Europe's Ivy League D. Breimer

A new network of 12 top universities seeks to compete in the competitive global market for talented young researchers.

EUROPE: Stepping-Stones to Independence K. Urquhart

Europe's international funding bodies are developing new schemes that pave the path to independence for early career scientists.

CANADA: Becoming Leaders L. McKarney

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SUBFIELD HISTORY: *Caenorhabditis elegans* as a System for Analysis of the Genetics of Aging T. E. Johnson

Worming our way through the past, anticipating the future.

NOTEWORTHY THIS WEEK: Purging Plaque M. Leslie

Activating receptor in blood cells might squelch atherosclerosis.

NOTEWORTHY THIS WEEK: Where's Telomerase? R. J. Davenport

Chromosome-sealing enzyme criss-crosses the nucleus.

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signal transduction knowledge environment

PERSPECTIVE: Bayesian Network Approach to Cell Signaling Pathway Modeling K. Sachs, D. Gifford, T. Jaakkola, P. Sorger, D. A. Lauffenburger

Explaining modeling using integrin signaling to FAK and ERK as an example.

REVIEW: Modeling the Cell's Guidance System P. A. Iglesias and A. Levchenko

Mathematical models of modular regulatory mechanisms that underlie finely tuned cellular chemotactic control systems.

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THIS WEEK IN Science

edited by Phil Szuromi

Imaging Sans Silver

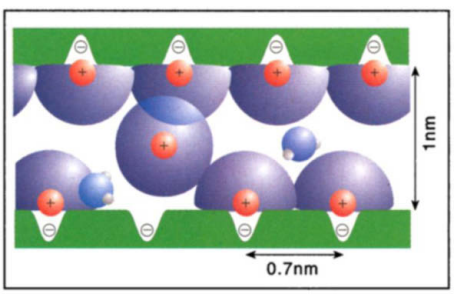
In color photography, silver is used not only to form the latent image but also during the development process that fixes dyes in different layers of the film. Marshall *et al.* (p. 1516) report on a different approach for creating color images that relies on the use of acid-base chemistry alone. Layers of the film (one for each color) contain sensitizing dyes that produce a small amount of acid after light exposure. This acid is then used in a thermal process to activate reactions that increase the amount of acid approximately 100-fold. During this step, unexposed areas are neutralized with a base, and pH-sensitive dyes from adjacent layers diffuse in and produce the final fixed image. Although the process is not yet as efficient as the silver process for taking photos, it may prove competitive in applications such as print formation because no by-products are formed.

Nucleating Diamonds

Applications of artificial diamond films include electronics products, heat sinks, cutting tools, and optics. In the bias-enhanced nucleation method, highly energetic species impinging on a surface induce diamond nucleation. Lifshitz *et al.* (p. 1531) have used experiments and computer simulations to propose a model in which the nucleation occurs not on the surface but just below the surface, in the dense matrix of hydrogenated amorphous carbon. The nuclei then grow through a preferential displacement mechanism in which loosely bound carbon atoms move to new diamond positions while existing diamond atoms remain unchanged.

Saltwater Slide

Previous experiments on thin films of aqueous salt solutions have indicated that the friction increases by several orders of magnitude, as the thickness of the layer approaches molecular dimensions. The implication from these observations was that the water molecules are tightly bound to the ions, and that these clusters are fairly immobile. Working with very clean surfaces, Raviv and Klein (p. 1540) find that the hydrated layers are mobile, and that the maximum viscosity is much lower. The authors believe that an exchange mechanism in which water molecules solvate different ions allows for the high mobility while under compression.



CREDIT: RAVIV AND KLEIN

1566 The Anatomy of Sexual Reflexes

Male sexual behavior comprises a complex sequence of physiological events dependent on olfactory, somatosensory, and visceral cues. The neuronal pathways that relay somatosensory and visceral information from the reproductive organs to the various brain areas involved are still not fully understood. Truitt and Coolen (p. 1566) describe the discovery of a small population of neurons in the rat spinal cord that project to the thalamus and to spinal autonomic nuclei involved in ejaculation, and that are involved in ejaculation but apparently no other components of the sexual response. These results could have implications for human sexual physiology and the treatment of male reproductive disorders.

And in Brevia ...

The demonstration of right asymmetry in the mouths of babies while babbling (Holowka and Petitto, p. 1515) is consistent with an early left hemisphere cerebral specialization for language.

A Coating of Many Colors

Recently, an approach for DNA detection has been developed in which target DNA strands bind to both a surface probe DNA and to a DNA linked to gold nanoparticles. The gold nanoparticles then catalyze the generation of a silver coating that can be read as a gray scale. Cao *et al.* (p. 1536) take this black and white scheme into "color" multiplexing not through fluorescence but by taking advantage of the surface-enhanced Raman scattering (SERS). When bound to silver or gold surfaces that are "rough" on a nanometer scale, many molecules exhibit huge enhancements in their Raman scattering, which provide vibrational spectroscopy "fingerprints" and, hence, several dye colors. When Raman-active dyes were incorporated into the DNA-nanoparticle probe, the gold particles were too small to achieve a SERS effect, and the dyes were effectively invisible. Development of the silver films activated the SERS effects to such an extent that a DNA detection limit of 20 femtomolar was readily achieved.

Organics in Fossils

It has generally been assumed that polar organic compounds that can be used to distinguish their biological sources are not preserved in buried organic matter or fossils. Otto *et al.* (p. 1543) have succeeded in identifying distinct polar terpenoids in conifer fossils dated to about 15 and 40 million years ago. These fossils can now also be confidently related to an extant conifer, supporting recent phylogenetic analyses.

Life and Death Without Clathrin

Clathrin plays a key role in receptor-mediated endocytosis, mediating the physical process by which the plasma membrane is deformed to form clathrin-coated vesicles. Wettey *et al.* (p. 1521) have generated a pair of cell lines conditionally deficient in clathrin; repression of clathrin expression induced apoptosis. However, a variant cell line revealed that even though endocytosis was reduced in the absence of clathrin, generation of endocytic compartments, like the lysosome, did not absolutely require clathrin expression.

Published online in *Science* Express

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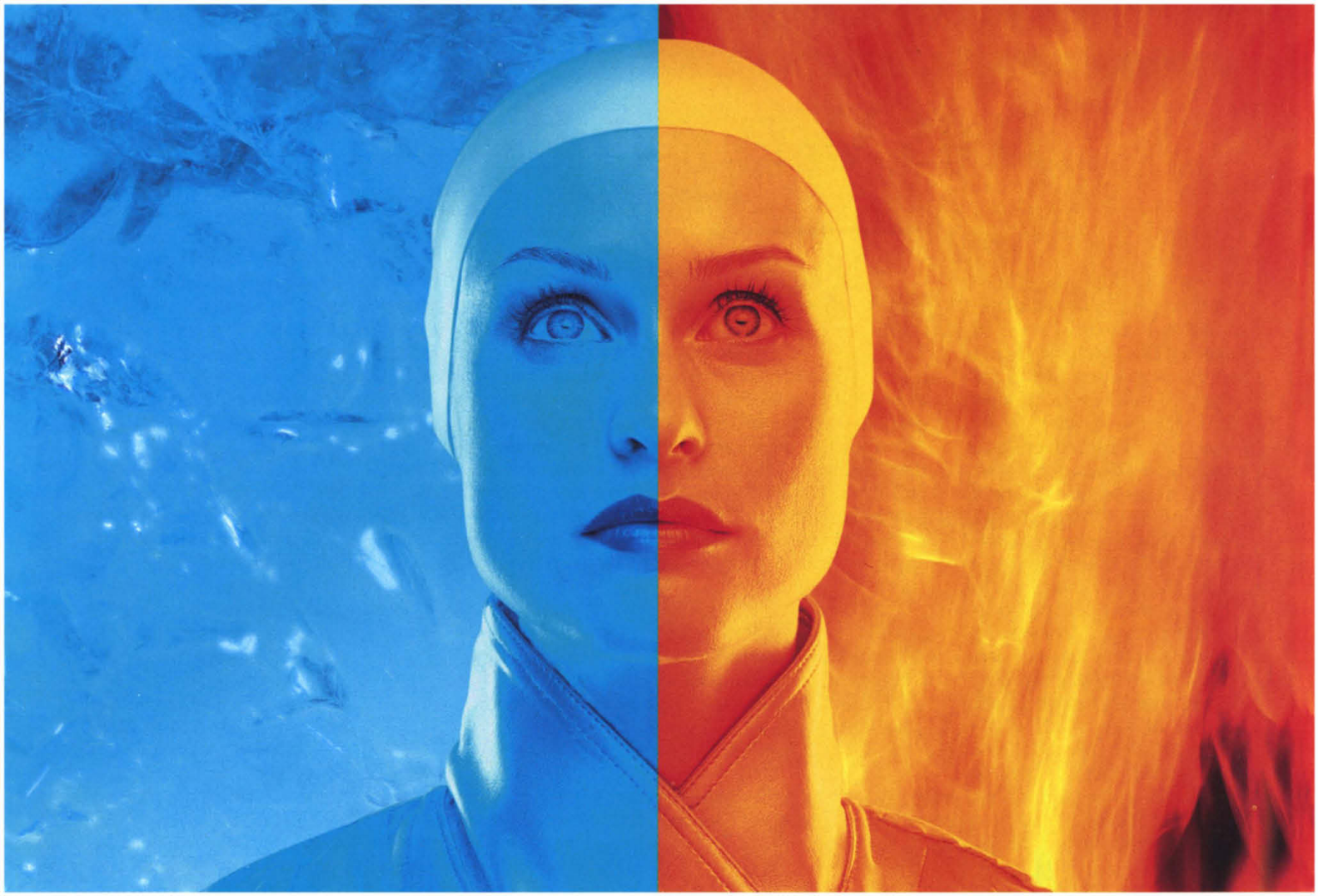

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Making New Ties

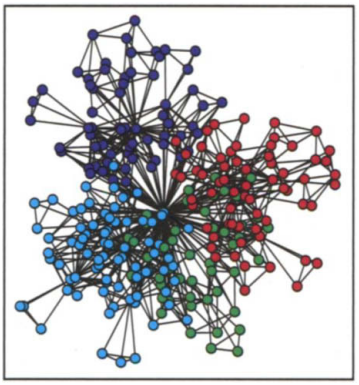
Neurons communicate with one another through specialized junctions called synapses that are so robust that they survive homogenization. Although several cell surface receptor-ligand pairs have been proposed to participate in forming and maintaining synapses, one of the best families of candidates—the immunoglobulin-domain proteins—have only been found in invertebrates. Biederer *et al.* (p. 1525) report that IGSF4 is a homophilic protein that can induce the formation of fully functional glutamatergic synapses when cotransfected into nonneural, vertebrate HEK cells along with glutamate receptors.

Trends in Biodiversity

The factors controlling species distribution and diversity are at the core of ecology, and remain a focus of intense research activity. Jetz and Rahbek (p. 1548) find that there are striking differences between widespread and localized species in terms of the ecological correlates of their distribution. Using a data set on the distribution of African birds, they find unexpected differences in these correlates for widespread versus narrowly distributed species. In particular, the importance of productivity as a correlate of diversity decreases at narrower species ranges, while the converse is true for topographic heterogeneity. These results suggest that conservation strategies based on species hotspots and biogeographic models will have to be rethought. The latitudinal gradient of increasing biodiversity from poles to equator is one of the most pervasive features of life on Earth. Allen *et al.* (p. 1545) present a general model, based on first principles of biochemical kinetics, that explains variation in biodiversity for terrestrial, freshwater, and marine taxa along latitudinal and elevational gradients in temperature. The model provides a thermodynamic basis for the regulation of species diversity and the organization of ecological communities.

Modular Networking

One of the challenges of the postgenome era is understanding cellular organization. In cellular function, there are examples both of modular organization and of complex webs of molecular interactions. Ravasz *et al.* (p. 1551) show that the metabolic networks of 43 organisms are organized into a hierarchical network in which small highly connected modules are replicated and connected to give larger, less cohesive units. Their network has the scale-free topology of networks with a few highly connected nodes, but with an inherent modular structure. They show that in *Escherichia coli* this hierarchical organization overlaps quite well with known metabolic functions and suggest that this may be a general structure for biological networks.



CREDIT: RAVASZ *ET AL.*

Representing Space in the Barn Owl Brain

What are the neuronal circuits through which visual and auditory spatial maps interact to create a mechanism for directing an animal's gaze? In the barn owl, the optic tectum projects to the inferior colliculus. This input has been shown to be necessary for the alignment of the visual map with the auditory space map. By pharmacologically blocking inhibition in the optic tectum Gutfreund *et al.* (p. 1556) show that highly specific visual responses can be recorded in the inferior colliculus. The visual projection is point-to-point with the auditory space map and ensures protection from a barrage of nonspecific visual input.

Signaling Brain Tumor Growth

Brain tumors are the leading cause of cancer-related deaths in children. The most common of these are medulloblastomas, highly aggressive tumors that arise in the cerebellum and whose molecular etiology is poorly understood. Berman *et al.* (p. 1559) show that initiation and continued growth of these tumors requires the Hedgehog (Hh) cellular signaling pathway. Treatment of mice with cyclopamine, a plant-derived molecule that inhibits Hh signaling, caused regression of medulloblastomas with no apparent side effects; thus, small-molecule antagonists of Hh may merit investigation as a new therapy for human medulloblastoma.

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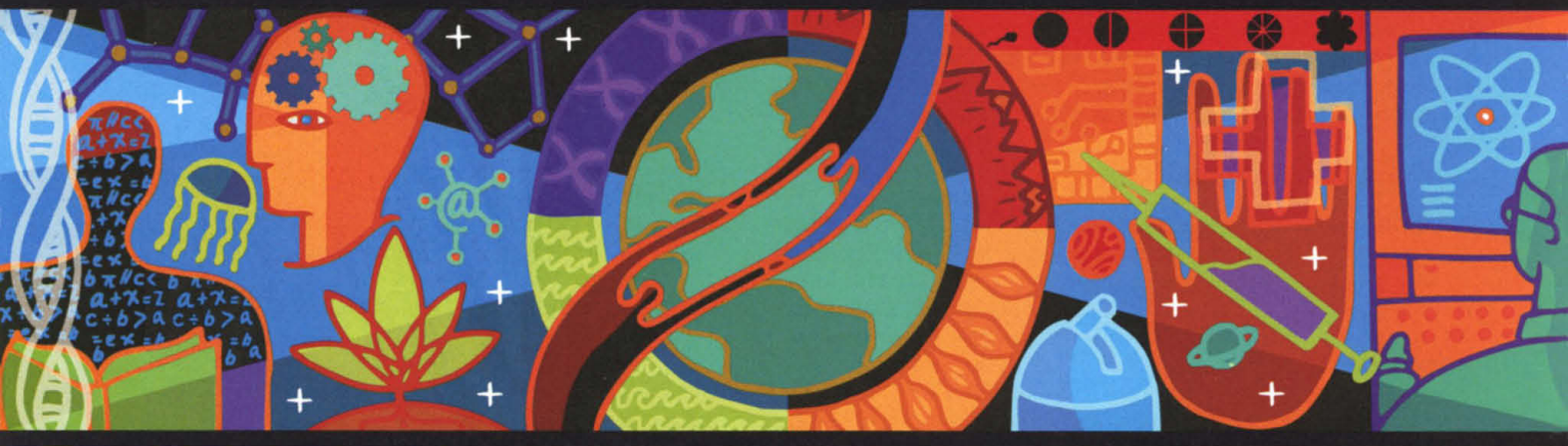

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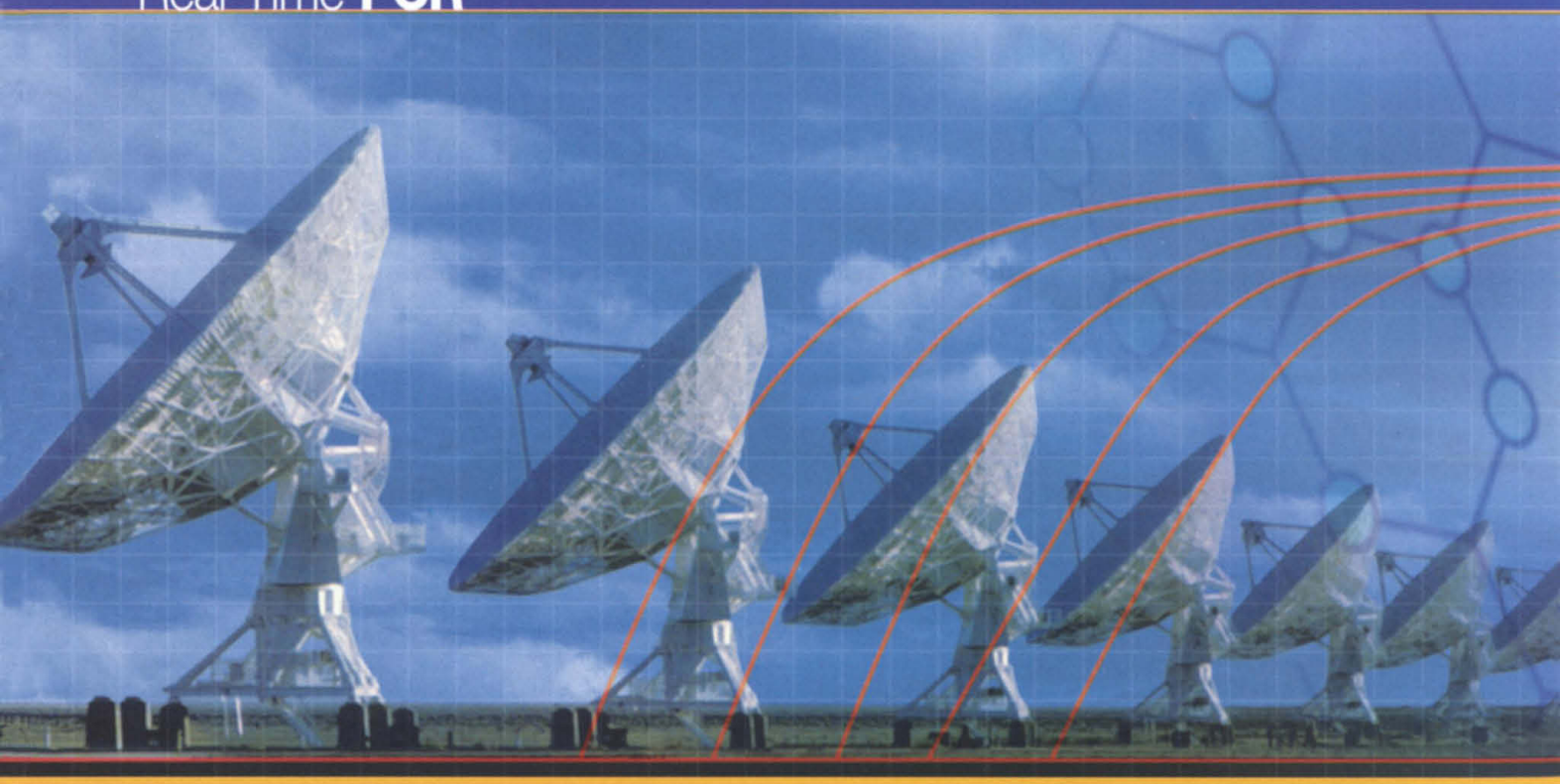

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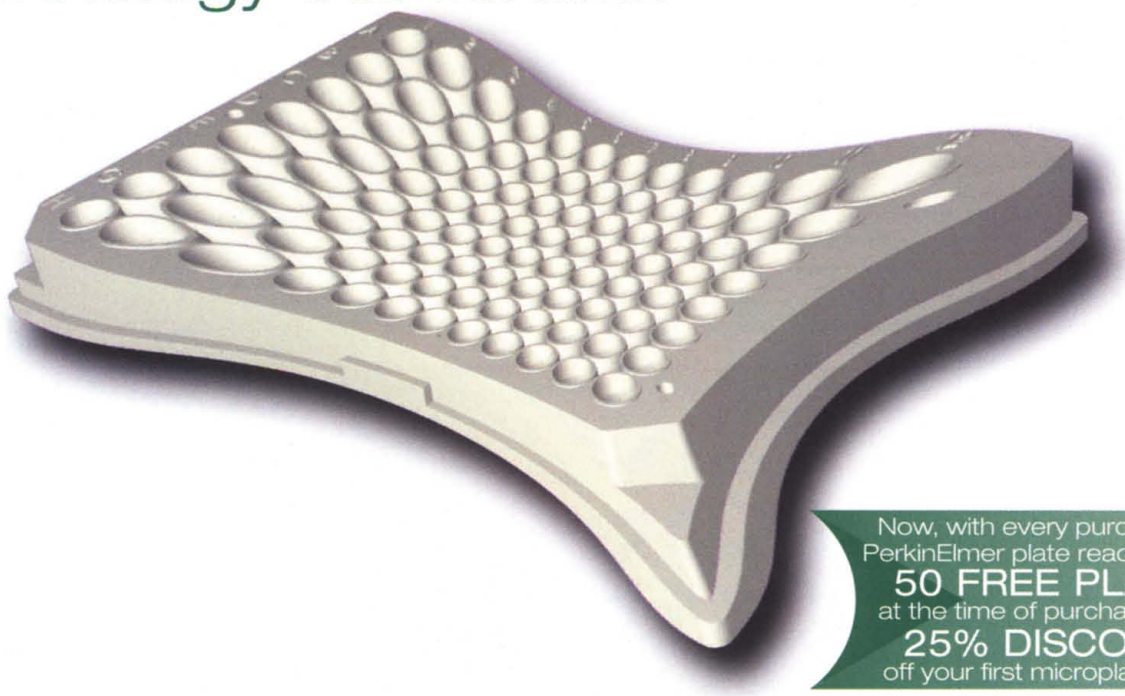

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