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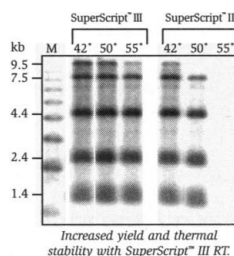
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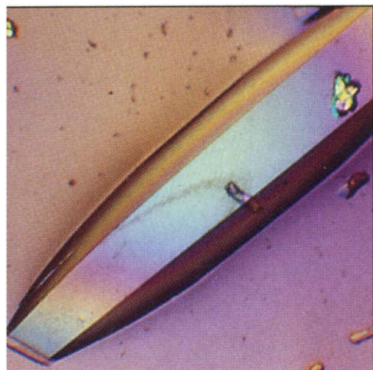
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Science

Volume 298 1 November 2002 Number 5595

917 **SCIENCE ONLINE**
919 **THIS WEEK IN SCIENCE**
923 **EDITORIAL**
Arthur L. Caplan and
Pamela Sankar
*Human Subjects in
Weapons Research*

925 **EDITORS' CHOICE**
929 **NETWATCH**
932 **CONTACT SCIENCE**
1045 **NEW PRODUCTS**
1048 **2003 AAAS MEETING
PROGRAM**



948

Hard slog from
DNA to structures

NEWS

NEWS OF THE WEEK

- 938 **AMPHIBIAN DECLINES:** Conflict Brewing Over Herbicide's Link to Frog Deformities
- 939 **FISHERIES SCIENCE:** Scientists Recommend Ban on North Sea Cod
- 939 **ASTRONOMY:** Iron Deficiency Reveals Nearly Pristine Star
- 941 **HUMAN GENOME:** HapMap Launched With Pledges of \$100 Million
- 941 **SCIENCESCOPE**
- 942 **WOMEN'S HEALTH:** More Questions About Hormone Replacement
- 942 **ANTHROPOLOGY:** Going Head-to-Head Over Boas's Data
- ▼945 **EVOLUTIONARY BIOLOGY:** Placentas May Nourish Complexity Studies
1018
- 945 **PFIESTERIA DEBATE:** Is Sugary Toxin the Smoking Gun?
- 946 **INTERNATIONAL COOPERATION:** NATO Ordered to Cut Science Program

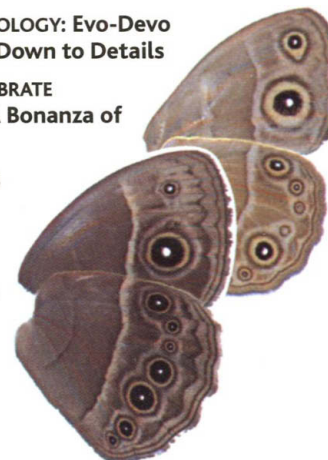
- 947 **DNA SEQUENCING:** Venter's Next Goal: 1000 Human Genomes

NEWS FOCUS

- 948 **STRUCTURAL GENOMICS:** Tapping DNA for Structures Produces a Trickle
Big Biology Without the Big Commotion
- 951 **JAPAN:** Postdocs Get Primer on How to Survive Abroad
- 952 **NUCLEAR TRAFFICKING:** Crime and (Puny) Punishment
- 953 **EVOLUTIONARY BIOLOGY:** Evo-Devo Enthusiasts Get Down to Details
- 955 **SOCIETY OF VERTEBRATE PALEONTOLOGY:** A Bonanza of Bones
- 959 **RANDOM SAMPLES**

953

Evo-devo:
details, details



SCIENCE'S COMPASS

961 LETTERS

Retraction Z. Bao, B. Batlogg, S. Berg, A. Dodabalapur, R. C. Haddon, H. Hwang, C. Kloc, H. Meng, J. H. Schön. **The Origin of a Most Contentious Rock** J. M. Palin. **Response** C. M. Fedo and M. J. Whitehouse. **The Search for an Amyloid Solution** S. R. Robinson and G. M. Bishop. **Response** D. J. Selkoe and J. Hardy

HISTORICAL ESSAY

- 967 **PORTRAITS OF SCIENCE:** Proof, Amazement, and the Unexpected R. Netz

BOOKS ET AL.

- 969 **MATHEMATICS:** *Mathematics Elsewhere* An Exploration of Ideas Across Cultures M. Ascher, reviewed by H. Selin
- 970 **HISTORY OF SCIENCE:** *The Glass Bathyscaphe* How Glass Changed the World/*Glass A World History* A. Macfarlane and G. Martin, reviewed by M. J. Gorman
- 971 **PHILOSOPHY:** *The Empirical Stance* B. C. van Fraassen, reviewed by P. Thagard

PERSPECTIVES

- ▼973 **ECOLOGY:** On the Crest of a Population Wave
1020 E. Ranta, P. Lundberg, V. Kaitala, N. Chr. Stenseth
- ▼974 **ENVIRONMENT:** Fishing for Microbes
1023 J. M. Gossett
- ▼975 **MATERIALS SCIENCE:** A Synchrotron Look at Steel
1003 M. Militzer
- ▼976 **MATERIALS SCIENCE:** Molecular "Ghosts"
1000 J. W. Steed
- ▼977 **IMMUNOLOGY:** Versatile Defensins
995, 1025 T. Ganz
- 979 **AURORAL AND SPACE PHYSICS:** The Heavens in a Pile of Sand M. P. Freeman and N. W. Watkins

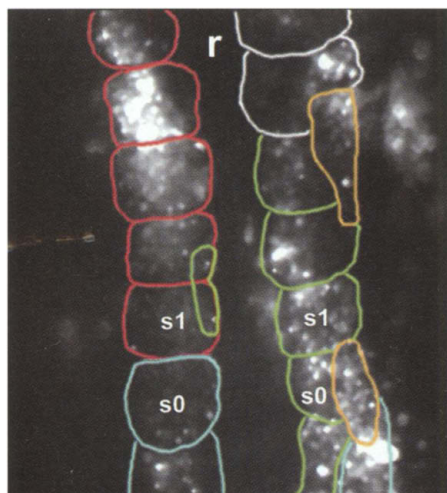
REVIEW

- 981 **ENGINEERING:** Advanced Technology Paths to Global Climate Stability—Energy for a Greenhouse Planet M. I. Hoffert, K. Caldeira, G. Benford, D. R. Criswell, C. Green, H. Herzog, A. K. Jain, H. S. Khesghi, K. S. Lackner, J. S. Lewis, H. D. Lightfoot, W. Manheimer, J. C. Mankins, M. E. Mauel, L. J. Perkins, M. E. Schlesinger, T. Volk, T. M. L. Wigley

967

Mathematical
legacy of
Archimedes





991 Sculpting somites

BREVIEW

- 989 **Estimating the Size of the World's Threatened Flora** N. C. A. Pitman and P. M. Jørgensen

RESEARCH ARTICLES

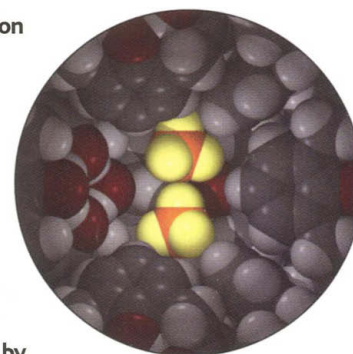
- 991 **Cell Dynamics During Somite Boundary Formation Revealed by Time-Lapse Analysis** P. M. Kulesa and S. E. Fraser
- ▼995 977 **Contribution of Human α -Defensin 1, 2, and 3 to the Anti-HIV-1 Activity of CD8 Antiviral Factor** L. Zhang, W. Yu, T. He, J. Yu, R. E. Caffrey, E. A. Dalmaso, S. Fu, T. Pham, J. Mei, J. J. Ho, W. Zhang, P. Lopez, D. D. Ho
- REPORTS**
- ▼1000 976 **Guest Transport in a Nonporous Organic Solid via Dynamic van der Waals Cooperativity** J. L. Atwood, L. J. Barbour, A. Jerga, B. L. Schottel
- ▼1003 975 **Grain Nucleation and Growth During Phase Transformations** S. E. Offerman, N. H. van Dijk, J. Sietsma, S. Grigull, E. M. Lauridsen, L. Margulies, H. F. Poulsen, M. Th. Rekveldt, S. van der Zwaag
- 1006 **Colloidosomes: Selectively Permeable Capsules Composed of Colloidal Particles** A. D. Dinsmore, M. F. Hsu, M. G. Nikolaidis, M. Marquez, A. R. Bausch, D. A. Weitz

- 1009 **Detection and Monitoring of Ongoing Aseismic Slip in the Tokai Region, Central Japan** S. Ozawa, M. Murakami, M. Kaidzu, T. Tada, T. Sagiya, Y. Hatanaka, H. Yarai, T. Nishimura
- 1012 **Stronger Constraints on the Anthropogenic Indirect Aerosol Effect** U. Lohmann and G. Lesins
- 1015 **Climate Change and Latitudinal Patterns of Intertidal Thermal Stress** B. Helmuth, C. D. G. Harley, P. M. Halpin, M. O'Donnell, G. E. Hofmann, C. A. Blanchette
- ▼1018 945 **Independent Origins and Rapid Evolution of the Placenta in the Fish Genus *Poeciliopsis*** D. N. Reznick, M. Mateos, M. S. Springer
- ▼1020 973 **Waves of Larch Budmoth Outbreaks in the European Alps** O. N. Bjørnstad, M. Peltonen, A. M. Liebhold, W. Baltensweiler
- ▼1023 974 **Microbial Dehalorespiration with 1,1,1-Trichloroethane** B. Sun, B. M. Griffin, H. L. Ayala-del-Río, S. A. Hashsham, J. M. Tiedje
- ▼1025 977 **Toll-Like Receptor 4-Dependent Activation of Dendritic Cells by β -Defensin 2** A. Biragyn, P. A. Ruffini, C. A. Leifer, E. Klyushnenkova, A. Shakhov, O. Chertov, A. K. Shirakawa, J. M. Farber, D. M. Segal, J. J. Oppenheim, L. W. Kwak
- 1029 **Cytoprotective Role of Ca^{2+} -Activated K^+ Channels in the Cardiac Inner Mitochondrial Membrane** W. Xu, Y. Liu, S. Wang, T. McDonald, J. E. Van Eyk, A. Sidor, B. O'Rourke
- 1033 **Hijacking of Host Cell IKK Signalosomes by the Transforming Parasite *Theileria*** V. T. Heussler, S. Rottenberg, R. Schwab, P. Küenzi, P. C. Fernandez, S. McKellar, B. Shiels, Z. J. Chen, K. Orth, D. Wallach, D. A. E. Dobbelaere
- 1036 **RNA Polymerase II Transcription in Murine Cells Lacking the TATA Binding Protein** I. Martianov, S. Viville, I. Davidson
- 1039 **Role of Histone H3 Lysine 27 Methylation in Polycomb-Group Silencing** R. Cao, L. Wang, H. Wang, L. Xia, H. Erdjument-Bromage, P. Tempst, R. S. Jones, Y. Zhang



COVER 1048

Science, engineering, and technology permeate all areas of modern life. The 2003 AAAS Annual Meeting and Science Innovation Exposition, convening 13 to 18 February in Denver, will explore science in our daily lives in a sterling array of symposia and lectures by leading experts. [Illustration: Jose Ortega]



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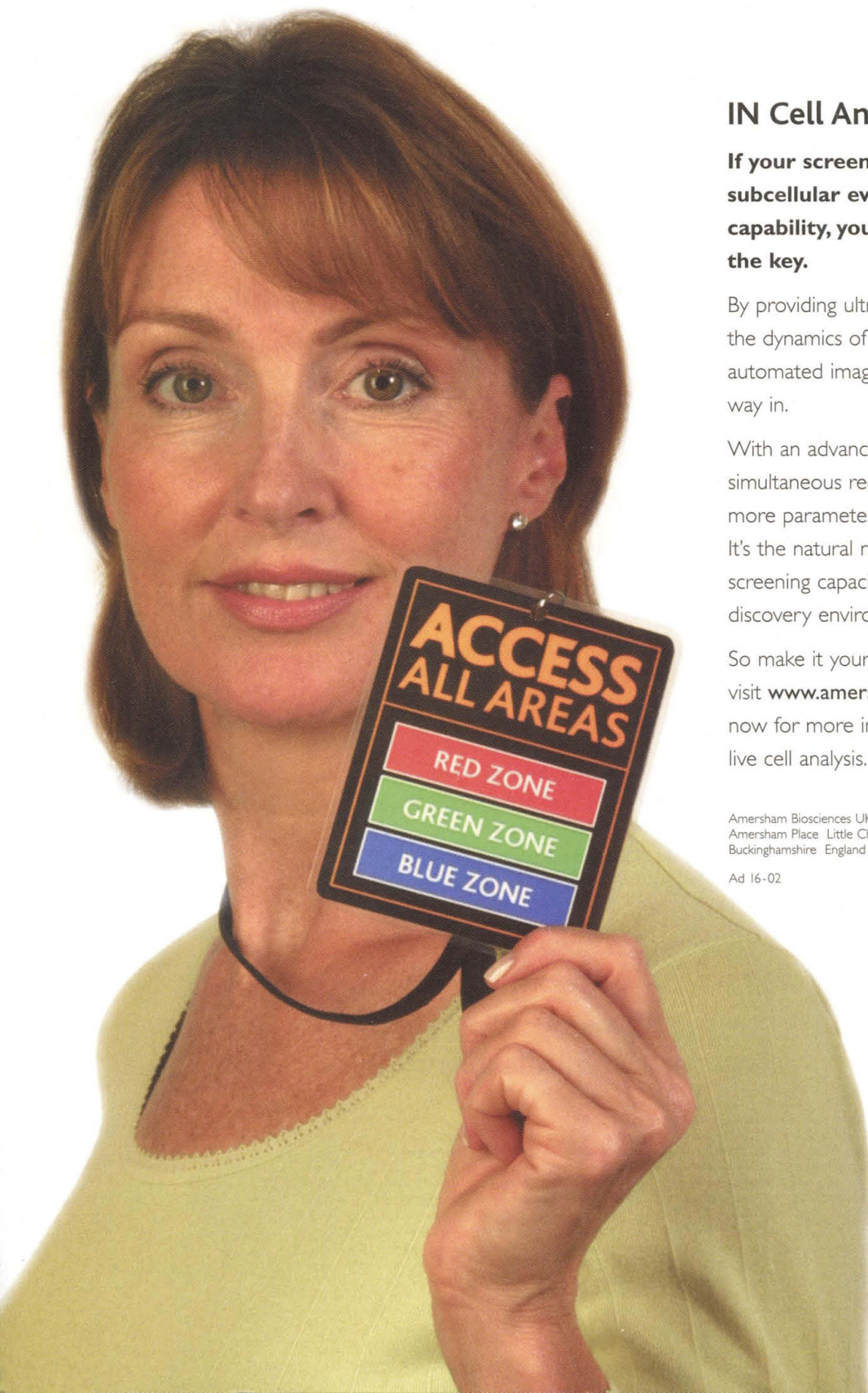


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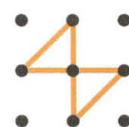
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CONTENT HIGHLIGHTS AS OF 1 NOVEMBER 2002

science magazine

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SCIENCE EXPRESS

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Determination of the Equation of State of Dense Matter

P. Danielewicz, R. Lacey, W. G. Lynch

Behavior of superdense matter, like that found in supernovae and neutron stars, is determined based on experimental extrapolation.

Long-Distance Signaling in Nodulation Directed by a CLAVATA1-like Receptor Kinase

I. R. Searle *et al.*

Receptor kinases control apical and nodule meristem proliferation in soybeans.

Small Nuclear Ribonucleoprotein Remodeling During Catalytic Activation of the Spliceosome

E. M. Makarov *et al.*

Proteomic analysis of two new complexes defines structural changes in the spliceosome that occur before and after RNA splicing.

TECHNICAL COMMENTS

Origin and Significance of Archean Quartzose Rocks at Akilia, Greenland

Fedo and Whitehouse (Reports, 24 May 2002, p. 1448) reinterpreted 3.8 billion year old quartzose rocks in Greenland—previously thought, based on carbon isotope signatures, to harbor evidence for Earth's oldest life—as metasomatized ultramafic igneous rocks, an origin that, they maintained, invalidates claims that the rocks record early biological activity. In separate comments, Mojzsis and Harrison and Friend *et al.* argue that rare earth element signatures and other geochemical patterns of these rocks are more similar to those of ancient sedimentary banded iron formations than to those of ultramafic igneous rocks, and that field relations suggest that Fedo and Whitehouse did not analyze a key unit sampled in earlier studies. Fedo and Whitehouse respond that these earlier studies, and the current comments, have relied heavily on a single sample that has not been adequately described in the literature, and that a more comprehensive evaluation of field and geochemical data from the Akilia locality supports the interpretation of these rocks as metasomatized ultramafics.

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/298/5595/917a

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career resources for scientists

GLOBAL: Careers Feature—Science on the Farm

Edited by L. McCarney
From microclimate mapping to bioengineering, the range of technologies applied to agricultural research is expanding exponentially—as are the career opportunities.

CANADA: A Multifaceted Approach

B. Van Bergen
It's difficult to define what a biosystems engineer does, except to say that they apply engineering principles to everyday life.

US: Making the Best of Your PI's Sabbatical

S. Collins
Your postdoc advisor is going on leave? Don't panic!

SINGAPORE: After the Ph.D.

C. Ng
A senior scientist's advice to doctoral students looking to make smart post-Ph.D. career choices.

UK: Personalized Development—Time Out for Postdocs

K. Urquhart

Going back to Gradschool—the Research Councils' intensive career development workshop—but this time as a mentor.

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PERSPECTIVE: Of Worms, Flies, Dwarfs, and Things That Go Bump in the Night

W. E. Sonntag and M. M. Ramsey

Insulin/IGF-1 signaling in the nematode influences life-span during adulthood but not during larval development.

NEWS SYNTHESIS: Flies Like Us

M. Leslie
Drosophila soars as a model for brain diseases.

NOTEWORTHY THIS WEEK: Tissue-Tampering Turn-On

R. J. Davenport
Protein activates senescence genes.

NOTEWORTHY THIS WEEK: The Eyes Have It

C. Seydel
A retina's own molecules might cause blinding disease.

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signal transduction knowledge environment

PERSPECTIVE: OxyR—A Molecular Code for Redox Sensing?

J. D. Helmann

A discussion of the controversy surrounding the activation of the bacterial transcriptional regulator OxyR.

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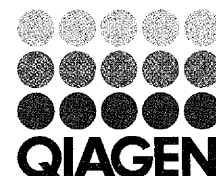
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THIS WEEK IN Science

edited by Phil Szuromi

Faster Growing Grains

When carbon steel is cooled from the melt, it forms a polycrystalline structure that undergoes several solid-state transformations. Using newly developed x-ray techniques and a synchrotron source, Offerman *et al.* (p. 1003; see the Perspective by Militzer) studied the transformations as they occur in individual crystal grains and found that current models do not capture the full physics of grain growth. Grain nucleation occurs much faster than previously thought. These observations may lead to enhanced methods for carbon steel forming.

Less Indirect Effect

The indirect aerosol effect—the modification of cloud coverage and properties by atmospheric aerosols—is the largest uncertainty in the calculation of the net solar energy budget. Lohmann and Lesins (p. 1012) propose a more precise estimate of the anthropogenic indirect aerosol effect by constraining predictions from complex climate models with observations of aerosol and cloud properties made by the POLDER satellite. By considering the effects of aerosols on both cloud albedo and cloud lifetime, their estimate of the indirect aerosol effect, 0.8 watts per square meter ($W\ m^{-2}$), is much smaller than previous values derived from climate model simulations alone ($1.4\ W\ m^{-2}$).

Silent Earthquake in Japan

The Tokai region of central Japan, about 200 kilometers south of Tokyo, has been accumulating strain since its last large earthquake in 1854, and there are concerns that another large-magnitude event may occur in the eastern Tokai region in the near future. Ozawa *et al.* (p. 1009) used global positioning system data to study ground deformation and found evidence for aseismic slip (also called a silent earthquake) as great as 2 centimeters in the western Tokai region in 2001. The aseismic slip in the western Tokai region is altering the stress state and may increase the probability of an earthquake in the eastern Tokai region. **X**

Moths Making Traveling Waves

Nonlinear processes should be capable of producing a variety of spatiotemporal patterns in animal population dynamics, such as traveling waves, but experimental examples have been rare. Bjørnstad *et al.* (p. 1020; see the Perspective by Ranta *et al.*) report their aerial survey data from the European Alps of the long-

1000 Cooperative Change

Transformations that preserve single crystals of organic molecules usually must avoid large motions of the lattice that would shatter the crystal and have mainly been seen in systems where double bonds convert to single bonds or where guest molecules move through pores. Atwood *et al.* (p. 1000; see the Perspective by Steed) observed a host-guest transformation where the addition of the guest to a nonporous host led to large-scale cooperative motion of the atoms, and thus maintained a single crystal. Once the transformation was initiated, it proceeded to equilibrium, even when the host was only partially saturated with guest molecules.

And in Brevia ...

A new assessment of the number of plant species threatened by human activity, by Pitman *et al.* (p. 989), indicates that at least 30% of all plant species are at risk of extinction this century.

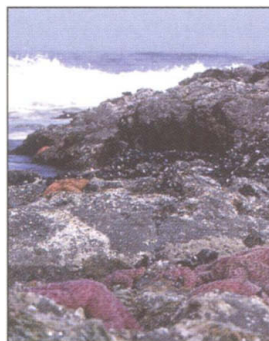
term defoliation dynamics (covering more than four decades) of the larch budmoth, a species that exhibits extreme local cyclicity in abundance. Statistical modeling of spatiotemporal data with spatially extended theoretical models reveal the presence of regular traveling waves of budmoth outbreaks every 8 to 9 years.

Solvent Scrubbing

An anaerobic bacterium that reductively dechlorinates trichloroethane, a problematic groundwater contaminant, has been discovered by Sun *et al.* (p. 1023; see the Perspective by Gossett). These organisms are phylogenetically different but related to other dechlorinating anaerobes. A bioaugmentation study described in this work shows that these organisms could be used in the cleanup of trichloroethane-contaminated groundwater sediments.

Intertidal Hot Spots

The intertidal zone is believed to be a bellwether of climate change because organisms there are thought to live very close to their thermal-tolerance limits. Helmuth *et al.* (p. 1015) show that the common intertidal mussel species *Mytilus californianus* responds to patterns of high-temperature exposure across a latitudinal gradient along the west coast of the United States in a manner more complex than might be expected. They find that in most cases, thermal stress is likely to be most severe at northern locations and may lead to localized extinctions rather than a general shift of the species to higher latitudes as warming progresses.



The Nature of Nurturing

The evolution of complex organs such as eyes or placentas presents a dilemma because they demand a large number of individual adaptations to function properly, so it can be difficult to envision how they could all fall into place. The live-bearing fish genus *Poeciliopsis* displays a continuum of placental development, which ranges from little or no provisioning (yolk feeding) to more extensive maternal provisioning, that allows evolution of this organ to be studied. Reznick *et al.* (p. 1018; see the news story by

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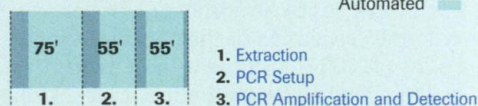
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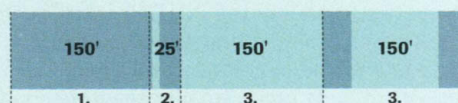
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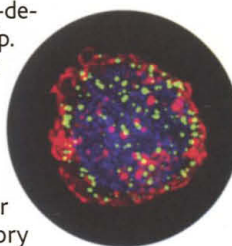
Morrell) show that there have been three independent origins of extensive maternal provisioning in the genus. The upper estimates for the evolution of extensive postfertilization provisioning range from 0.75 to 2.34 million years. Such relatively rapid evolution has been predicted in theoretical models.



Defensins Strategies

The innate immune system responds rapidly to pathogens, either by obstruction and direct killing of microbes or by activation of the adaptive arm of the immune system. Defensins have feet in both camps, and two studies add insight into how they work (see the Perspective by Ganz). Although chemokines play a role in the inhibition of human immunodeficiency virus-type 1 (HIV-1) replication by CD8 T cells, the full identity of the factors involved has been elusive.

Zhang *et al.* (p. 995;  see the 27 September news story by Cohen) used mass spectrometry and protein chip technology to examine culture supernatants from CD8 cells isolated from patients who are long-term nonprogressors to AIDS. On the basis of amino acid sequencing and antibody recognition, they identified a set of defensins that only appeared upon T cell activation. Antibodies to these molecules blocked viral inhibition by CD8, and commercial preparations of α -defensins-1 and -2 inhibited different HIV-1 isolates. Biragyn *et al.* (p. 1025) find that one defensin, β -defensin-2, could activate dendritic cells (DCs) by binding Toll-like receptor-4 (TLR-4), a cell-surface pattern-recognition protein hitherto considered to be limited to recognizing pathogen-derived molecules, such as the Gram-negative bacterial endotoxin, lipopolysaccharide (LPS). In DCs, the interaction of β -defensin-2 with TLR-4 induced much the same cellular activation program as LPS, with the stimulation of costimulatory molecule and pro-inflammatory cytokine expression.



Protecting the Heart

Within the mitochondria of heart cells, ion channels control the flux of different ions and change the physiological status of the mitochondria, which in turn affect the relative health of the heart cell. Xu *et al.* (p. 1029) now describe the role of a calcium-activated potassium channel in the inner mitochondrial membrane of guinea-pig heart cells in protecting the cells from ischemia. A drug that opened the channel could protect the heart from infarction.

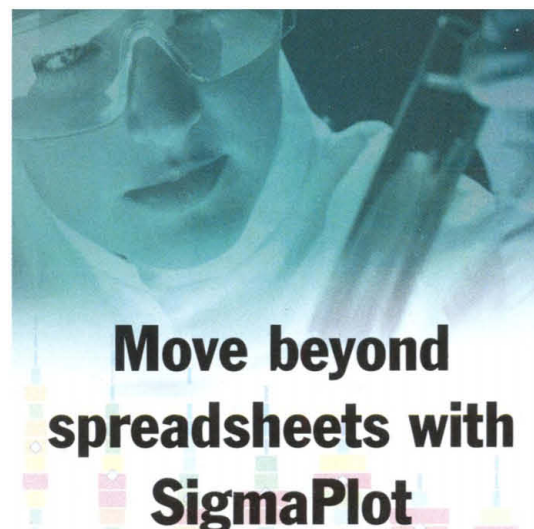
Taking Advantage of the Host

The tick-borne protozoan parasites *Theileria* spp. (related to the malaria parasites, *Plasmodium* spp.) cause a cancer-like disease in cattle that is of major economic importance in Africa and Asia. Heussler *et al.* (p. 1033) show how this pathogen subverts its host's signaling pathway for its own good. The schizont stage of the parasite infects the B and T cells of the immune system and immortalizes them into tumor-like cells capable of metastasis. Transformation seems to occur because the parasite activates the nuclear factor- κ B (NF- κ B) pathway and prevents apoptosis. This activation cannot be blocked by treatment with drugs that affect steps in the NF- κ B signaling pathway upstream of multisubunit I κ B kinase (IKK). The authors show that the intracellular foci of *Theileria* are associated with recruitment and aggregation of the IKK signalsome complex. Such aggregation seems to be sufficient to activate the kinase and subsequently activate NF- κ B.

Polycomb Group Methylation

The covalent modification of histones, proteins that help package genomic DNA into chromatin, plays a critical role in gene expression and the segregation of chromosomes. The Polycomb (Pc) group of proteins have been implicated as chromatin-modifying proteins, and Cao *et al.* (p. 1039) now show that one of the two known Pc complexes, ESC-E(Z), specifically methylates histone H3 on residue lysine 27. This modification recruits the second complex, Polycomb repressive complex 1, likely through Polycomb protein itself, and shuts down gene expression. 

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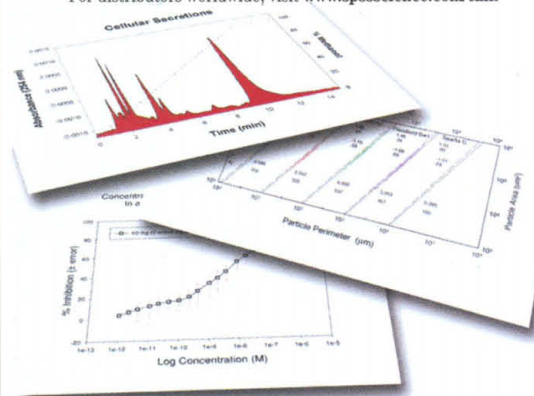
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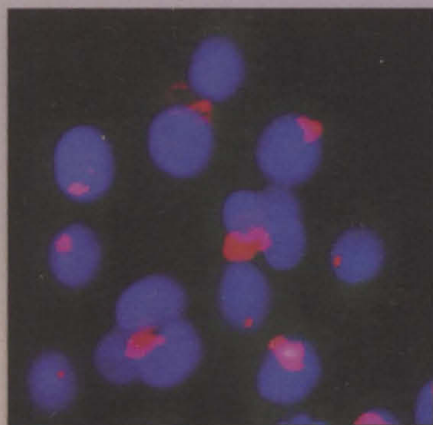
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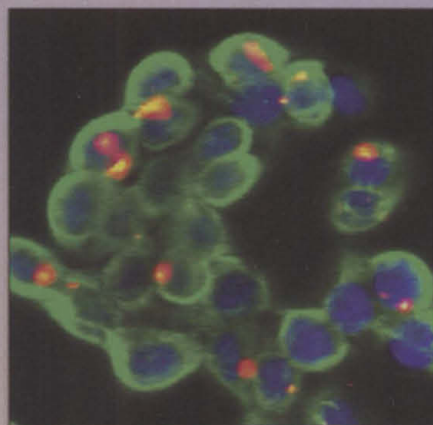
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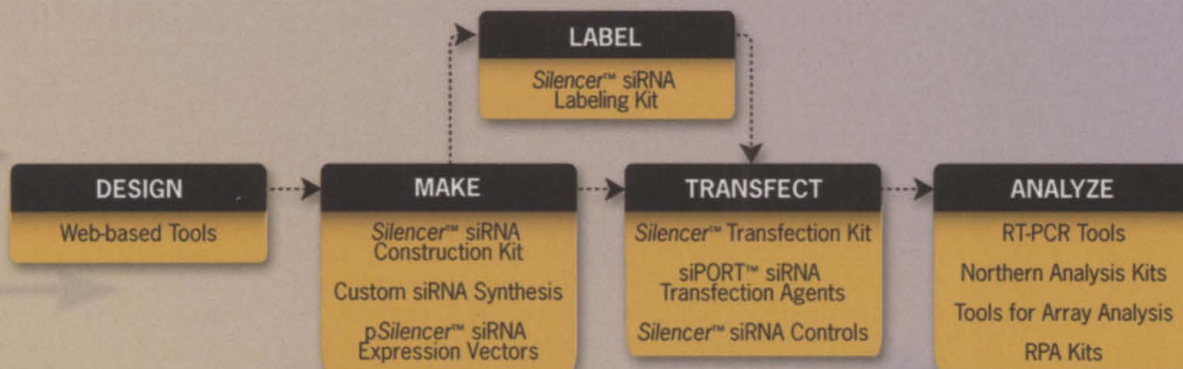


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siRNA Silencing of GAPDH Gene Expression. siRNA to human GAPDH (Cat #4602) and a scrambled control were fluorescently labeled with Cy³ using the *Silencer*[™] siRNA Labeling Kit (Cat #1632), transfected into HeLa S3 cells, and analyzed by fluorescence microscopy. **LEFT:** siRNA silencing of GAPDH expression. **RIGHT:** Control siRNA had no effect on GAPDH protein levels. **RED:** Cy3 labeled siRNA; **GREEN:** Anti-GAPDH antibody detected with fluorescein labeled secondary antibody; **BLUE:** DAPI stained nuclei.

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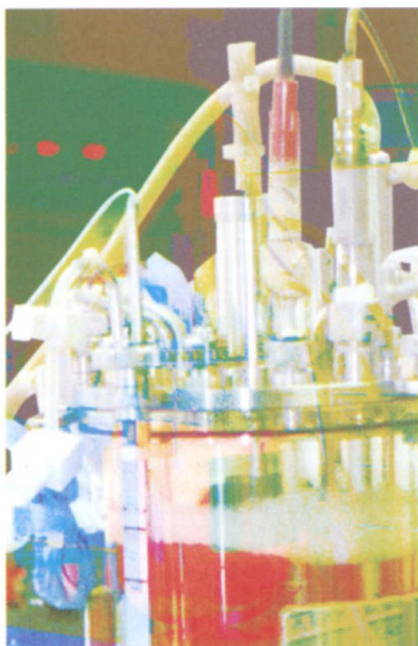
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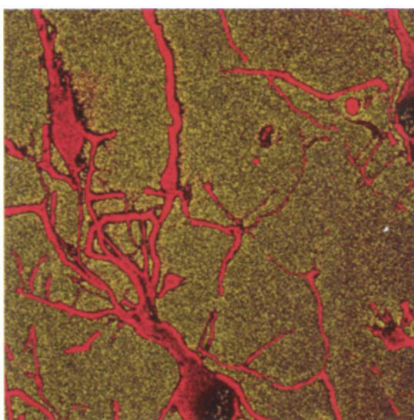


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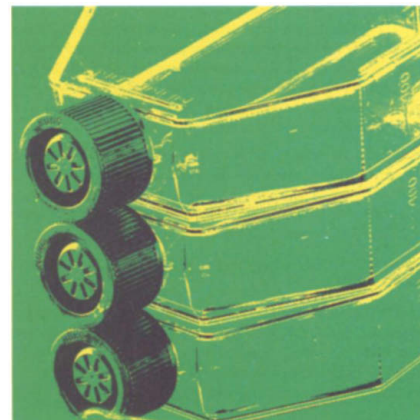


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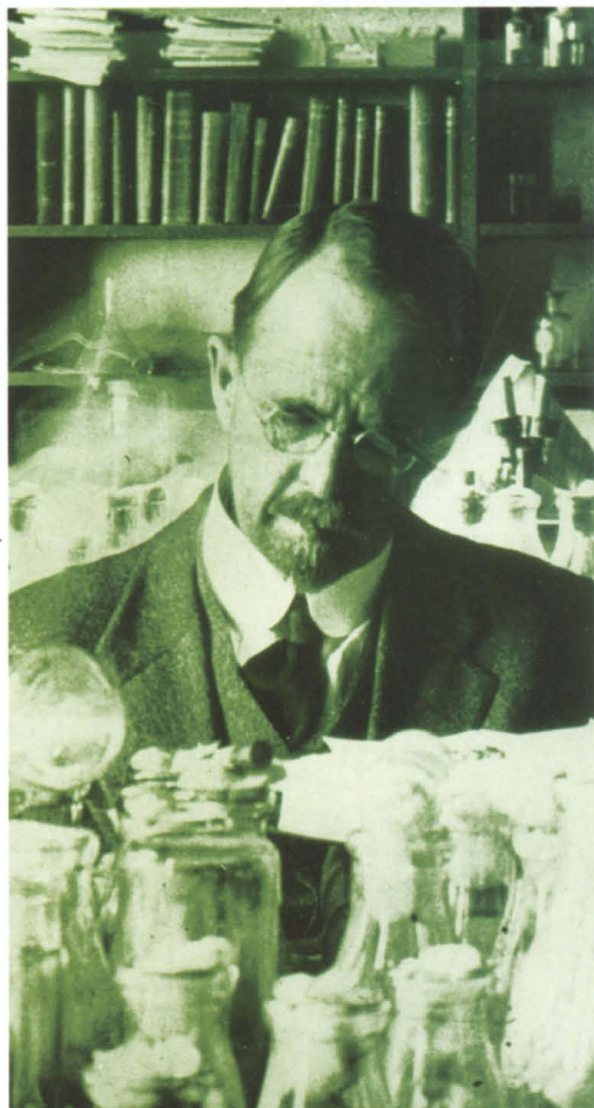
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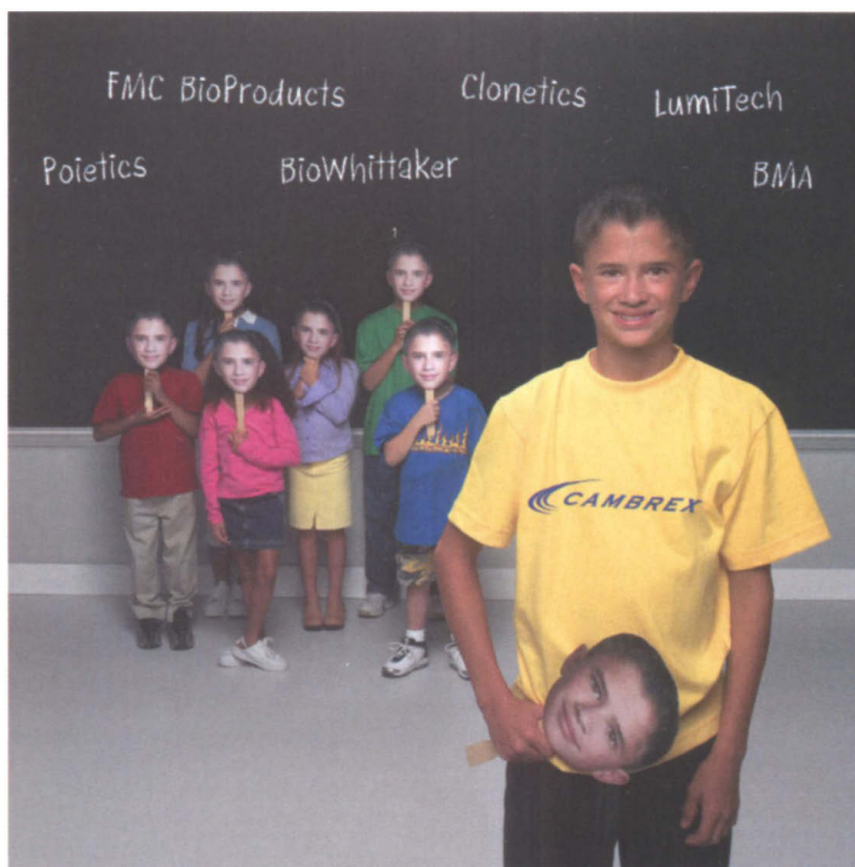
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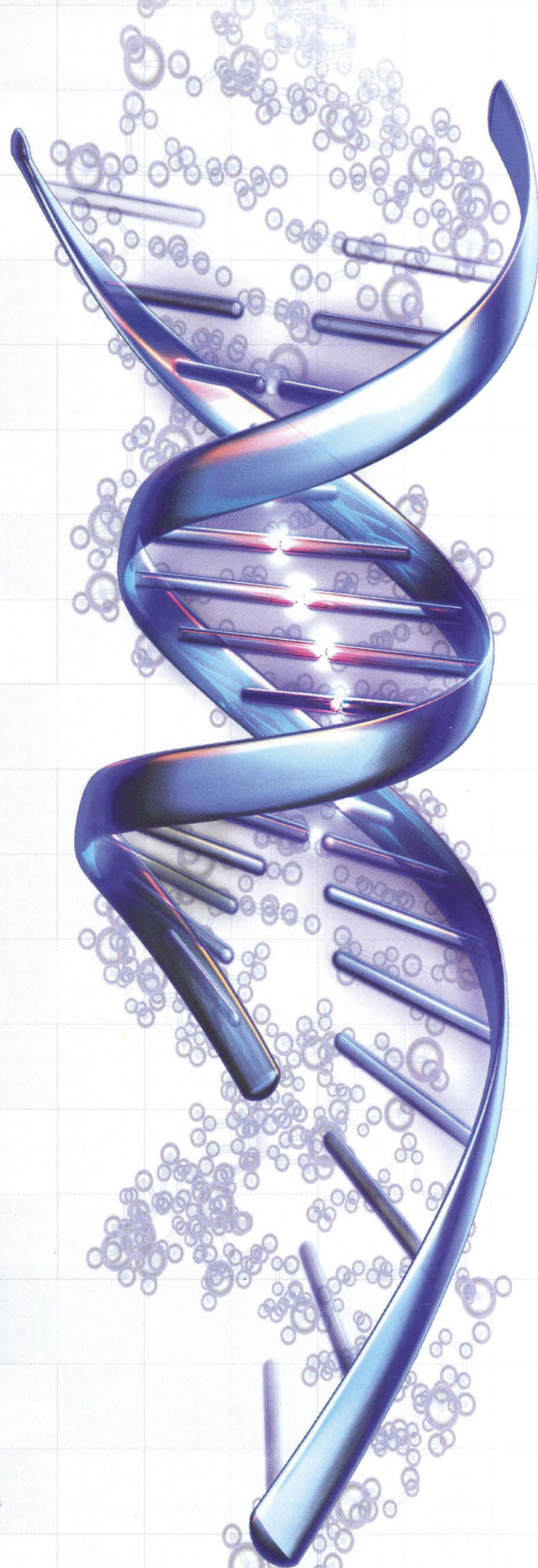
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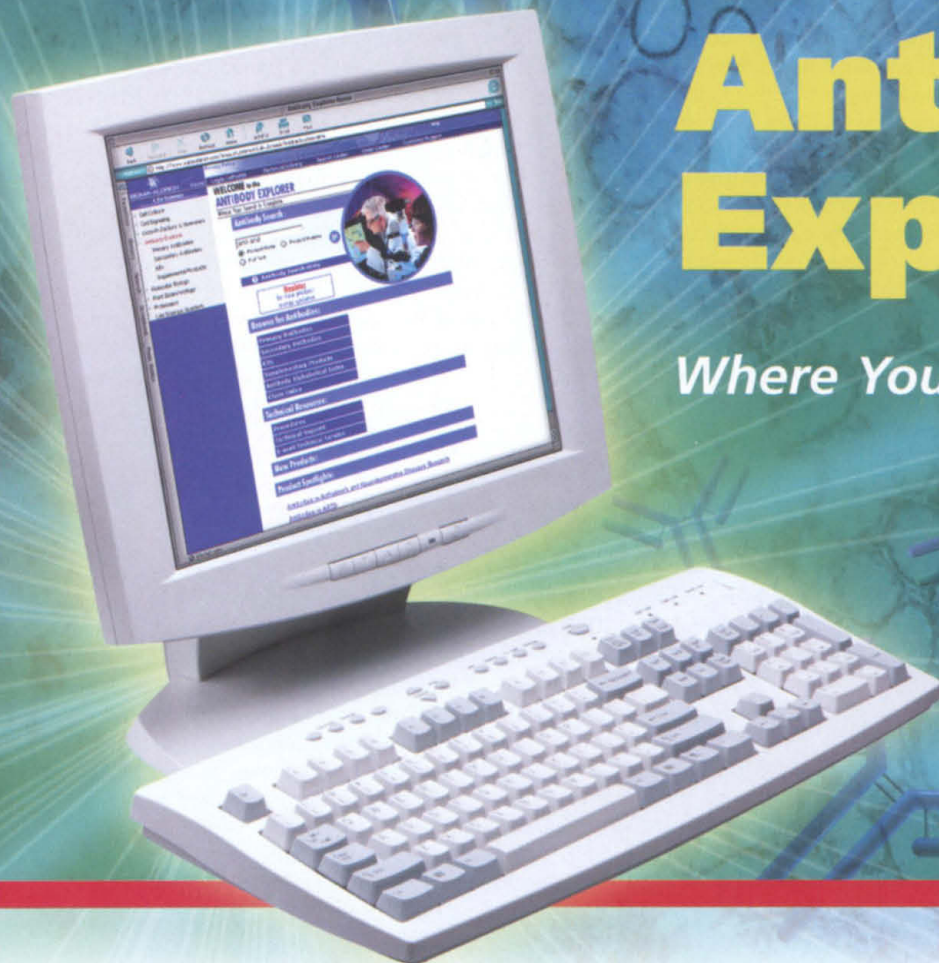
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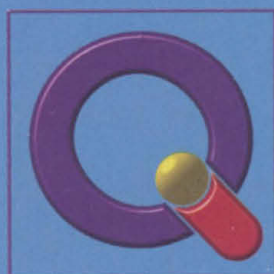
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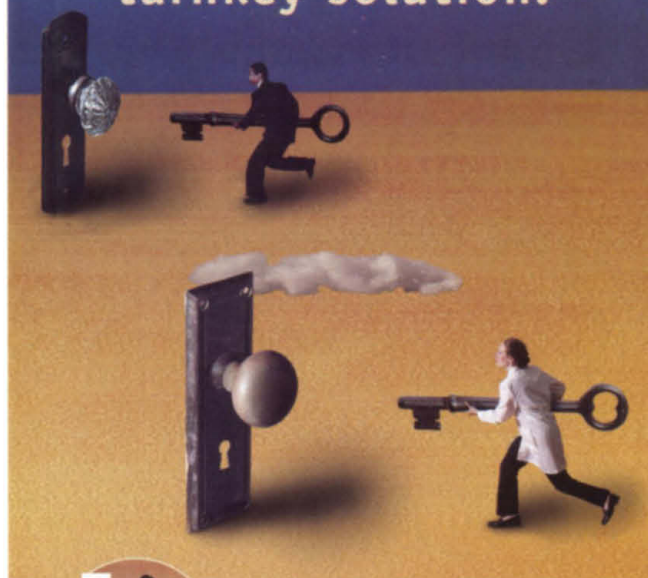
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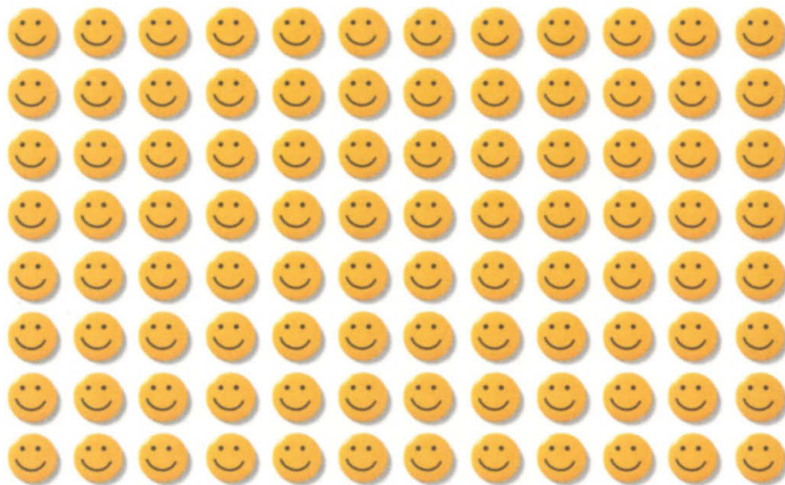
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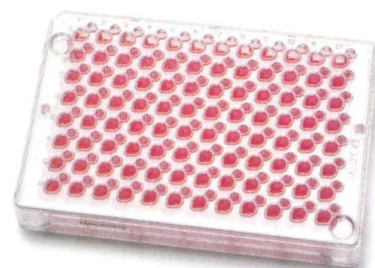
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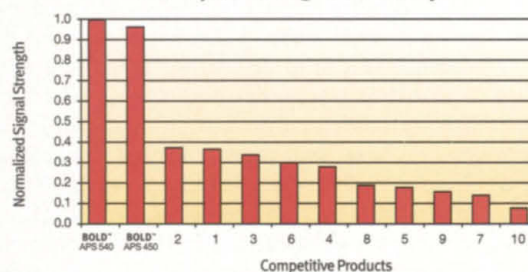
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Akt, ERK, JNK & p38 MAPK phosphoELISAs™



Tools for kinase network exploration.

BioSource phosphoELISA™ Advantages

- Quantitative
- ~10x more sensitive than Western blotting
- Kits contain all reagents needed
- 96-wells, 8-96+ results, 4 hours
- Fully optimized
- Normalize results with Total Protein ELISA



* Patent pending

For research use only.

New! phosphoELISA™ Kits*:
Akt, ERK, JNK, p38 MAPK, Rb, Insulin Receptor (IR)

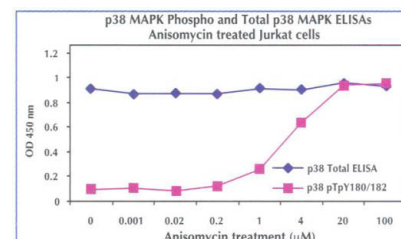
phosphoELISAs™	
Akt [pS473]	JNK1/2 [pTpY183/185]
ERK1/2 [pTpY185/187]	Rb [pT821]
p38 MAPK [pTpY180/182]	Rb [pSpT249/252]
EGFR [pY1068]	Tau [pS199]
EGFR [pY1173]	Tau [pS214]
IR [pY1158]	Tau [pS396]
IR [pYpY1162/1163]	

Coming soon! Src & p53 phosphoELISA™ kits

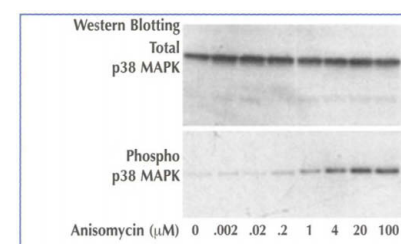
Total Target Protein ELISAs	
Akt	JNK
ERK1/2	p38 MAPK
EGFR	Rb
IR (β-subunit)	Tau

Visit www.biosource.com for a complete product menu

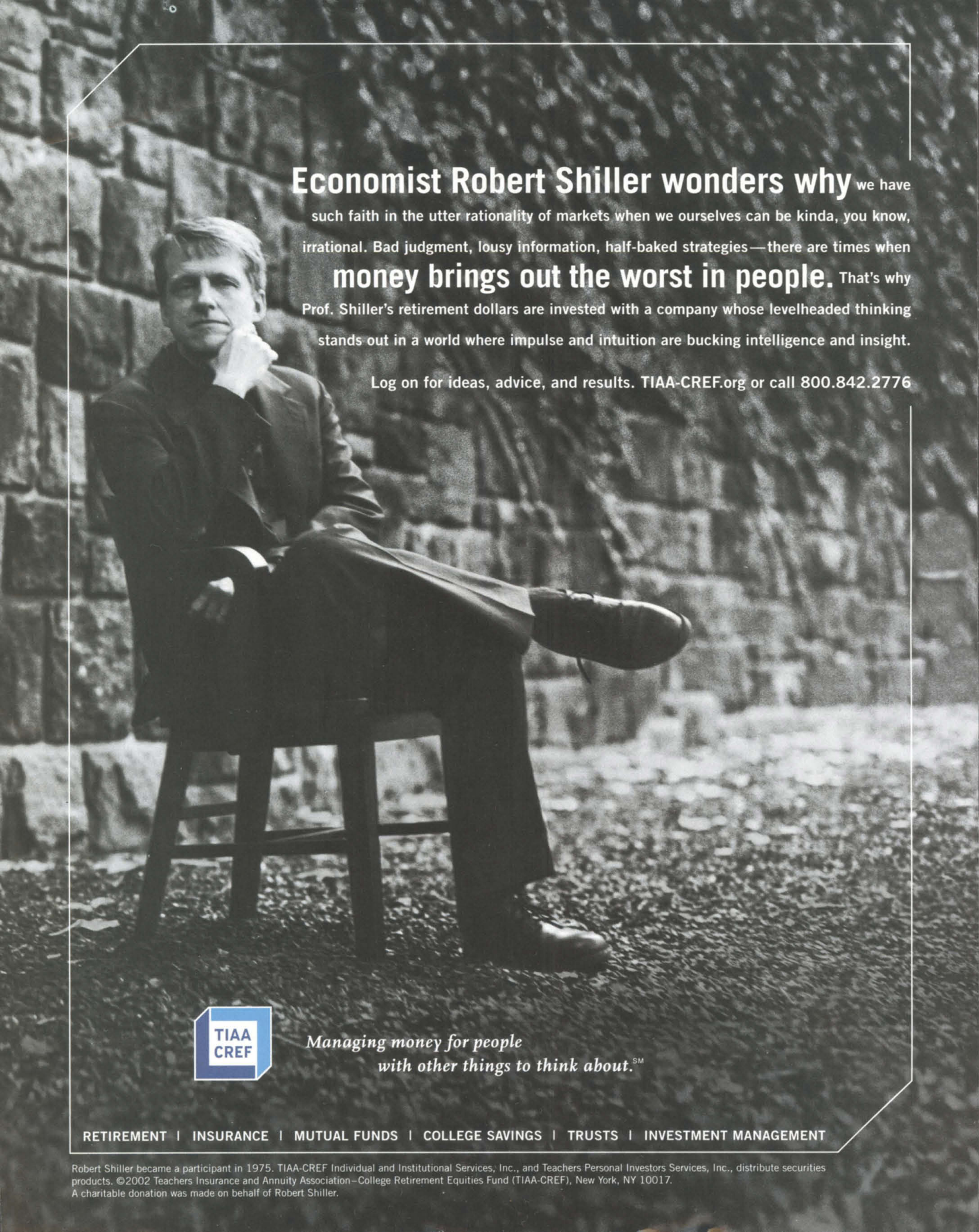
Solid Performance



Solid Results



Cell lysates from Jurkat cells treated with various concentrations of anisomycin were tested with Total p38 MAPK ELISA (Cat.#KHO0061), phospho p38 MAPK ELISA (Cat.#KHO0071) and Western blotting. The data show excellent correlation between ELISA and Western blotting.

A black and white photograph of economist Robert Shiller. He is sitting on a wooden stool, leaning against a rough stone wall. He is wearing a dark jacket and trousers, and has his hand resting on his chin in a thoughtful pose. The background is a textured stone wall.

Economist Robert Shiller wonders why we have

such faith in the utter rationality of markets when we ourselves can be kinda, you know, irrational. Bad judgment, lousy information, half-baked strategies—there are times when

money brings out the worst in people. That's why Prof. Shiller's retirement dollars are invested with a company whose levelheaded thinking stands out in a world where impulse and intuition are bucking intelligence and insight.

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