

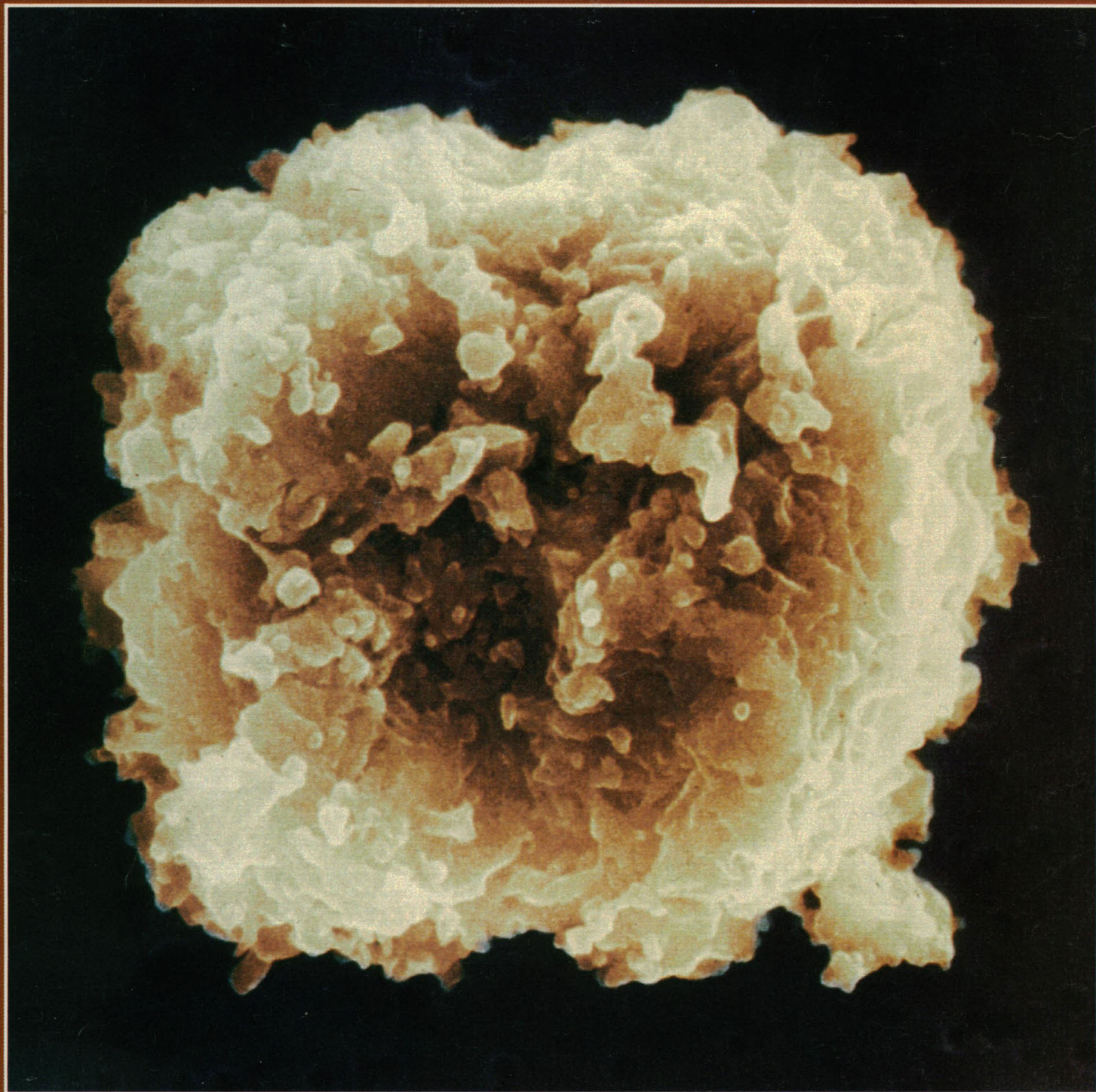
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1. Nielson, K. and Mathur, E.J. (1990) Strategies 3:17-19.
2. Nielson, K. and Mathur, E.J. Manuscript in preparation.

3. Nielson, K. and Mathur E.J. (1989) U.S. patents filed.
4. Mullis, K.B., and Faloona, F.A. (1987) Meth. Enzymol. 155:335-350.

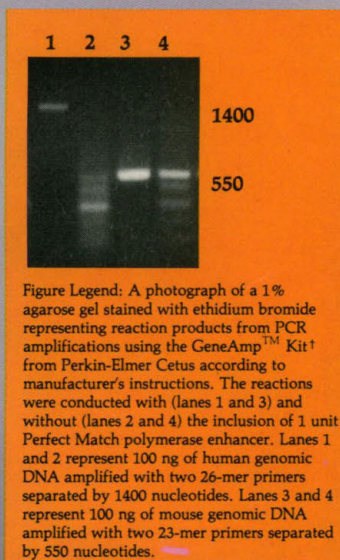


Figure 1 shows two examples of *in vitro* amplification reactions that are significantly enhanced by the addition of Perfect Match polymerase enhancer to the polymerase preparation. Note that in lanes 1 and 2, the desired PCR product cannot be detected unless Perfect Match polymerase enhancer is added to the amplification reaction.

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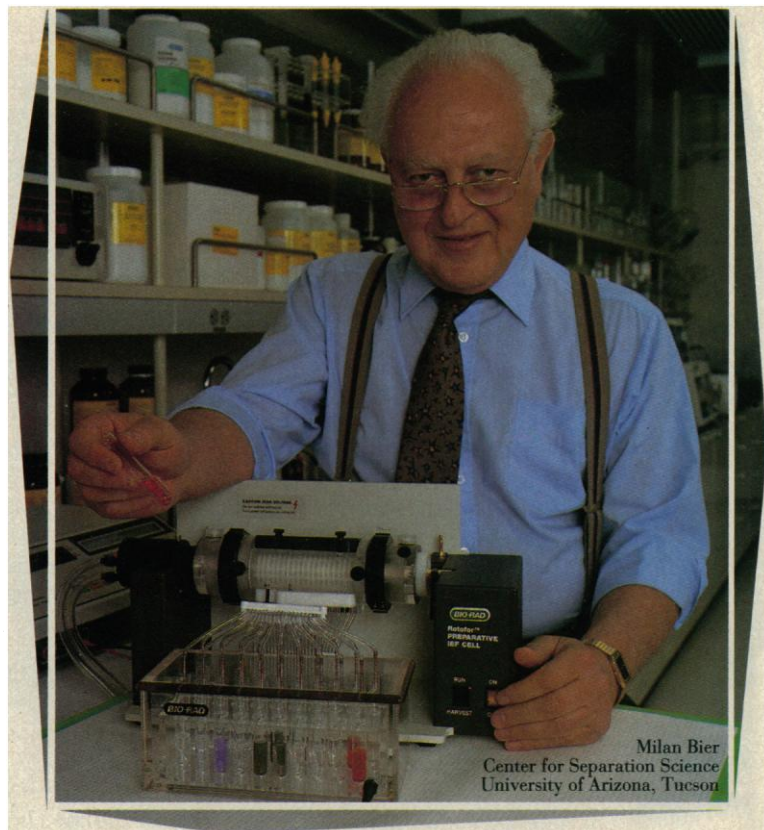
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495 This Week in *Science*

Editorial

497 War and Science

Letters

498 Archeology and Looting: Preserving the Record: C. B. DONNAN; EDITORS' RESPONSE: W. M. SUDDUTH; P. E. DIETZ; R. E. W. ADAMS ■ Cold Fusion Results: J. O'M. BOCKRIS; R. POOL ■ Units Unite!: J. R. PRATT; J. J. KARPINSKI; R. E. DAVIES; R. K. MULTER ■ Cystic Fibrosis Research: P. GORDEN ■ ACT Questions: M. D. RECKASE ■ Cool Heads; A. O. ROSS

Policy Forum

504 Paper Versus Polystyrene: A Complex Choice: M. B. HOCKING

ScienceScope

507 Soviet satellites scoop SPOT; scholars hit the fraud circuit; etc.

News & Comment

508 NIH: The Price of Neglect ■ Networking the Labs: Doing It Right
512 War with Iraq Spurs New Export Controls ■ How Western Technology Aided Iraq's War Machine ■ Academy Backs Export Overhaul
514 U.S. Bio-Defenses Faulted by GAO
Methanol-Powered Cars Get Ready to Hit the Road
516 Briefings: Opening Window on Quantum Weirdness ■ Buckyballs for Sale ■ Search for ETs Gets Fiscal Reprieve ■ Canada Sacrifices for Middle East ■ Assessing High School Achievement ■ Final Word on Agent Orange? ■ The Case Against Crop Chemicals ■ New Audit at Stanford

Research News

518 Is NIH Failing an AIDS "Challenge"? ■ Finding the Right HIV Strain—Not an Easy Task
521 RNA Scissors Go Commercial
522 Slowly, Hubble Begins to Do Science

Articles

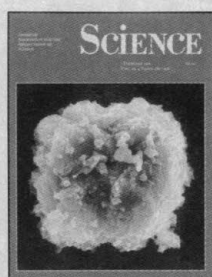
527 Population Aging Policies in East Asia and the United States: L. G. MARTIN
531 Ultrafast X-ray Pulses from Laser-Produced Plasmas: M. M. MURNANE, H. C. KAPTEYN, M. D. ROSEN, R. W. FALCONE
537 Shedding Light on Baryonic Dark Matter: J. SILK

Reports

542 Identification of the ¹H-NMR Spectra of Complex Oligosaccharides with Artificial Neural Networks: B. MEYER, T. HANSEN, D. NUTE, P. ALBERSHEIM, A. DARVILL, W. YORK, J. SELLERS

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COVER A 10 by 10 micrometer "layer silicate" interplanetary dust particle collected from the stratosphere by the NASA Johnson Space Center Cosmic Dust Collection Program. Data from analytical electron microscopic studies establish that some (and potentially all) interplanetary dust particles of the "layer silicate" subset are derived from asteroids. See page 549. [Scanning electron micrograph by J. P. Bradley; image processing by J. Barabe and S. Kilbourne]

- 544 Rapid Changes in the Range Limits of Scots Pine 4000 Years Ago: A. J. GEAR AND B. HUNTLEY
- 547 Deuterium on Venus: Observations From Earth: C. DE BERGH, B. BÉZARD, T. OWEN, D. CRISP, J.-P. MAILLARD, B. L. LUTZ
- 549 An Interplanetary Dust Particle Linked Directly to Type CM Meteorites and an Asteroidal Origin: J. P. BRADLEY AND D. E. BROWNEE
- 552 A New Method for Carbon Isotopic Analysis of Protein: D. E. NELSON
- 555 Cystic Fibrosis Transmembrane Conductance Regulator: Nucleotide Binding to a Synthetic Peptide: P. J. THOMAS, P. SHENBAGAMURTHI, X. YSERN, P. L. PEDERSEN
- 558 Transducin Activation by Rhodopsin Without a Covalent Bond to the 11-*Cis*-Retinal Chromophore: E. A. ZHUKOVSKY, P. R. ROBINSON, D. D. OPRIAN
- 560 Inhalational Anesthetics Stereochemistry: Optical Resolution of Halothane, Enflurane, and Isoflurane: J. MEINWALD, W. R. THOMPSON, D. L. PEARSON, W. A. KÖNIG, T. RUNGE, W. FRANCKE
- 561 Regulation of the Apolipoprotein AI Gene by ARP-1, a Novel Member of the Steroid Receptor Superfamily: J. A. A. LADIAS AND S. K. KARATHANASIS
- 565 Cortical Computational Maps Control Auditory Perception: H. RIQUIMAROUX, S. J. GAIONI, N. SUGA
- 568 ACh Receptor-Rich Membrane Domains Organized in Fibroblasts by Recombinant 43-Kilodalton Protein: W. D. PHILLIPS, C. KOPTA, P. BLOUNT, P. D. GARDNER, J. H. STEINBACH, J. P. MERLIE
- 570 Protein Kinase C and Regulation of the Local Competence of *Xenopus* Ectoderm: A. P. OTTE, I. M. KRAMER, A. J. DURSTON

Book Reviews

- 574 How Monkeys See the World, *reviewed by* A. JOLLY ■ Unified Theories of Cognition, J. A. FELDMAN ■ The Decline and Fall of Hemispheric Specialization, M. C. CORBALLIS ■ The Deep Sea Bed, C. R. SMITH ■ The Milky Way as a Galaxy, F. SCHWEIZER ■ Books Received

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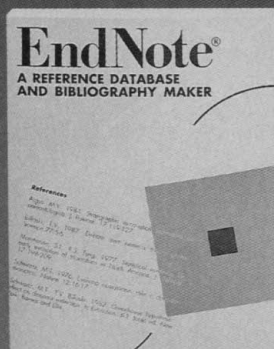
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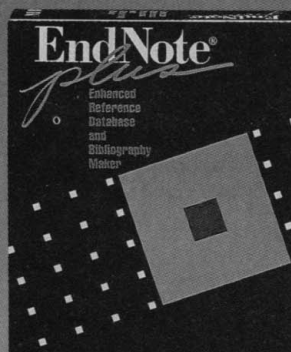
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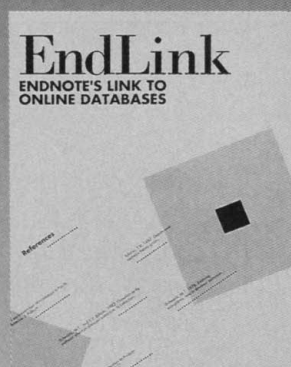
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discovery of yet another species (3) which is now the undisputed progeny (1) of the species at hand. While the true origin of this larger reptile is uncertain, it is thought to be from central or eastern Asia.

Where the other species (15) arose is a mystery. If it was central Asia, we can reasonably infer that other reptiles were not dominant in this ecosystem. Some evidence that the emerging reptile was a small-boned and duck-billed, with a larger wing-like arm.

References

1. M. B. Turnhouse.
2. T. V. Billoski, *Science*.
3. S. I. Morehouse, R.
4. M. T. Schwartz.
5. M. V. Argus.
6. R. Zartman.
7. H. Akiyoshi (1988).
8. A. Logan.
9. B. Carter.
10. O. Concho.
11. R. Hall, *Jou*.
12. M. T. Schwartz (Barnes and Ell)



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This Week in **SCIENCE**

Baryonic dark matter

MOST of the universe, somewhere between 90 and 99%, is nonluminous. It exists as dark matter that eludes detection by conventional means. Determining the nature of this material is one of the major puzzles in astronomy, and a number of candidate particles and proposals have been put forward in recent years. A new hypothesis is presented by Silk on page 537. He argues that compact stellar remnants, such as neutron stars and white dwarfs, would be plausible candidates for the missing matter. They are abundant in galaxies, have the right masses, and formed at the right place (in the outer halos of galaxies) at the right time in star formation. The prediction is subject to observational test, because, as compact dark matter evolves, some percentage of the neutron stars would become binary x-ray sources that should be detectable in the glow of galaxy halos. Bursts of gravitational radiation might also be produced as the neutron star binaries merge, and these bursts could be detected. The luminous binary neutron stars might also be an important source of the unexplained x-ray background radiation that is present in the universe.

Transitory pine forests

IN northern Scotland some 4000 years ago, the range of Scots pine forests first rapidly expanded and then retreated by about 80 kilometers during a 600-year period (page 544). Although there is no pollen evidence for the existence of the forests, stumps of fossil pine trees in peat attest to their presence. About 4400 years ago the bog surfaces grew drier, and soil conditions were conducive to rapid growth of pines. Then around 4000 years ago another change occurred, causing the trees to begin to die out. By 3800 years ago the northern region apparently had no pine forests; the forests had returned to their original more southerly position, where they are still found today. Gear and Huntley propose that the driving forces for the rise and fall of the

pine forests were shifting climates caused by changes in atmospheric circulation; they note that other evidence from northern Europe supports the notion that climate changed rapidly at that time. Although the forests responded reasonably rapidly to climate changes, the speed of the response—several hundred meters per year—is not one that would be fast enough to keep pace with changes that could come as a result of greenhouse warming.

Hydrogen isotopes at Venus

NEW near-infrared measurements made from Earth indicate that the ratio of deuterium to hydrogen in the atmosphere of Venus is about 100 times what it is on Earth (page 547). These measurements confirm earlier data obtained by the Pioneer Venus spacecraft. The atmosphere of Venus is much drier than the atmosphere of Earth, but the inventories of two volatiles—carbon dioxide and nitrogen—on Earth are similar to the abundances of these two gases in the Venus atmosphere. De Bergh *et al.* suggest that the observed enrichment of deuterium in the water vapor on Venus would be consistent with the release of large amounts (oceans) of water at some time during the early evolution of Venus. As outgassing occurred, the lighter hydrogen atoms would have been released preferentially over the heavier deuterium atoms. Models of planetary evolution must account for the sizable differences in the characteristics of the atmospheres of these two terrestrial planets.

Role for cystic fibrosis protein


THE gene encoding the protein cystic fibrosis transmembrane conductance regulator (CFTR) is defective in cystic fibrosis; the protein it produces is dysfunctional. Some of the domains in CFTR, a large molecule containing some 1480 amino acids, are known to be structurally similar to do-

main in other proteins that bind nucleotides, stretch across membranes, and perform regulatory functions. A 67-amino acid peptide patterned on residues 450 to 516 of CFTR was synthesized (page 555); this portion of the protein has been thought to include a nucleotide-binding domain. The peptide folded into a predominantly β sheet structure, and it bound a number of adenine-containing nucleotides. It is known that in some 70% of people with cystic fibrosis the phenylalanine residue at position 508 of CFTR is deleted. Thomas *et al.* therefore speculate that loss of that one amino acid may dramatically change the structure of a predicted β strand and reduce the molecule's ability to interact with nucleotides, thereby accounting for loss of function in cystic fibrosis.

Cortical maps

JAMAICAN mustached bats use sonar for hunting insects and for getting oriented in their surroundings. Bats compute their own location or the location of target insects by evaluating frequency and temporal information from both sound pulses that they emit and the echos that are returned. This information is programmed into "computational maps" in the cortex of the brain. Two parts of the cortex that participate in such mapping and information processing are the DSCF and the FM-FM regions. Riquimaroux *et al.* assessed how the perception of the bats changed when each of these regions was chemically inactivated (page 565). The bats were trained to make frequency and temporal discriminations on synthesized pulse-echo pairs. Then muscimol, an agonist of the neurotransmitter GABA, was applied to a small region of the cortex. Inactivation of the FM-FM area disrupted temporal discriminations; inactivation of the DSCF area disrupted fine frequency discriminations. Some of the basic principles revealed in these studies may be relevant not only to bat echolocation but also to the mechanisms by which various other species process auditory information.

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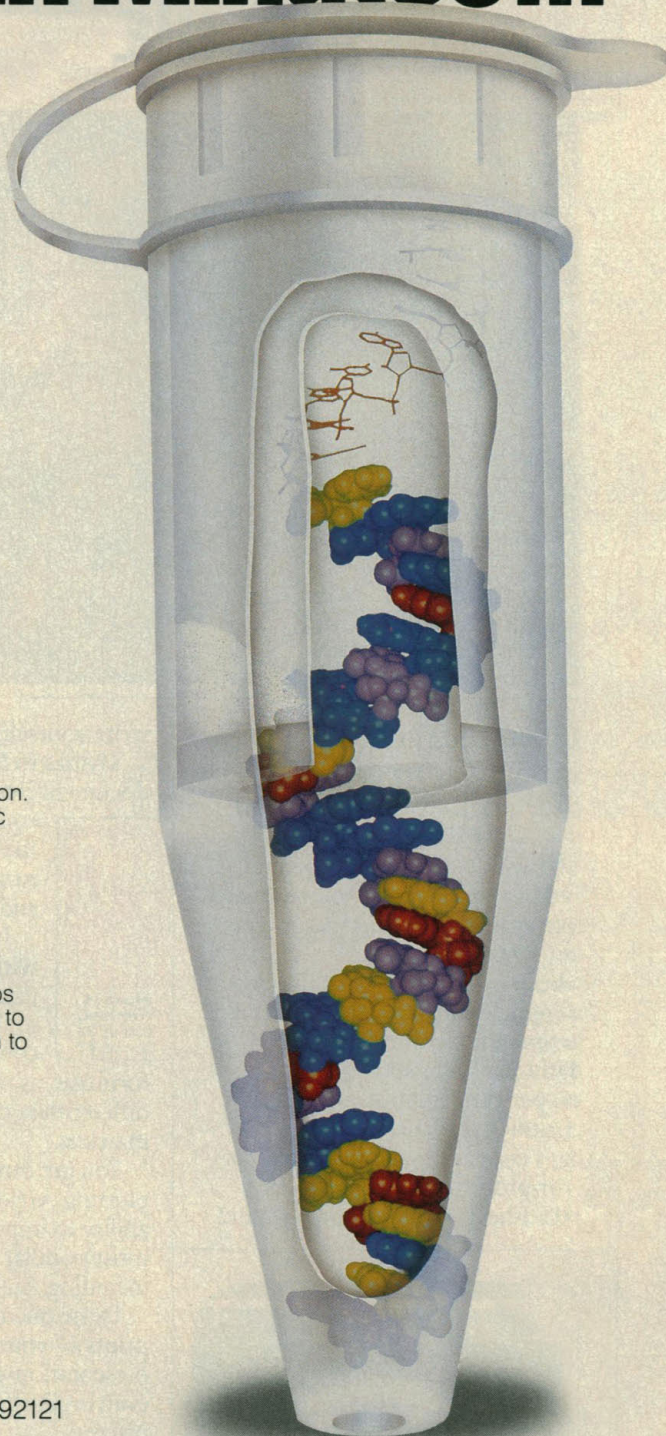


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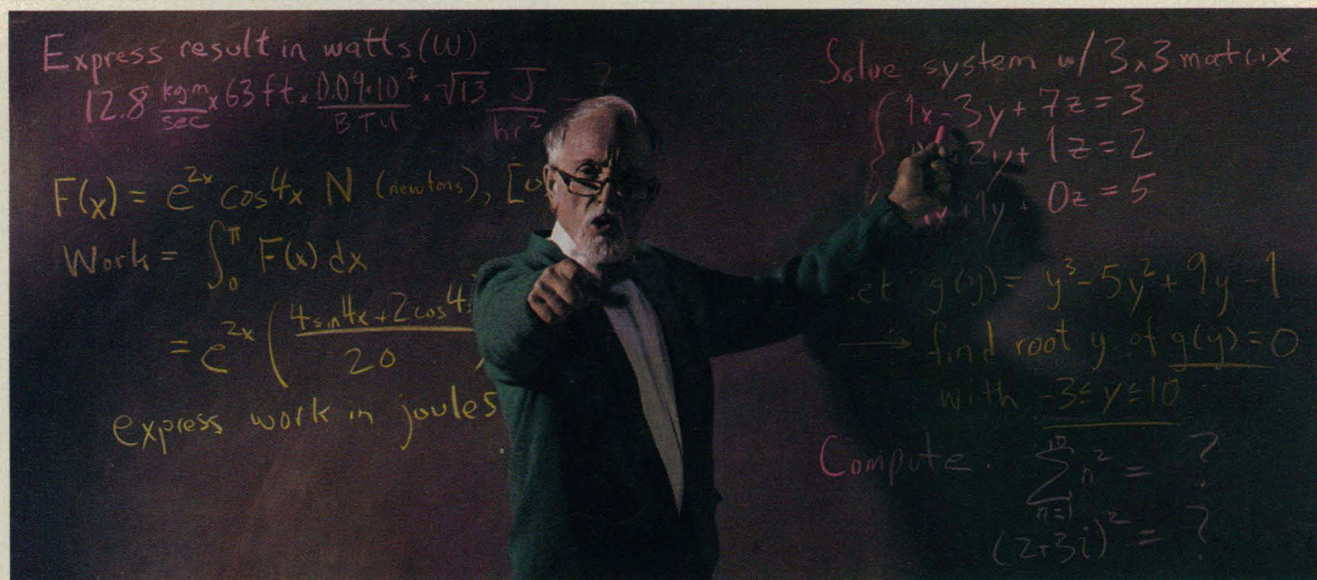
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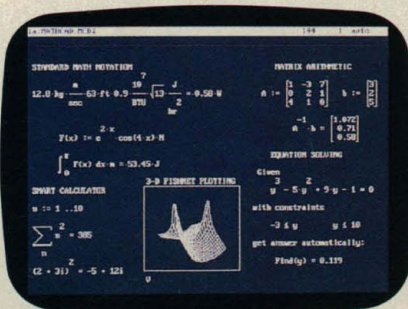
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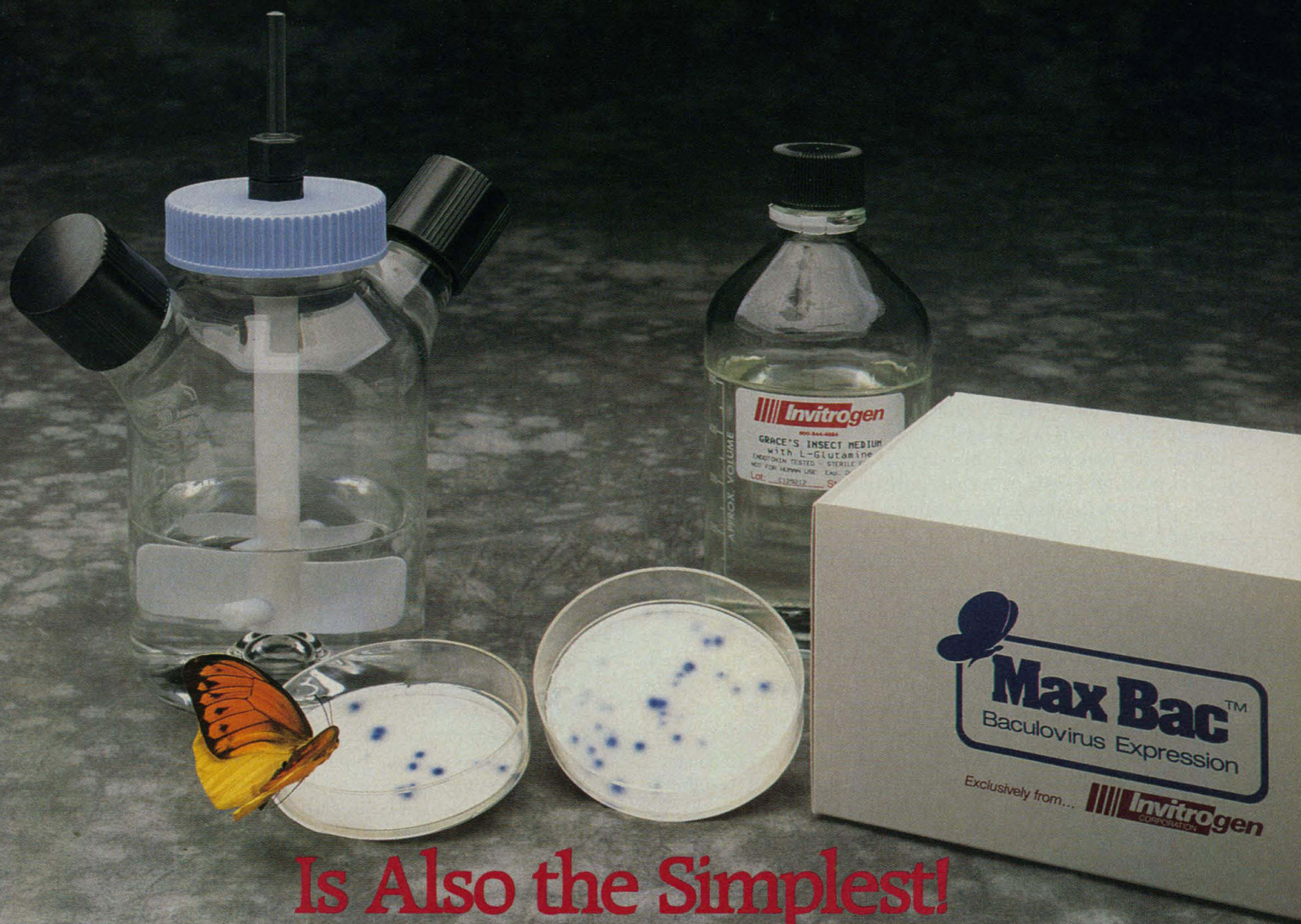
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Figure 1. Infected Sf9 insect cells showing viral occlusions.

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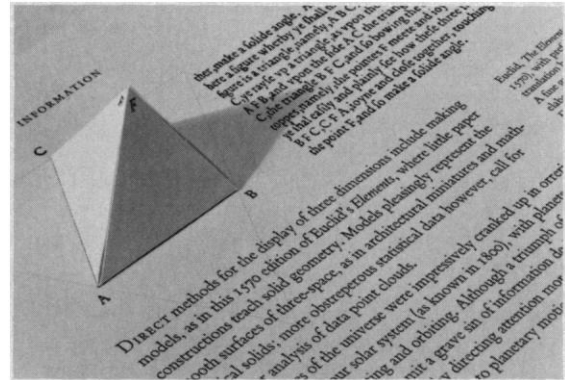
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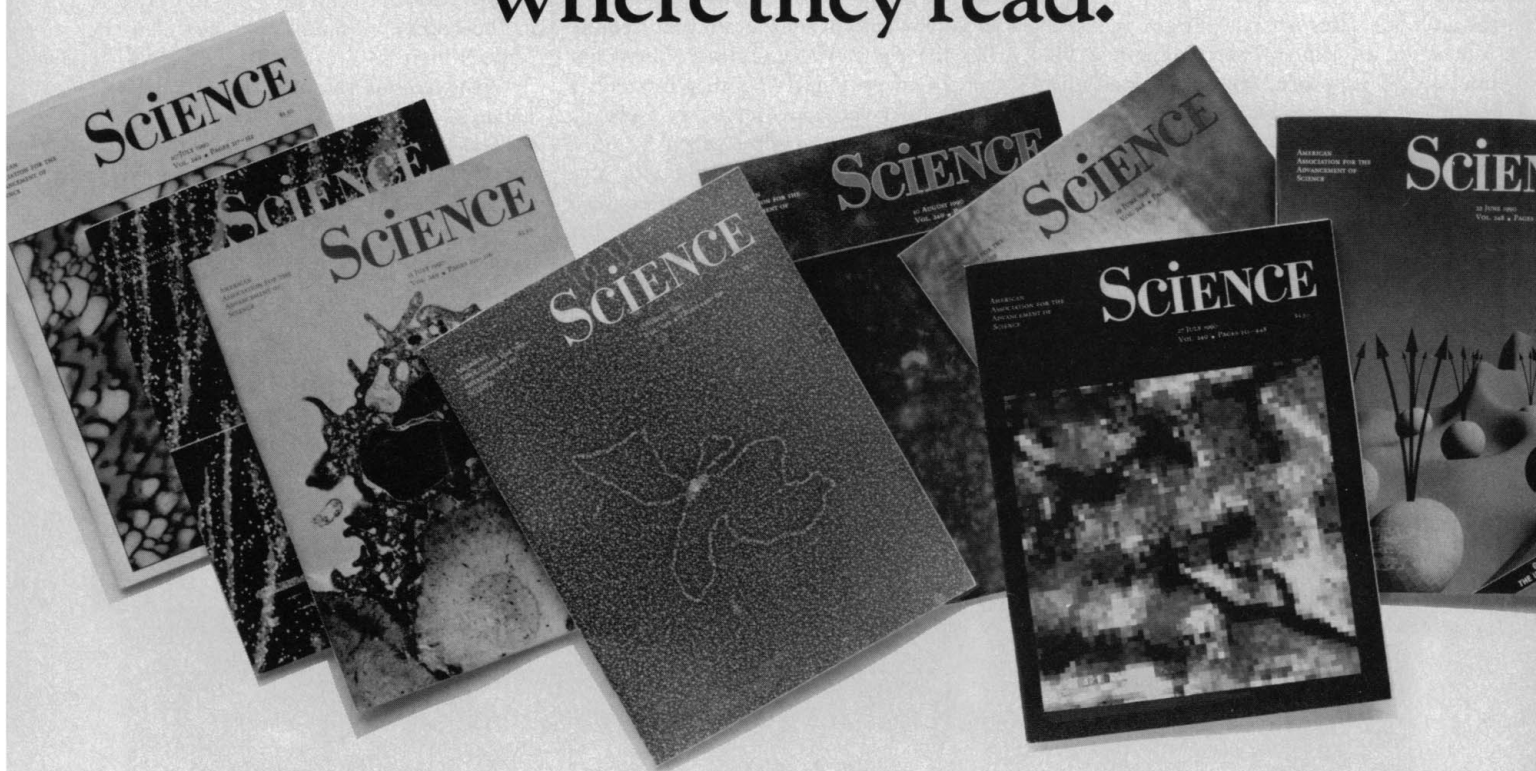
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The Program on Conscious and Unconscious Mental Processes of the John D. and Catherine T. MacArthur Foundation has its research center at the Langley Porter Psychiatric Institute. It has intra- and extramural task forces for collaborative and convergent studies on person schemas, defenses, and topics of thought and communication. The director of the program is Mardi J. Horowitz, M.D., Professor of Psychiatry at UCSF.

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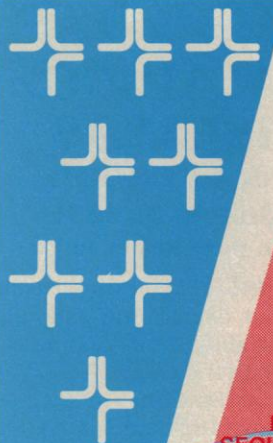
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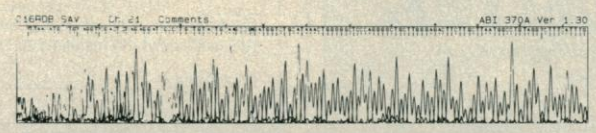
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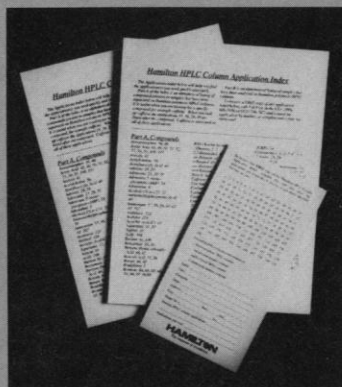


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Biological Control of Tree Diseases and Insect Pests

Drs. I. Chet, D. Dean, B. McCown and L. Miller

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Drs. R. Farrel, T. Jeffries, T. K. Kirk and A. Springer

Techniques of Tree Culture and Protection

Drs. T. Bradshaw, A. Handler, E. Lam, D. O'Malley and A. Stomp

Techniques in Wood Utilization

Drs. D. Cullen, R. Crawford, M. Leisola and M. Tien

Public Policy Issues

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The deadline for submission of abstracts for poster presentation is 5-1-91. For registration material and abstract forms please contact Rhonda Cobourn, USDA Forest Service, Northeastern Forest Experiment Station, 359 Main Road, Delaware, Ohio, USA, 43015, (614) 369-4476, fax (614) 363-1437.

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