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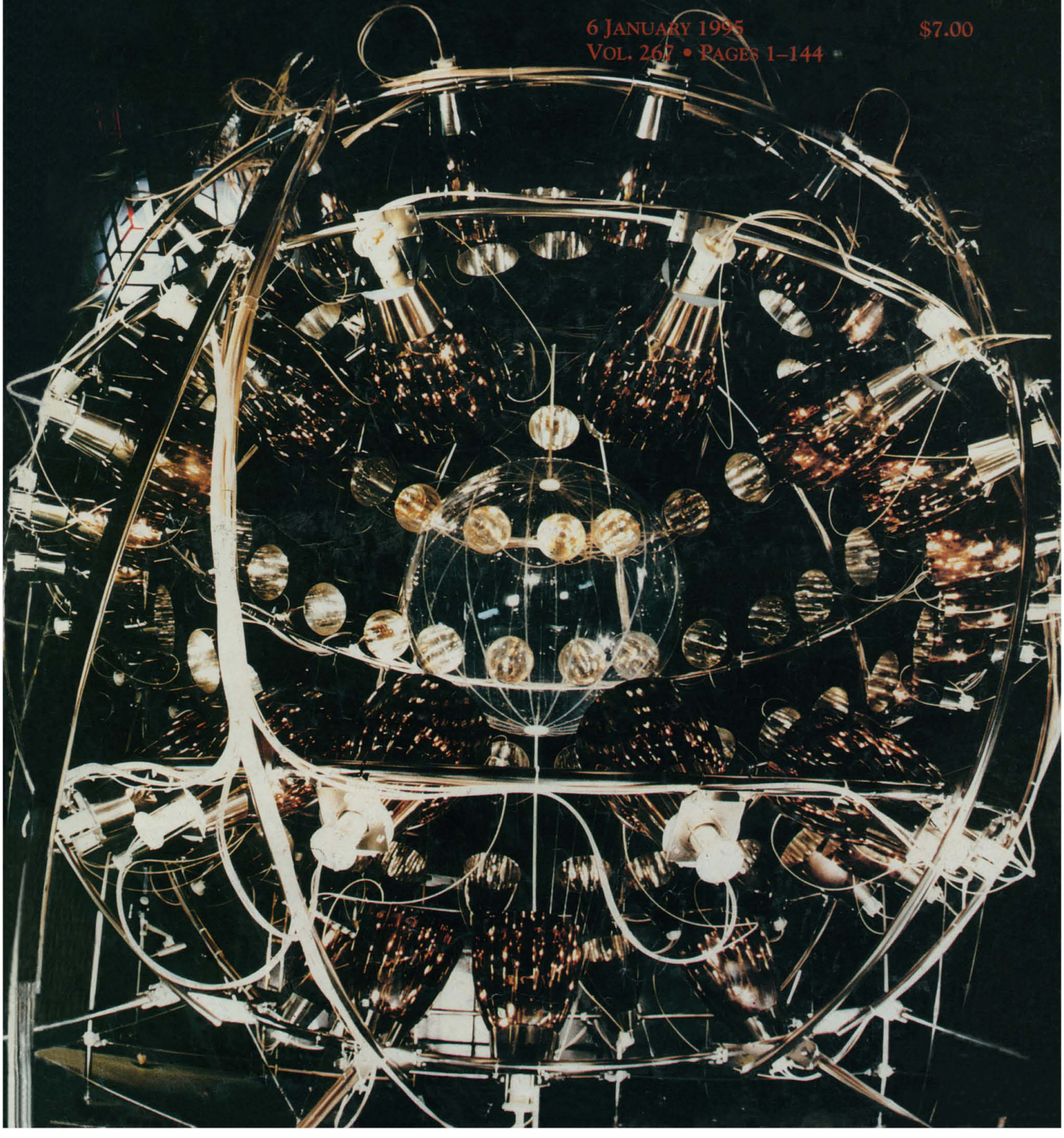

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1. Lundberg, K.S., et al. (1991) *Gene* 108, 1-6

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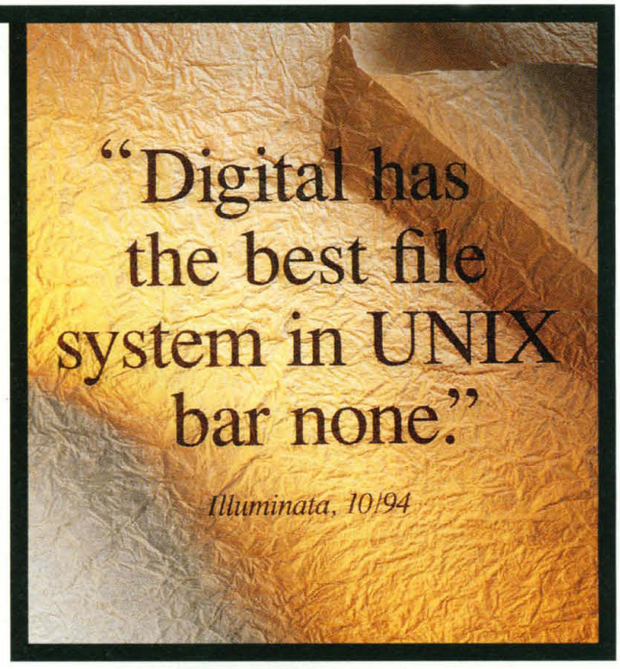

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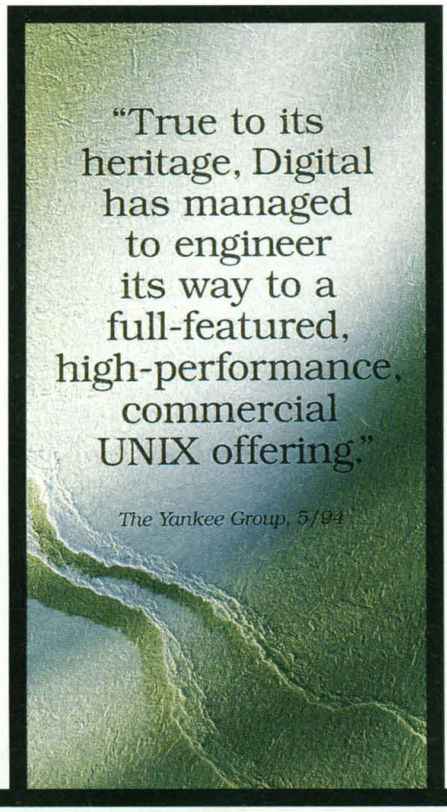

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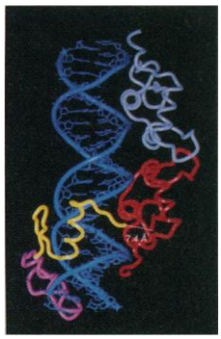
Observing evolution, past and present



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Redesigning transcription factors

NEWS

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COVER

Prototype of BOREXINO, a 100-ton liquid scintillation detector planned for low-energy solar neutrino spectroscopy. The central bubble (a 2-meter nylon sphere) contains 5 tons of an ultrapure organic liquid that signals neutrino reactions by light flashes that trigger the surrounding array of phototubes. The entire assembly is immersed in 1 million liters of pure water in an 11 meter by 11 meter tank in Hall C of the Gran Sasso National Laboratory under the Appenine mountains in Italy. See page 45. [Photo: BOREXINO Collaboration]

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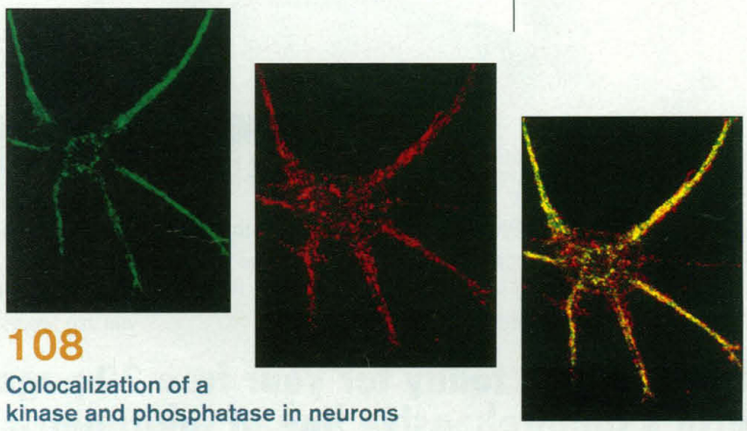
The cell tells



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Colocalization of a kinase and phosphatase in neurons

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◩ Indicates accompanying feature

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THIS WEEK IN SCIENCE

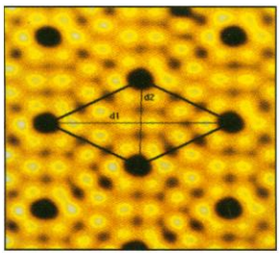
edited by PHIL SZUROMI

Cells as detectors

In any analytical separation technique, there must be some way of identifying the various fractions. Detectors used in electrophoresis and chromatography range from film and thermal sensors to mass spectrometers. Shear *et al.* (p. 74) have used the responses of single cells to detect biomolecules separated by capillary electrophoresis. The response of the cell to ligand binding by its surface receptors allows it to be used as a biosensor. For example, acetylcholine was detected through its binding to receptors on a rat PC-12 cell. Binding released intracellular calcium, which was detected by the fluorescence of the indicator dye fluo-3. In another approach, transmembrane currents were measured in a *Xenopus* oocyte that was injected with a messenger RNA that encoded a serotonin receptor.

Scanning more clearly

Achieving atomic resolution with the atomic force microscope (AFM) is difficult when



the interaction forces between the sample and the probe tip are large. Atomic resolution has been achieved previously by studying samples in water to reduce these forces, but for ultra-high-vacuum conditions atomic resolution with the AFM has been elusive. Giessibl (p. 68) used a modified cantilever beam for holding the tip to implement a force detection scheme that senses the force gradient in a frequency-modulation mode. Atomic-resolution images of the silicon (111)-(7×7) reconstructed surface were obtained.

Designer transcription factors

Transcription factors are proteins that bind to gene promoters regulating expression of the gene. If transcription factors with suitable specificities can be produced and introduced into cells, certain genes could be controlled at will. Pomerantz *et al.* (p. 93) describe a method for designing a transcription factor with a completely new specificity by fusing together parts of two other transcription factors with defined, distinct specificities. This approach could be important in controlling genes introduced into patients during gene therapy.

Putting on weight

The long-standing solar neutrino problem—a shortfall in the detected flux of neutrinos from nuclear reactions in the sun's core, compared to theoretical expectation—has deepened with the advent of detectors able to measure neutrinos from different branches of the nuclear reaction chain. Raghavan (p. 45; see cover) argues that an overall solution can be found neither in nuclear physics nor in astrophysics; only if the neutrino has non-zero mass, so that neutrino species can interconvert, are the results explicable.

Land plant survival

The Permian-Triassic extinction (about 250 million years ago) was one of the largest marine extinctions in the fossil record. Retallack (p. 77), on the basis of a recorrelation of terrestrial sequences in Australia, shows that the effects on terrestrial plants were also dramatic. As a result, Early Triassic floras were evidently dominated by a few survivors for several million years.

In slow motion

In order to flow, glaciers must overcome friction against their bed. Flow can be rapid in ice streams or when large glaciers collapse. Iverson *et al.* (p. 80) measured bed deformation, fluid pressures, and other parameters in boreholes in a glacier in Sweden to investigate the mechanisms controlling flow at the base of the glacier. As discussed in a Perspective by Clark (p. 43), the results imply that high fluid pressures that allow the glacier to decouple from its bed rather than deformation of soft sediments appear to accommodate flow.

No high fliers

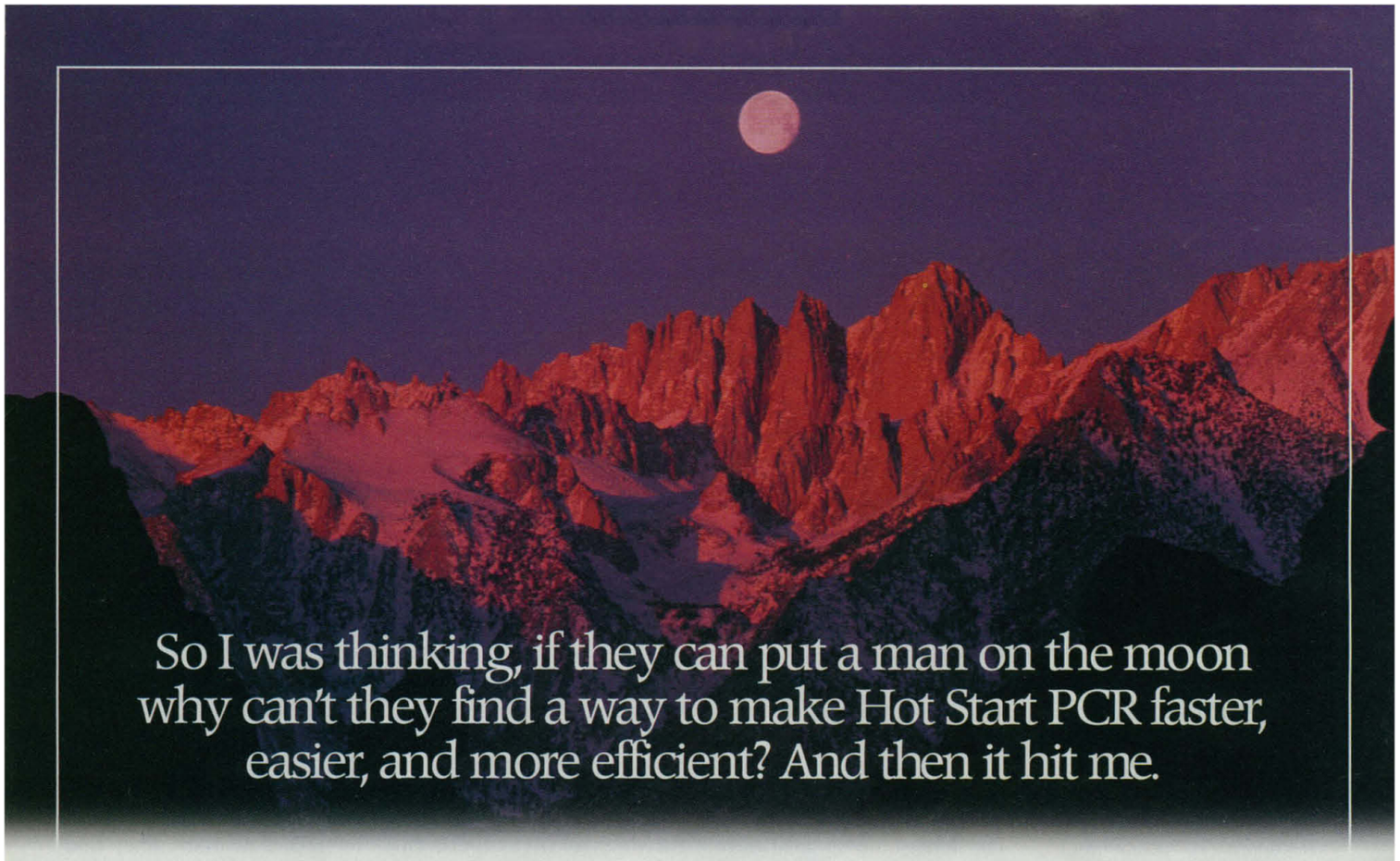
Earlier this year, it had been proposed that stratospheric ozone losses due to the presence of chlorine-containing compounds could be mitigated by ion chemistry. The action of ultraviolet light on balloon-launched screens of aluminum or zinc could be used to inject electric charge into the stratosphere and convert chlorine atoms to unreactive chlorine ions, which could then also be collected. However, measurements of stratospheric negative ion composition by Viggiano *et al.* (p. 82) show that chlorine-containing ions [Cl^-, $Cl^-(H_2O)$, and $Cl^-(H_2O)_2$] would never account for more than 1 percent of the ions generated. On the basis of these data and other arguments, they conclude that such a remediation scheme is not feasible.

Making contact

The p53 tumor suppressor protein regulates the transcription of genes that inhibit or arrest cellular proliferation. In order to function, p53 requires both a DNA binding domain and an activation domain. In order to understand how p53 transmits it activation signal to the basal transcription machinery, Thut *et al.* (p. 100) have examined the requirement for components of the initiation complex for p53 activation. They find that p53 directly contacts two TATA binding protein–associated factors (TAFs). These TAFs were required for the activation in vitro.

Selecting stem cells

Blood cells arise from cell differentiation processes that begin with hematopoetic stem cells; isolating stem cells in a pure form would be useful for many clinical and research applications. Conventional methods of cell sorting can enrich the population of stem cells from bone marrow but may alter the cell's physiology or contain residual, more mature cells. Berardi *et al.* (p. 104) stimulated human bone marrow cells with two cytokines, the Kit ligand and interleukin-3, in the presence of an antimetabolite. This single step killed progenitor cells and left a small population (1 in 10^5 cells) of quiescent cells with a stem cell immunophenotype. These cells were able to produce myeloid and lymphoid lineage cells.



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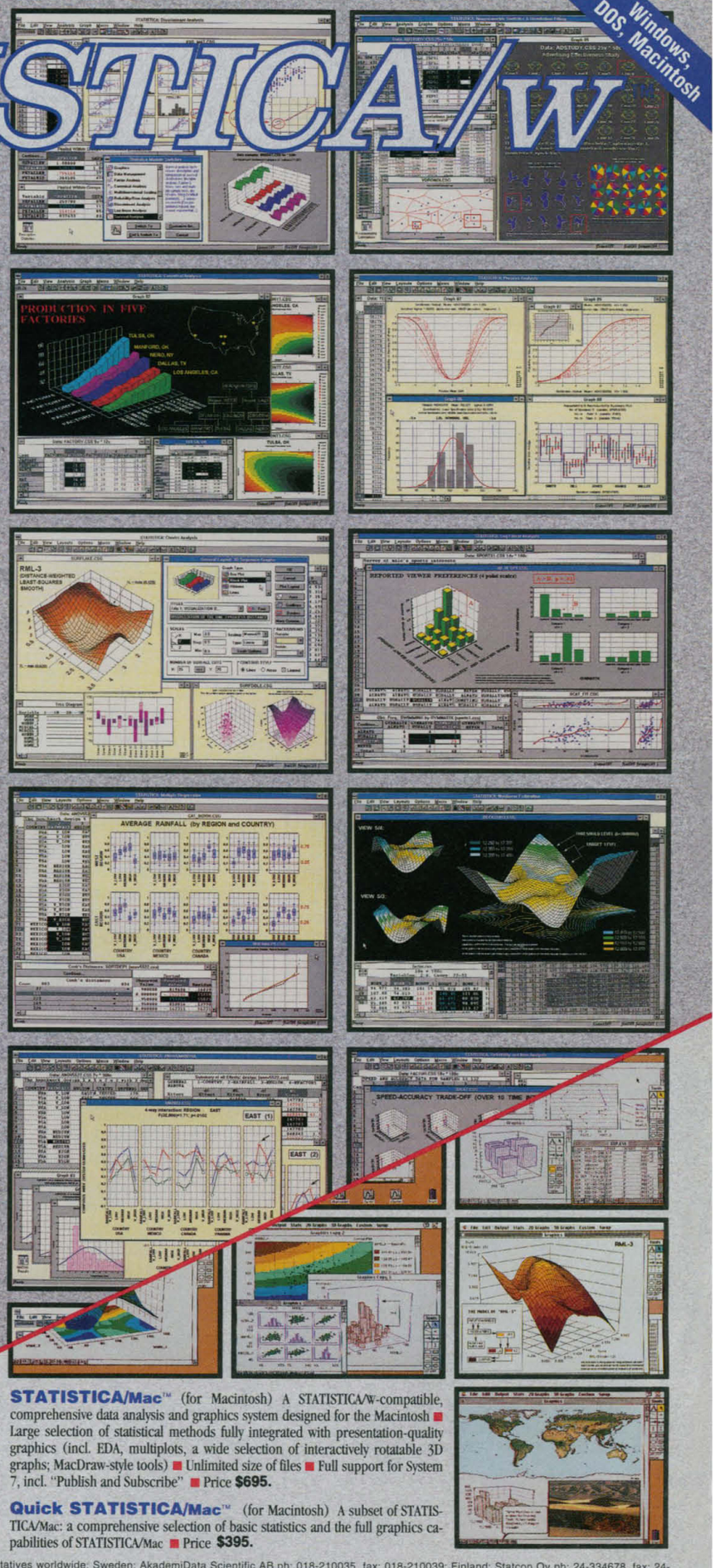

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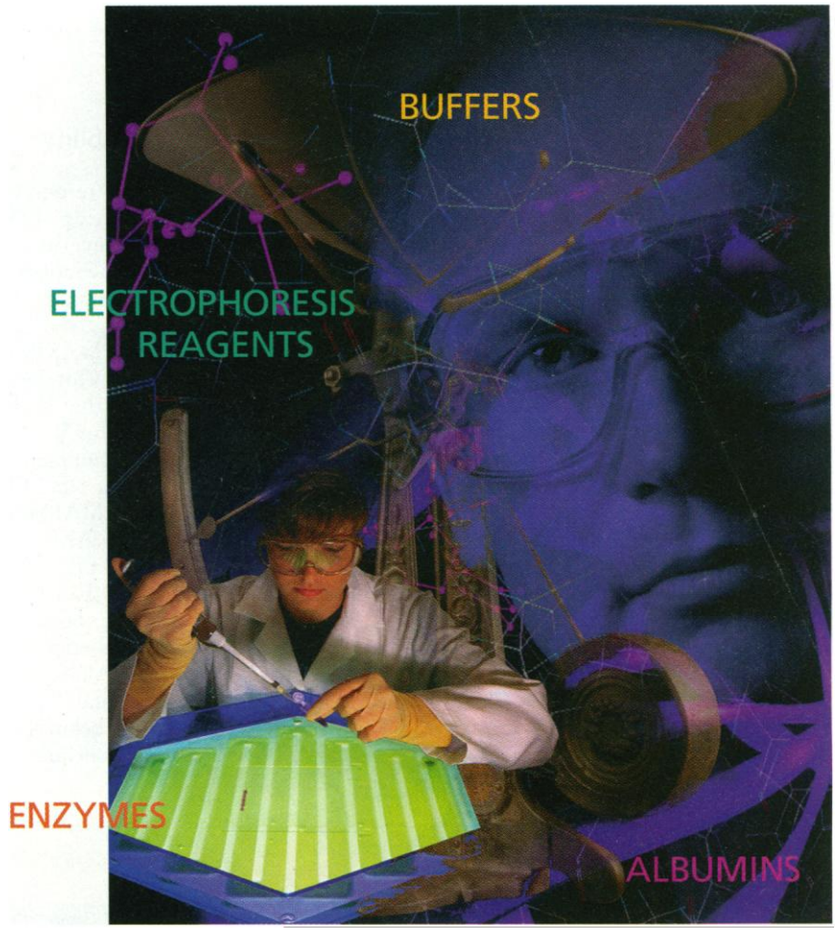

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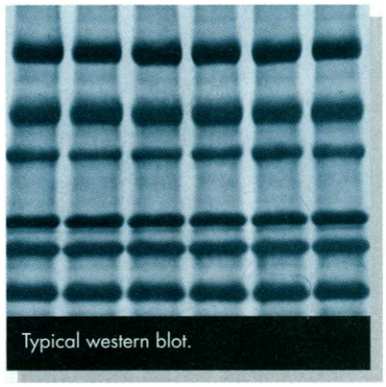

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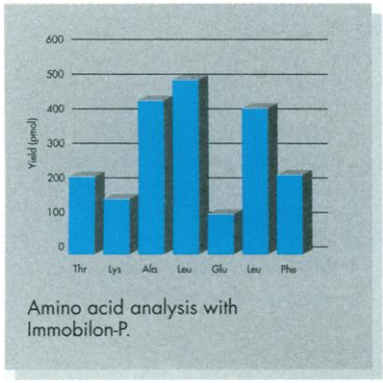

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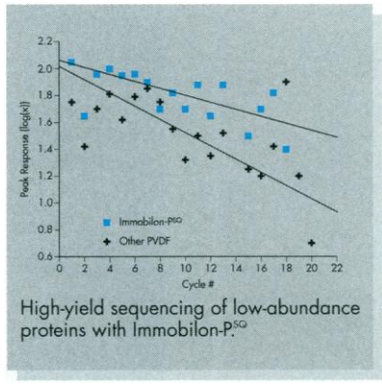

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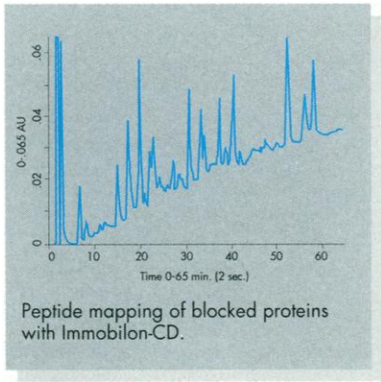

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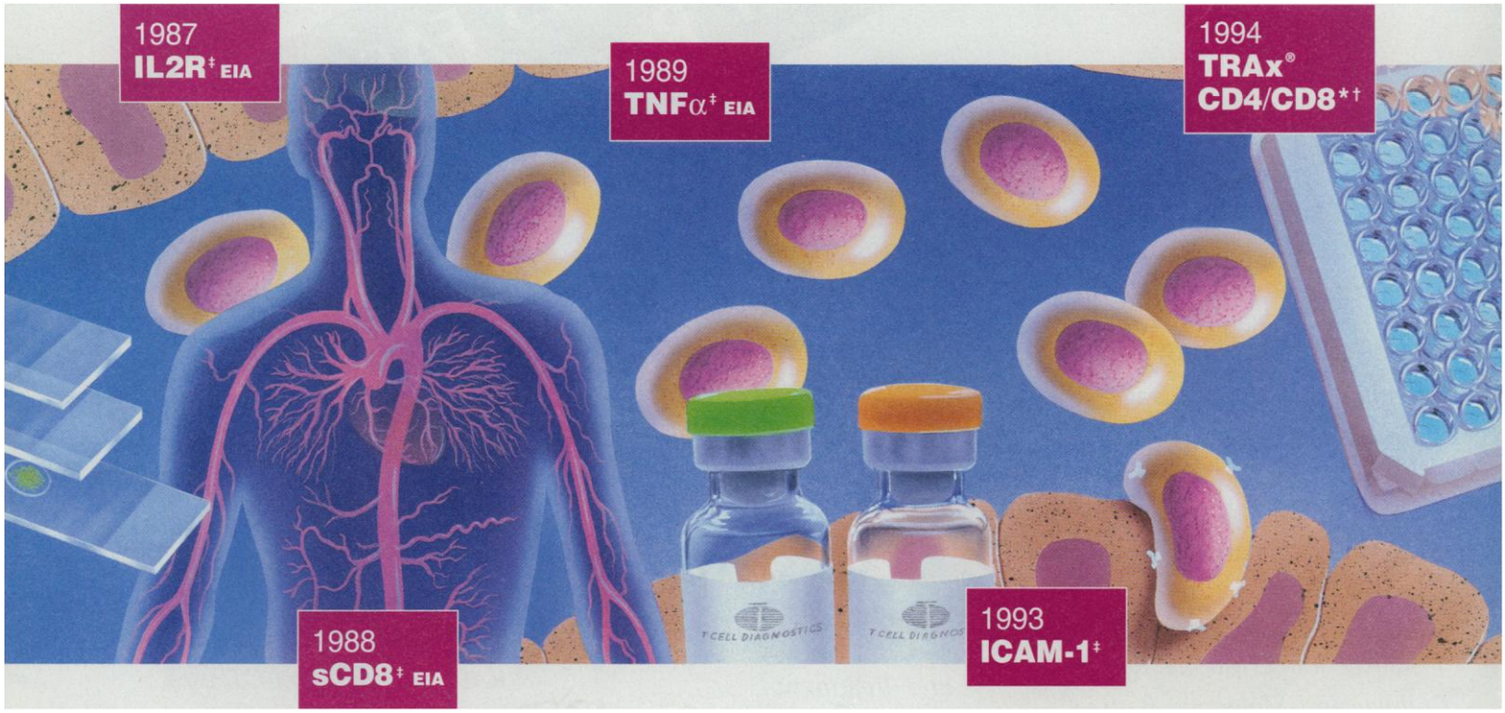

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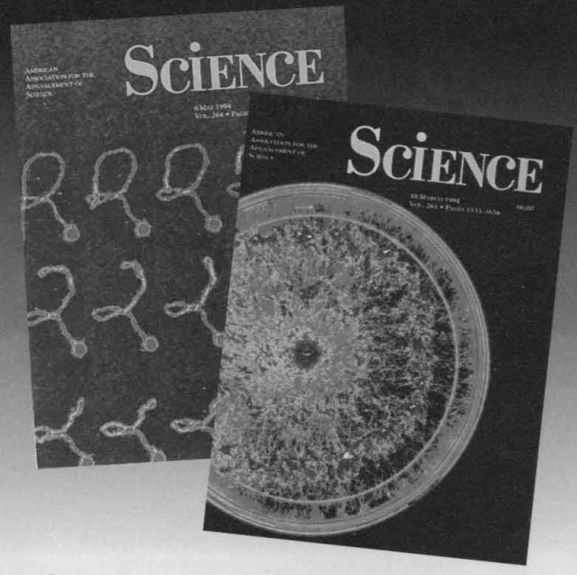

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Journals

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). [two authors].
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]