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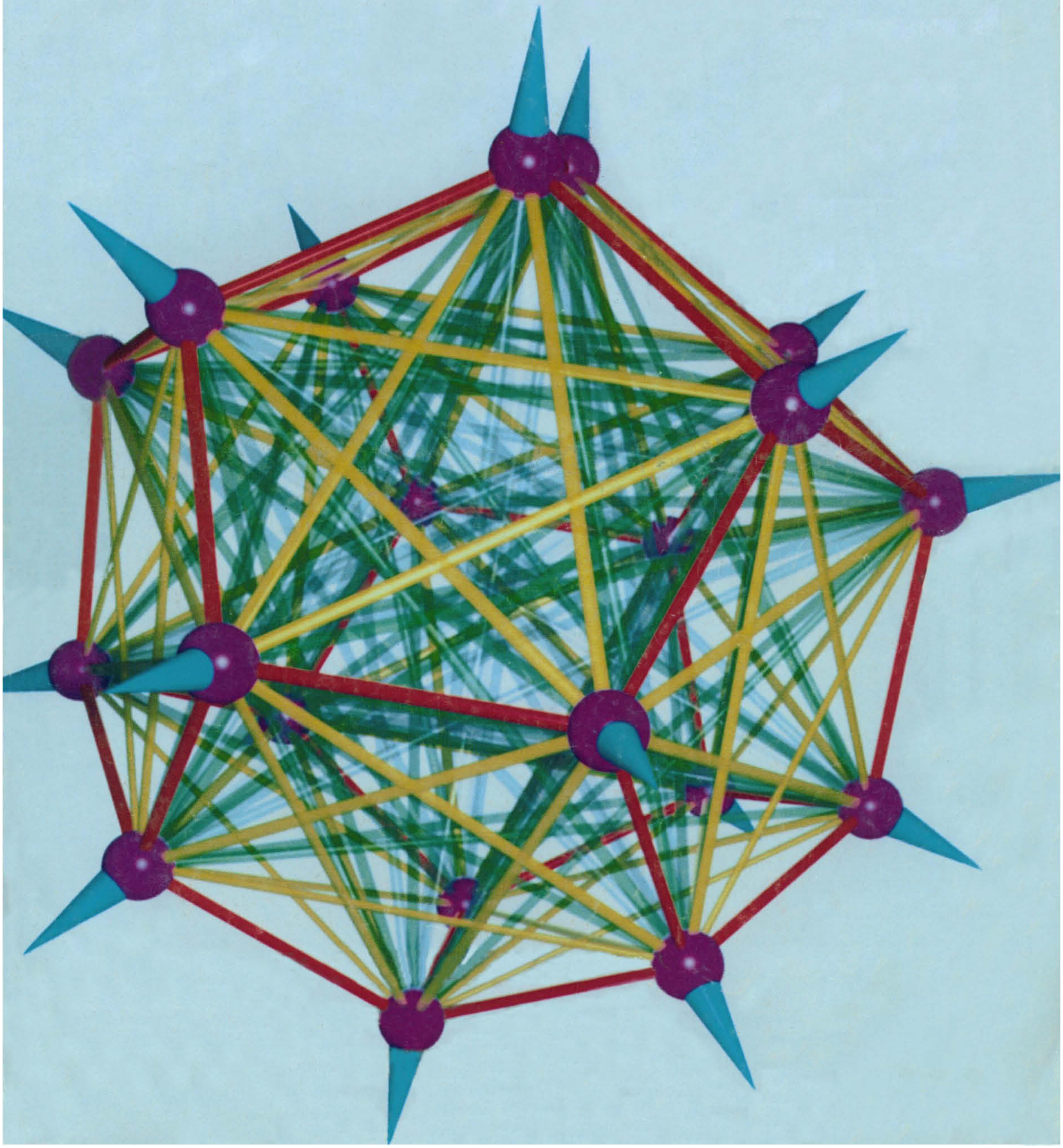

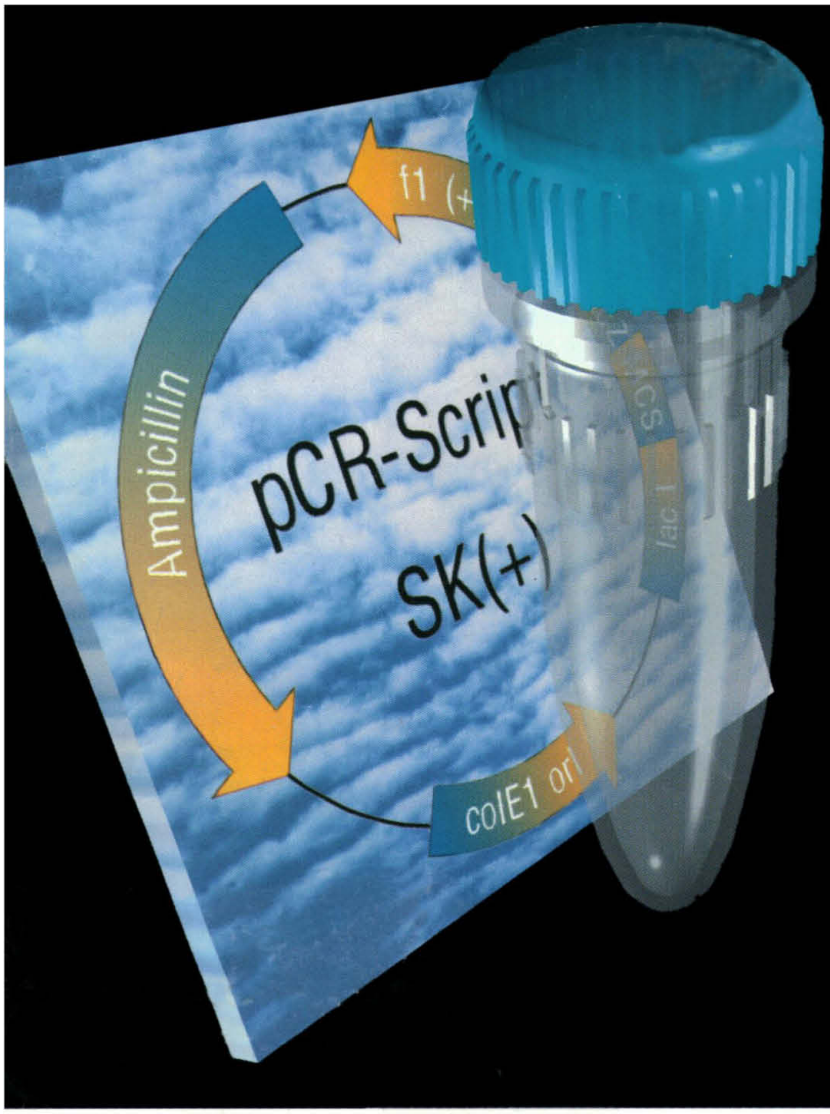

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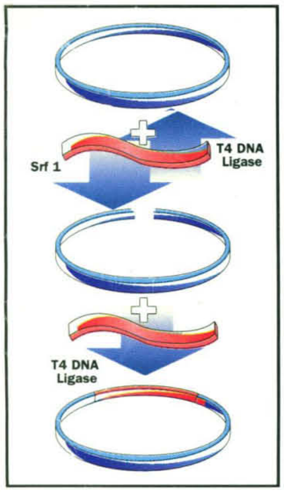

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1. Bauer, J., et al. (1992) *Stratagies* 5:2-64

* The polymerase chain reaction (PCR) process is covered by patents in the United States owned by Hoffmann-La Roche. Use of the PCR process requires a license.

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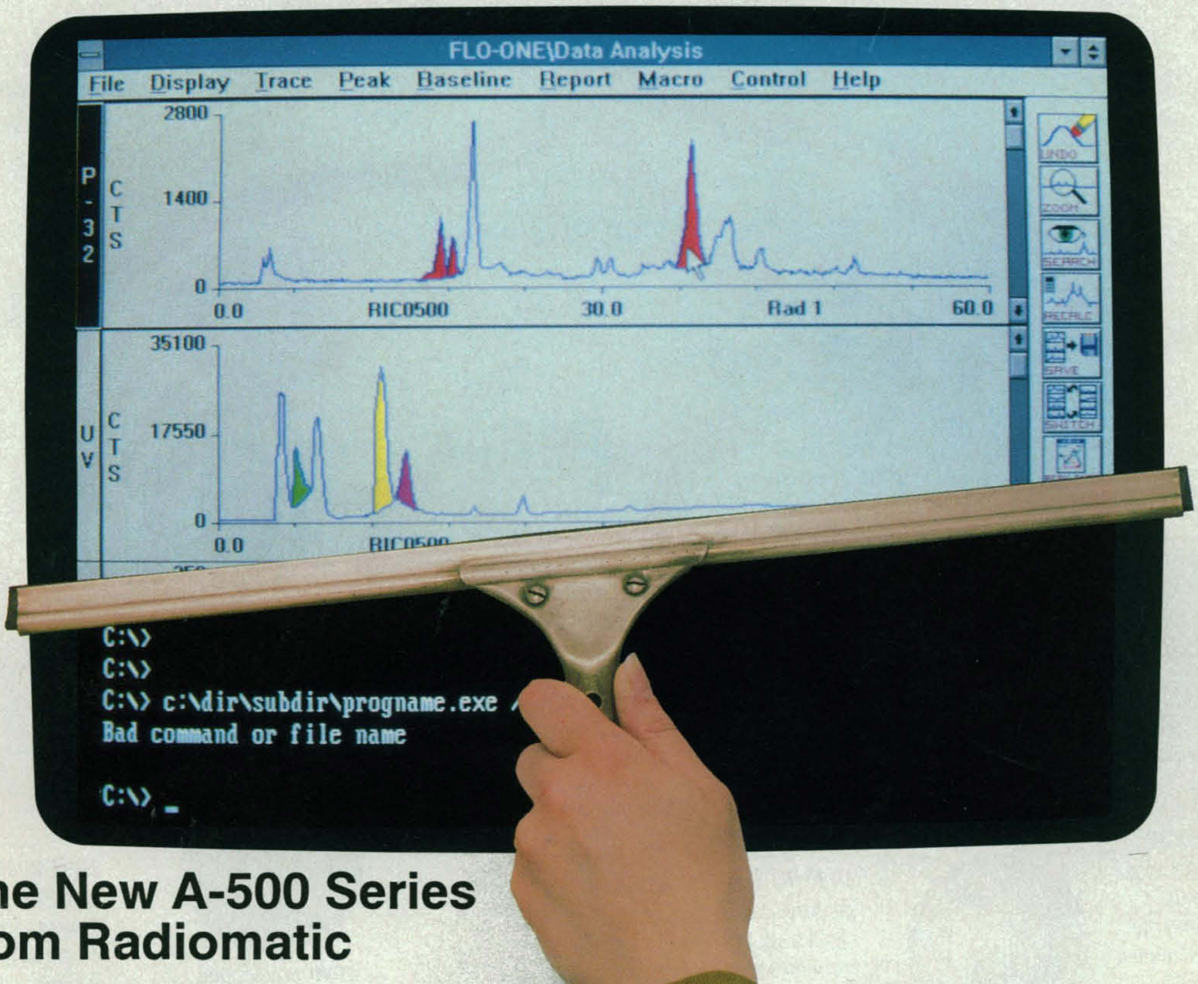

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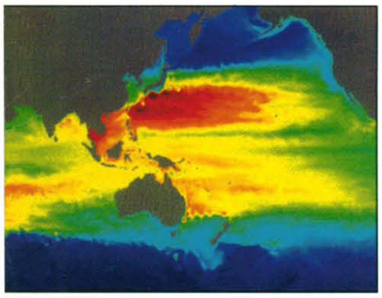

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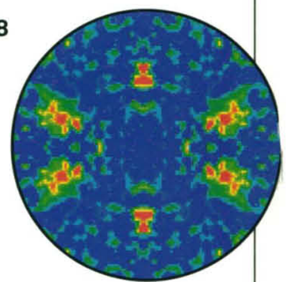

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Neural network model of the primate motor cortex, with cells coding different directions of movement (purple balls with directional blue cones). Interactions between cells vary, ranging from strong excitatory (red, similar directions) to strong inhibitory (green, opposite directions), depending on the similarity of the preferred directions in a cell pair. See page 47. [Computer graphics, Masato Taira and Apostolos Georgopoulos. Production: Eugene Eubank, Medical Media Service, Minneapolis Veterans Affairs Medical Center]

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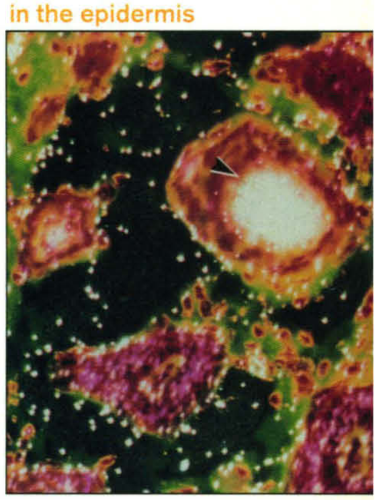
Regulatory elements in the epidermis



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edited by PHIL SZUROMI

Transcription, DNA repair, and helicases

Transcription requires an accurate DNA template; the RNA polymerase elongation complex, which makes the RNA copy, may help to repair the DNA master. Schaeffer *et al.* (p. 58) show that one of the subunits of the human transcription initiation factor TFIIH is encoded by the gene *ERCC-3*, whose product has been implicated in DNA repair. Selby and Sancar (p. 53), working with an *Escherichia coli* transcription system reconstituted in vitro, show that the *mfd* gene product, which is required for strand-specific repair, acts as a transcription-repair coupling factor. In a Perspective, Buratowski (p. 37) discusses models for how helicase proteins, which unwind double-stranded DNA, link transcription and DNA repair.

Silicon illuminated

Silicon has an electronic structure that does not allow direct transitions between the conduction and valence bands and hence the bulk crystal cannot emit light by photoluminescence. When electrochemically etched, silicon can emit light but the mechanism is still a subject of debate. Iyer and Xie (p. 40) review the current research on light-emitting silicon, including several engineered solutions to overcoming the radiative prohibition.

Interstellar diamonds?

In a spectral study of protostars in dense interstellar molecular clouds, Allomandola *et al.* (p. 64) identified a prominent infrared stretching band characteristic of tertiary CH. The magnitude of this peak relative to other C–H stretching bands implies that these dense clouds contain abundant small carbon molecules in the diamond structure. The tertiary carbon peak was seen in all four dense clouds examined but surprisingly was not seen in diffuse interstellar medium. These observations have implications for the abundance and form of carbon in space, galactic evolution, and the origin of interstellar diamonds found in some meteorites.

Fibers, strong and flexible

Thin carbon fibers have possible applications in sensors, infrared detectors, and electronic devices. Fabricating such fibers is difficult with conventional methods. Wallenberger and Nordine (p. 66) produced high-quality carbon fibers through laser-assisted chemical vapor deposition. A laser is focused onto a substrate in the presence of methane or ethylene as the substrate is pulled away from the focal point. The concentrated energy of the laser causes a fiber filament to grow out from the substrate. The fibers produced in this way exhibit superior chemical purity and structural uniformity.

Peroxide chemistry in clouds and fog

Peroxides drive a number of oxidation reactions that take place within the water droplets of clouds and fog. It has been assumed that the hydrogen peroxide (H_2O_2), or its precursor, $HO_2^{\cdot}$, in these water droplets came from the gas phase. Two reports show that absorption of ultraviolet radiation within the droplets can form peroxides. Faust *et al.* (p. 73) irradiated samples of fog water collected from several locations and show that this route to peroxide formation can be the dominant source. They point out that peroxide is the limiting reagent in the conversion of sulfur dioxide to sulfuric acid over eastern North America. Zuo and Hoigné (p. 71) suggest that cycling of iron III and iron II is involved in peroxide formation and may also produce hydroxyl radicals.

Enfeebled fungus

Fungi of the genus *Colletotrichum* infect a variety of agricultural crops and, through a pathogenic interaction, induce severe disease in the plant. Freeman and Rodriguez (p. 75) have analyzed the interaction between watermelon seedlings and a fungal mutant that has lost pathogenicity. The fungal mutant infects and grows within the plant without inducing disease symptoms and yet retains its host specificity. Thus pathogenicity and host-fungal compatibility are determined by different genetic loci.

Epidermal expression

In epidermal development, cells proliferate from a basal layer of epithelial cells and, as they differentiate, generate layers of cells that have regulated expression of genes such as keratins. Andersen *et al.* (p. 78) describe a transcription regulator of the POU domain family that is specifically associated with terminally differentiated epidermal cells and hair follicles. This factor has two forms; Skn-1i has an unusual amino-terminal domain that inhibits DNA binding as well as transactivation of genes by Oct-1, whereas Skn-1a, which has a different amino-terminal domain, activates expression of the cytokeratin 10 gene. Both forms are highly related to Oct-2, a factor involved in terminal differentiation of other cell types.

Gene history

Little is known about how genes with novel functions evolve. Long and Langley (p. 91) find that the *jingwei* (*jgw*) gene of *Drosophila* is actually a chimera. The *jgw* gene was created when a processed messenger RNA for alcohol dehydrogenase was retrotransposed into another gene whose upstream regulatory regions, exons, and introns were acquired to form *jgw*. Further analyses indicate that *jgw* was functional and subject to natural selection since its origin.

Proteoglycan switch

Heparin-binding fibroblast growth factors (FGFs) help regulate the proliferation, migration, and differentiation of neural precursor cells, and their activity requires the presence of heparin analogs such as heparan sulfate proteoglycans (HSPGs). Nurcombe *et al.* (p. 103) show that during the early stages of brain development (embryonic day 9) when neurons are largely undifferentiated, basic FGF, or FGF-2, begins to be expressed. During this stage, a single type of HSPG is expressed that is specific for FGF-2. As the population of differentiated neurons begins to emerge at embryonic day 11, cells begin to produce acidic FGF (FGF-1) and the binding specificity of HSPG switches from FGF-2 to FGF-1 through changes in the way the core protein is glycosylated. This tight coordination between growth factor expression and HSPG specificity may also occur in other cell types.

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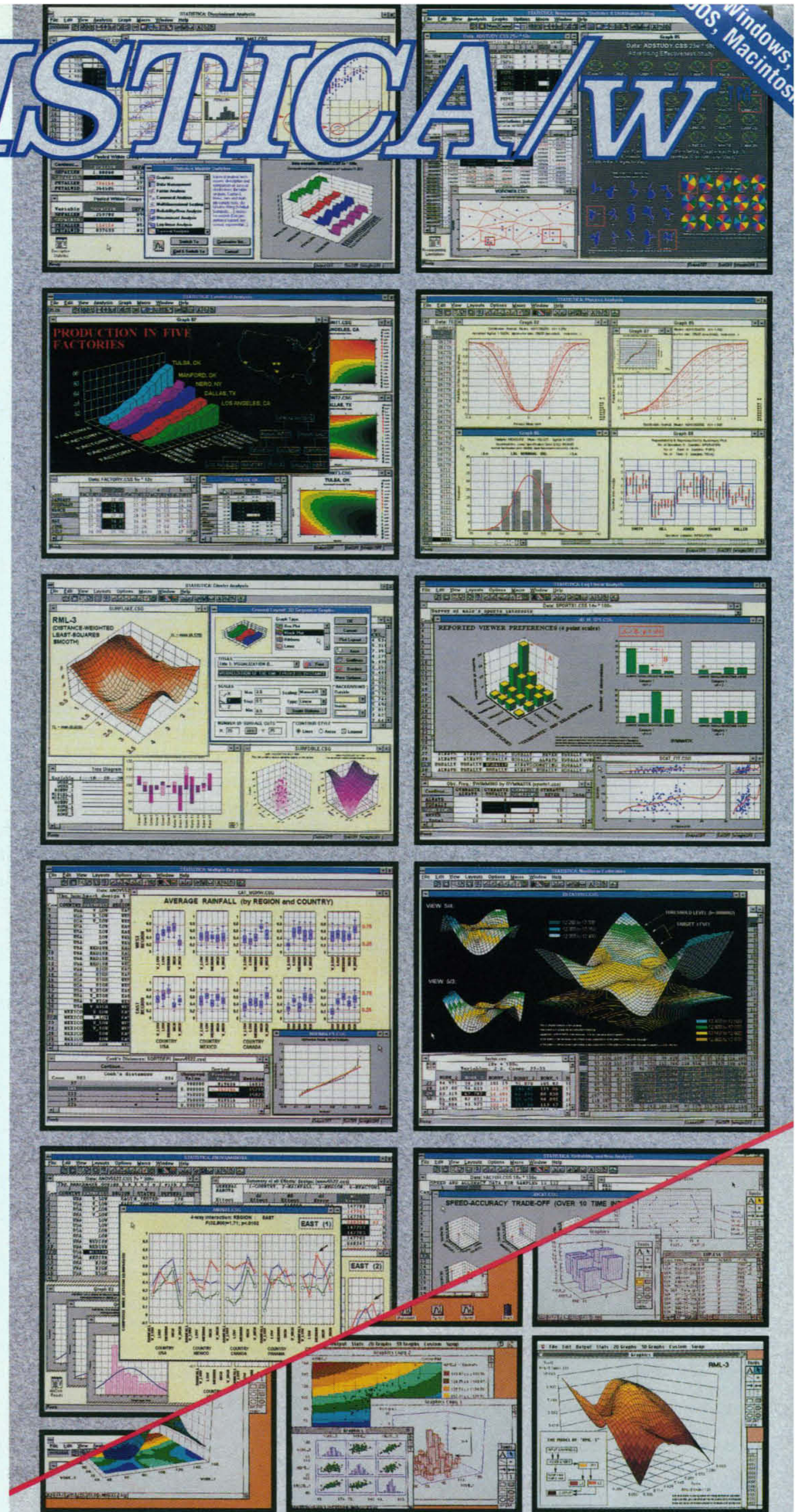

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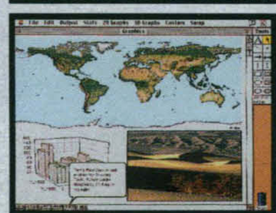

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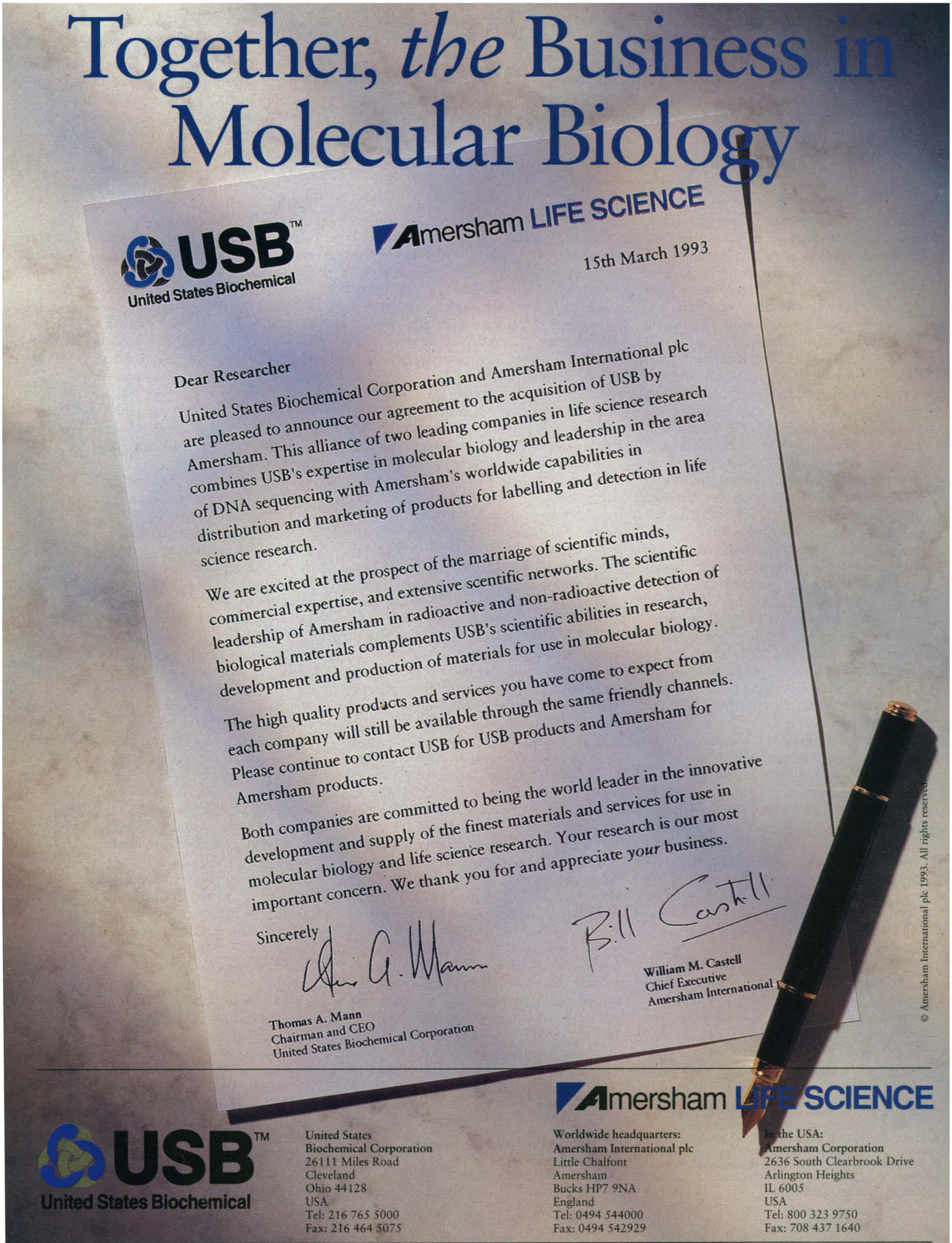

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