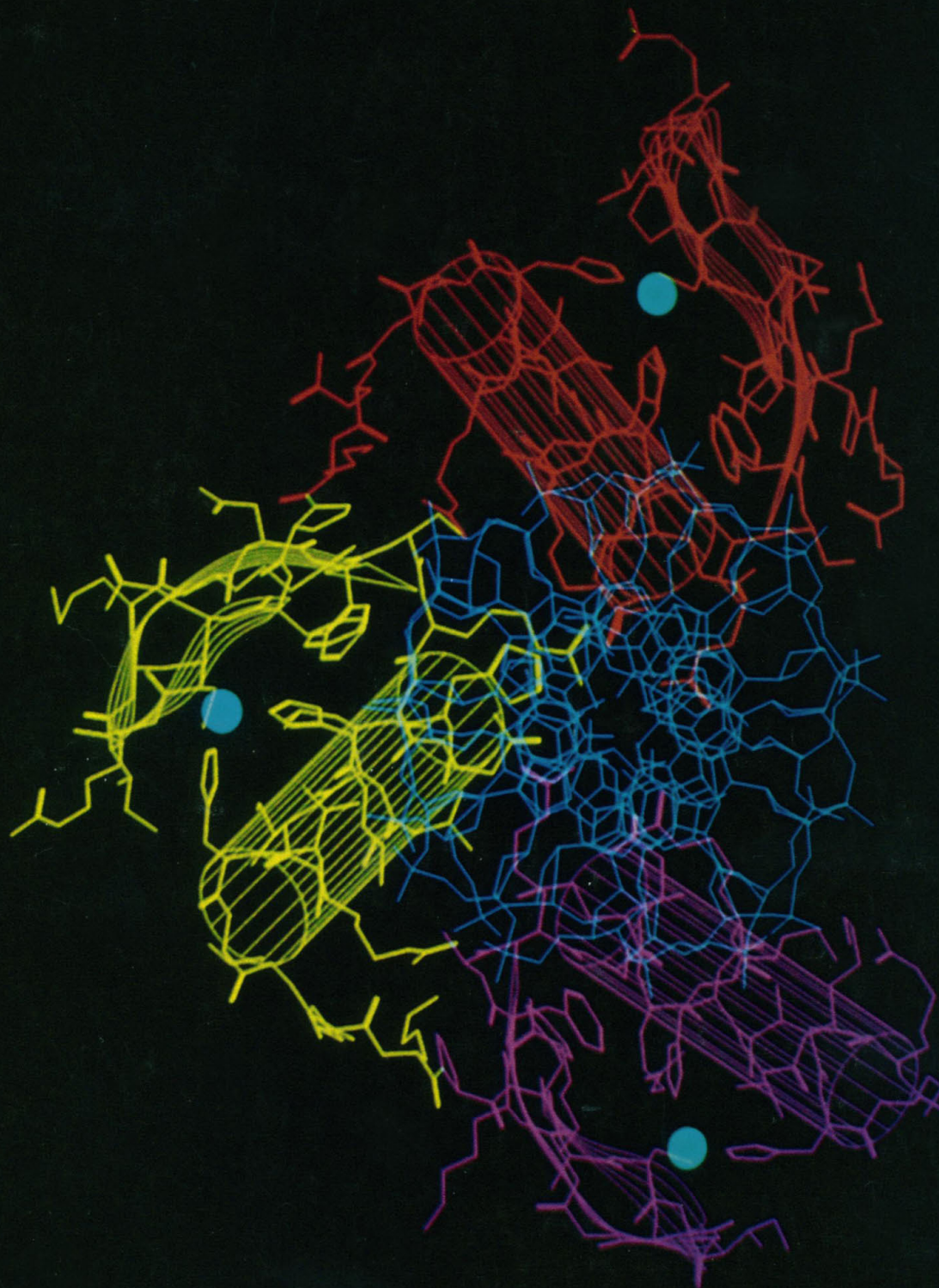


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755 This Week in *Science*

Editorial

757 Technology for America's Future

Letters

763 Science in the Persian Gulf: T. M. BOYCE ■ Math Problems: T. M. MURPHY; M. W. LEVINE; R. D. HANSON; C. B. HATFIELD; D. E. KOSHLAND, JR. ■ Energy Savings: A. B. LOVINS; G. M. BARNWELL ■ EPA Committee: M. E. O'CONNOR ■ Crystal Structure of Bee-Venom Phospholipase A₂: Correction: D. L. SCOTT, Z. OTWINOWSKI, M. H. GELB, P. B. SIGLER ■ Membrane-Bound Phosphotyrosine Phosphatases: A. F. WILLIAMS

ScienceScope

767 Sweeping overhead rates under the rug; gambling with Poker Flat science; etc.

News & Comment

768 Baltimore Throws in the Towel ■ David Baltimore's Mea Culpa
771 The True Source of HIV?
772 Science Under Wraps in Prince William Sound
773 Science Academy Elects New Members
774 *Briefings*: Hidden Costs of the Space Station ■ A Big Gift from Big Oil ■ A Billion Bucks for Materials ■ Congressional Day ■ Ten Years for the Brain ■ Cuban AIDS Control ■ Biotechnology Execs Earn More ■ Correction

Research News

776 Engineering Dogma Gives Way to Chaos ■ Flying High with Chaos Control
778 A New Ball Game in Nuclear Physics
779 How Peptide Hormones Get Ready for Work
781 Praying Mantises Play Top Gun
782 Sex and the Single Gene
783 Deep Rocks Stir the Mantle Pot

Articles

789 Reproductive Behavior and Health in Consanguineous Marriages: A. H. BITTLES, W. M. MASON, J. GREENE, N. A. RAO
795 Neutron Scattering: Progress and Prospects: J. D. AXE
802 Diversity of G Proteins in Signal Transduction: M. I. SIMON, M. P. STRATHMANN, N. GAUTAM

Research Articles

809 Zinc Finger-DNA Recognition: Crystal Structure of a Zif268-DNA Complex at 2.1 Å: N. P. PAVLETICH and C. O. PABO
817 A New Cofactor in a Prokaryotic Enzyme: Tryptophan Tryptophylquinone as the Redox Prosthetic Group in Methylamine Dehydrogenase: W. S. MCINTIRE, D. E. WEMMER, A. CHISTOSERDOV, M. E. LIDSTROM

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COVER Crystal structure of a zinc finger-DNA complex from the mouse protein Zif268. The view is down the axis of the double-helical DNA and emphasizes the symmetry of the complex. The DNA is blue; individual zinc finger domains are red, yellow, and purple; and zinc atoms are light blue. Similar DNA-binding domains occur in a large family of eukaryotic regulatory proteins. See page 809. [Photograph by N. P. Pavletich and C. O. Pabo]

Reports

- 825 Geometry, Topology, and Universality of Random Surfaces: J. R. BANAVAR, A. MARITAN, A. STELLA
- 827 Ultradeep (>300 Kilometers) Ultramafic Xenoliths: Petrological Evidence from the Transition Zone: V. SAUTTER, S. E. HAGGERTY, S. FIELD
- 830 In Situ Biodegradation: Microbiological Patterns in a Contaminated Aquifer: E. L. MADSEN, J. L. SINCLAIR, W. C. GHORSE
- 833 Control of *doublesex* Alternative Splicing by *transformer* and *transformer-2* in *Drosophila*: K. HOSHIJIMA, K. INOUE, I. HIGUCHI, H. SAKAMOTO, Y. SHIMURA
- 836 Solution Structure of FKBP, a Rotamase Enzyme and Receptor for FK506 and Rapamycin: S. W. MICHNICK, M. K. ROSEN, T. J. WANDLESS, M. KARPLUS, S. L. SCHREIBER
- 839 Atomic Structure of FKBP-FK506, an Immunophilin-Immunosuppressant Complex: G. D. VAN DUYN, R. F. STANDAERT, P. A. KARPLUS, S. L. SCHREIBER, J. CLARDY
- 842 HBV X Protein Alters the DNA Binding Specificity of CREB and ATF-2 by Protein-Protein Interactions: H. F. MAGUIRE, J. P. HOEFFLER, A. SIDDIQUI
- 844 Inhibition of PDGF β Receptor Signal Transduction by Coexpression of a Truncated Receptor: H. UENO, H. COLBERT, J. A. ESCOBEDO, L. T. WILLIAMS
- 848 FTZ-F1, a Steroid Hormone Receptor-Like Protein Implicated in the Activation of *fushi tarazu*: G. LAVORGNA, H. UEDA, J. CLOS, C. WU
- 851 Ca^{2+} Permeability of KA-AMPA-Gated Glutamate Receptor Channels Depends on Subunit Composition: M. HOLLMANN, M. HARTLEY, S. HEINEMANN
- 854 Experimental Therapy of Human Glioma by Means of a Genetically Engineered Virus Mutant: R. L. MARTUZA, A. MALICK, J. M. MARKERT, K. L. RUFFNER, D. M. COEN
- 856 Identification of a Peptide Specific for *Aplysia* Sensory Neurons by PCR-Based Differential Screening: J.-F. BRUNET, E. SHAPIRO, S. A. FOSTER, E. R. KANDEL, Y. IINO

Technical Comment

- 860 Land Plants and Weathering: J. M. ROBINSON; R. A. BERNER

Book Reviews

- 863 Physical Chemistry from Ostwald to Pauling, reviewed by R. FRIEDEL ■ Meteorology in America, 1800-1870, B. SINCLAIR ■ Fundamentals of Molecular Evolution, M. T. CLEGG ■ Books Received

Products & Materials

- 866 Computer Vision Software ■ Custom Peptide Synthesis ■ Monoclonal Antibodies ■ Sample Preparation Kits ■ Tracking Software ■ Phosphorylated Protein Enrichment Kit ■ Molecular Biology Buffers and Reagents ■ Literature

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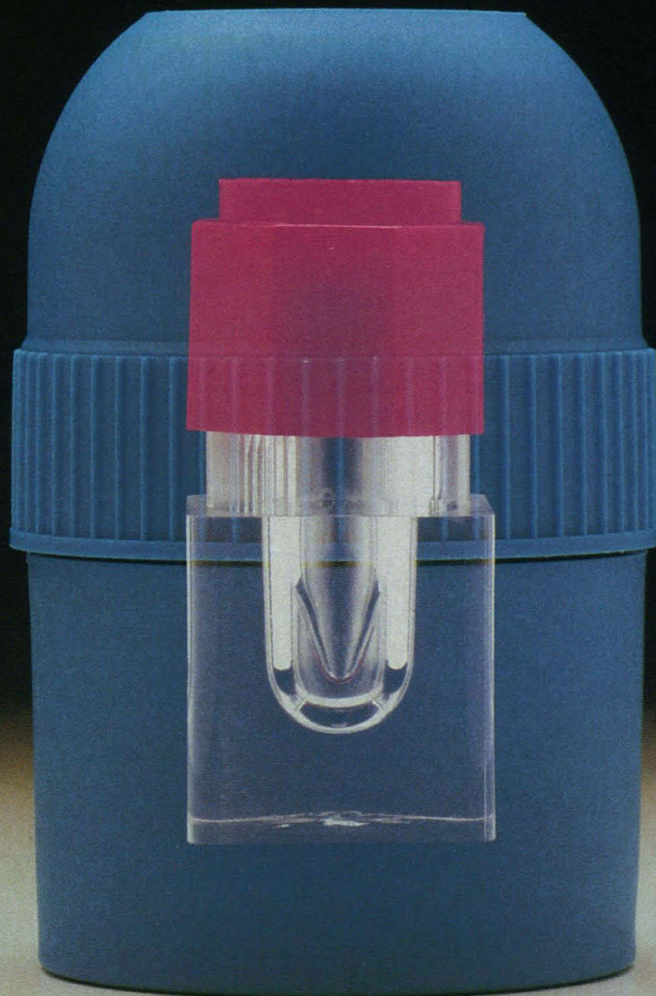
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Fingers touch DNA

ZINC fingers are structural motifs found in many DNA-binding proteins in the portion of the protein that makes direct contact with the DNA. Therefore, an understanding of the physical interactions of zinc fingers with DNA can provide important clues to how these DNA-binding proteins recognize DNA and how the bound proteins regulate gene expression (page 809). Pavletich and Pabo provide x-ray diffraction data on a complex of DNA with the DNA-binding domain of the mouse protein Zif268 (cover). This domain contains three zinc fingers linked to form a C that fits into the major groove of the DNA. Each finger makes its primary contact with a base pair triplet. As is true for other structural motifs of prokaryotic and eukaryotic DNA-binding proteins, the α helices of Zif268 are critical for site-specific recognition of DNA. In theory, it should be possible to identify and produce zinc fingers that recognize each of the 64 possible base pair triplets; then, the various fingers could be assembled into novel DNA-regulating proteins.

Transition zone rocks

THE upper and lower mantles of the earth are separated and distinguished by a seismic transition zone at a depth of 400 to 670 kilometers. Rocks that formed in this deep region of the earth and were transported to the crust by an eruptive kimberlite are now helping in the characterization of this otherwise inaccessible zone (page 827). Sautter *et al.* describe the rocks (xenoliths) that have been recovered at the Jagersfontein kimberlite at the southeastern edge of the Kaapvaal craton of South Africa. The chemical compositions and crystal organizations of the rocks and their inclusions indicate what types of mineralogic changes can occur in the transition zone and clarify relations of two of the mantle's main mineral constituents—pyroxene and garnet. The findings constrain hypotheses about the structure of the mantle,

the physical conditions that pertain and the dynamic processes that occur at the transition zone, and the conditions of the crust at the time that the rocks later reequilibrated. Kerr describes the impact of these studies on continuing controversies regarding the structure and properties of the mantle (page 783).

Assessing biodegradation

IT has been difficult to assess the extent to which organics that are contaminating ground water are eliminated by microorganisms both because such sites are fairly inaccessible and because many abiotic processes, such as dilution and volatilization, can affect the level of a contaminant. Madson *et al.* have tackled the problem of uncertain measurements by applying a set of tests of microbe abundance and activity to sediments in and near a contaminated aquifer (page 830). Their studies were carried out at a site where a truckload of coal tar was buried 30 years ago; coal tar components—naphthalene and phenanthrene—have spread through the sediments. Samples from boreholes near the burial site, at a distance from it but still within the contaminated area, and in a nearby pristine site were compared. Close to the burial site, bacteria were not only more prevalent than elsewhere but were adapted for rapid metabolism of the contaminants. Both bacteria that can mineralize the organics (break them down to inorganic compounds) and protozoa that prey on the quickly multiplying bacteria were found to flourish in association with contaminated sediments. These results strengthen the proposal that “bioremediation” may be brought about by the actions of microbes.

Sex determination in fruit flies

IN fruit flies, sex is not determined by X and Y chromosomes. It is determined by the ratio of X chromosomes to other non-sex-related (au-

tosomal) chromosomes in the fly and by the actions of a number of regulatory genes. Two such genes that produce protein products that are known to bias sex determination toward the production of females are called *transformer* (*tra*) and *tra-2*. Exactly how the expression of these genes influences sex differentiation is now known (page 833). In studies by Hoshijima *et al.*, the products of *tra* and *tra-2* were shown to induce the maximum production of female-style messenger RNA molecules by the *doublesex* (*dsx*) gene. The *dsx* messenger RNA molecules are assembled in the female manner when the female-specific exon is spliced to a common exon; the gene products made from *tra* and *tra-2* activated the female-specific acceptor site on *dsx*, favoring its usage in assembly of the messenger RNA molecules. The resulting gene product promotes femaleness by repressing male-specific differentiation.

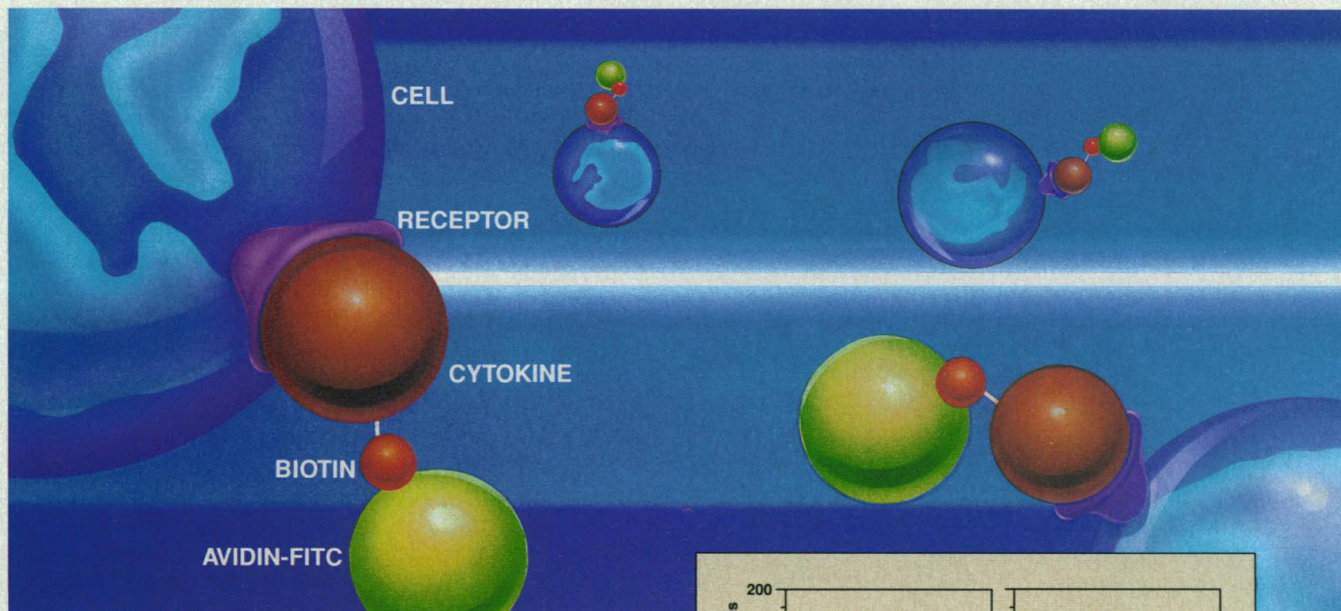
Hepatitis virus and transcription factors

THE hepatitis virus infects and takes over a host liver cell, disrupting the cell's normal functioning and using some of the host-cell machinery to bring about its own replication. Some of the targets of the viral takeover are host transcription factors, proteins that regulate gene expression. Maguire *et al.* have found that the X protein (pX) of the hepatitis virus, which is produced in infected liver cells, has an effect on at least two cellular transcription factors, CREB and ATF-2 (page 842): interaction with pX alters the DNA-binding specificities of CREB and ATF-2. In complexes with CREB or ATF-2, pX causes binding to enhancer elements that have nucleotide sequences that differ from those these proteins usually recognize; the enhancer is one of a small number of elements that controls the expression of the four genes of the virus. The commandeering of host transcription factors by the pX protein may lead to altered gene expression of both viral genes and genes of the host cell.

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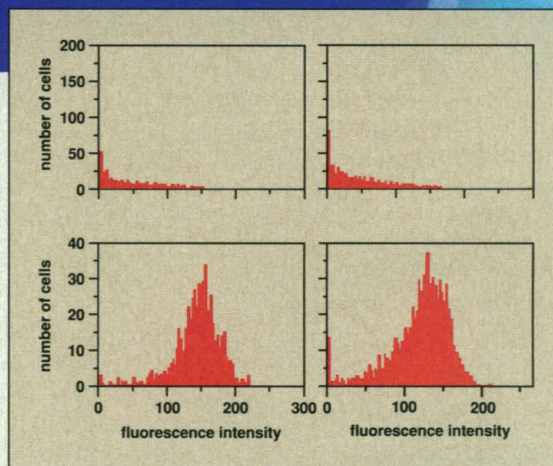
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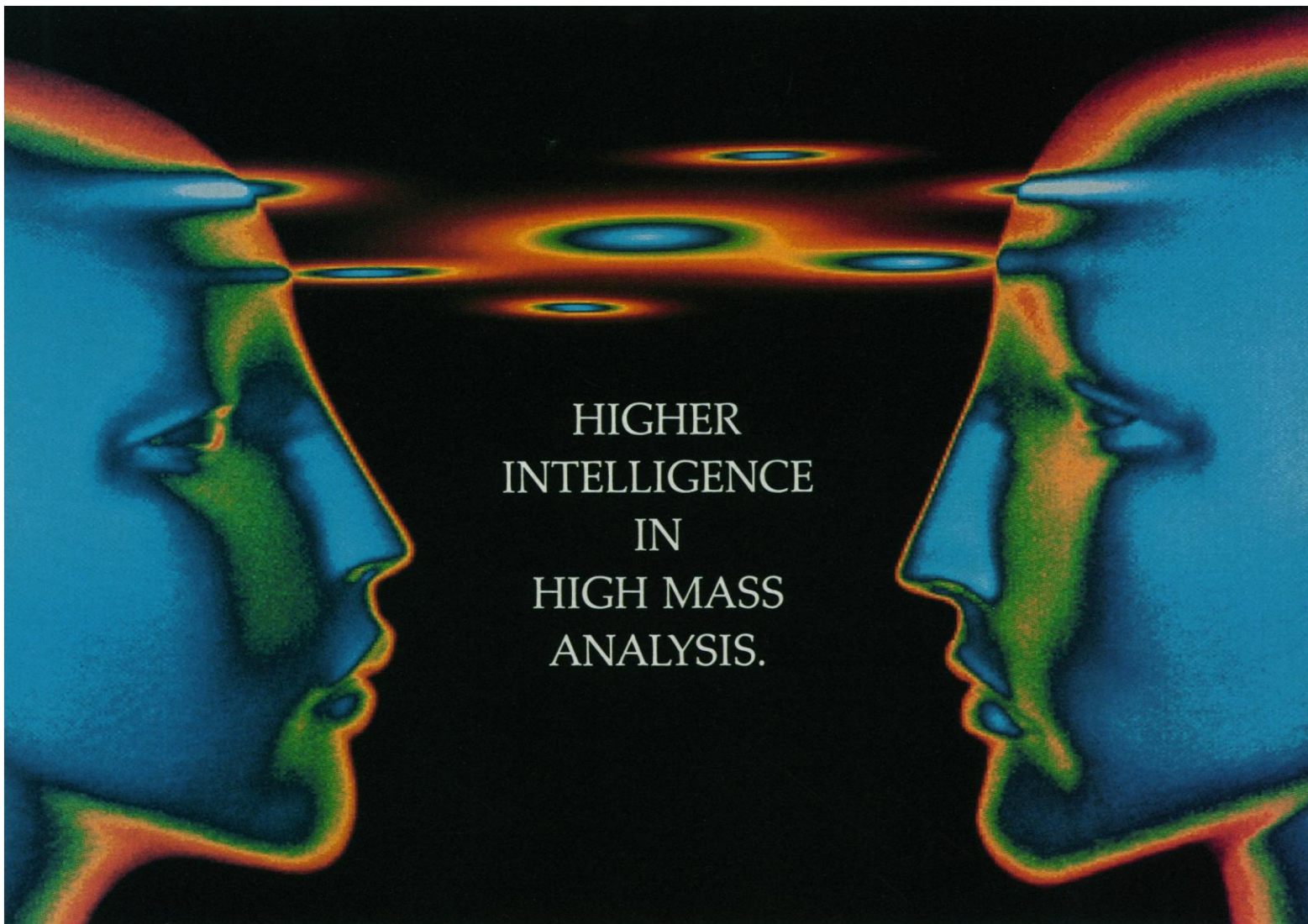
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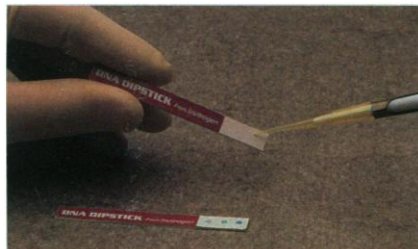
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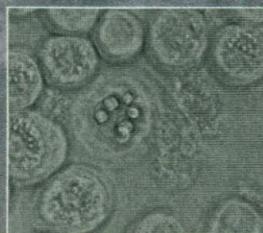


Figure 1. Infected Sf9 insect cells showing viral occlusions.

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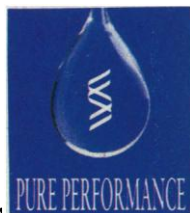
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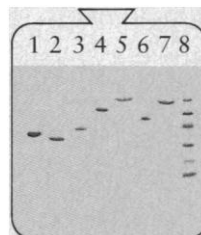


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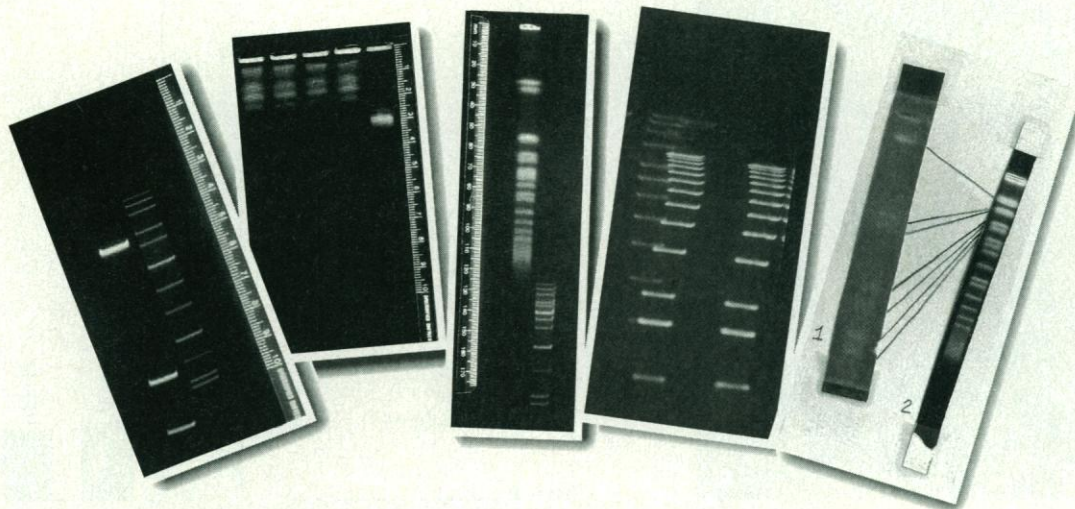
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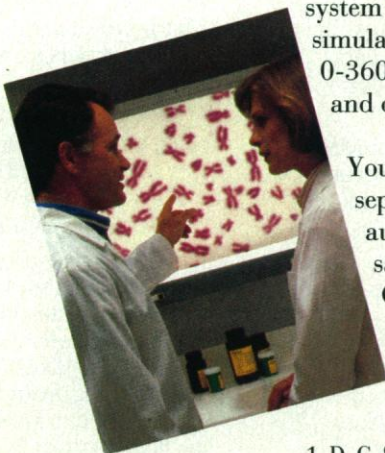
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Left to right: Asymmetric voltage FIGE, 5-50 kb; *S. pombe* 24 hrs, 106° angle; 8kb - 2.2 mb; 2-D separation of linear and supercoiled DNA; 8 state high resolution separation of *S. cerevisiae*.

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1. D. C. Schwartz and C. R. Cantor. *Cell*, 67 (1984).
2. Programmed Autonomously Controlled Electrodes. See S. M. Clark, E. Lai, B. W. Birren and L. Hood. *Science*, 241, 1203 (1988).

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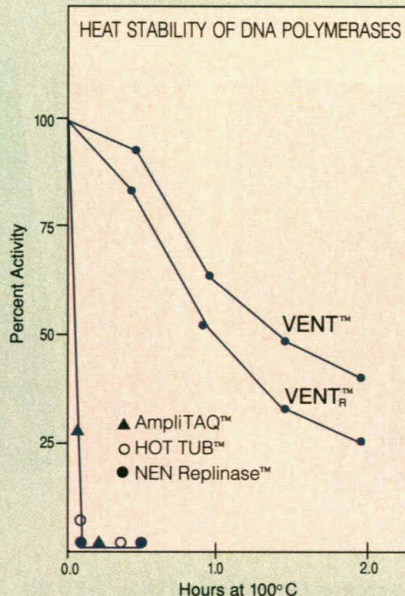
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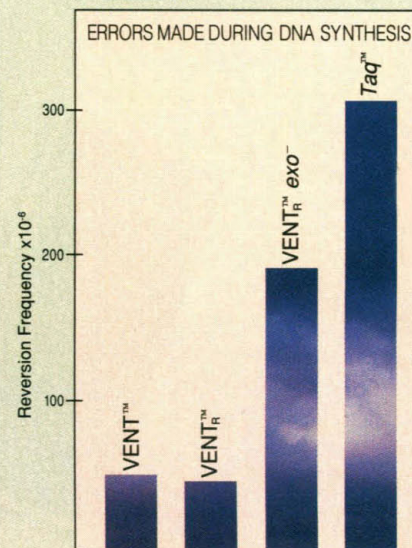
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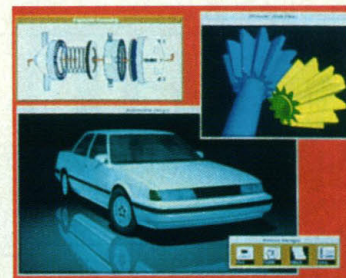
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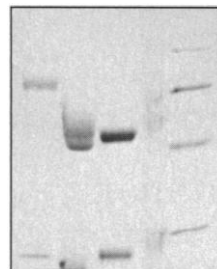
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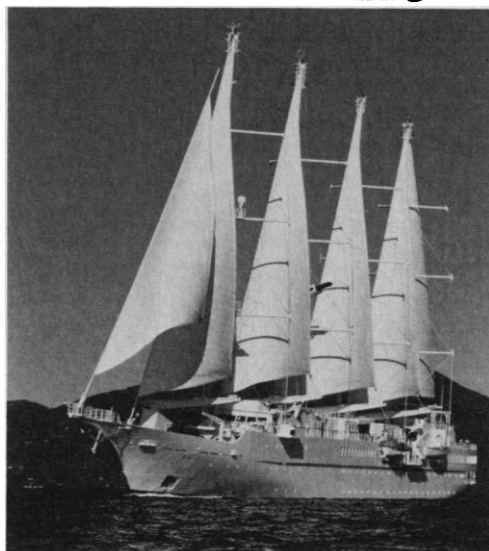


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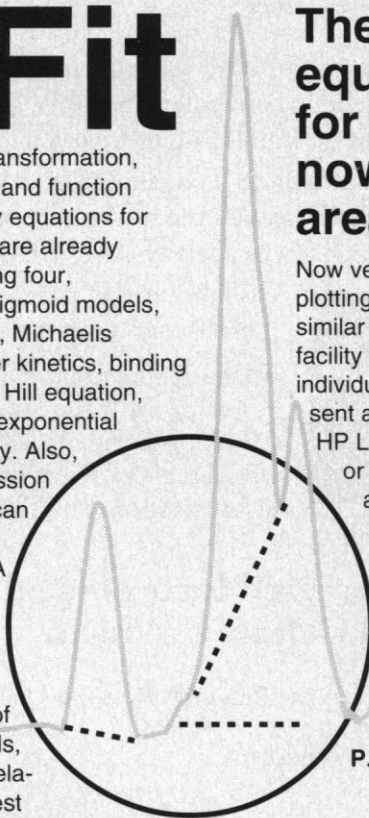


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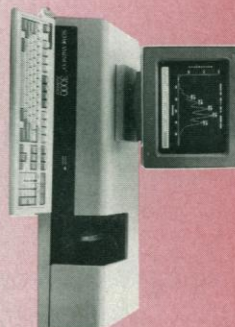
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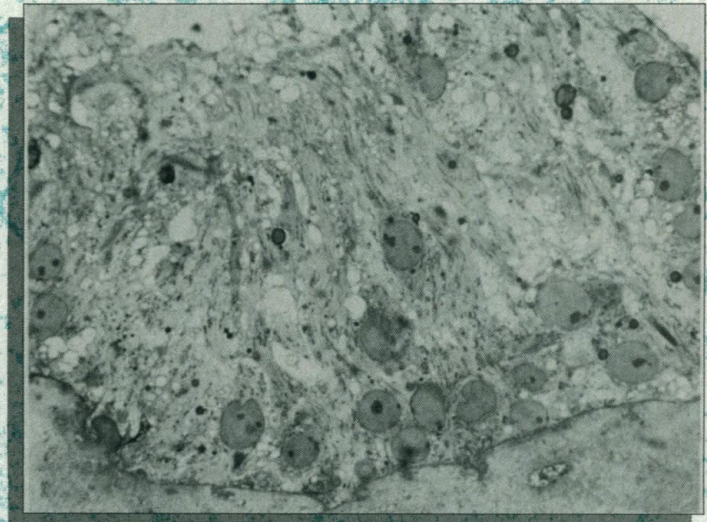
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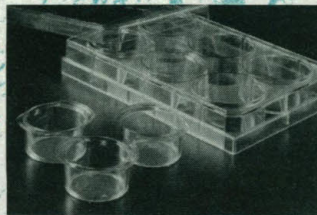


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