

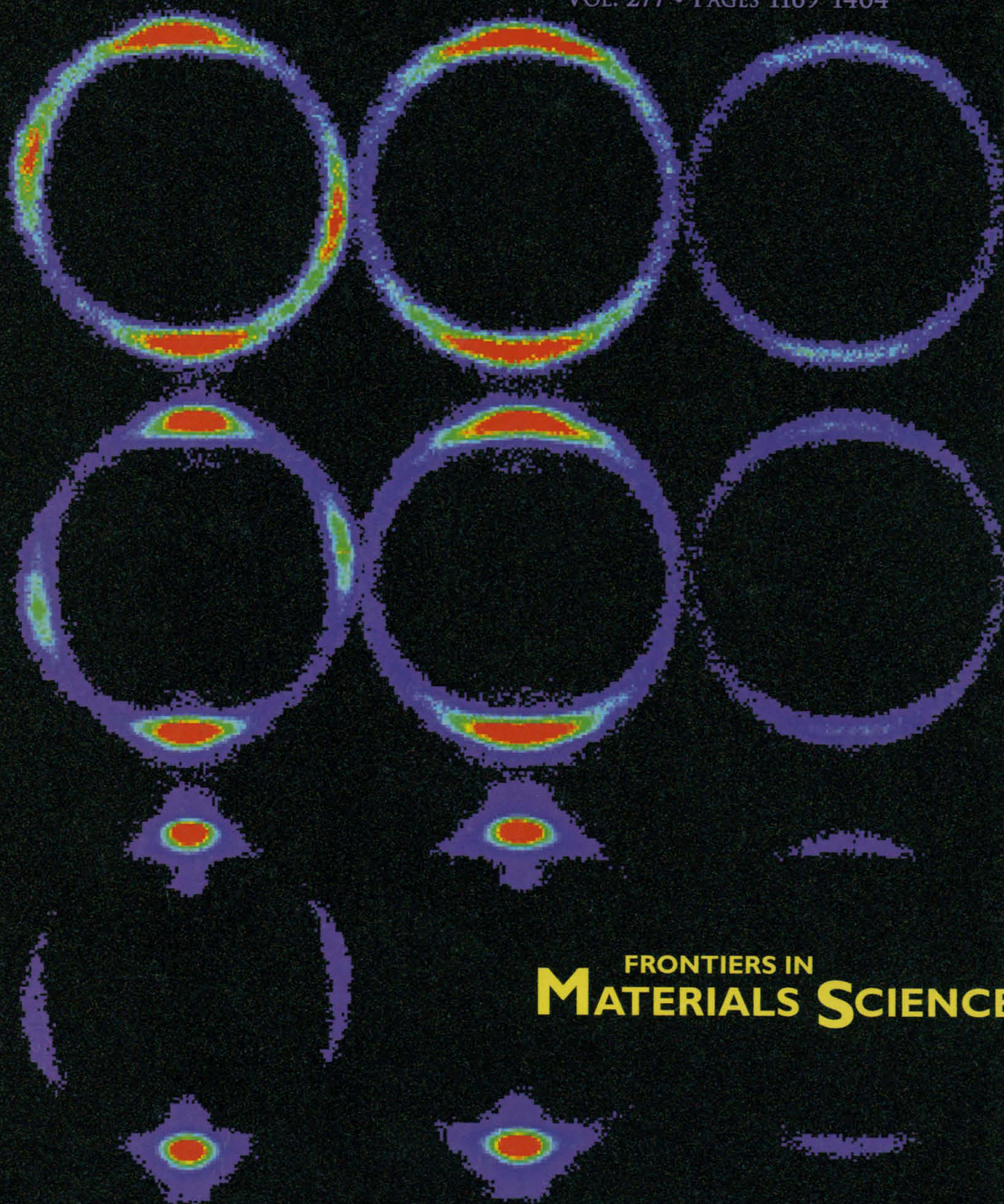


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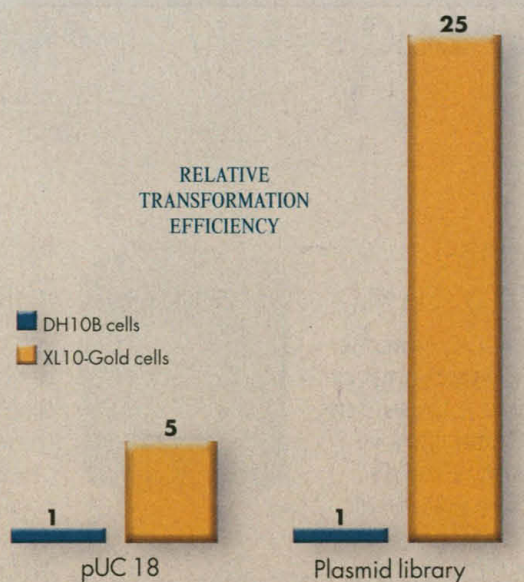
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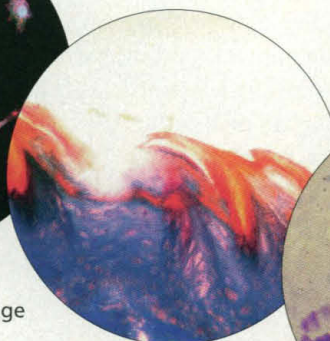
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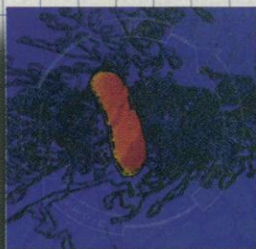
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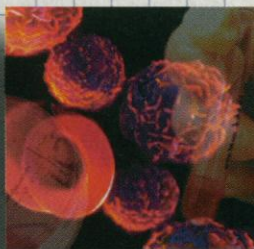
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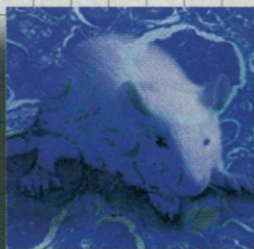
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Polymers that join two regions with different chemical compositions can separate into phases on a nanometer scale. This particular layered material responded to shear flow in a dynamic manner; it became well aligned (its x-ray scattering pattern is shown at the

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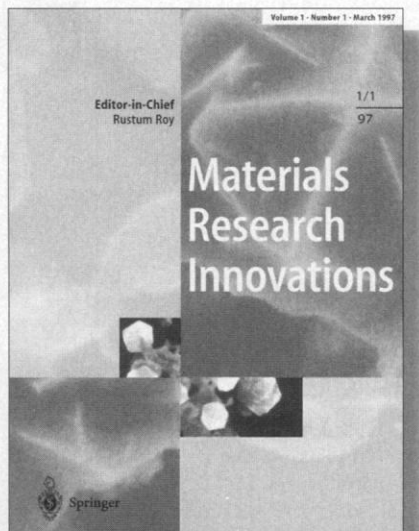
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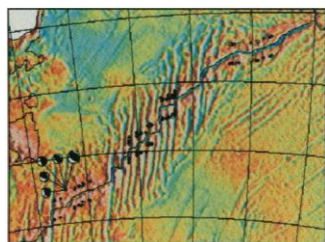
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Earth's extra plates

Reconstruction of plate tectonic boundaries is more difficult than fitting together the pieces of a puzzle because geologists do not know the location of all of the boundaries. Perhaps one of the more difficult boundaries to reconstruct is in the Indian Ocean. Royer and Gordon (p. 1268) used



magnetic seafloor anomalies and seismic data to determine that the Indo-Australian plate is not one plate, but three plates with diffuse boundaries. The definition of these additional plates will help refine the deformational history of this region, including the collision of India with Eurasia to produce the Himalayas.

Long-lived spin states

Electron spins in a solid can be aligned with a magnetic field, but usually this alignment is rapidly lost even at very low temperatures. Kikkawa *et al.* (p. 1284; see the Perspective by Sham, p. 1258) measured electron spin precession with femtosecond time resolution by monitoring the Kerr rotation of light induced by the spins. In a negatively doped semiconductor heterostructure that confined a two-dimensional electron gas, they found spin precession times on the order of nanoseconds, far greater than the carrier lifetimes of the electron and holes or of spins in insulating samples. Long lifetimes were observed even at room temperature and appear to arise from inefficient electron-hole scattering of the spins. Such spin coherence may find application in ultrafast magneto-optical devices.

Diversity versus composition

What are the relative roles of species diversity and composition in ecosystem function? Three reports, one based on measurements in natural ecosystems and two on experimental manipulation, address the question (see the Perspective by Grime, p. 1260). Wardle *et al.* (p. 1296) analyzed the ecosystem properties of 50 relatively pristine islands of varying size in an archipelago in northern Sweden. Plant diversity actually decreased with increasing island size, most likely because of the increased risk of lightning-induced fire disturbance with increasing size, yet ecosystem process rates were highest on larger islands. Hooper and Vitousek (p. 1302) and Tilman *et al.* (p. 1300) seeded experimental plots with different combinations of species and functional groups; they assessed how richness and composition of plant functional groups affected a range of ecosystem functions, including productivity and nutrient retention. The studies from natural and experimental systems concur: The characteristics of the dominant plants and the functional composition of the ecosystems are determining features, while diversity per se is not.

Overcoming kinetic complexity

Reaction kinetics are usually determined by identifying individual steps and measuring their rates, an approach that becomes more difficult for complex pathways that involve several steps and are regulated by feedbacks (such as enzymatic syntheses). Recently a theoretical approach was developed for determining the component processes by following perturbations to the reaction at steady state. Arkin *et al.* (p. 1275) show that this approach, when applied to initial steps of glycolysis, does indeed capture the underlying kinetics.

Tube replacement

Gallium nitride nanostructures are of high technological interest because of their semiconducting and optical properties. Han *et al.* (p. 1287) show that by using carbon nanotubes as templates, gallium nitride nanorods can be made from oxide and ammonia precursors. The nanorods closely maintain the morphology and dimensions of the original carbon nanotubes. Similar results were obtained for silicon nitride, indicating that a wider range of compounds may be accessible through this route.

A date with history

Accurate radiometric dating of young rocks is critical for many fields and for Holocene samples the primary method has been radiocarbon dating. Renne *et al.* (p. 1279) show that the argon-40/argon-39 method can be used to date even into the historical realm. They dated the famous ash flow produced by the 79 A.D. eruption of Mount Vesuvius.

Tectonic activity remaining on Venus?

Venus is comparable to Earth in size but its tectonic history and activity seems to have been quite different. For example, Venus exhibits circular collections of faults and ridges that range up to 2600 kilometers across, known as coronae. Smrekar and Stofan (p. 1289) present a model in which these features are formed by upwelling associated with plumes and suggest that some may still be active.

Ribosomal switch

As the ribosome translates nucleic acid sequences into proteins, it is thought to undergo large conformational changes. Lodmell and Dahlberg (p. 1262)

constructed mutations in the 912 region of the central domain of 16S ribosomal RNA (rRNA) that led to increases or decreases in the fidelity of translation similar to those seen for mutants of the ribosomal proteins S12 and S5. Sequences were identified that engage in a conformational switch in rRNA. This switch is facilitated by S5 and S12 and appears to affect the codon-anticodon arrangement and the selection of the correct transfer RNA at the ribosomal A site.

Binds and winds

Although it is known that transcription activators stimulate transcription, the structural basis for this regulation has been elusive. Uesugi *et al.* (p. 1310) describe the secondary structure that is induced in the activation domain of the herpes simplex virus VP16 protein when complexed to its target protein, hTAF_{II}31 (a subunit of the human general transcription factor TFIID). Upon binding, VP16 undergoes an induced transition from random coil to α -helix. Sequence similarities in the acidic activation domains of VP16 and other proteins suggest a general recognition element of acidic activation domains for hTAF_{II}31.

Signs of age

A helicase gene, WRN, is defective in the human disease, Werner's syndrome, a disease that exhibits some of the same features as normal aging. A similar gene in yeast, SGS, also codes for a helicase. Sinclair *et al.* (p. 1313; see the Perspective by Botstein *et al.*, p. 1259) show that the absence of SGS causes yeast cells to show signs of premature aging: a shorter average lifetime, sterility, and nucleolar fragmentation. Further elucidation of the functions of SGS may shed light on the process of normal aging.

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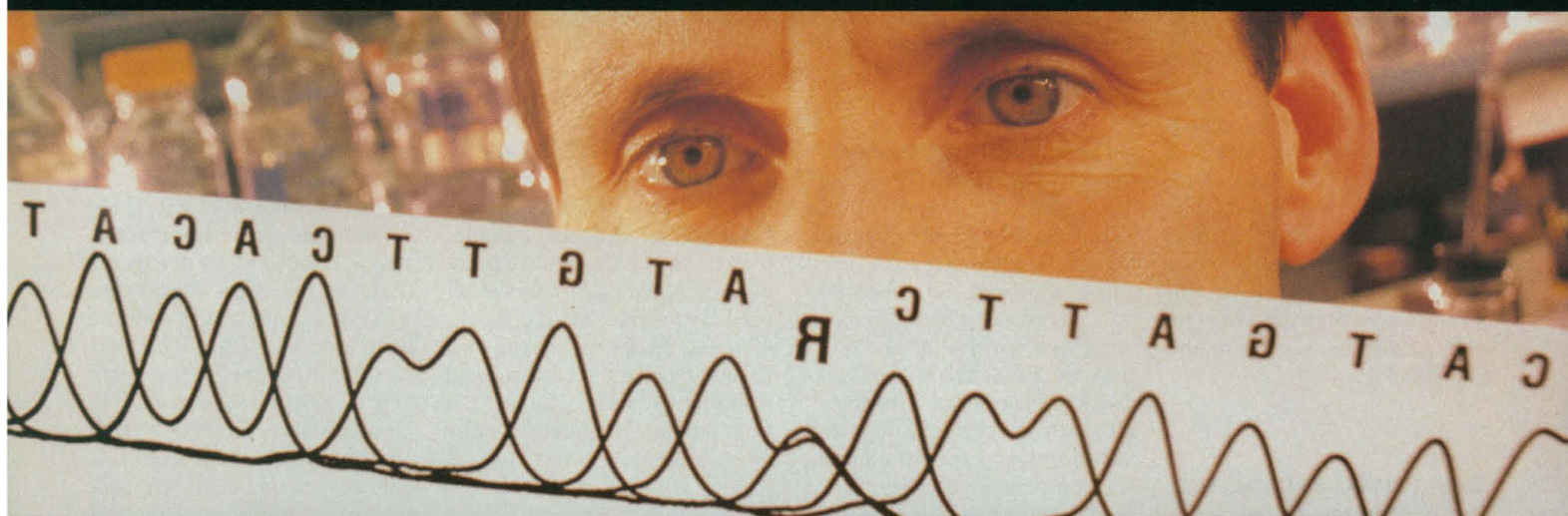
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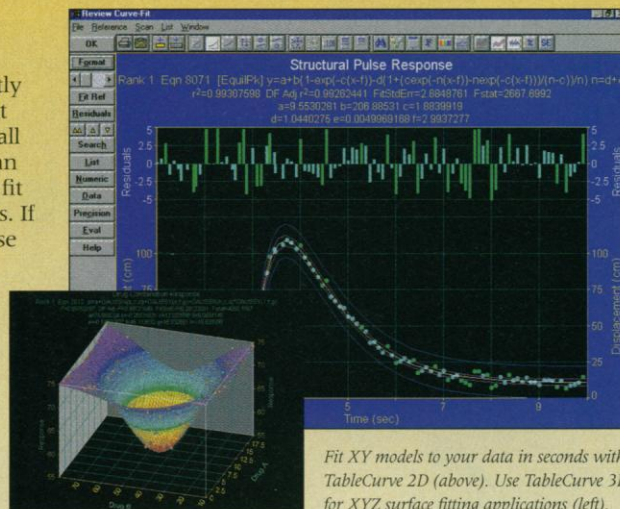
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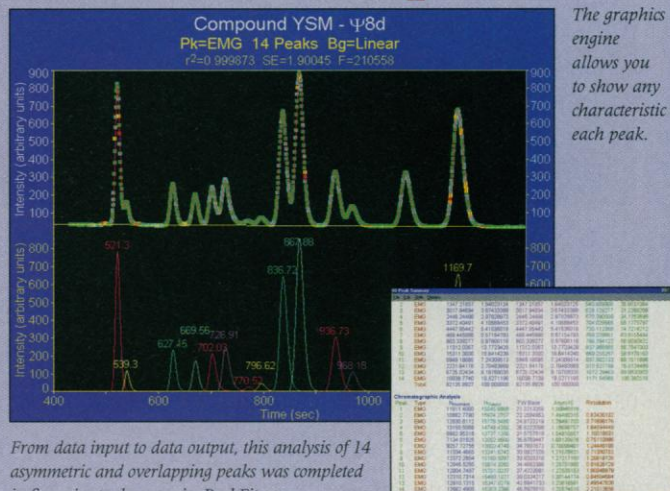
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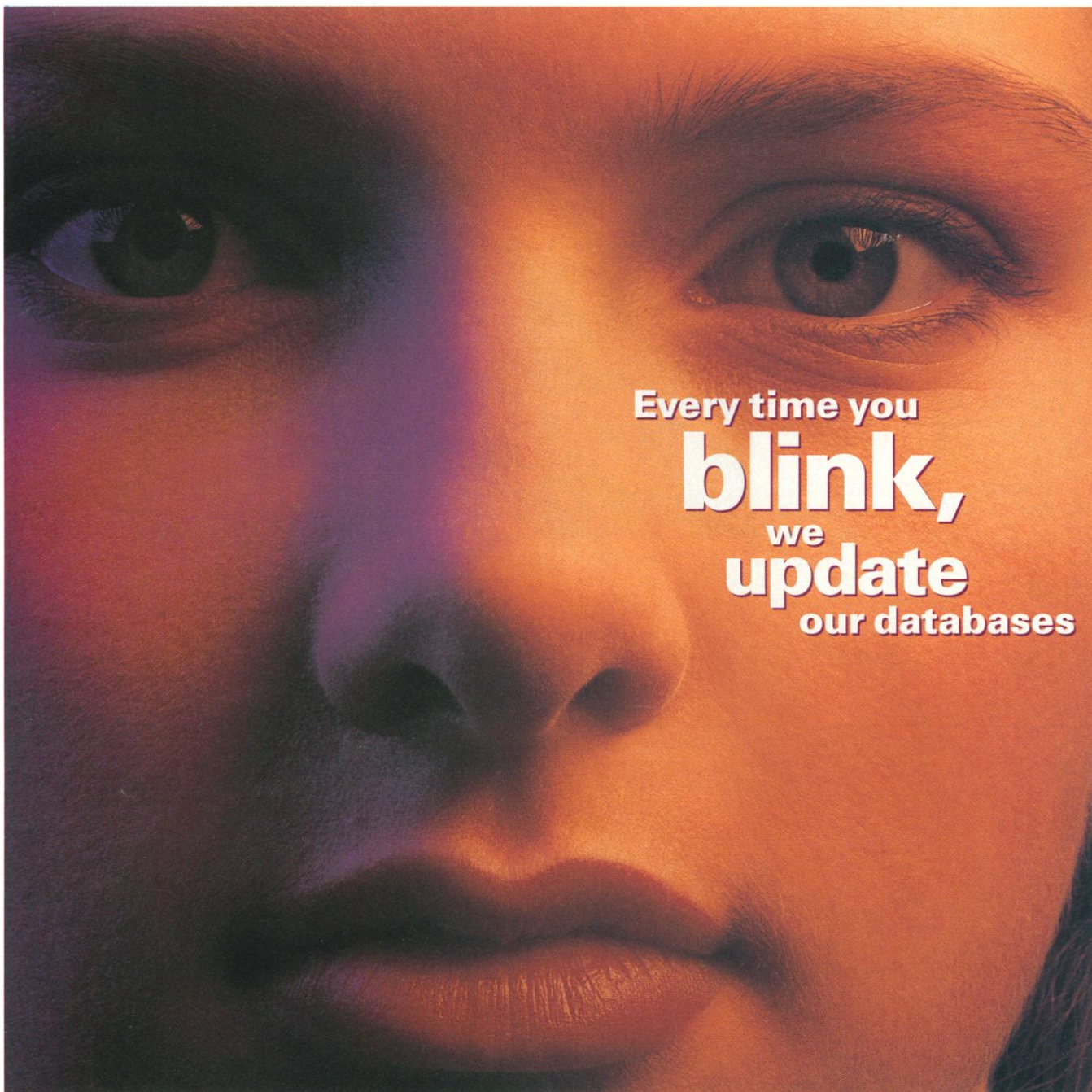
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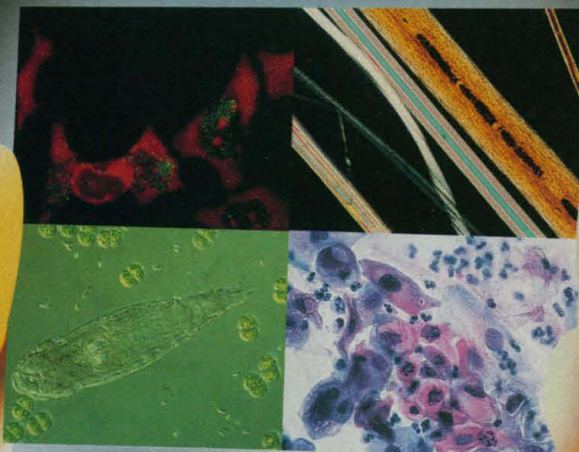
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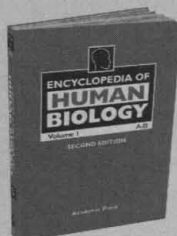
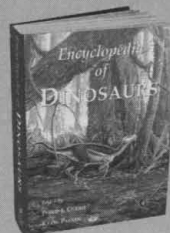
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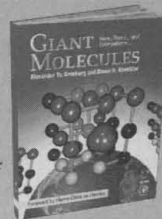
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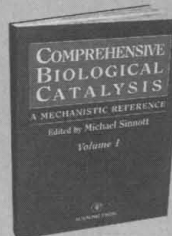
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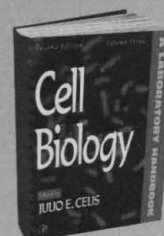


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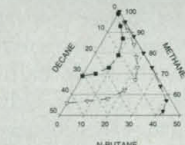
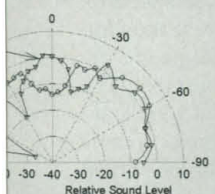
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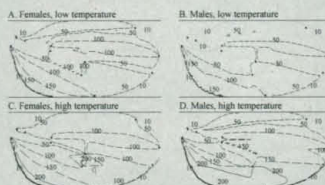
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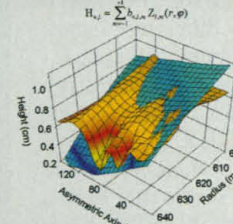
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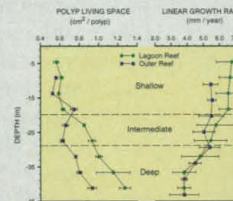
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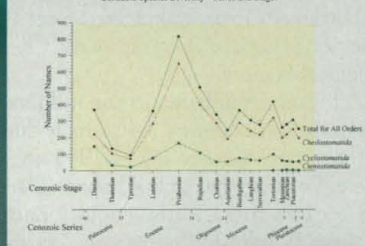
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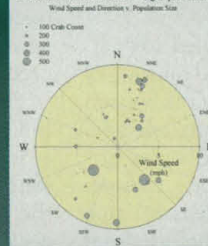
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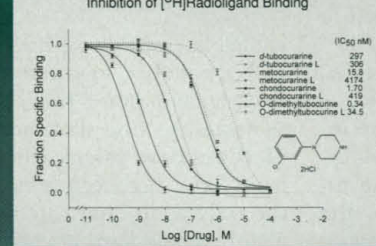
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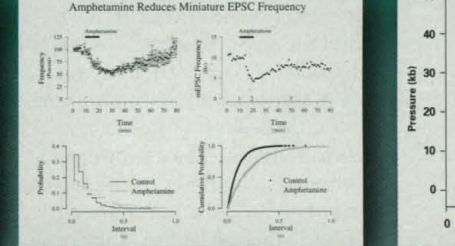
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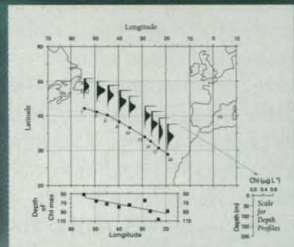
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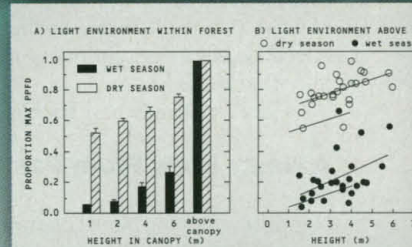


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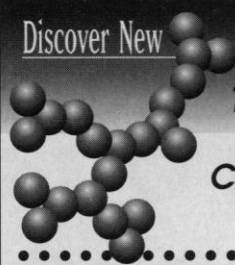
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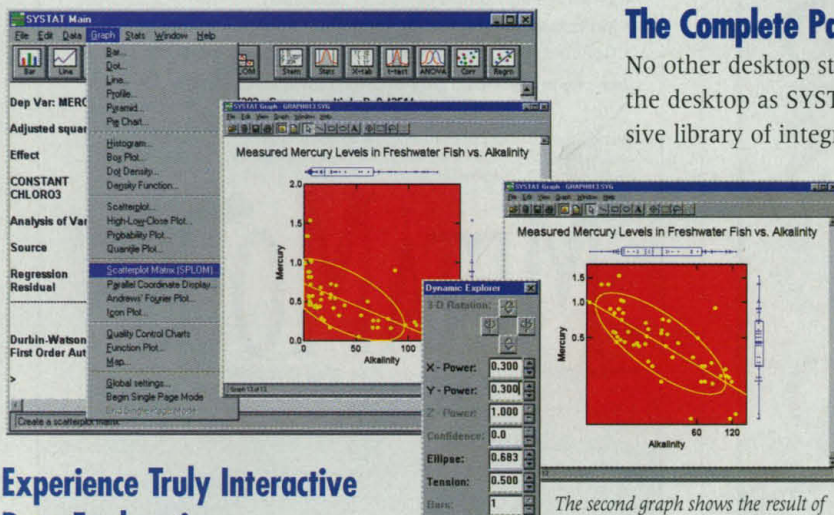
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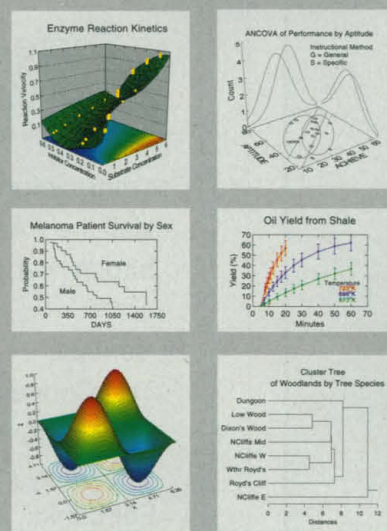
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