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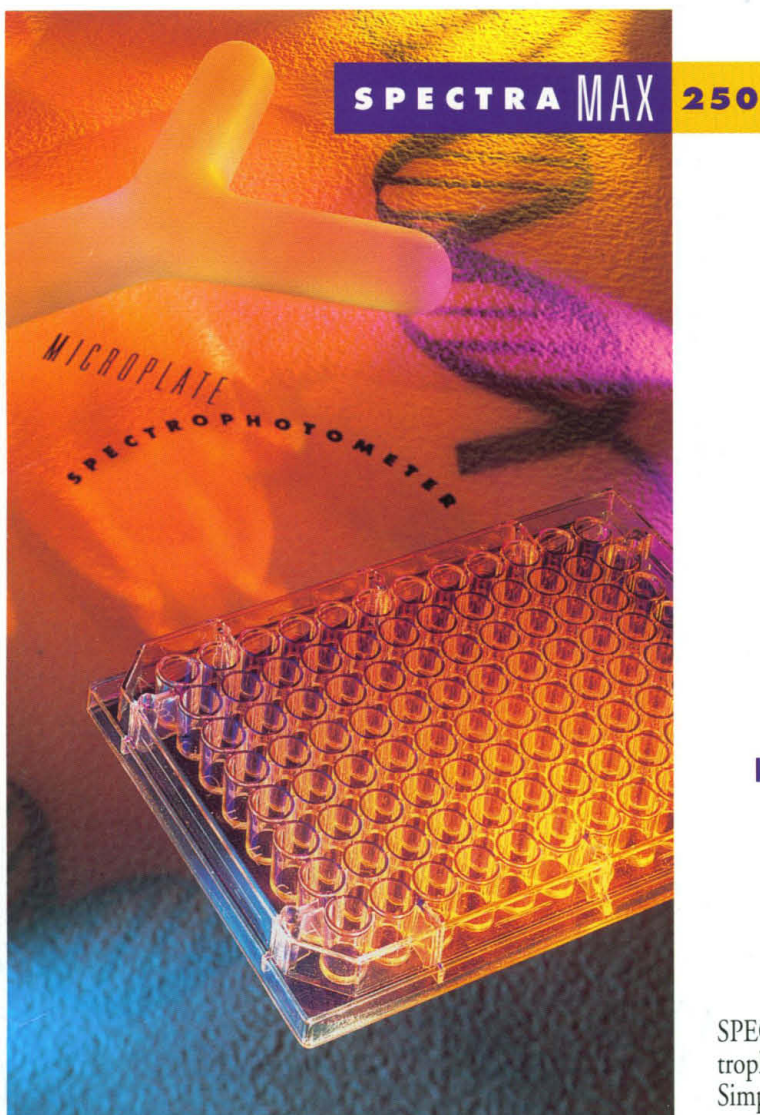
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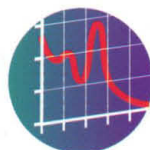
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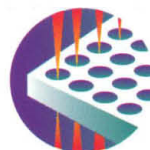
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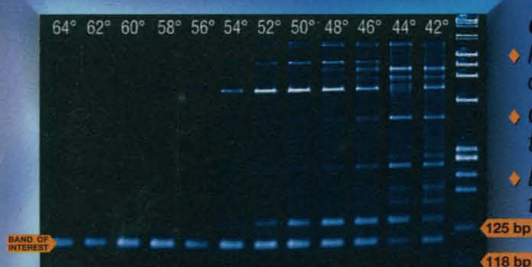
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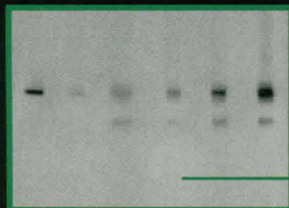


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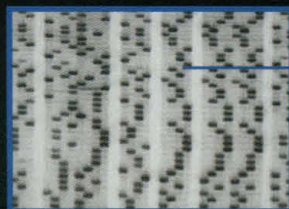
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This skull of 90-million-year-old *Carcharodontosaurus saharicus*, reconstructed from fossils found in Morocco, provides new evidence of Africa's isolated dinosaurian fauna. Although it rivals in size the skull of *Tyrannosaurus rex*, the volume of its braincase (205

cubic centimeters) is only half that of *T. rex*, and the estimated volume of its brain (~100 cubic centimeters) is only about one-fifteenth that of an average human's. See page 986 and the Perspective on page 971. [Photo: H. Larsson, D. Christopher, P. Sereno, University of Chicago]



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Island tour

Bursts of activity from hydrothermal vents, notably on the East Pacific Rise, inject voluminous plumes of water laden with helium-3 into the ocean depths. These plumes provide a natural marker to trace ocean circulation at depth and also provide a clue to the vigor of hydrothermal systems driven by magmatism at ocean ridges. Lupton (p. 976) now reports the discovery of a large helium-3 plume emanating from Loihi Seamount on the flanks of Hawaii. This plume can be traced 400 kilometers north and 2000 kilometers east of the Hawaiian Islands.

Solar variability and climate

Solar irradiance varies over the 11-year sunspot cycle, but the impact of this variability on climate has proven difficult to simulate in a realistic fashion. Haigh (p. 981; see the Perspective by Robock, p. 972) now shows in a simulation that not only solar irradiance variability but also the resulting modulation in stratospheric ozone levels should be taken into account. The model results suggest that increases in stratospheric temperature in response to enhanced solar irradiance result in stronger summer easterly winds, which allow transmission of the solar effects from the stratosphere to the troposphere. Changes in temperature, storm track position, and zonal wind are similar to but generally smaller than those observed.

Getting over a breakup

Dinosaurs were affected greatly by the breakup and separation of the large continents, which

Young stars from another galaxy

During a search for quasars behind the Large Magellanic Cloud, Beaulieu *et al.* (p. 995) discovered seven stars that appear to be in the very early stages of star formation. Their classification of these stars as pre-main-sequence candidates is based on irregular light curves and hydrogen emission spectra. If these are young stars from another galaxy, then they represent a rare opportunity to study the early evolution of stars.

became extensive during the Cretaceous. Understanding how this geographic change affected their evolution has been hampered by the sparse number of fossils from southern continents. Sereno *et al.* (p. 986; see cover and the Perspective by Currie, p. 971) describe dinosaur fossils, including a large skull of a predator, from the Kem Kem region of Africa. These findings imply that there was abrupt differentiation of dinosaur fossils in Africa during the Late Cretaceous and an earlier global radiation of large predators.

Zinc and ischemia

When the brain is deprived of oxygen, neurons rapidly begin to die. The process by which transient ischemia causes death in particular areas of the brain was examined by Koh *et al.* (p. 1013). They showed that the

accumulation of extracellular zinc around degenerating neurons would likely contribute to selective neuronal death. Injection of zinc chelator into the brain could, indeed, prevent neurodegeneration.

Producing the pituitary

The pituitary gland, which secretes hormones required for homeostasis, growth, and reproduction, normally forms from cells of the embryonic brain and the oral ectoderm. This initial inductive interaction begins a process of differentiation that eventually generates the several specific cell lineages of the adult pituitary. Sheng *et al.* (p. 1005) demonstrate in a mouse knockout that the LIM homeobox gene *Lhx3* is a key regulator of this developmental pathway. The *Lhx3* gene is normally expressed in embryonic and adult pituitary. In mice lacking functional *Lhx3*, the early stages of pituitary formation fail with a lack of proliferation and differentiation of the pituitary cell lineages.

Sorting machinery

The epidermal growth factor (EGF) receptor is internalized from the plasma membrane in clathrin-coated pits after binding to its ligand, EGF. Once inside the cell, the receptor-

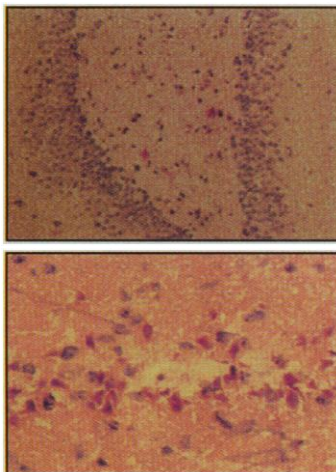
ligand complex is delivered to the lysosome for degradation. Kurten *et al.* (p. 1008) have discovered a protein they term a sorting nexin that interacts with the receptors and stimulates their efficient transport to the lysosome. The protein may be the prototype of a family of similar proteins involved in the regulation of endocytic membrane traffic.

Long lifelines

In the worm *Caenorhabditis elegans*, certain genes are known to affect the life-span of the organism. For example, mutations in the *daf-2* genes involved in the formation of an alternative dormant larval stage, the dauer phase, can extend lifetime. Lakowski and Hekimi (p. 1010; see the news story by Pennisi, p. 949) have identified another set of genes (the *clock* genes) in which mutations can extend life-span independent of the dauer phase. However, the two systems can interact: A double mutation (in *daf-2* and in a newly identified gene, *clk-1*) can lead to a fivefold extension of the worm's normal lifetime.

Aging brains

As brains age, their neurons become more fragile. Thibault and Landfield (p. 1017) show that part of the aging process that may account for the increased fragility is an increase in the number of calcium channels in aged neurons. The change was also shown to correlate with a reduction in the ability of aged rats to learn. These age-associated changes in neuronal physiology begin to explain the increasing vulnerability to neurodegenerative conditions with age.



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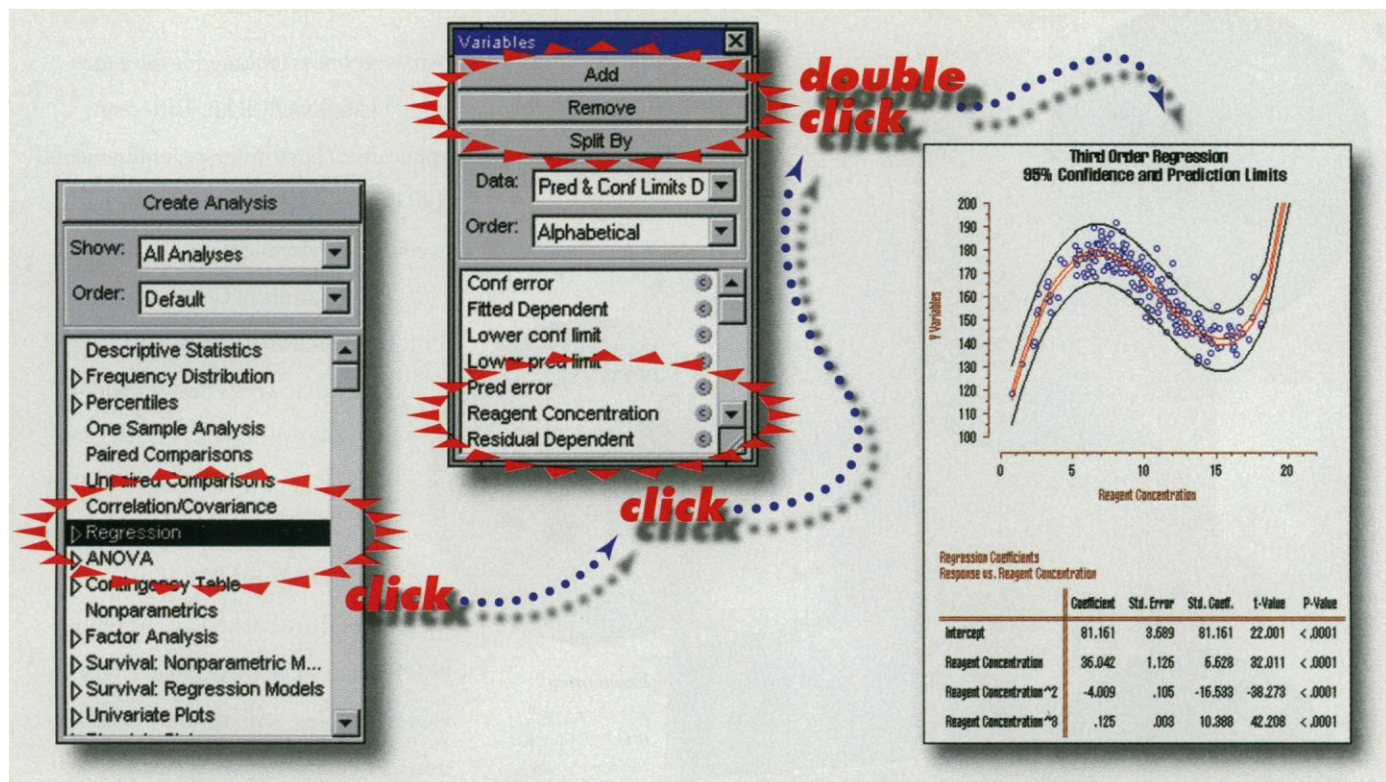
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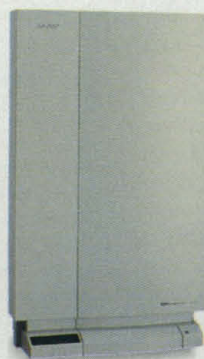
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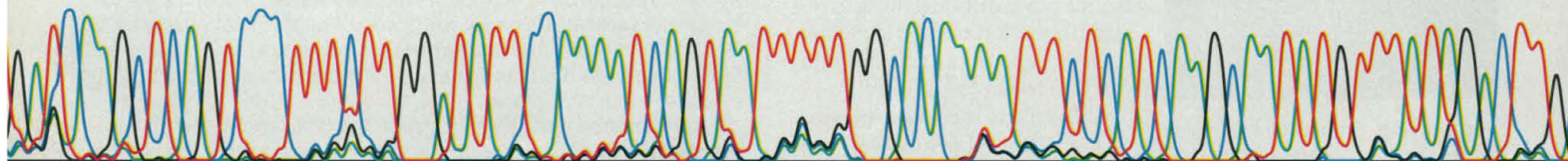
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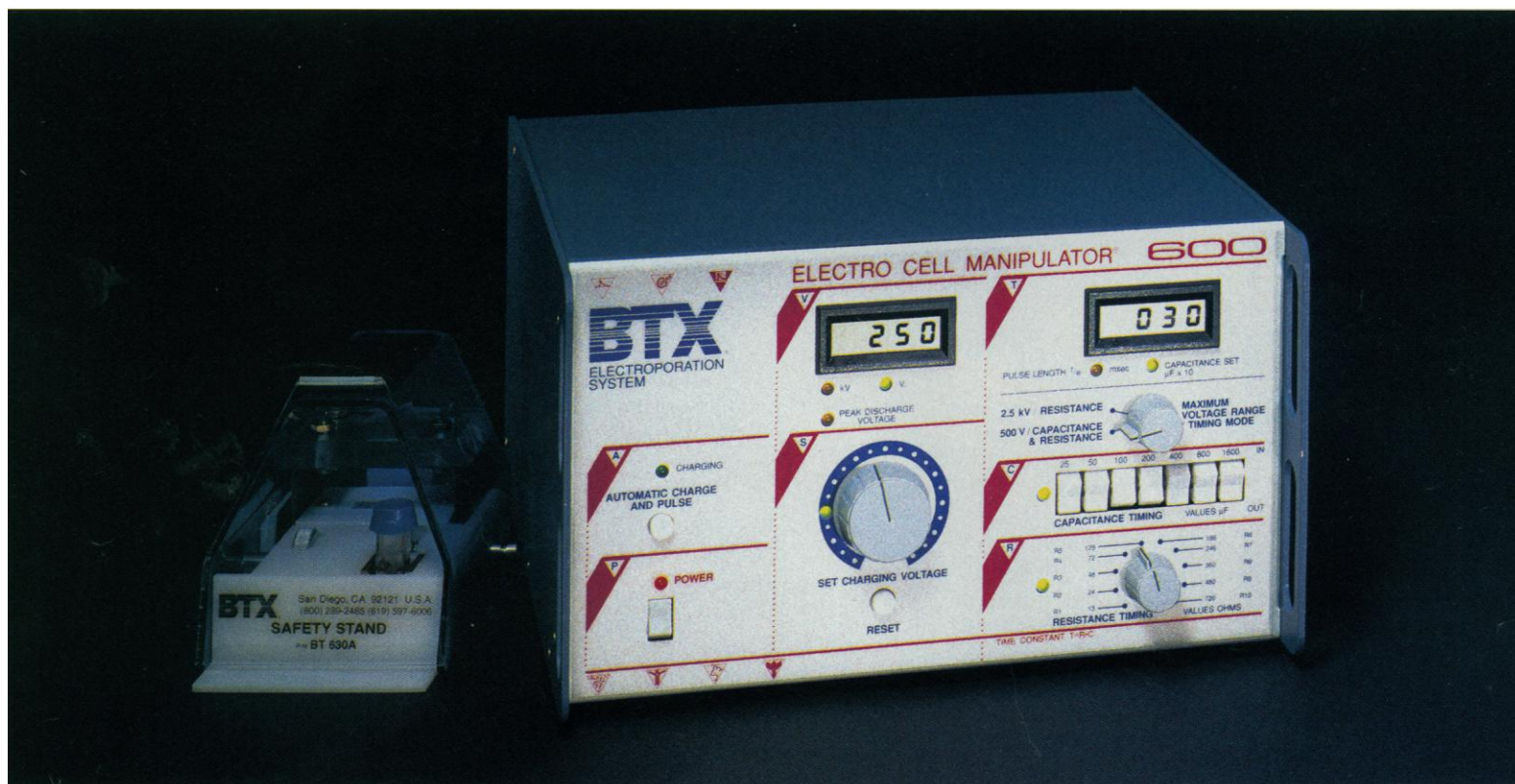
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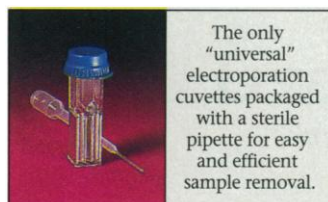
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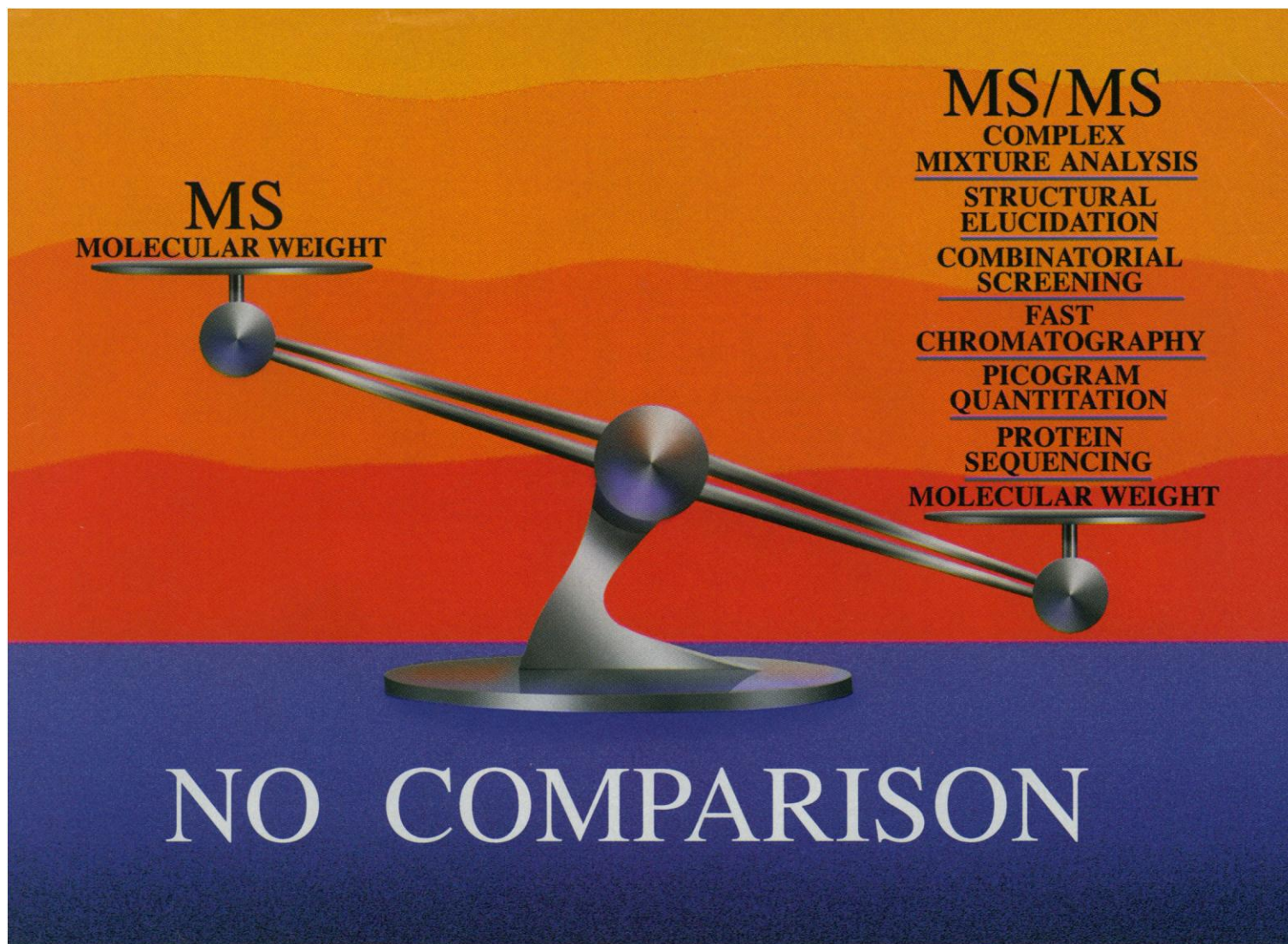
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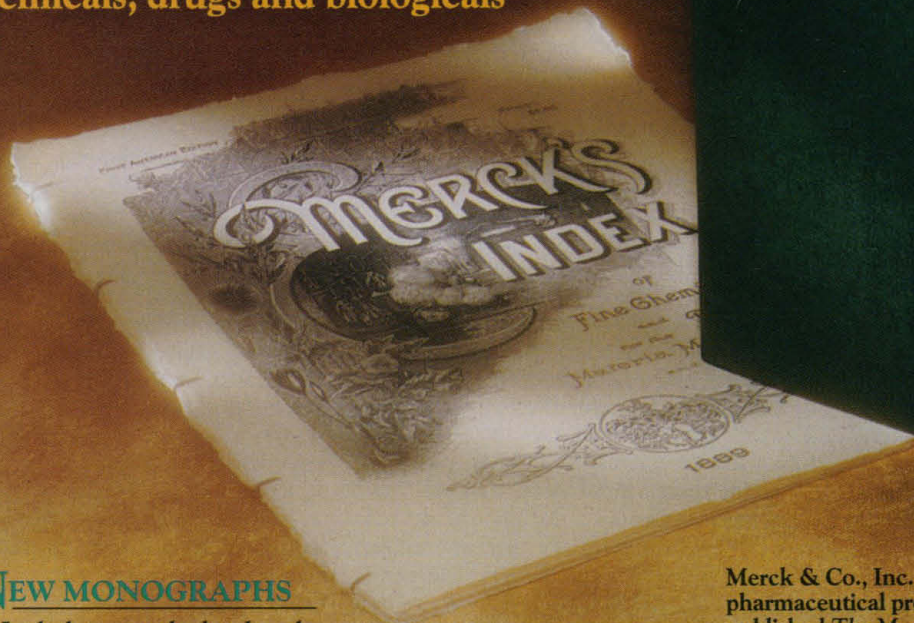
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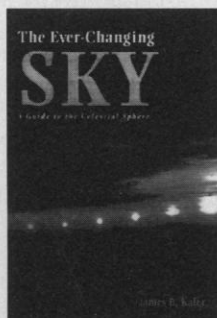
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