



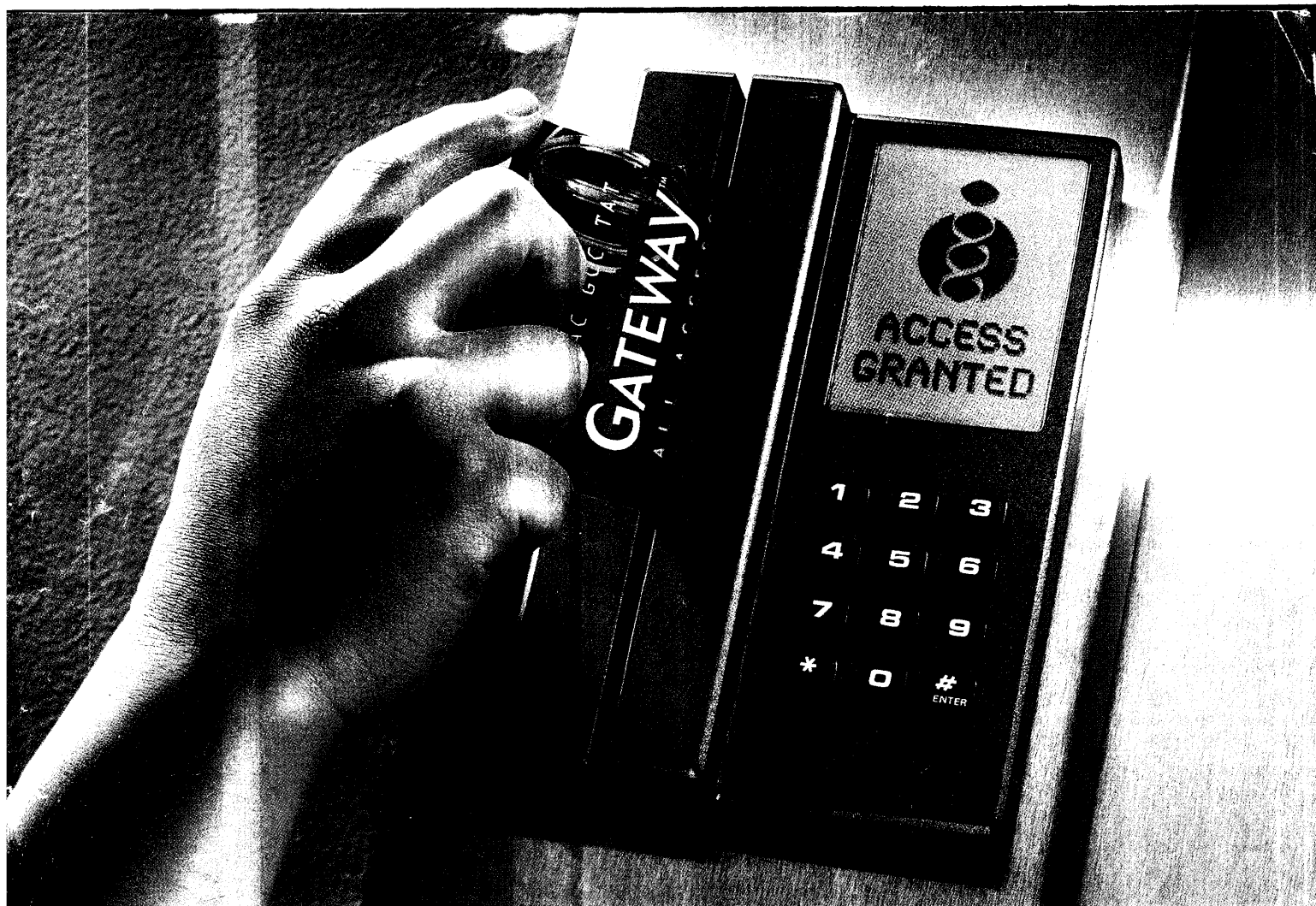
Science

19 October 2001

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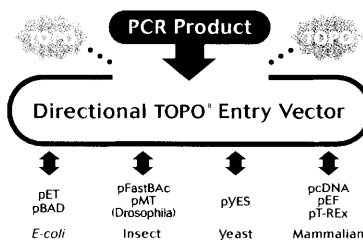
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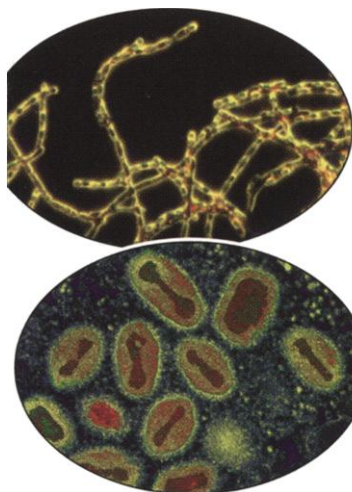
471 **SCIENCE ONLINE**
473 **THIS WEEK IN SCIENCE**
477 **EDITORIAL**
J. Zinsstag and M. G. Weiss
Livestock Diseases and Human Health

479 **EDITORS' CHOICE**
483 **NETWATCH**
486 **CONTACT SCIENCE**
621 **TECH.SIGHT/NEW PRODUCTS**
DNA Chips and Microarrays

NEWS

NEWS OF THE WEEK

- ▼490
498 **BIOTERRORISM: This Time It Was Real: Knowledge of Anthrax Put to the Test**
- 491 **PROFESSIONAL TRAVEL: NIH Chafes at Limits on Attending Meetings**
- 493 **BIOMEDICAL PHILANTHROPY: Klausner Makes Case for New Foundation**
- 493 **SCIENCESCOPE**
- 494 **SYNCHROTRON RADIATION: Swiss Source Shows Small Is Powerful**
- ▼494
581 **WEATHER FORECASTING: Getting a Handle on the North's 'El Niño'**
- 495 **VOLCANOLOGY: Vesuvius: A Threat Subsiding?**
- 497 **ASTRONOMY: Pulsars Solve Mystery of Missing Gas**



490, 498

Biowarfare strikes home

NEWS FOCUS

- ▼498
490 **BIOTERRORISM: Vaccines for Biodefense: A System in Distress**
Blocking Smallpox: A Second Defense
- ▼502
471 **NOBEL PRIZES: Science Awards Pack a Full House of Winners**
- 506 **INFECTIOUS DISEASES: Hard-Won Advances Spark Excitement About Hepatitis C**
- 508 **ALZHEIMER'S DISEASE: Bad for the Heart, Bad for the Mind?**
- 511 **RANDOM SAMPLES**

502

The Nobel class of 2001



SCIENCE'S COMPASS

519 LETTERS

Innovation and Inspiration in Education R. H. Brodhead, R. J. Wyman; J. R. Jungck; F. Heppner; A. Fraknoi. **Science Education in a University Town** B. Weber. **HIV/AIDS Control in Sub-Saharan Africa** S. Hanson. **Response** B. Schwartländer, N. Walker. **Corrections and Clarifications**

POLICY FORUM

- 525 **PUBLIC HEALTH: The Mexico City Policy and U.S. Family Planning Assistance** R. P. Cincotta and B. B. Crane

BOOKS ET AL.

- 527 **HIGHER EDUCATION: *The Creation of the Future The Role of the American University*** F. H. T. Rhodes, reviewed by R. M. Rosenzweig
- 528 **STATISTICS: *The Science of Conjecture Evidence and Probability before Pascal*** J. Franklin, reviewed by J. Hawkins

528 BROWSINGS

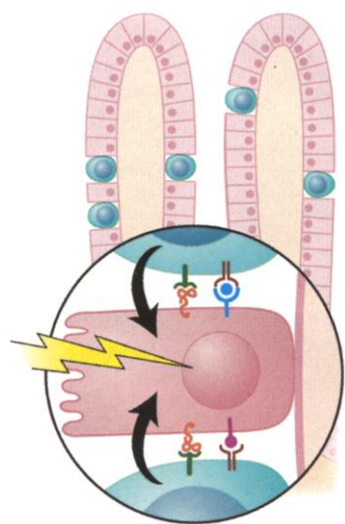
PERSPECTIVES

- 529 **COSMOLOGY: A Census of Cosmic Matter** B. D. Fields

- ▼530
559
564 **DEVELOPMENT: Endothelium—Chicken Soup for the Endoderm** N. Bahary and L. I. Zon
- ▼533
555 **GENETICS AND EVOLUTION: Come Fly, and Leave the Baggage Behind** R. E. Lenski
- ▼534
605 **IMMUNOLOGY: Stress, NK Receptors, and Immune Surveillance** D. M. Pardoll
- ▼536
571 **MOLECULAR ELECTRONICS: It's All About Contacts** K. W. Hipps
- 537 **ASTRONOMY: Toward Resolving the Mystery of Galaxy Formation** M. Scodeggio

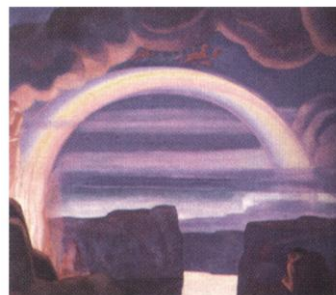
REVIEW

- 543 **CELL CYCLE: The Mitotic Spindle—A Self-Made Machine** E. Karsenti and I. Vernos



534

Immune surveillance in the skin and gut



528

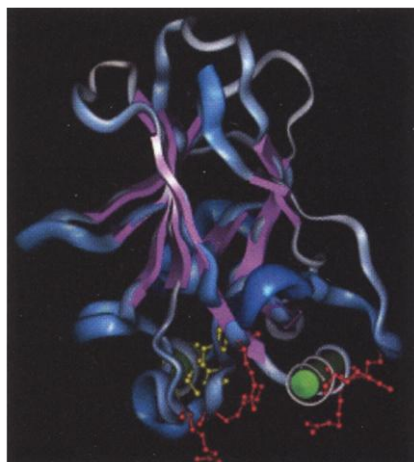
Rainbows in art and science

RESEARCH ARTICLES

- ▼555
533 **Sexual Recombination and the Power of Natural Selection** W. R. Rice and A. K. Chippindale

- ▼559
530 564 **Liver Organogenesis Promoted by Endothelial Cells Prior to Vascular Function** K. Matsumoto, H. Yoshitomi, J. Rossant, K. S. Zaret

- ▼564
530 559 **Induction of Pancreatic Differentiation by Signals from Blood Vessels** E. Lammert, O. Cleaver, D. Melton



591

A p53 homolog in worms

REPORTS

- 567 **Charge Migration in DNA: Ion-Gated Transport** R. N. Barnett, C. L. Cleveland, A. Joy, U. Landman, G. B. Schuster

- ▼571
536 **Reproducible Measurement of Single-Molecule Conductivity** X. D. Cui, A. Primak, X. Zarate, J. Tomfohr, O. F. Sankey, A. L. Moore, T. A. Moore, D. Gust, G. Harris, S. M. Lindsay

- 574 **Present-Day Crustal Deformation in China Constrained by Global Positioning System Measurements** Q. Wang, P.-Z. Zhang, J. T. Freymueller, R. Bilham, K. M. Larson, X. Lai, X. You, Z. Niu, J. Wu, Y. Li, J. Liu, Z. Yang, Q. Chen

- 578 **The Initiation of Subduction: Criticality by Addition of Water?** K. Regenauer-Lieb, D. A. Yuen, J. Branlund

- ▼581
494 **Stratospheric Harbingers of Anomalous Weather Regimes** M. P. Baldwin and T. J. Dunkerton

- 584 **Climatic Impact of Tropical Lowland Deforestation on Nearby Montane Cloud Forests** R. O. Lawton, U. S. Nair, R. A. Pielke Sr., R. M. Welch

- 587 **A Fossil Lemur from the Oligocene of Pakistan** L. Marivaux, J.-L. Welcomme, P.-O. Antoine, G. Métais, I. M. Baloch, M. Benammi, Y. Chaïmanee, S. Ducrocq, J.-J. Jaeger

- 591 ***Caenorhabditis elegans* p53: Role in Apoptosis, Meiosis, and Stress Resistance** W. B. Derry, A. P. Putzke, J. H. Rothman

- 595 **Integration Between the Epibranchial Placodes and the Hindbrain** J. Begbie and A. Graham

- 598 **Crystal Structure of an Early Protein-RNA Assembly Complex of the Signal Recognition Particle** K. Wild, I. Sinning, S. Cusack

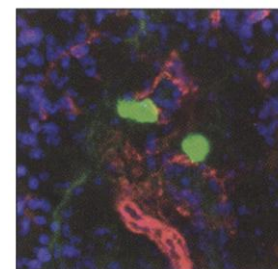
- 602 **Lattice Effects Observed in Chaotic Dynamics of Experimental Populations** S. M. Henson, R. F. Costantino, J. M. Cushing, R. A. Desharnais, B. Dennis, A. A. King

- ▼605
534 **Regulation of Cutaneous Malignancy by $\gamma\delta$ T Cells** M. Girardi, D. E. Oppenheim, C. R. Steele, J. M. Lewis, E. Glusac, R. Filler, P. Hobby, B. Sutton, R. E. Tigelaar, A. C. Hayday

- 610 **A Trypanosome Structure Involved in Transmitting Cytoplasmic Information During Cell Division** F. F. Moreira-Leite, T. Sherwin, L. Kohl, K. Gull

584

Cloud forests at risk



COVER 564

Confocal image showing the close association of immature pancreatic islets of Langerhans (green fluorescence) with blood vessels (red fluorescence) during embryogenesis; cell nuclei are blue. Blood vessels induce the formation of the islets during development, which leads to the intimate contact that allows islets to secrete insulin directly into the bloodstream in response to blood glucose levels. [Image: Ondine Cleaver]



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CONTENT HIGHLIGHTS AS OF 19 OCTOBER 2001

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TECHNICAL COMMENTS

Variation in Food Supply, Time of Breeding, and Energy Expenditure in Birds

One effect of global warming is to hasten the availability of food for birds each year, and many species have responded by advancing their breeding dates. By measuring metabolic rates and life-spans in bird populations with variable breeding times, Thomas *et al.* (Reports, 30 March 2001, p. 2598) concluded that the excessive parental metabolic effort resulting from mismatching of breeding time to peak food supply lowers reproductive efforts in adult birds. In a comment, Verhulst and Tinbergen protest these conclusions, suggesting that the Thomas *et al.* report suffers from "the problem of interpretation" in comparing persistence of birds in populations and that "only experiments can demonstrate a causal relationship between timing of breeding" and "any other parameter." In response, Thomas *et al.* clarify their original presentation of "a unique natural experiment," and state that their data were "consistent with theory predicting tradeoffs between current effort and future reproductive prospects."

The full text of these comments can be seen at
www.sciencemag.org/cgi/content/full/294/5542/471a

SPECIAL FEATURE

Celebrating the 2001 Nobel Physics Laureates

Classic *Science* papers, news, and commentary on the accomplishments of prizewinners Cornell, Wieman, and Ketterle—as well as many others—in the field of Bose-Einstein condensates.
www.sciencemag.org/feature/data/nobelprize/2001/physics.shtml

SCIENCE EXPRESS

www.sciencexpress.org

Bose-Einstein Condensation of Potassium Atoms by Sympathetic Cooling G. Modugno *et al.*

502 A Bose-Einstein condensate of potassium atoms is realized by a technique of sympathetic cooling, whereby a different atomic species, rubidium, is used to cool the potassium atoms through favorable collisions.

Rapid Increase in Clusters of Presynaptic Proteins at Onset of Long-Lasting Potentiation I. Antonova *et al.*

Short-term LTP, a cellular correlate of fast synaptic plasticity, is accompanied by surprisingly rapid changes in synaptic organization in both presynaptic and postsynaptic cells.

science's next wave

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career resources for scientists

US: Job Search Bliss—A Happy Job Seeker Is a Successful Job Seeker D. Jensen

In *Tooling Up*, advice about how to gear up for the job search, and keep stress to a minimum, when the rest of the world seems to be going out the window.

Singapore: Career Opportunities for Ph.D.'s J. Wong

What are the best job options for Singapore's Ph.D.'s?

Germany: The Challenges of Intensity and Excellence

E. von Ruschkowski

The University of Göttingen's collaborative neuroscience and molecular biology programs attract international students and scholars—but how do they get used to life in Germany?

UK: The Secrets of Research Success P. H. Dee

To our *Yours Transferably* columnist, the secret of developing into an independent researcher is being selective about what you communicate to your peers.

Canada: Ontario's Biotech Community L. McKarney

In this installment of *Under One Roof*, we examine Ontario's emerging biotech clusters and how government funding initiatives are supporting industry expansion.

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News Focus: Get Some Glasses, Ump! K. Miller

Long judged unfairly, research on aging might finally get its own NIH study sections.

Neurodegenerative Disease Case Study: Dementia with Lewy

Bodies H. Posner, S. Chin, K. Marder

Patients mistake inanimate objects for people.

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signal transduction knowledge environment

Perspective: Highlights of Alternative Splicing Regulation

Session—Yes, No, Maybe: A History of Paradigm Shifts T. A. Cooper

New insights into the proteins that dictate exon inclusion or exclusion.

Perspective: Insulin Signaling—Lessons from the *Drosophila*

Tuberosus Sclerosis Complex, a Tumor Suppressor J. Montagne,

T. Radimerski, G. Thomas

Connections between cell size, the cell cycle, and the tuberous sclerosis complex.

Connections Map: The Jasmonate Biochemical Pathway

Pathway Authorities: E. E. Farmer and R. Liechti

A pathway describing the biosynthesis of the jasmonate plant signaling molecules.

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THIS WEEK IN Science

edited by Phil Szuromi

Ion-Gated Carrier Transport in DNA

Many experimental and theoretical studies have been aimed at elucidating the mechanism for the transport of electrons and holes through DNA. Barnett *et al.* (p. 567) have now used molecular dynamics simulations and first-principles structure calculations to show that even the hydrated counterions that interact with phosphate groups can exert a large effect on the rate of hole transport. Inclusion of the hydrated ion favors correlated motions of the helix that facilitate transport. Experimental studies revealed that electron transport rates are reduced in DNA strands containing uncharged methylphosphonate bridges.

Stratospheric Effects on Weather

Vigorous circulation in the troposphere makes predicting the weather more than 1 week in advance difficult. The stratosphere, which lies immediately above the troposphere, is far more stable but is not often considered to have much effect on surface weather patterns. Baldwin and Dunkerton (p. 581, see the news story by Kerr) present evidence that strong variations in stratospheric circulation at altitudes above about 50 kilometers can descend into the troposphere and affect the weather there. These events may be followed by months during which patterns of surface pressure are systematically altered, as reflected in large-scale atmospheric pressure patterns called the Arctic Oscillation and the North Atlantic Oscillation. This effect may allow storminess and storm tracks to be predicted more accurately.

Lemur Origins

Small, nocturnal lemurs are divided into two extant orders, the Lemuriformes, isolated in Madagascar, and the Lorisiformes, found in Africa and Asia. The fossil and molecular record of how and when these orders may have evolved is poorly sampled and contradictory. Marivaux *et al.* (p. 587) have discovered a lemuriform fossil, *Bugtilemur mathesoni*, in Oligocene sand deposits in Pakistan. Diversification of lemuriforms outside of Madagascar thus occurred at least 30 million years ago, which is more than 50 million years after the continental breakup of Madagascar from India. Hence, the lemuriforms either found land bridges from Madagascar to Asia or they evolved in Asia before the continental breakup.

Making Better Contacts

Studies of single-molecule conductivity yield a wide range of values, in part because of the difficulties of making reliable contacts to individual molecules. Cui *et al.* (p. 571; see the Perspective by Hipps) now describe a method for covalently attaching gold nanoparticles to alkane thiol molecules self-assembled on a gold surface. Current-voltage curves are observed that can be attributed to making contact with

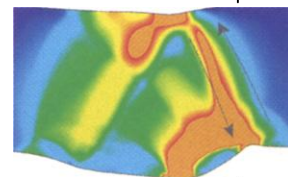
574 Crustal Shortening and Extrusion

The major continent-to-continent collision of India into Eurasia has created the high-standing Tibetan plateau, major fault zones, and a natural laboratory for a crustal deformation study. Wang *et al.* (p. 574) combine 10 years of geodetic data into a comprehensive kinematic model of crustal motion throughout China. They find that 90% of the deformation is taken up in crustal shortening to create the plateau and most of the remaining 10% is taken up by eastward extrusion and rotation of the crust into southeastern China.

costs? Lawton *et al.* (p. 584) use satellite imagery of clouds and regional atmospheric modeling to show that clearing lowland forests in Costa Rica alters the surface energy budget enough to diminish dry season cloudiness, which in turn deprives downwind montane cloud forests of the moisture that they need to survive.

Starting Subduction

How does a tectonic plate bend and break to initiate a subduction zone? Regenauer-Lieb *et al.* (p. 578) developed a nonlinear elastovisco-plastic finite element model to examine the initiation of subduction. In their model, a sedimentary load was piled onto the lithosphere (similar to a passive continent-ocean margin), and the water content of the lithosphere was varied. The addition of water promoted the development of a narrow shear zone through the lithosphere that started the subduction process.



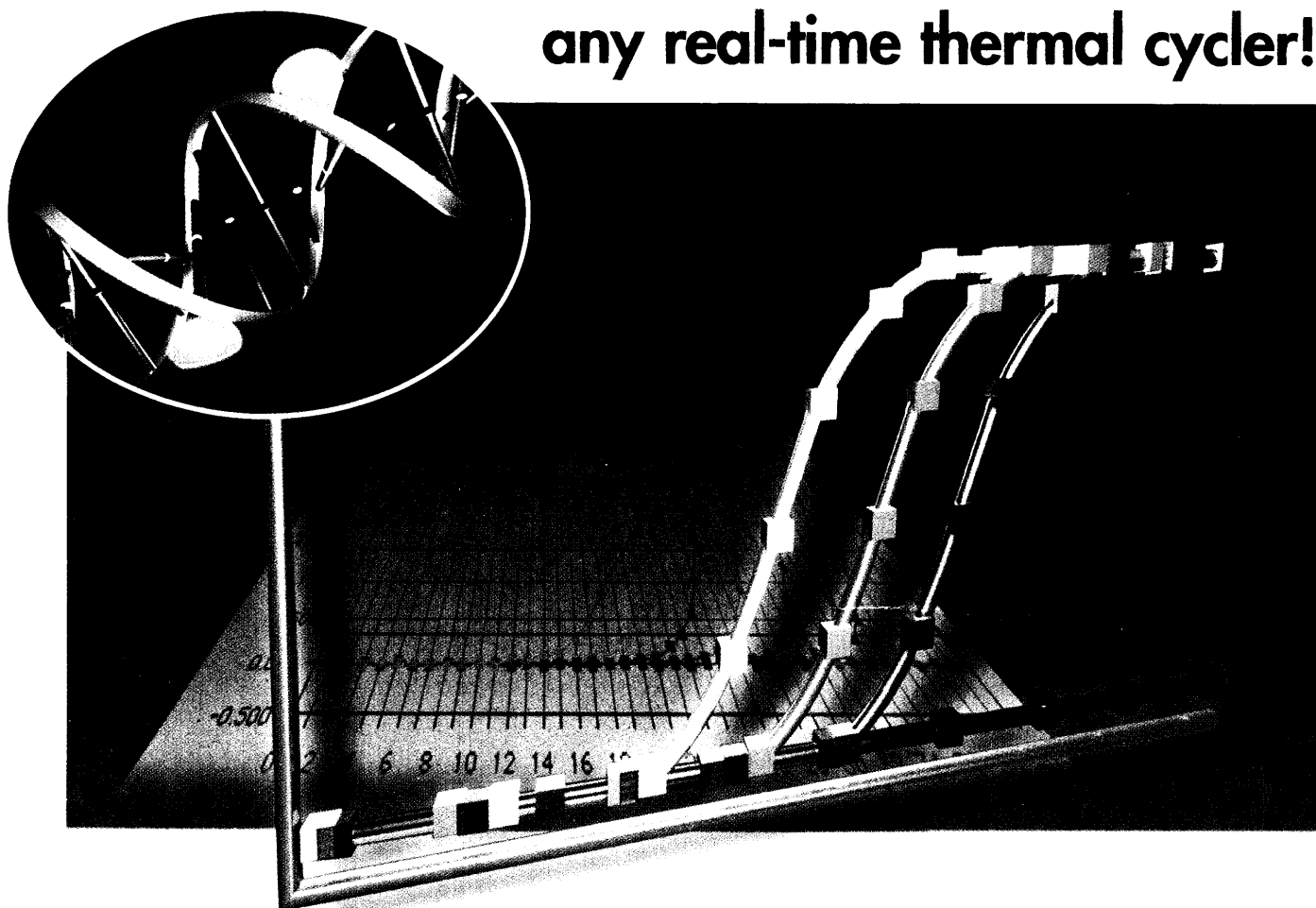
Sex and Fitness

The experimental evaluation of the adaptive significance of sexual recombination has been hampered by inconsistent experimental results. Rice and Chippindale (p. 555; see the Perspective by Lensky) present a set of *Drosophila* experiments that directly compared nonrecombining and freely recombination replicates. In the nonrecombining population, the variability among lines was very large, as expected, but the average increase in the favored allele was slight and seemed to saturate after about eight generations. In the recombining strain, the fitness continued to increase throughout the experiment.

Blood Vessels Originating Organs

Blood not only sustains and oxygenates organs—two reports show how blood vessel endothelium plays important roles in organ development (see the Perspective by Bahary and Zon and the 28 September news story by Seydel). Lammert *et al.* (p. 564; see the cover) found that the endothelium supplies signals that are necessary for pancreatic differentiation and insulin expression. Removal of the dorsal aorta in *Xenopus* embryos led to a failure in insulin expression, whereas vascularization in transgenic mice in the posterior foregut led to ectopic islet formation and insulin expression. Matsumoto *et al.* (p. 559) used

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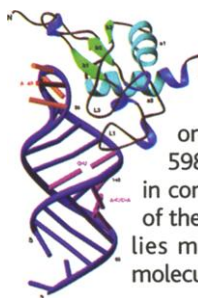
flk-1 mutant mice, an embryo tissue explant system, and an angiogenesis inhibitor to show that endothelial cells promote liver development prior to vascular blood flow. Σ

Worming Secrets Out of p53

The *p53* tumor suppressor gene is among the most frequently mutated genes in human cancer. Although much has been learned about *p53* from studies of mammalian cells, progress in understanding its function and regulation has been hampered by the lack of a genetically accessible system. Derry *et al.* (p. 591) have identified a *p53* homolog in the nematode *Caenorhabditis elegans*, an organism previously thought to be devoid of *p53*. This gene, *cep-1*, functions in apoptosis and meiotic chromosome segregation in the germ line and mediates responses to environmental stress in somatic cells. The genetic potential offered by the *C. elegans* system is likely to lead to new insights into *p53* and other cancer-related genes. Σ

Riding the Neural Crest

Stitching together the circuitry that connects central and peripheral nervous systems requires a wiring diagram with complex assembly instructions. Begbie and Graham (p. 595) now show that, in the chick, neurons extending from peripheral epibranchial placodes toward the hindbrain find their way by following tracks defined by neural crest cells migrating in the opposite direction, from the hindbrain outward. These ganglionic connections later relay sensory information such as taste from the oral cavity to the brain.



A Signal Assembly

The signal recognition particle (SRP) is an RNA-protein complex that bridges active ribosomes and internal membranes and enables the coordinated synthesis and insertion of membrane proteins. Wild *et al.* (p. 598) have solved the structure of one of the protein components, SRP19, in complex with helix 6 of the SRP RNA. This complex, postulated to be one of the early intermediates in assembly of the SRP, reveals that recognition relies mainly on shape complementarity, mediated by a layer of water molecules, rather than direct nucleotide-amino acid contacts.

Everybody Counts

Organisms are discrete entities in space and time, but most ecological models simulate populations as a continuum. Lattice models can handle populations that have discrete numbers, and by this means Henson *et al.* (p. 602) have shown in laboratory populations of the flour beetle, *Tribolium*, that it does matter whether organisms are treated as points rather than smears. Accounting for lattice effects can dramatically alter the predictions of ecological models, especially those with complex dynamics used in conservation biology and wildlife management.

$\gamma\delta$ T Cells Get Under the Skin

T cells bearing the $\gamma\delta$ T cell receptor reside in large numbers within the epidermis of the skin. The growing evidence that $\gamma\delta$ T cells contribute to dermal integrity is supported by the study by Girardi *et al.* (p. 605; see the Perspective by Pardoll), who show these lymphocytes can protect against cutaneous malignancy. Thus, in the absence of $\gamma\delta$ T cells, mice coped poorly with experimentally induced forms of skin carcinoma. Induction of malignancy correlated with the up-regulation of the protein Rae-1, which contributed to the killing of carcinoma cells by a $\gamma\delta$ T cell line in vitro. Binding studies revealed that Rae-1 interacts with the NKG2d receptor on $\gamma\delta$ T cells, which suggests that this ligand may be a functional homolog of tumor-related MICA/B proteins in humans. Σ

The Past Molds the Future

Trypanosomes possess a characteristic flagellum that winds helically around the cell. How is this complex structure passed on to the resulting daughter cells during cell division? Moreira-Leite *et al.* (p. 610) examined the process and found that the new and the old flagella are physically linked during division such that the structural form is passed directly from mother to progeny. This type of morphogenetic inheritance is known as cytotaxis.

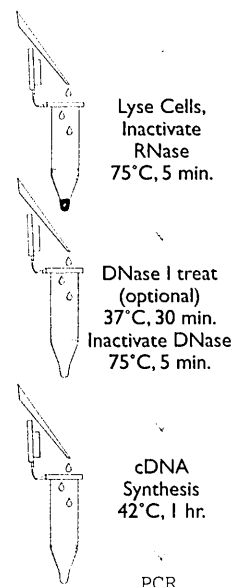
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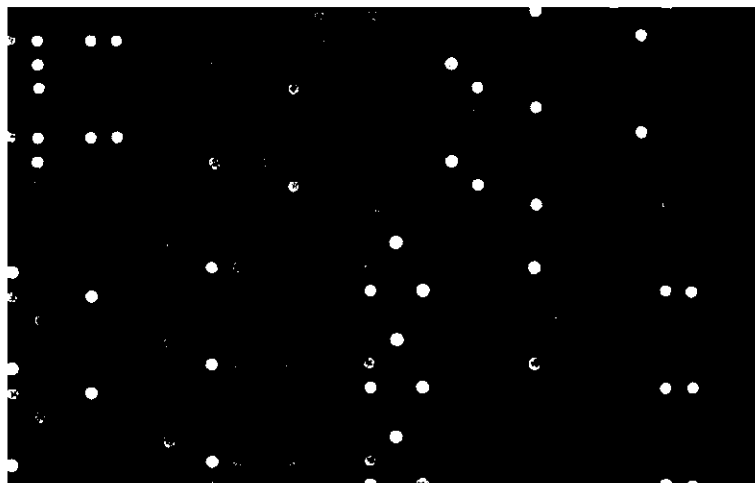
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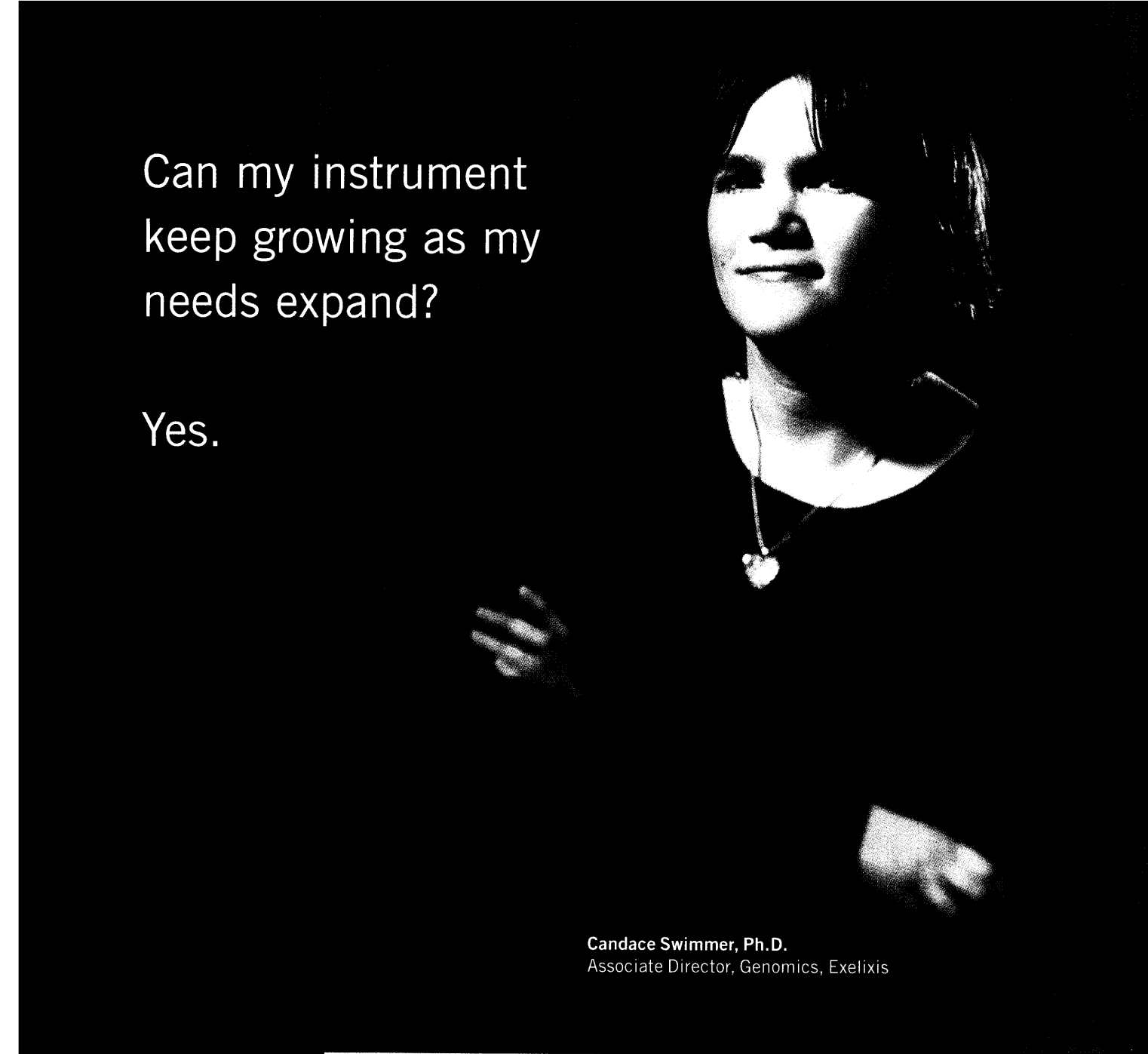
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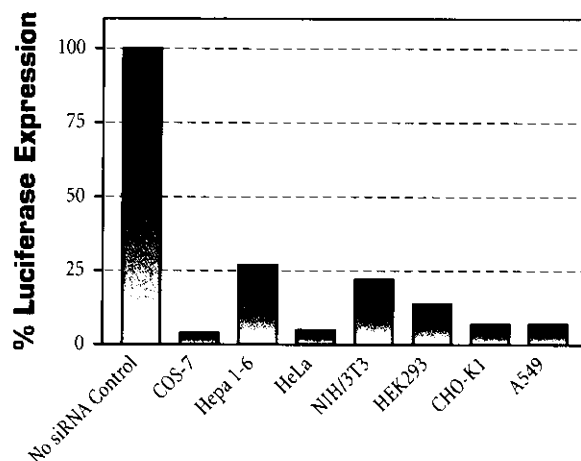
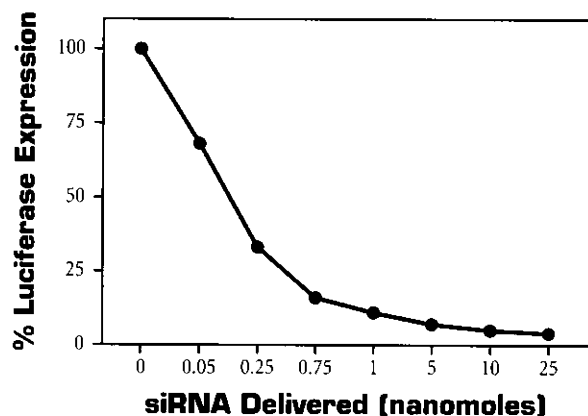
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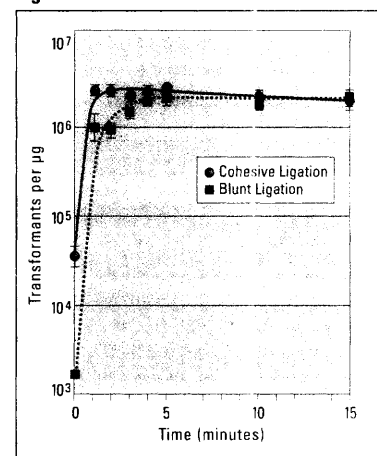
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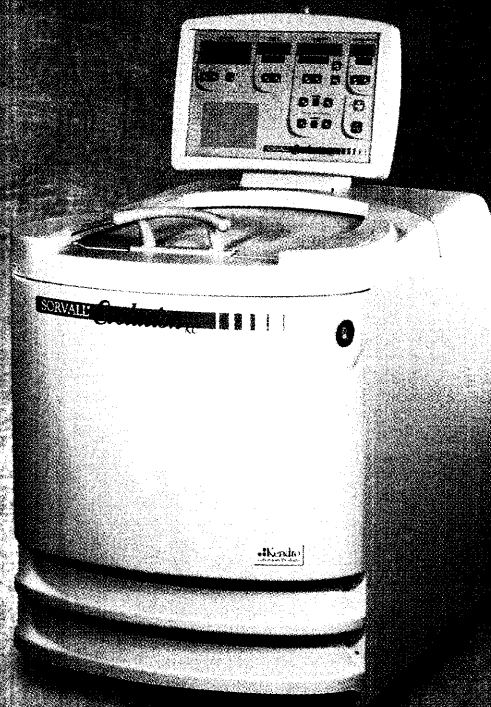


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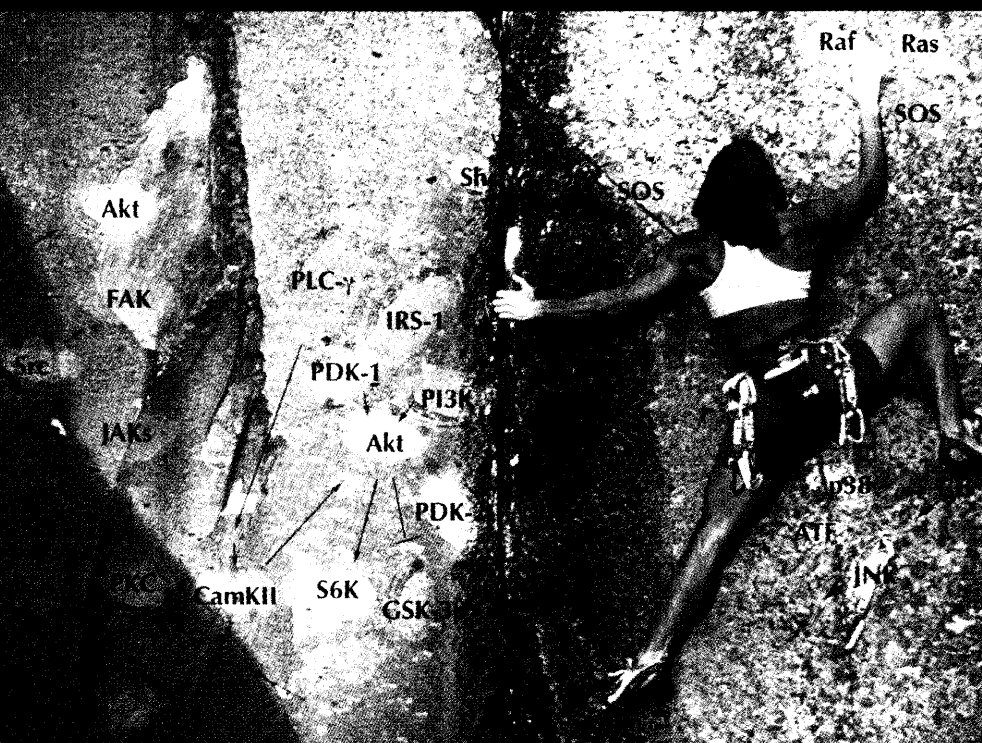
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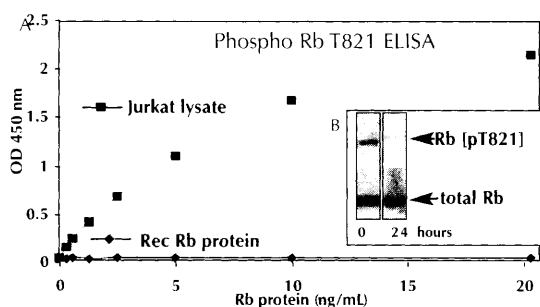
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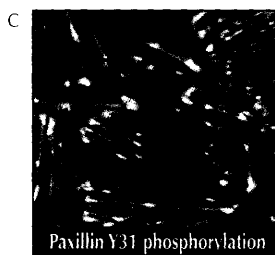
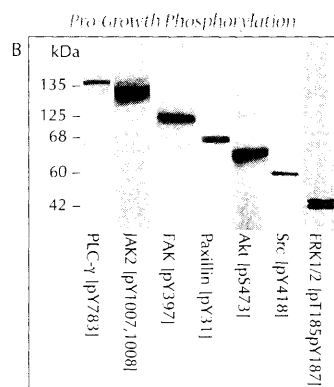
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AST6/01



Phospho-specific Antibodies

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CB1	IκB-α	PKR
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c-Raf	Integrin-β1	Pyk2
EGF-R	Integrin-β3	Rb
elF-2α	IRS-1	RON
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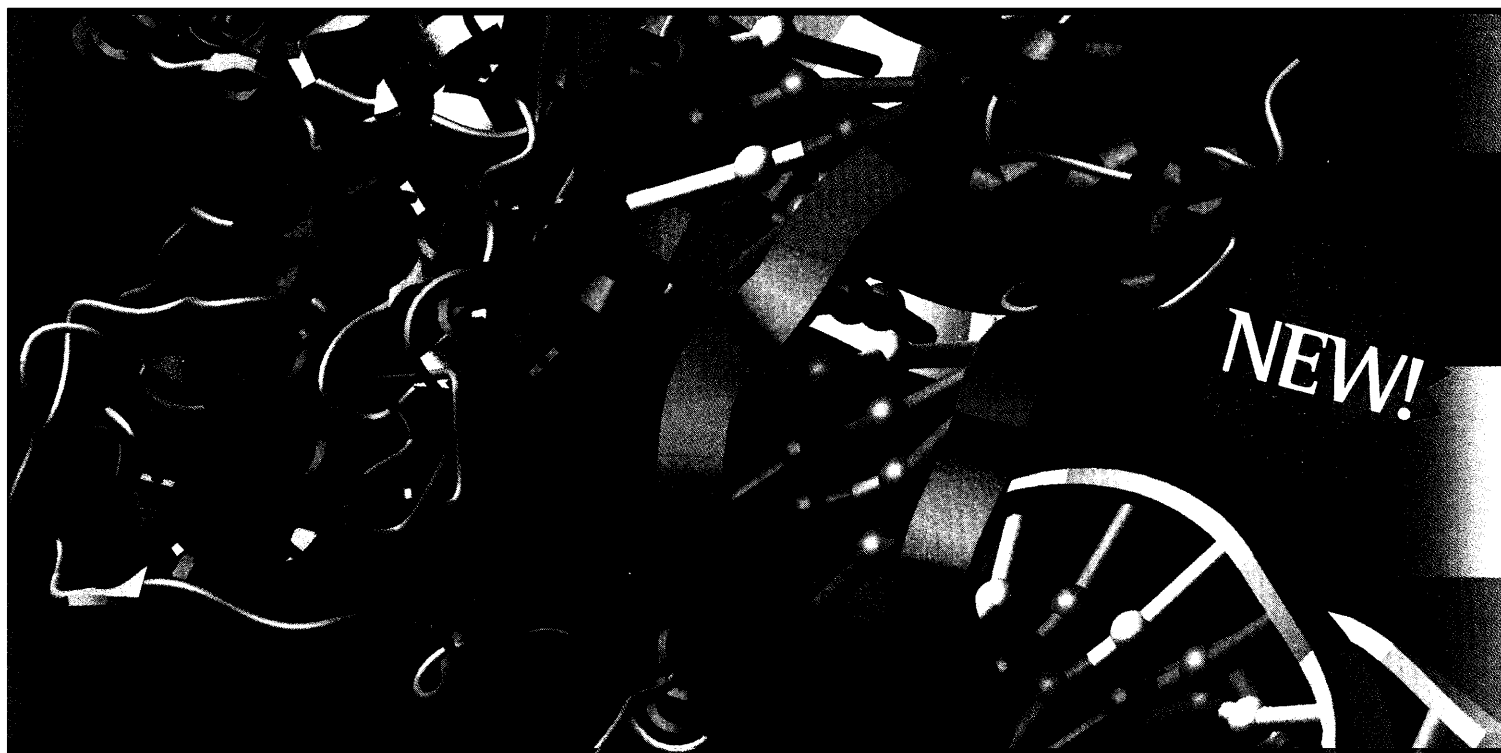
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Picture: Model of a Taq DNA Polymerase with a DNA strand.

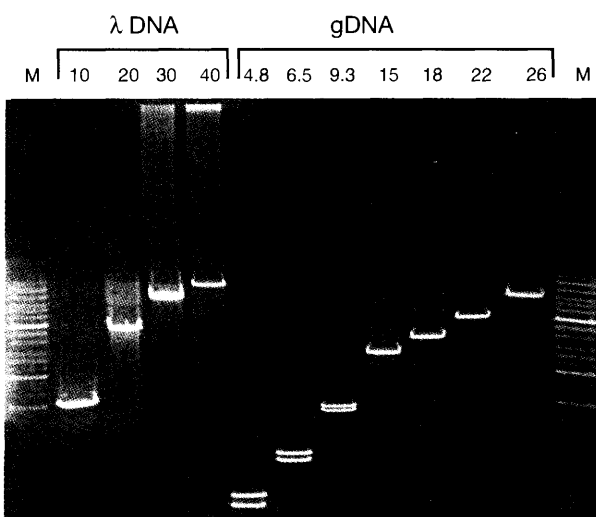
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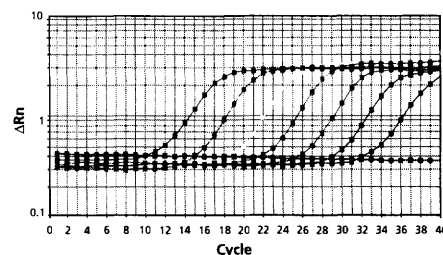
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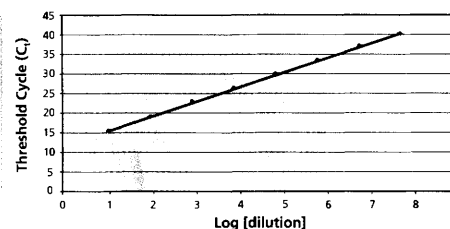
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Threshold cycle (C_t) values for the lambda amplicon using SYBR Green JumpStart Taq ReadyMix

Quantitative PCR (qPCR) performed on pBac-2cp. Initial template copy number was 10¹, diluted 10-fold in subsequent wells. Threshold cycles (C_ts) determined using the ABI PRISM 7700 Sequence Detection software.



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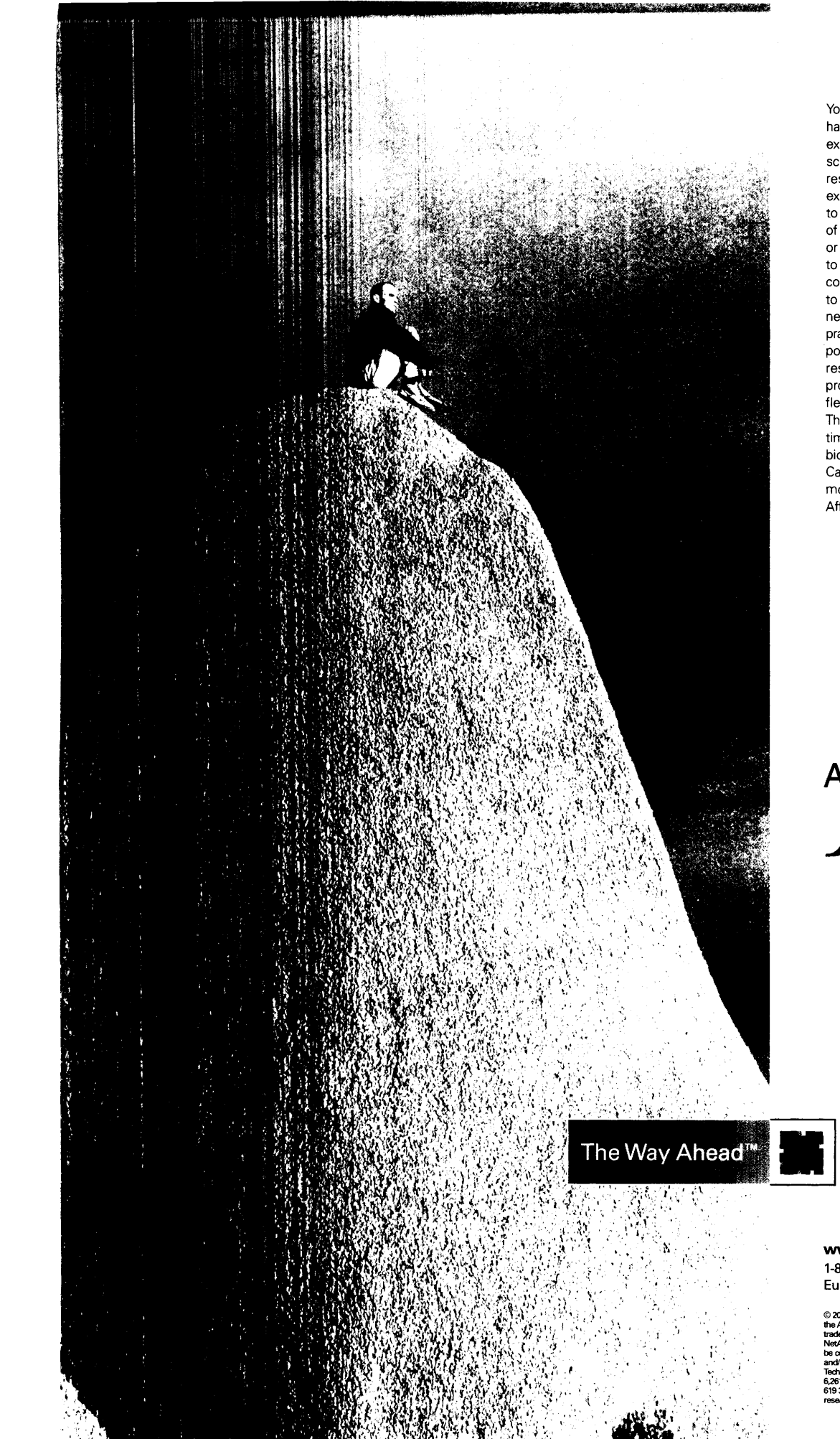
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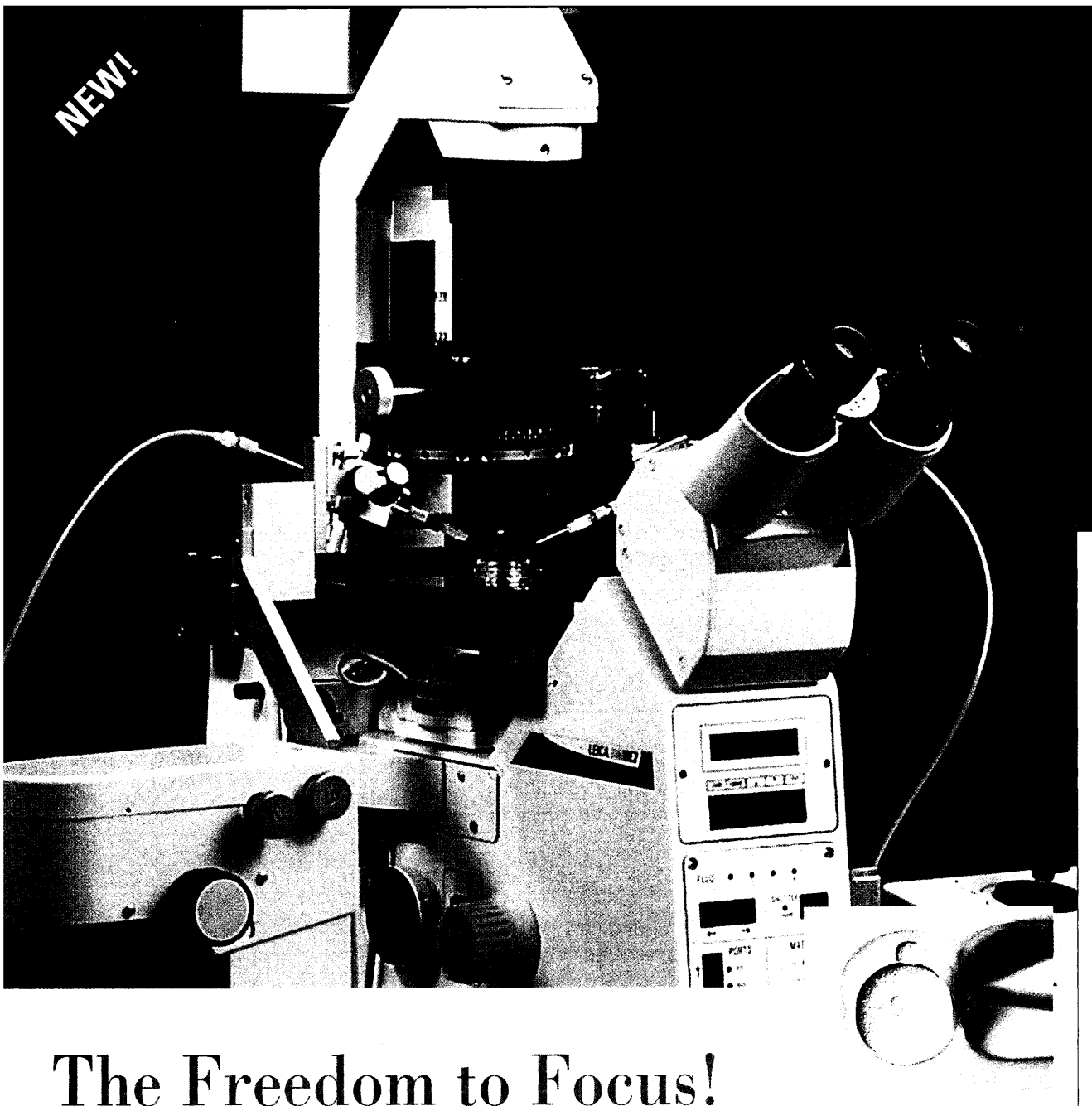
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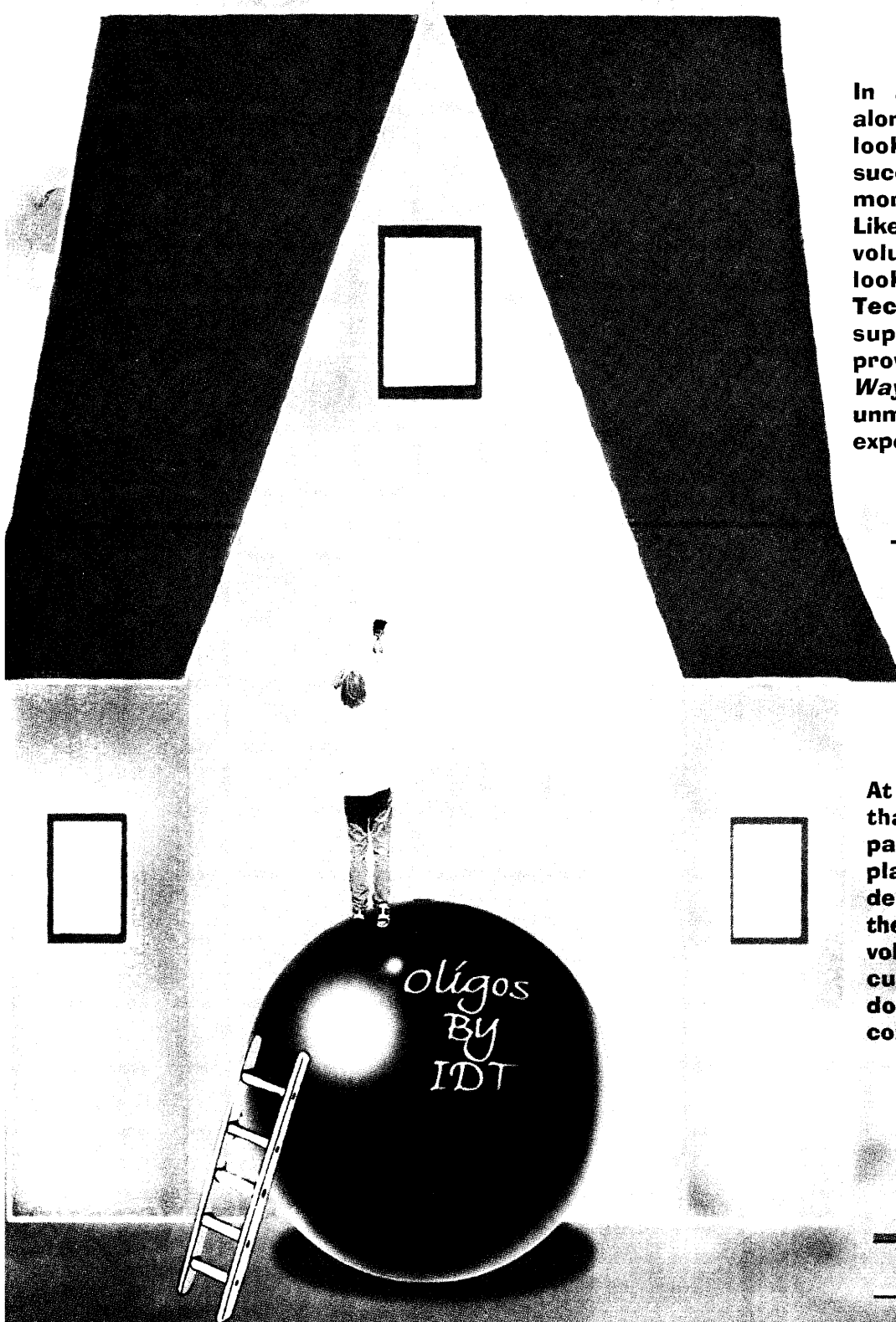
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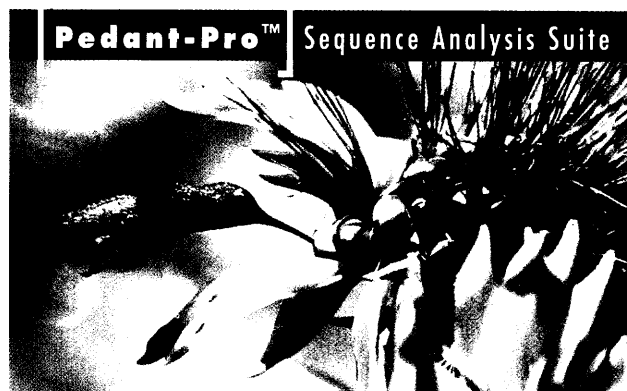
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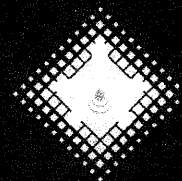


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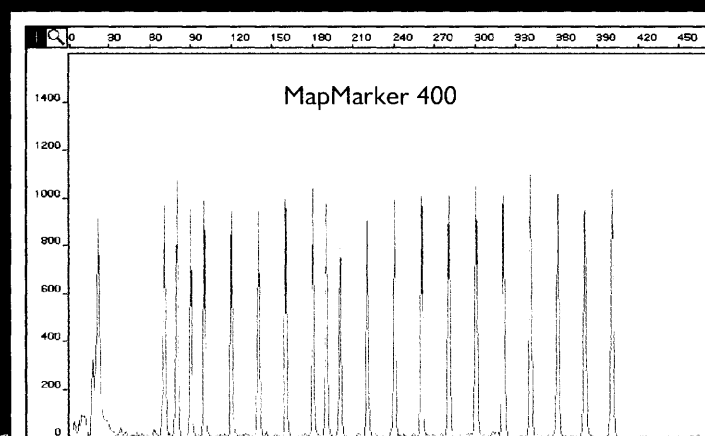


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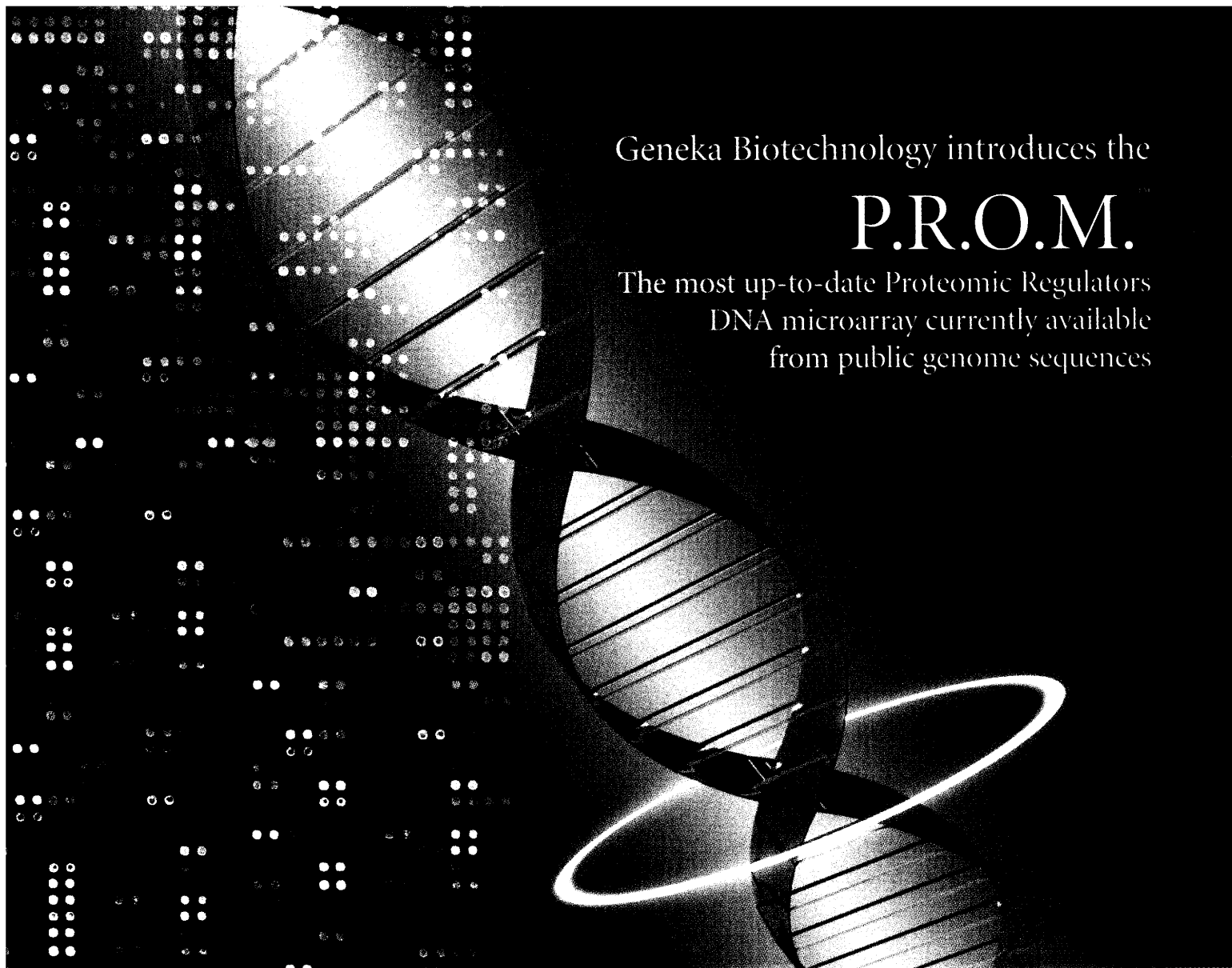
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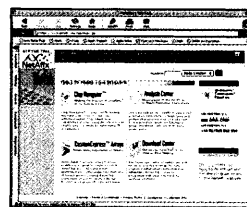
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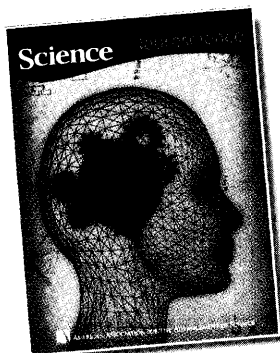
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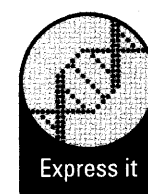
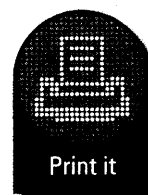
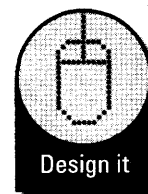
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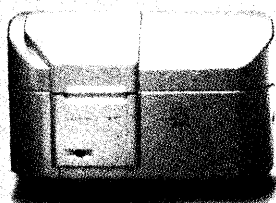
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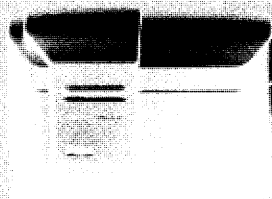
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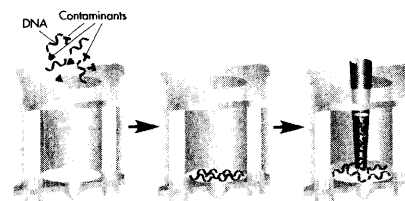
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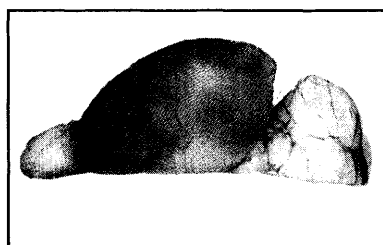
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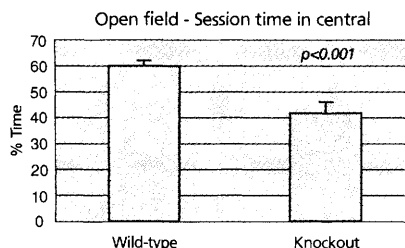
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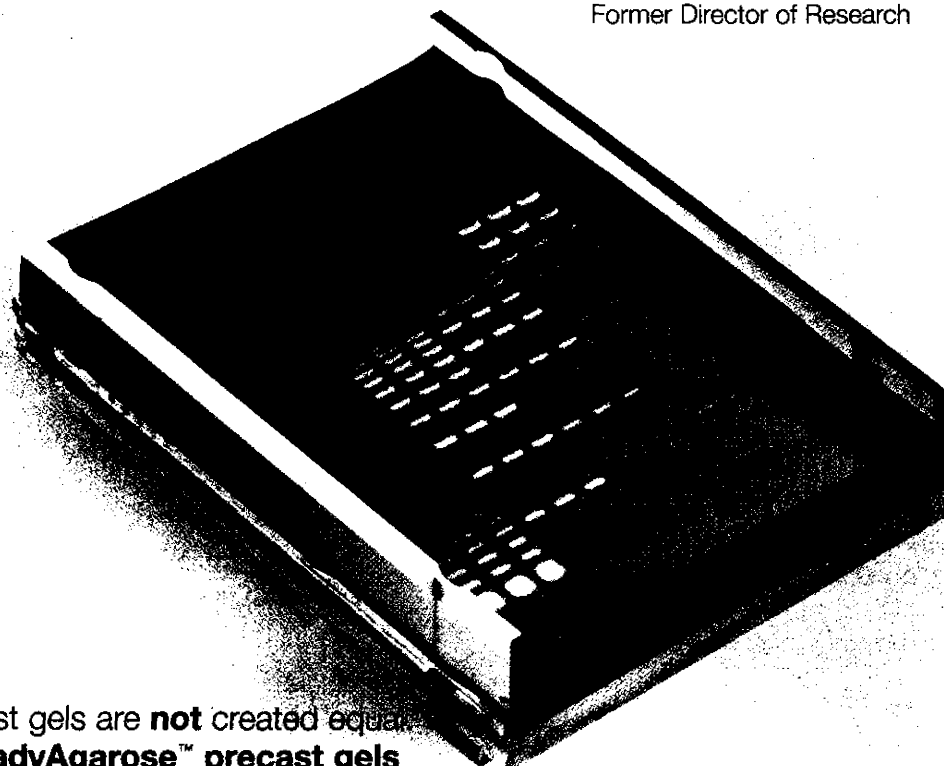
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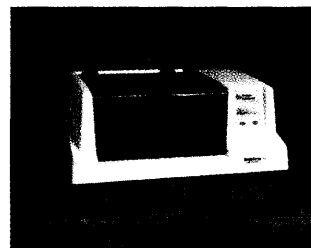
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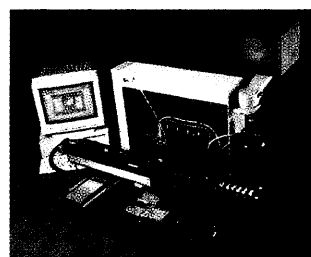
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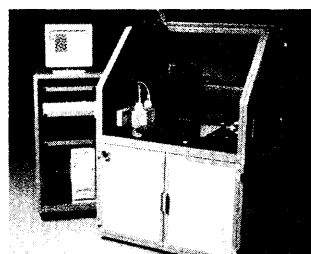
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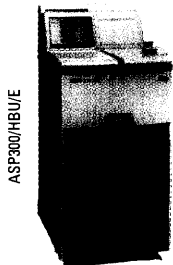
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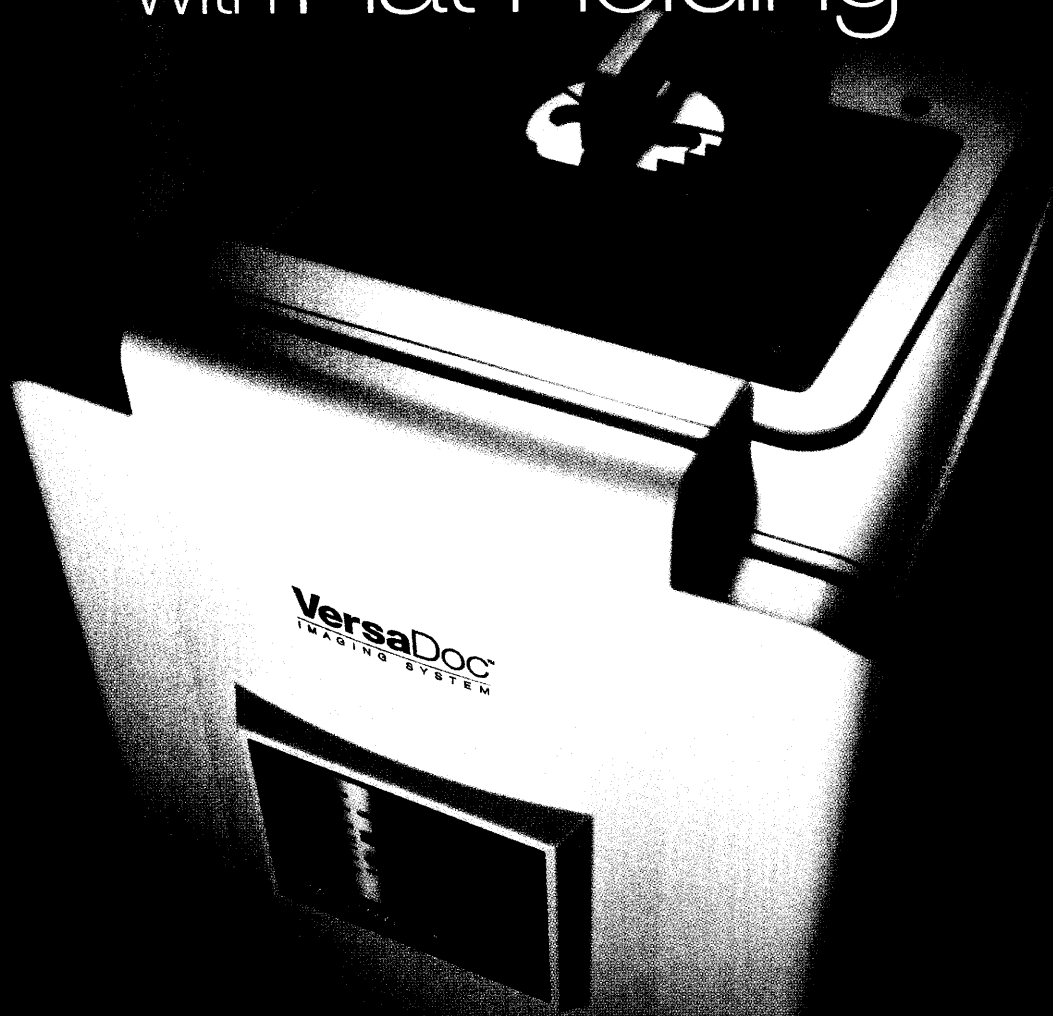
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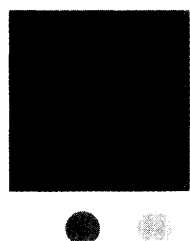
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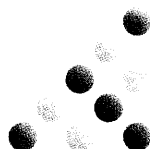
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