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1 JANUARY 1993
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Figure A Figure B

Sequencing data of a point mutation generated in the pBluescript® II Vector using the DoubleTake™ Mutagenesis Kit. A) Sequence of unmutated plasmid DNA. The arrow indicates the target adenine residue. B) Sequence of plasmid DNA isolated after site-directed mutagenesis. The arrow indicates the adenine to guanine transition.

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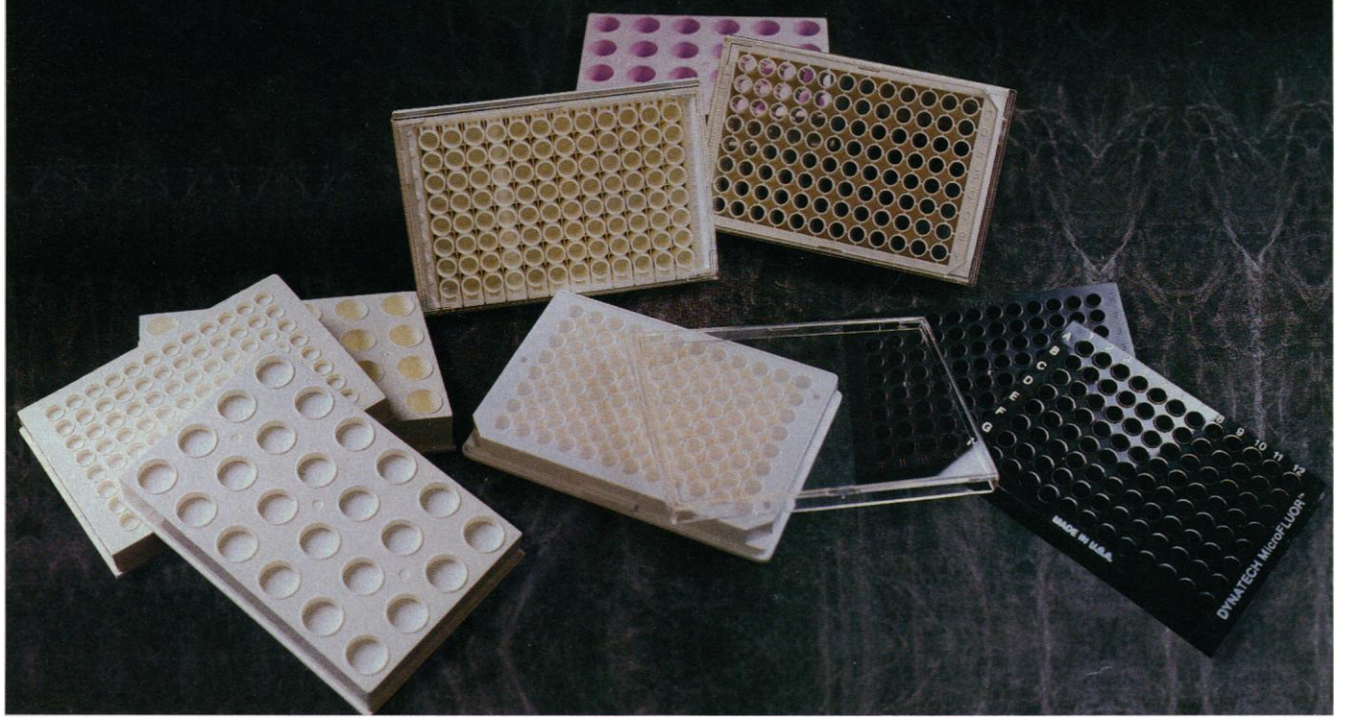

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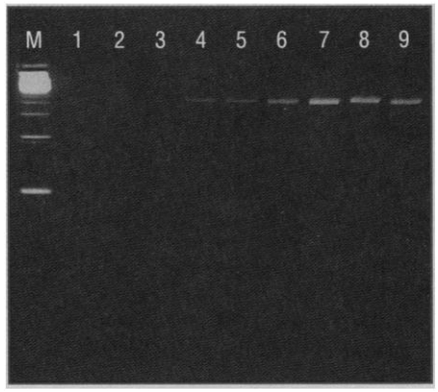

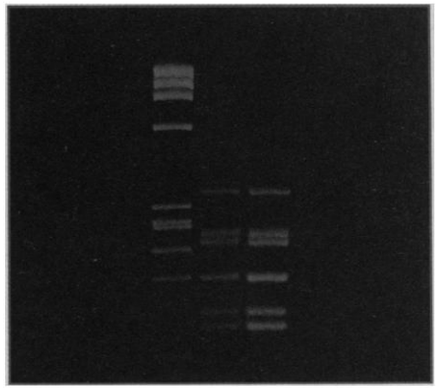

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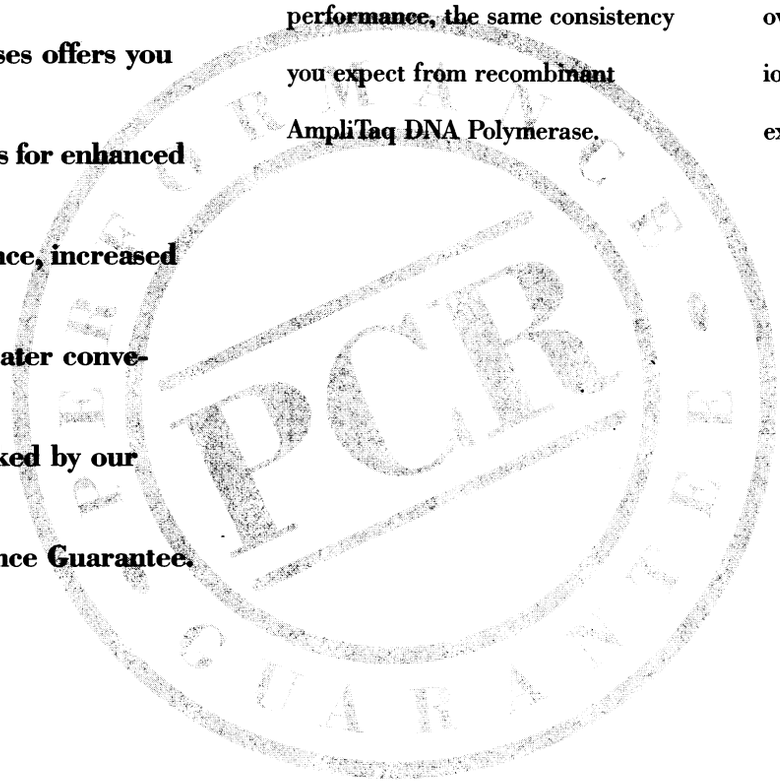

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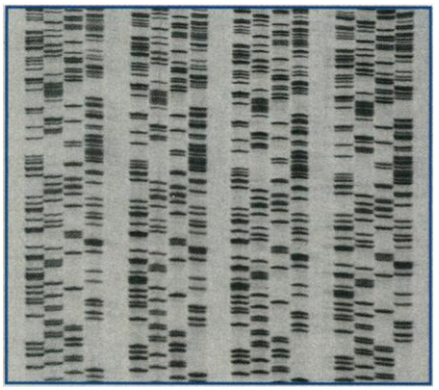

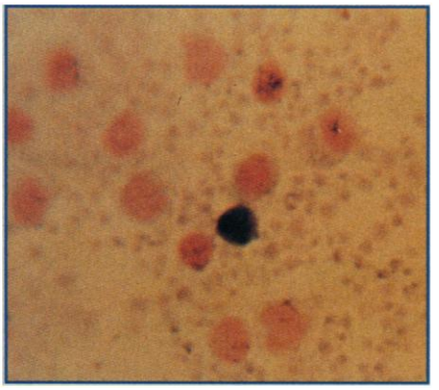

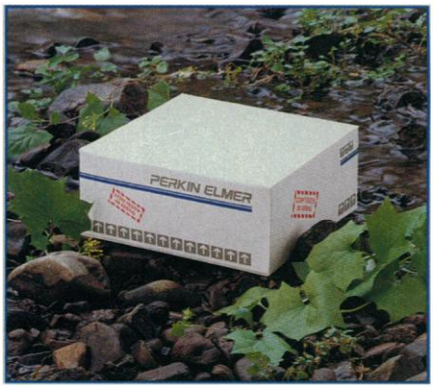

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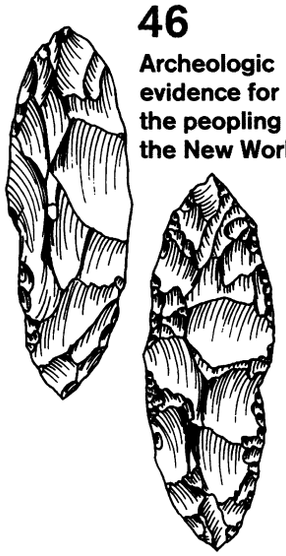
Identification of whitefly species



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Archeologic evidence for the peopling of the New World

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COVER

Representation of the responses of a single macaque neuron in visual area V4 to polar gratings; responses ranged from vigorous (red) to none (dark blue). This cell was highly selective for a narrow range of spiral gratings. Such selectivity may reflect an intermediate stage of form analysis during visual information processing. See page 100. [Image: Jack L. Gallant]

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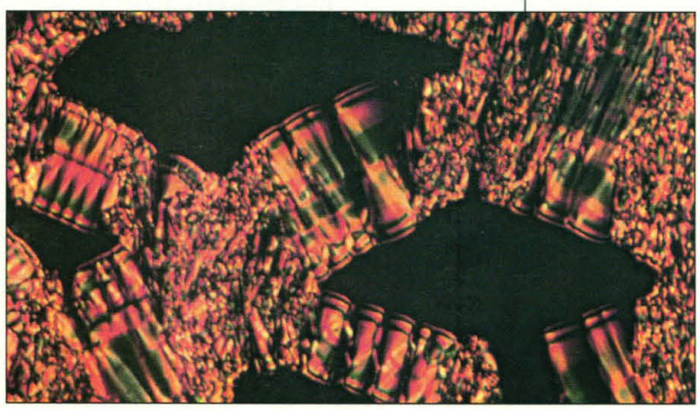
Polymer plates



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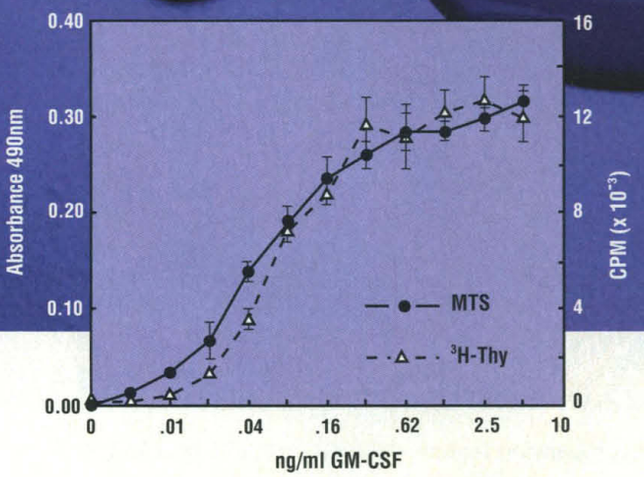

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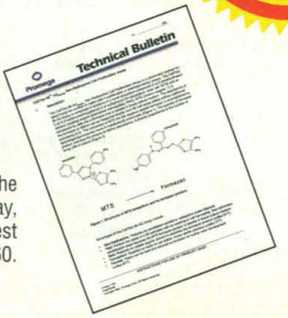

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THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Crossing the bridge

During the low sea level stands of the Pleistocene, the land mass between northeast Asia and Alaska formed a land bridge; Hoffecker *et al.* (p. 46) review archeological and geochronological data which show that this region, Beringia, was colonized between 12,000 and 11,000 years ago. Migration appeared to be limited by climatic conditions; the warming that occurred during this period made Beringia a habitable although still a harsh environment.

Two-dimensional polymers

Synthetic polymers consist of long chains that are interwoven in three dimensions; Stupp *et al.* (p. 59) have "stitched" together self-organized oligomeric molecules into two-dimensional sheet-like objects. The resulting polymer molecules are soluble and can form crystals. In a Perspective, Thomas (p. 43) discusses potential applications in areas as varied as tribology and second harmonic generation.

Lower mantle oxidation state

The oxidation state of the lower mantle affects its conductivity, mineralogy, and chemical equilibrium with the metallic iron core. One constraint is provided by the amount of ferric iron that can be accommodated with increasing pressure in (Fe,Mg)O, one likely phase in the lower mantle. McCammon (p. 66) studied this relation using the iron end member, Fe_xO, and a multianvil press. The results suggest that the ferric iron content of Fe_xO in equilibrium with metallic iron is small and decreases continuously with pressure until reaching a plateau at pressures greater than about 10 gigapascals, in contrast with earlier data. Because conductivity measurements suggest that the ferric iron content of the lower mantle is greater than indicated by the phase relations, it is unlikely that the lower mantle is in equilibrium with metallic iron.

Selectively taming arithmetic demons

If the synthesis of a compound requires a large number of steps, reasonably good yields can be quickly whittled down; even at 90 percent yields, a 12-step reaction gives less than 30 percent overall yield. Crispino *et al.* (p. 64) have executed a stereochemically demanding transformation, the complete polyhydroxylation of squalene, to yield only one of the 36 possible isomers in high yield (>75 percent) after 12 steps. Osmium-catalyzed asymmetric dihydroxylation can be used to add two hydroxyl groups to each double bond and form only one stereochemical product. Whereas enzymes tend to perform selective transformations of substrate molecules, these catalysts exhaustively react with all of the double bonds in the molecule to produce the perhydroxylated product.

Cochlear model

The mechanical structures of the ear have a broad frequency response, yet the response of the entire auditory system to stimuli is highly tuned. To resolve this paradox, Hubbard (p. 68) offers a model of the cochlea that resembles in some ways the traveling-wave amplifiers used in microwave applications. The model starts from the complicated anatomical arrangement of the sound pathways by viewing them as a pair of coupled transmission lines. Quantitative tests of the model yield a frequency response that agrees well with psychophysical auditory data.

Nitric acid phases and the stratosphere

Polar stratospheric clouds (PSCs) can trap nitric acid, a process that facilitates stratospheric ozone destruction. Worsnop *et al.* (p. 71) present thermodynamic data which show that the formation of $HNO_3 \cdot 2H_2O$, which is a metastable hydrate, may occur more readily than the formation of $HNO_3 \cdot 3H_2O$, which is the most stable nitric acid hydrate under stratospheric conditions. The metastable $HNO_3 \cdot 2H_2O$ phase may be critical for nucleating and forming type I PSCs. When temperatures decrease such that water ice clouds (type II PSCs) form, transfer of $HNO_3 \cdot 2H_2O$ to these particles would form the stable $HNO_3 \cdot 3H_2O$ phase.

Heat shock protein meets tumor suppressor

How the tumor suppressor protein p53 functions to control cell proliferation is unknown. Agoff *et al.* (p. 84) find that p53 represses transcription from the growth-regulated human hsp70 gene. They also find that the p53 protein interacts with CCAAT binding factor (CBF), a factor known to stimulate transcription from the hsp70 gene. Thus, the repression of the hsp70 promoter by p53 may be mediated by the protein-protein interaction of p53 and CBF. Such p53–transcription factor interactions may regulate other genes.

Tumor regression

Glioblastomas are the most frequently occurring brain tumor in humans, and there is currently no effective treatment. Glioma cells, the malignant glial cells comprising these tumors, express high amounts of insulin-like growth factor I (IGF-I) and, when injected into rats, form tumors that grow rapidly. Trojan *et al.* have shown that glioma cells that express antisense complementary DNA for IGF-I did not form tumors in rats. They now show (p. 94) that injection of such transfected glioma cells can cause regression of established tumors formed by nontransfected glioma cells and can prevent tumor formation when the two types of cells are injectedinto the rat at different sites. The transfected cells appear to trigger a $CD8^+$ lymphocyte response that also acts against the nontransfected glioma cells.

Seeing more than straight

In visual processing, the neurons that receive the initial signals are responsive to simple patterns, such as arrays of light and dark bars that are referred to as Cartesian patterns; higher order processing (such as recognizing faces) occurs further downstream in the inferotemporal cortex. Gallant *et al.* (p. xxx) present evidence that non-Cartesian patterns (polar patterns, such as a bull's eye, and hyperbolic patterns) can be preferentially recognized by neurons in the intermediate processing area V4. In macaques, 16 percent of the cells tested in this region selectively responded to non-Cartesian patterns. Previous observations and theoretical models of visual information processing have suggested the existence of cells responding to such stimuli.

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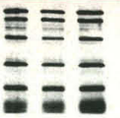

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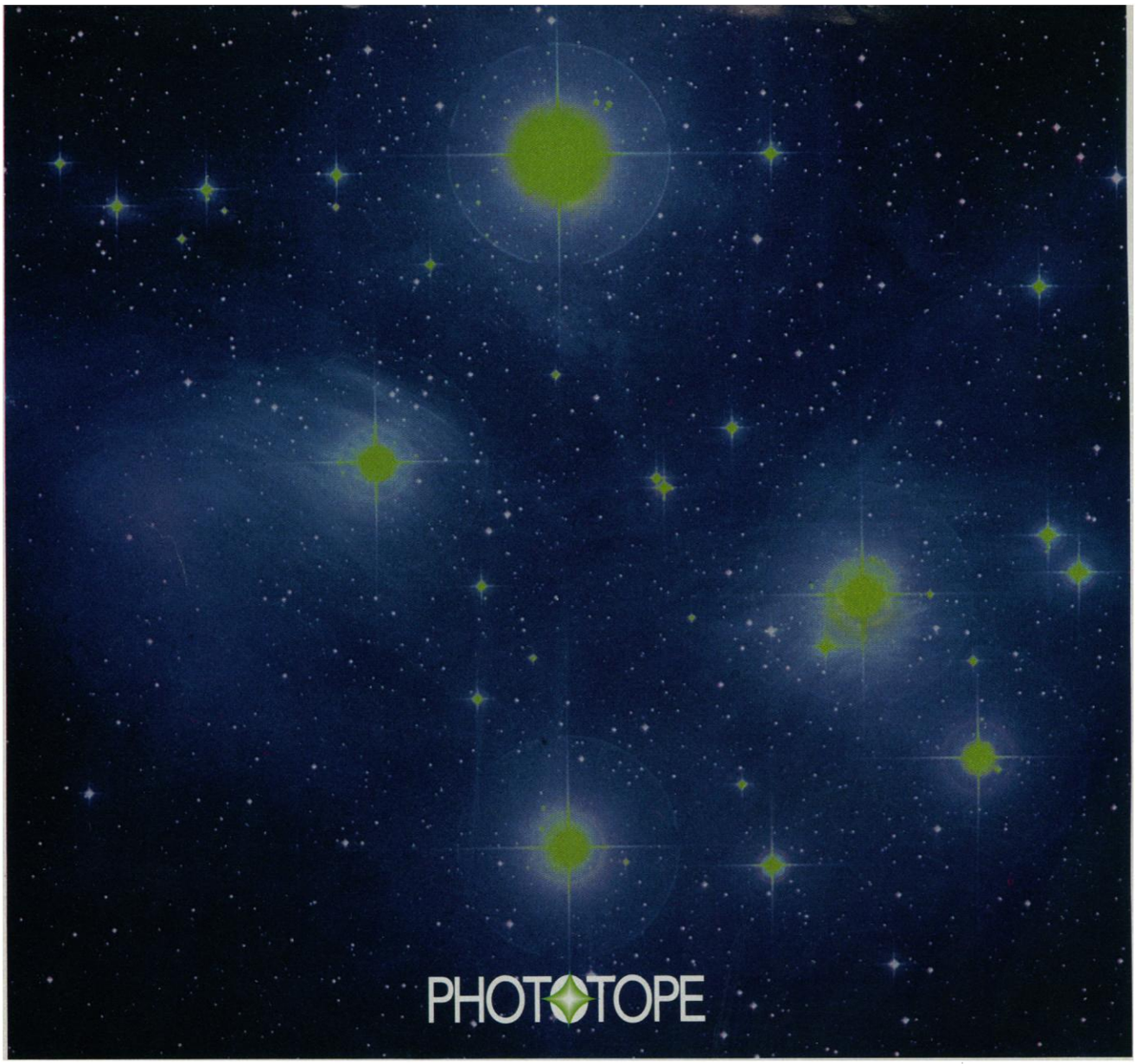

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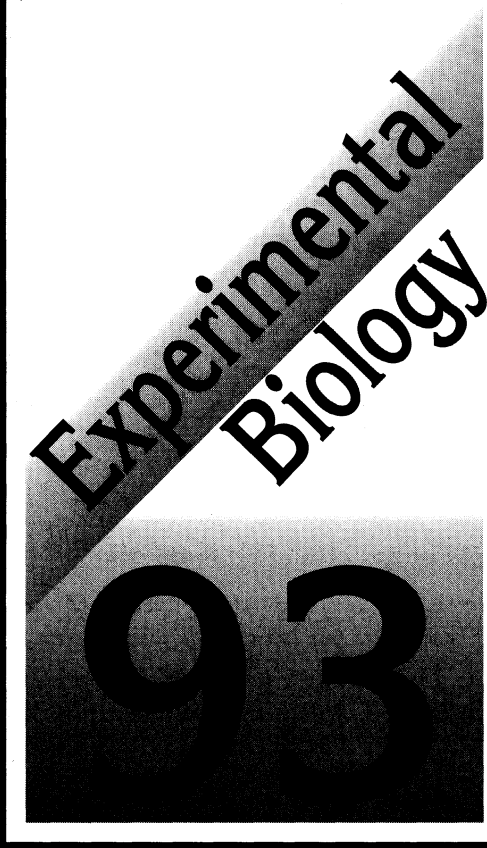

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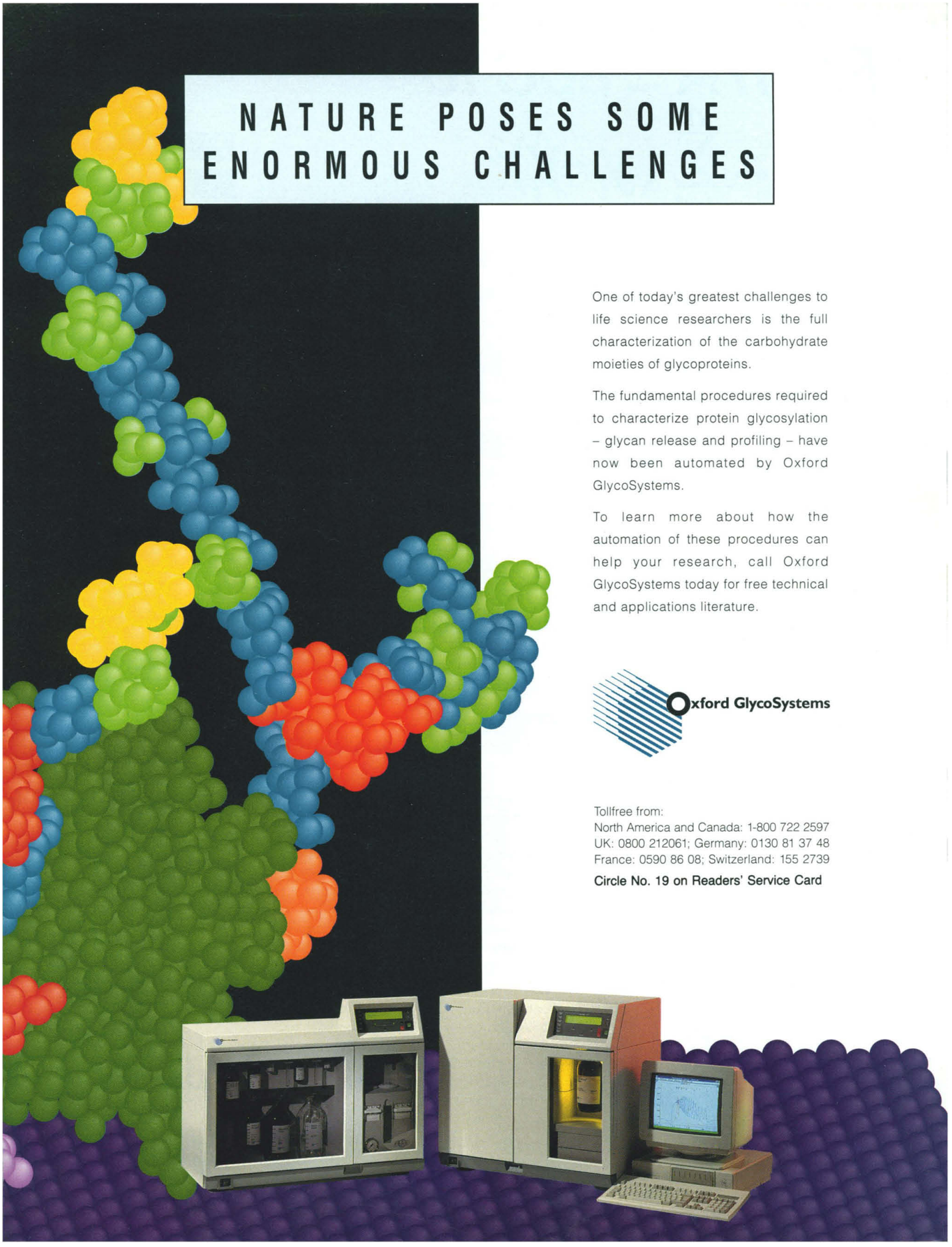

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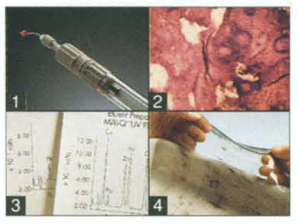

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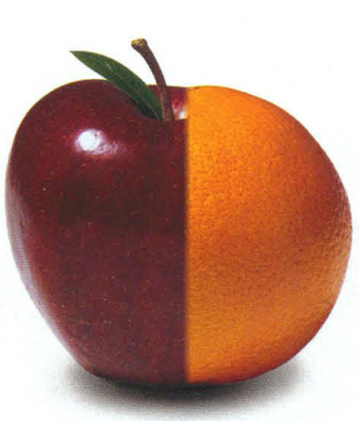

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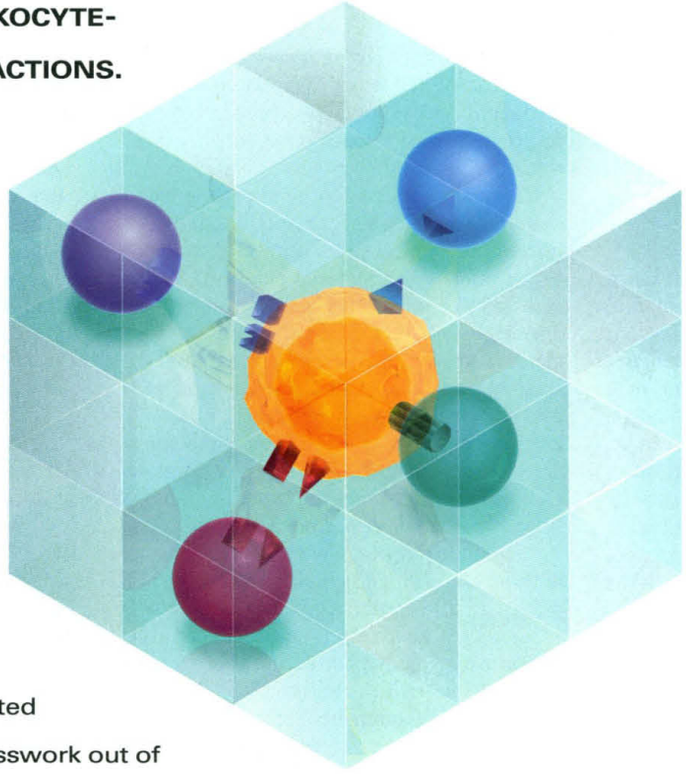

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Journals

1. I. N. Tang, *Atmos. Environ.* **14**, 819 (1980). [one author]
2. J. C. Smith and M. Field, *Proc. Natl. Acad. Sci. U.S.A.* **51**, 930 (1964).
3. J. C. Cheeseborough III, S. Trajmar, J.-T. Yang, *EMBO J.*, in press. [three to five authors]
4. G. Sunshine *et al.*, *Lancet* **i**, 711 (1975). [more than five authors]
5. M. Schmidt, *Sci. Am.* **251**, 58 (November 1984). [journal paginated by issue]
6. J. Brown, *ibid.*, p. 67.

Technical reports

1. D. E. Shaw, *Technical Report No. CUCS-29-82* (Columbia University, New York, 1982).
2. F. Press, "A report on the computational needs for physics" (National Science Foundation, Washington, DC, 1981). [unpublished or access by title]
3. "Assessment of the carcinogenicity and mutagenicity of chemicals," *WHO Tech. Rep. Ser. No. 546* (1974).

Proceedings

1. *Proceedings of the Fifth IEEE Pulsed Power Conference*, Arlington, VA, inclusive dates of meeting (publisher, publisher's location, year).
2. *Proc. IEEE* **88**, 452 (1968).
3. *Title of symposium published as a book*, sponsoring organization, location of meeting, dates (publisher, location, year).

Paper presented at a meeting (not published)

1. M. Konishi, paper presented at the 14th Annual Meeting of the Society for Neuroscience, Anaheim, CA, 10 October 1984. [Sponsoring organization should be mentioned if it is not part of the meeting name.]

Theses and unpublished material

1. B. Smith, thesis, Georgetown University (1973).
2. J.A. Norton, unpublished material.

Books

1. A. M. Lister, *Fundamentals of Operating Systems* (Springer-Verlag, New York, ed. 3, 1984), pp. 7–11. [third edition]
2. J. B. Carroll, Ed., *Language, Thought and Reality: Selected Writings of Benjamin Lee Whorf* (MIT Press, Cambridge, MA, 1956).
3. R. Davis and J. King, in *Machine Intelligence*, E. Acock and D. Michie, Eds. (Wiley, New York, 1976), vol. 8, chap. 3.
4. D. Curtis *et al.*, in *Clinical Neurology of Development*, B. Walters, Ed. (Oxford Univ. Press, New York, 1983), pp. 60–73. [*et al.* = more than five authors]
5. F. R. Sabier, *Contributions to Embryology* (Publ. 18, Carnegie Institution of Washington, Washington, DC, 1917), p. 61.
6. *Principles and Procedures for Evaluating the Toxicity of Household Substances* (National Academy of Sciences, Washington, DC, 1977). [organization as author and publisher]