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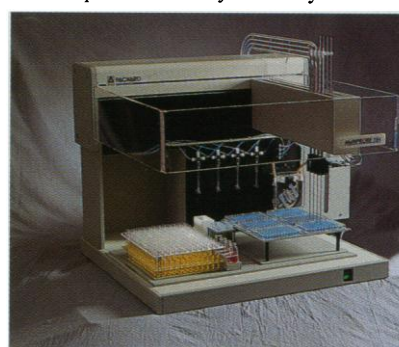
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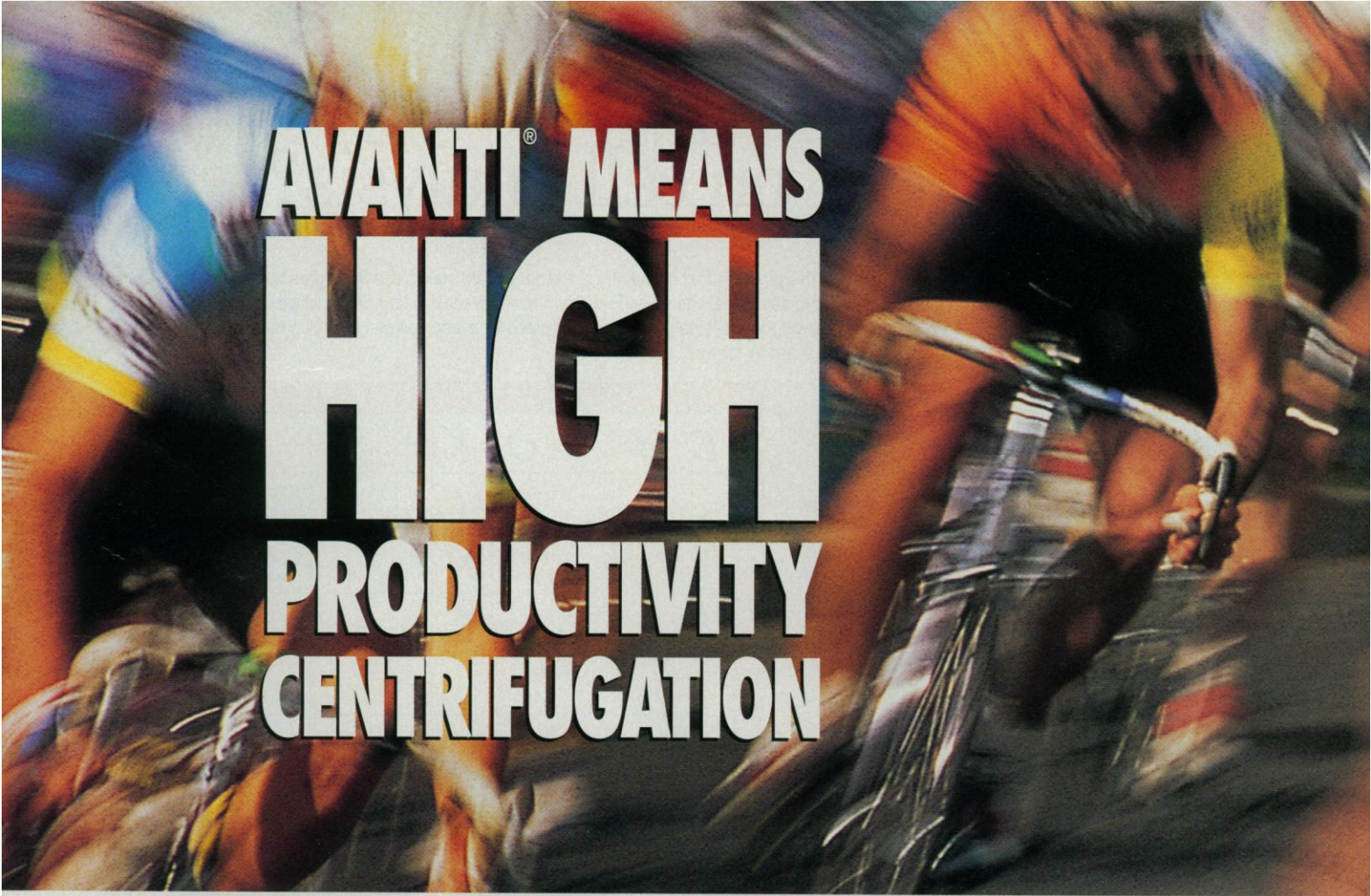
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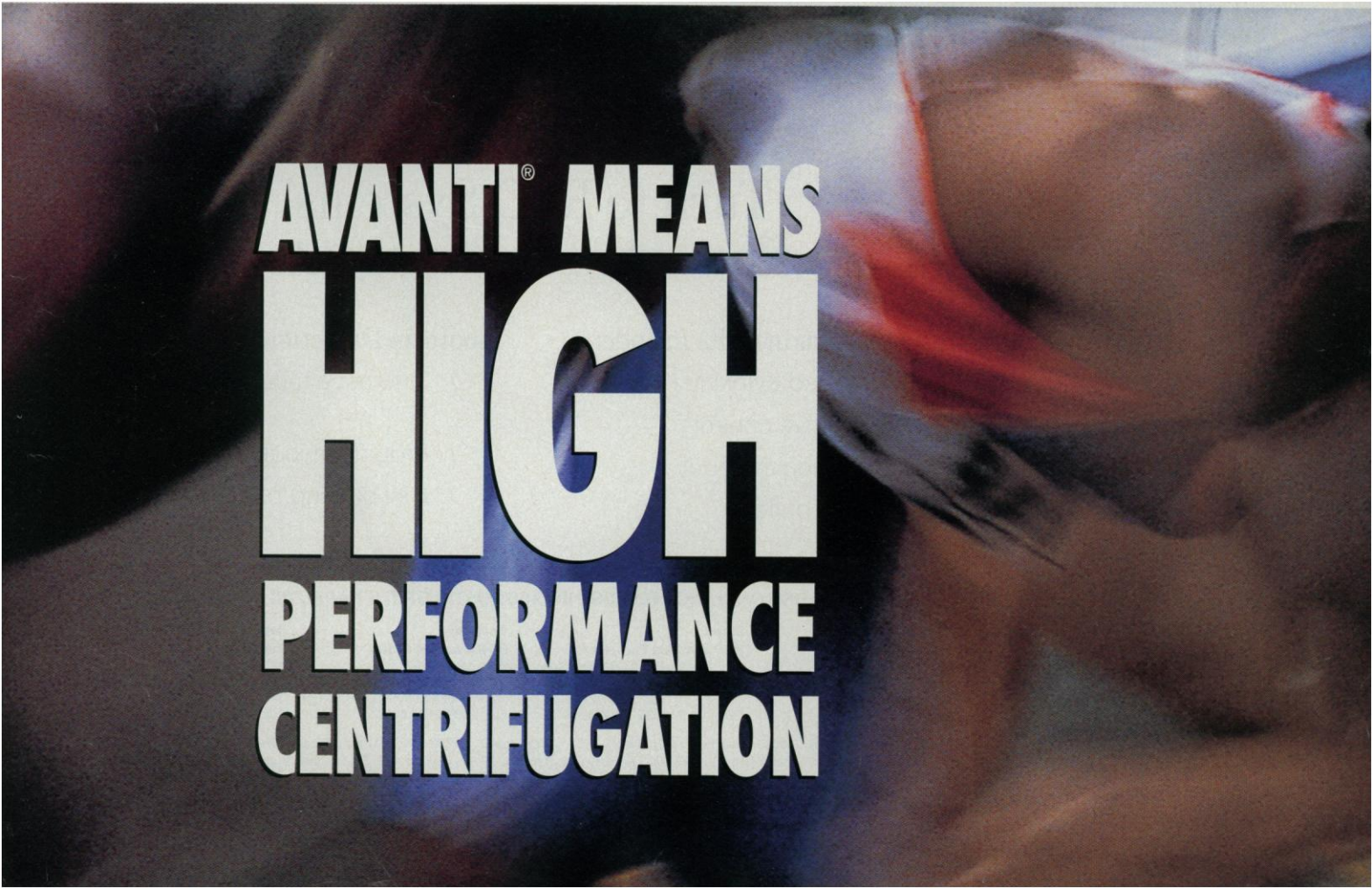
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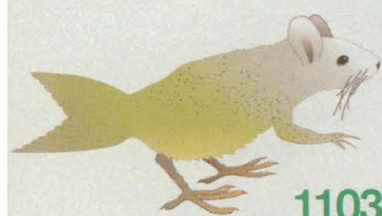
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COVER

Waves of spontaneous neural activity create domains in the developing mammalian retina. Activity was detected in the retinal ganglion cell layer of a newborn ferret by fluorescence imaging with a calcium indicator. The gray background is a fluorescence image of a P2

retina. The colors correspond to six consecutive waves that occurred during 1 minute of imaging, and the intensity indicates the direction of propagation (dark to light). See page 1182. [Image: M. B. Feller, D. P. Wellis, D. Stellwagen, F. S. Werblin, and C. J. Shatz]



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Vegetarian beginnings

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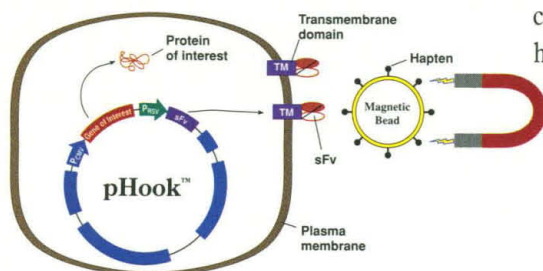
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THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Assembly lines

The self-assembly of amphiphilic molecules on surfaces into highly ordered films could find applications that include biosensors and corrosion inhibi-



tors. Poirier and Pylant (p. 1145; see the Perspective by Chiang, p. 1123) investigated the assembly mechanism of such monolayers by scanning tunneling microscopy and observed a two-step growth mode. A phase transition to a denser phase occurred as coverage increased.

Older hoofed order

Orders of ungulates (hoofed mammals) have been recognized back to the early Tertiary (about 65 million years ago). In a phylogenetic analysis, Archibald (p. 1150; see the news story by Peterson, p. 1102), now suggests that they can be related back to fossils primarily from the 85 million-year-old Bissekty Formation, Uzbekistan. These fossil deposits may mark the beginning of herbivory in placental mammals.

Ocean carbon control

The ocean surface is home to much biologic activity, including the incorporation of atmospheric CO₂ into biomass by means of photosynthesis. A portion of the biogenic carbon is then exported to ocean depths. Rivkin *et al.* (p. 1163) show that, in the Gulf of St.

Atomic realization of Schrödinger's cat

In quantum mechanics, microscopic states can be combined in superpositions that may defy our classical view of reality. In a famous thought experiment, "Schrödinger's cat" was placed in a sealed box with a radioactive decay experiment, the result of which determines whether the cat lives or dies. Strictly speaking, even after the detector records the decay event, we cannot say the cat is alive or dead; we can only give a probability. In an effort to better understand this aspect of quantum mechanics, Monroe *et al.* (p. 1132; see the news story by Taubes, p. 1101) have constructed an atomic system (a laser-cooled beryllium ion held in a harmonic oscillator potential) that can entangle the electronic and motional states of the atom in a manner analogous to Schrödinger's cat. Such systems can be used to study quantum decoherence, the evolution of these states into statistical mixtures.

Lawrence, biogenic carbon export was similar from both herbivorous and omnivorous food webs and was not directly proportional to new photosynthetic production, which can increase dramatically during spring bloom. Models predicting the amount and nature of biogenic carbon transport may need to rely on other parameters.

Collecting copper

Some of the world's richest copper deposits were formed at low temperatures when descending fluids dissolved, and then concentrated copper minerals originally formed in magmatic hydrothermal systems, a process called supergene enrichment. Sillitoe *et al.* (p. 1153) now provide morphological evidence—essentially metallized bacterial fossils—that bacteria were involved in supergene enrichment in copper deposits in northern Chile and may have facilitated copper fixation at depth.

Going for the Golgi

Vesicles and organelles must have address tags that control the budding and fusion events of

intracellular transport. Subramaniam *et al.* (p. 1161) identified a cis-Golgi membrane protein that acts as one of the targeting receptors. The protein is thought to be involved in the recognition of vesicles derived from the endoplasmic reticulum that must fuse with the cis-Golgi.

Tapping the TGF- β receptor

Transforming growth factor- β (TGF- β) regulates functions of many different cell types and has potential therapeutic applications, but the way in which signals are transmitted from the TGF- β receptor are not well understood. This receptor, itself a serine threonine kinase, activates a member of the mitogen-activated protein kinase kinase (MAPKKK) family that is known as TAK1. MAPKKKs activate a series of protein kinases and thus carry signals from various receptors on the cell surface to the nucleus. Shibuya *et al.* (p. 1179) identified a new protein, TAB1, that interacts with the MAPKKK and that is not related to any known protein. TAB1 appears to participate in activation of TAK1 by TGF- β and to provide a new

mechanism by which members of a MAP kinase cascade can be activated.

Regulating antigen signaling

When antigens activate the T cell receptor (TCR), they initiate the immune response (T cell proliferation) by triggering tyrosine phosphorylation within the cell. Two reports show that negative regulation of kinase activity by phosphatases is initiated as well. Marengère *et al.* (p. 1170) show that CTLA-4, whose surface expression increases after TCR activation, is associated with the tyrosine phosphatase SYP. The CTLA-4-associated SYP can down-regulate both the TCR and the RAS pathways. Plas *et al.* (p. 1173) show that T cell activation causes the binding of the tyrosine phosphatase SHP-1 to the tyrosine kinase ZAP-70. This kinase is stimulated by TCR activation but SHP-1 binding decreases its activity.

Cryptic origins

Cancers are generally thought to be monoclonal in origin, that is, to arise from a single mutant cell and its descendants. Novelli *et al.* (p. 1187) have tested this hypothesis by studying a rare patient who was an XO/XY mosaic and who also had familial adenomatous polyposis, a disorder characterized by the development of multiple precancerous microadenomas in the colon. In situ hybridization studies of tissue sections with Y chromosome-specific probes revealed that intestinal crypts were monoclonal in origin, but surprisingly the majority of microadenomas were polyclonal in origin.

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1. Mix

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2. Cycle

Temperature cycle to extend and incorporate mutation primers resulting in nicked circular strands

3. Digest

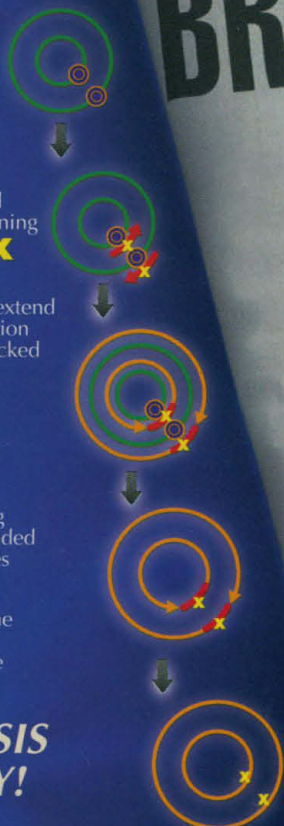
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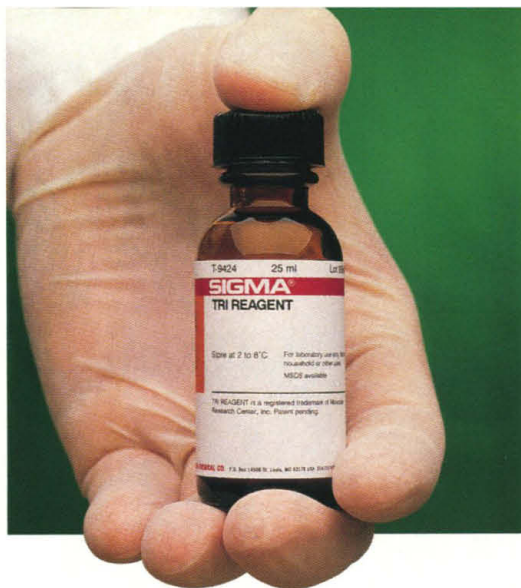
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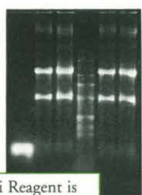
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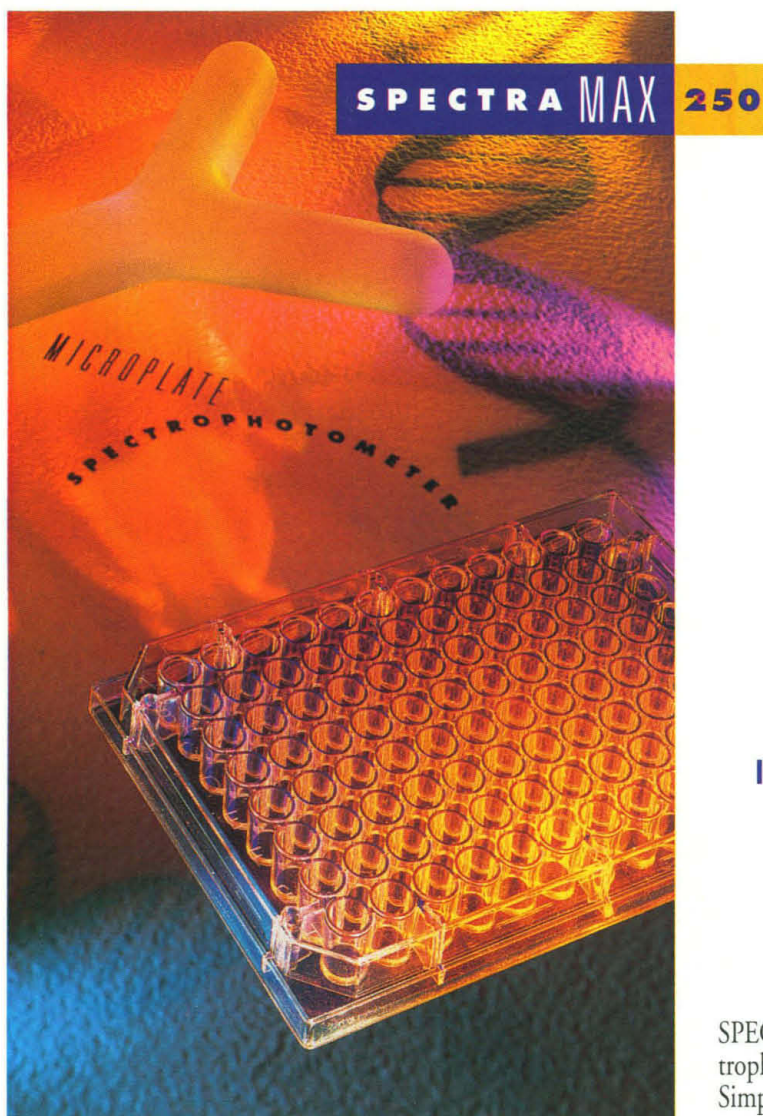
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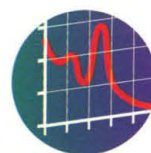
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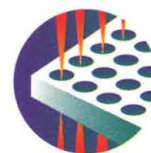
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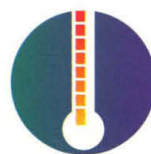
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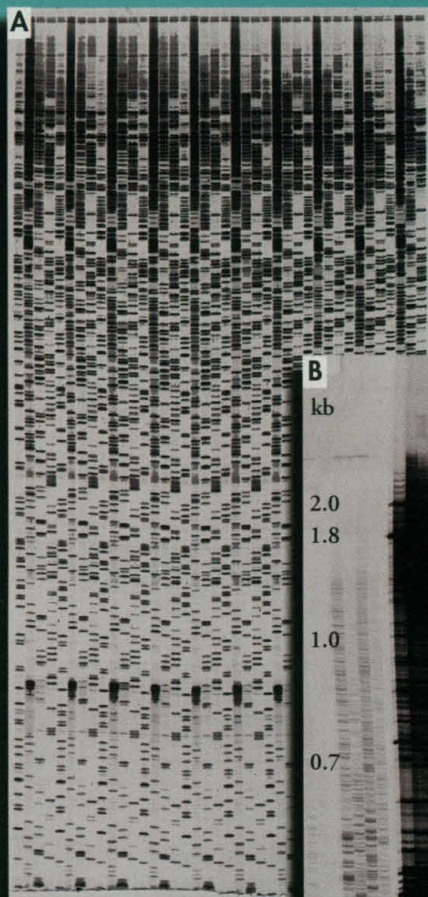
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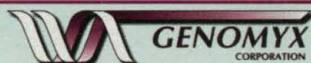
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Panel A: pTTQ plasmid template samples run on **genomyxLR DNA Sequencer** (2 hr, 100 W, 3000 V, 50°C, 6% HR-1000™ denaturing gel).

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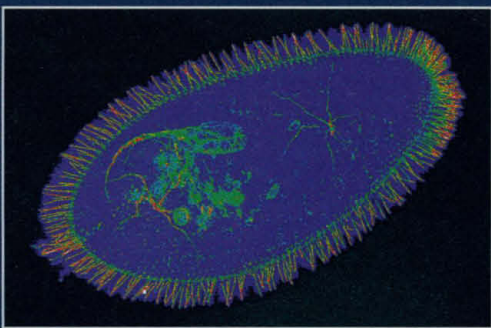
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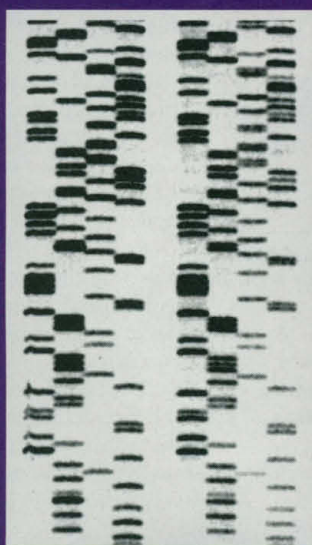
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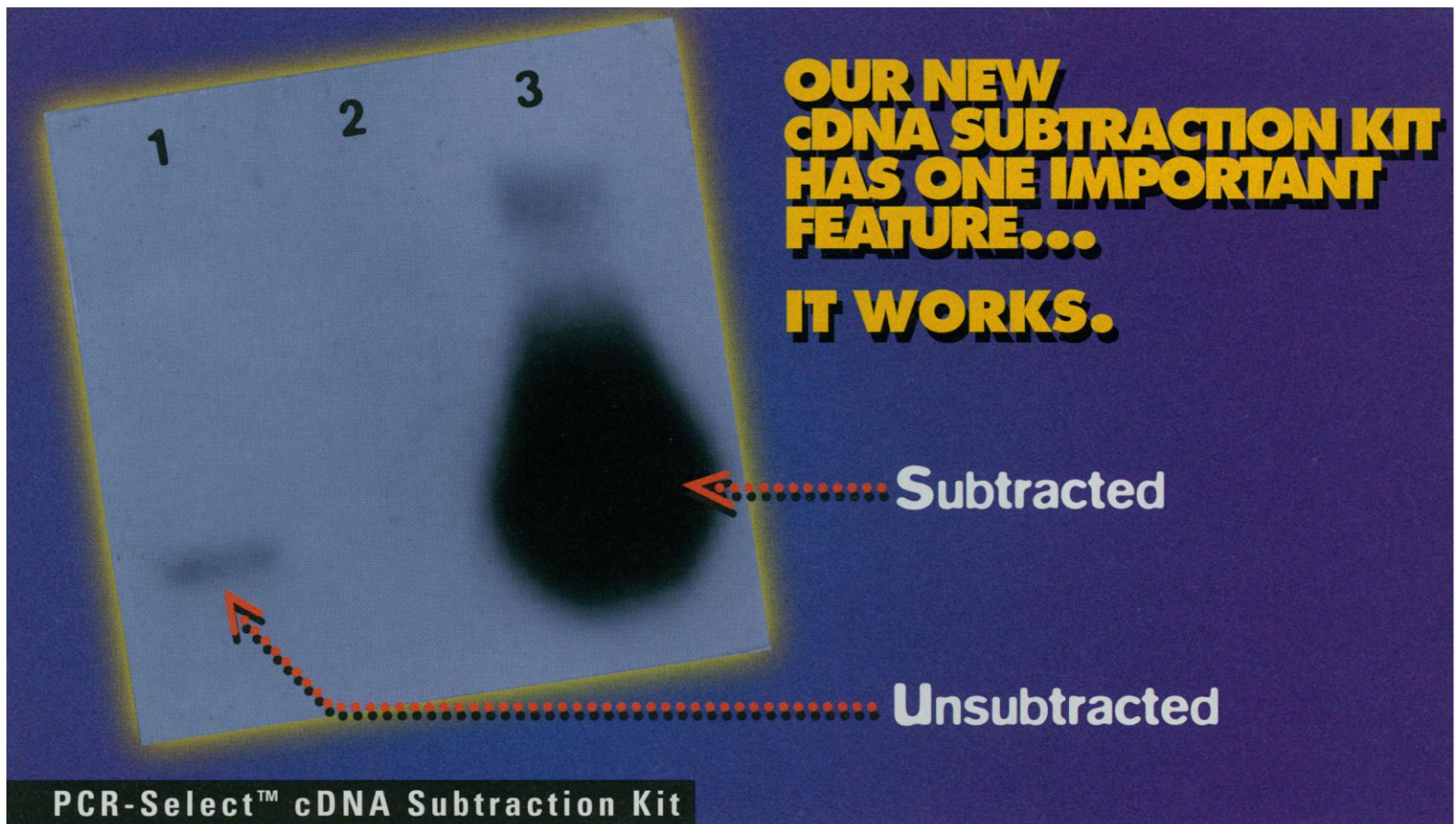
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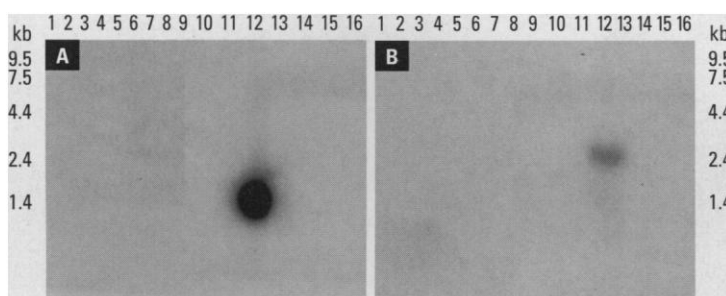
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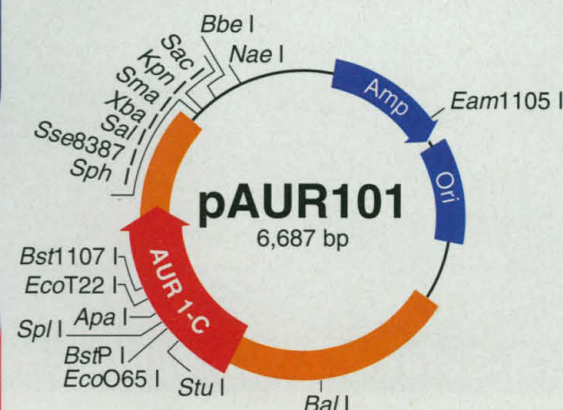
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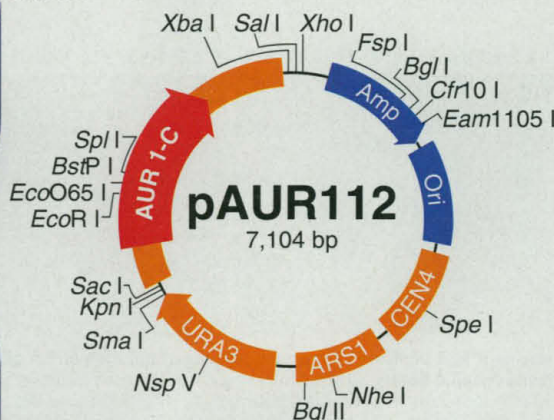
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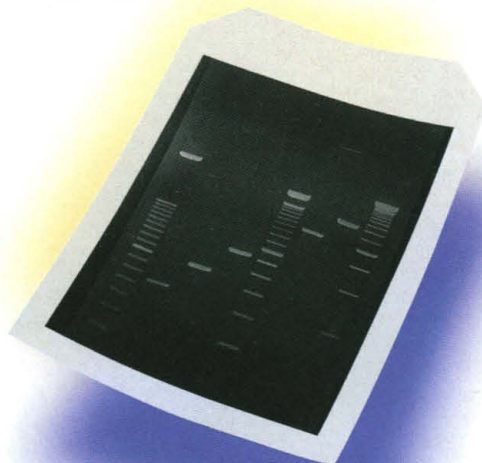
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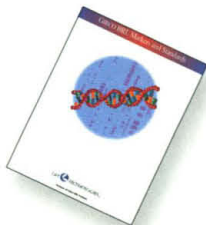
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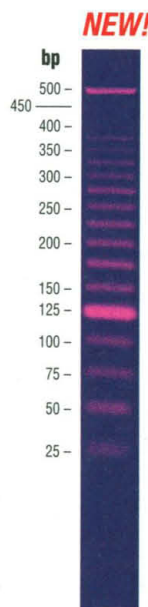
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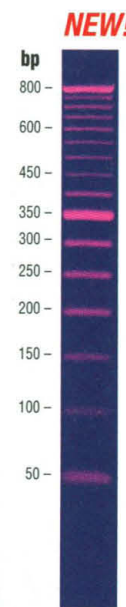
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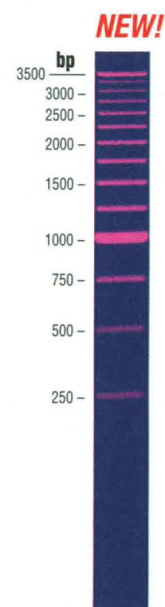
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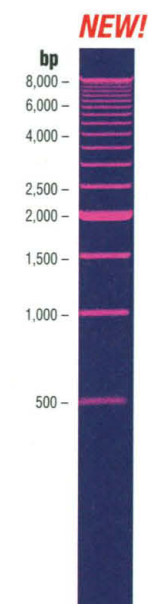
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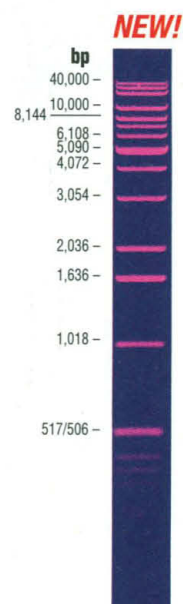
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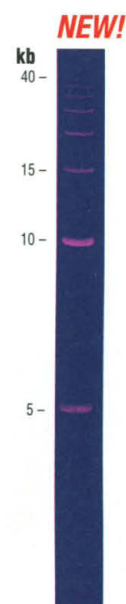
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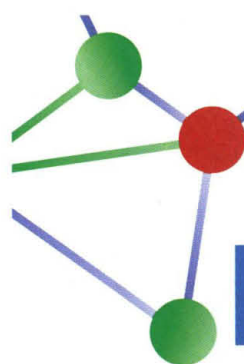
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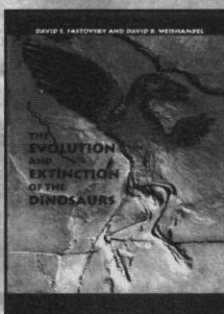
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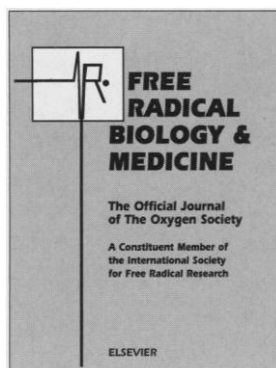
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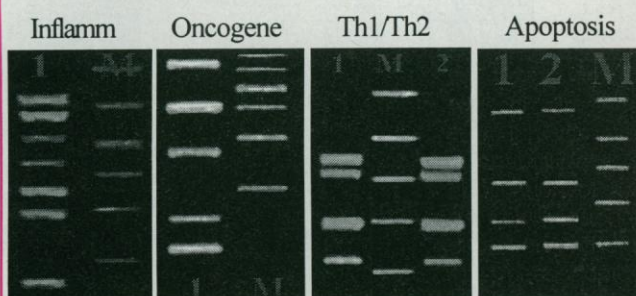
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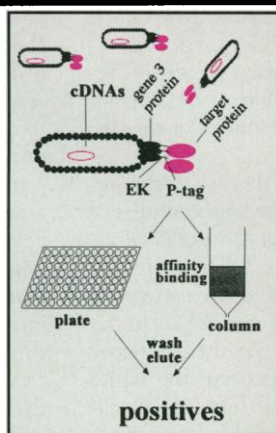
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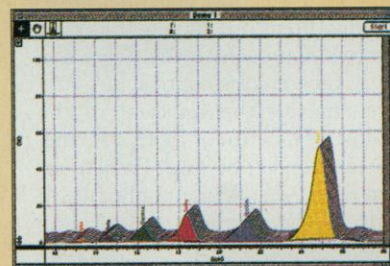
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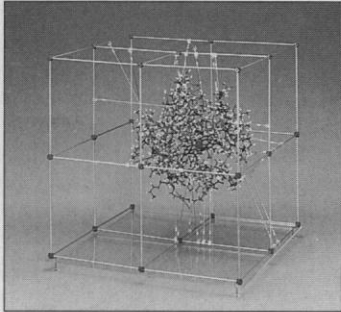
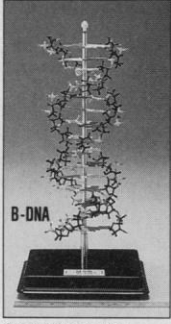
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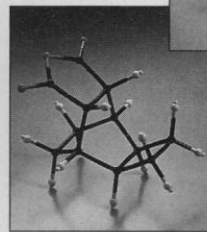
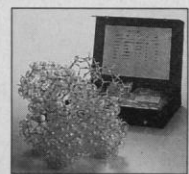
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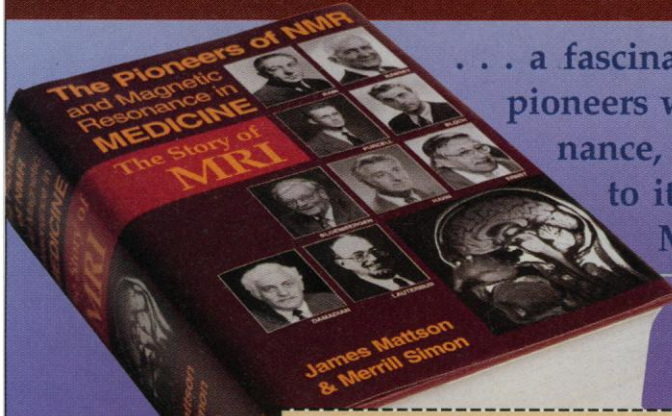
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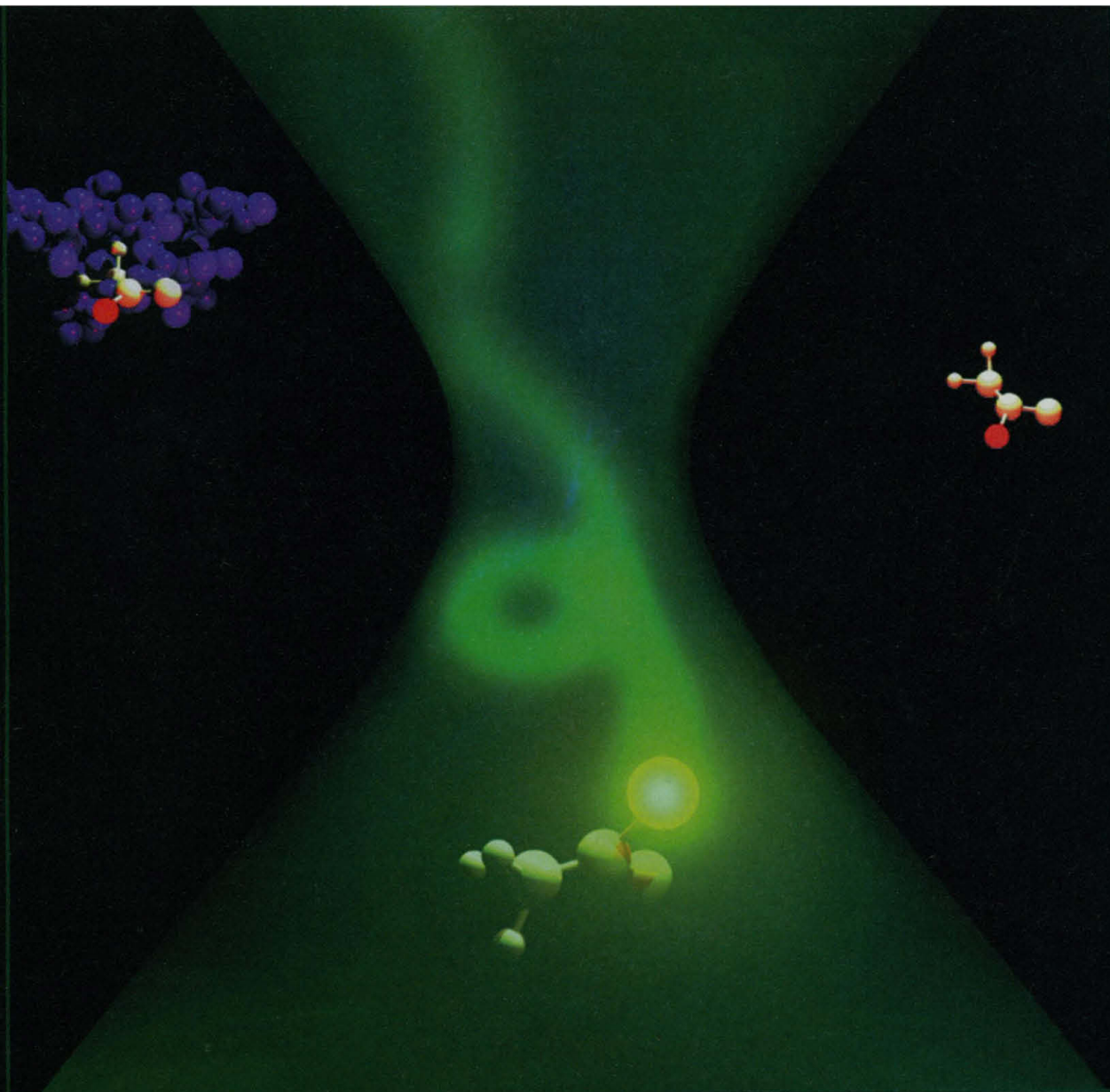
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