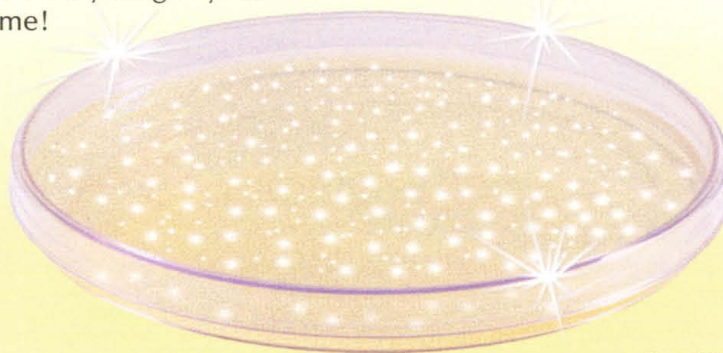


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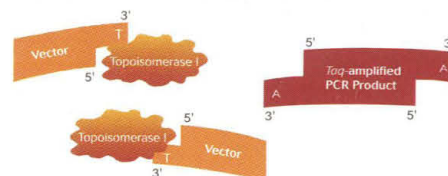


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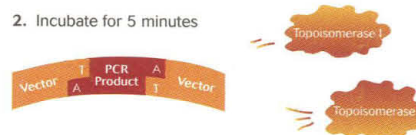
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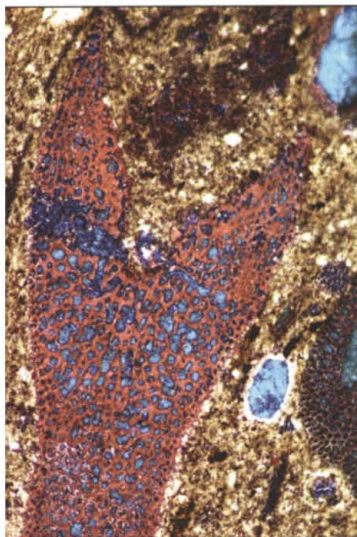
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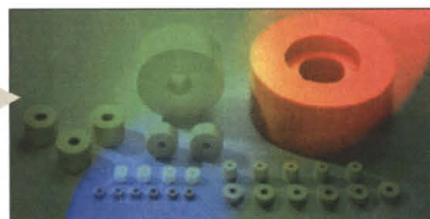
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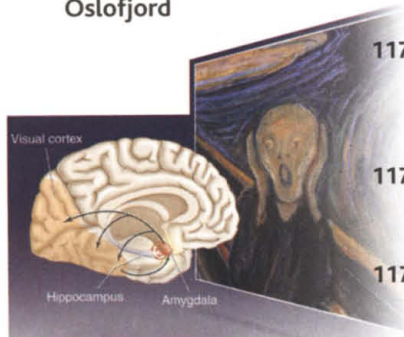
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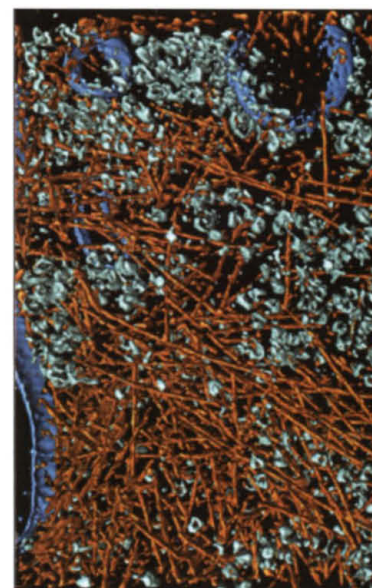
COVER 1195

Employees of Afghanistan's National Museum hid this 6th-to-7th-century A.D. Buddha, excavated in 1937 by French archaeologist Jean Carl in Fondukistan, to prevent its destruction by the Taliban last year. The fate of the country's artifacts, museums, and archaeological sites is covered in this week's special section. [Photo: Chapuis Patrick/Gamma]

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Inside eukaryotic cells, close up



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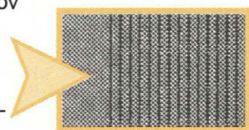
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Martian Meteorite Launch: High-Speed Ejecta from Small Craters J. N. Head, H. J. Melosh, B. A. Ivanov

Modeling shows that small impacts on Mars can eject enough fragments to escape Mars and reach Earth, accounting for our small but valuable martian meteorite collection.



Alcohol Consumption Impairs Detection of Performance Errors in Medial Prefrontal Cortex K. R. Ridderinkhof *et al.*

Alcohol specifically impairs error monitoring in the prefrontal cortex.

Observation of a Strongly Interacting Degenerate Fermi Gas of Atoms K. M. O'Hara, S. L. Hemmer, M. E. Gehm, S. R. Granade, J. E. Thomas

The anisotropic expansion dynamics of a two-component Fermi gas may bear the signature of the formation of a Fermi superfluid.

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GENETICALLY ALTERED MICE: Glutamate-Cysteine Ligase Modifier Knockout Mouse

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NEWS SYNTHESIS: The Plot Thickens on Thin Bones R. J. Davenport

New discoveries offer promise for the development of bone-building osteoporosis drugs.

NOTEWORTHY THIS WEEK: Dead Last M. Leslie

Study boosts hypothesis for why aging ceases in the very old.

NOTEWORTHY THIS WEEK: Feed a Cell, Deprive an Organism?

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Life-shortening protein shuttles organic molecules across the cell membrane.

NOTEWORTHY THIS WEEK: Winding Up to Wind Down R. J. Davenport

Dearth of DNA-loosening enzyme makes cells slumber.

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career resources for scientists

SINGAPORE: Scientists in Venture Capital T. Yugarani

Some Singaporean scientists find their niche in V.C.

UK: Creating and Exploiting Intellectual Property—My Job as a Manager A. Bach

A first-hand account with an insider's tips for breaking into the IP job market.

NETHERLANDS: Time to Reconsider S. Löhner

A Ph.D. student leader offers solutions to some burning issues.

CANADA: Tenure Review—The Long and the Short of It L. McKarney

The contentious debate over the appropriate length of faculty probationary periods heats up again.

US: Biotech Job Market Hype—Reading the Media Spin D. Jensen

Our *Tooling Up* columnist tells the real story about how to open doors to biotech careers.

US: A Career Development Plan for Postdocs L. Haak

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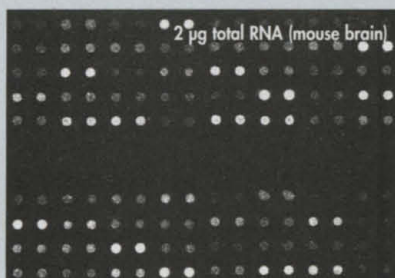
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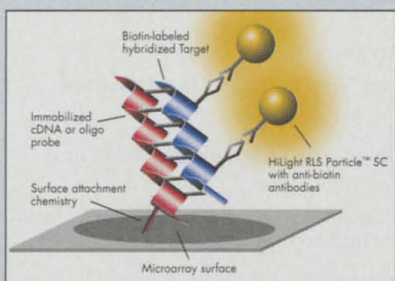
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THIS WEEK IN Science

edited by Phil Szuromi

Superconducting Lithium

At ambient pressure, lithium can be well described as a simple metal and has been shown to be so at ambient pressures down to 4 millikelvin. Recent theoretical work, however, has suggested that the structural changes induced under pressure may result in superconductivity. Using a diamond anvil technique modified to handle this chemically reactive material, Struzhkin *et al.* (p. 1213) present resistivity and magnetic susceptibility measurements, which confirm that superconductivity can be induced. However, the experimental transition temperatures (reaching ~16 kelvin by ~35 gigapascals) are appreciably lower than those that were predicted, which suggests that more sophisticated theoretical treatments are needed even for these putatively simple metals. **X**

Proxy Problems

The determination of paleo sea surface temperatures (SSTs) usually requires geochemical proxies, and two reports reassess assumptions that underlie two different methods. Alkenones produced by certain types of haptophyte algae have found wide application as an SST proxy because their degree of chemical unsaturation depends on temperature. Unfortunately, it appears that the ages of alkenones found in marine sediments are not necessarily the same as those of the planktonic foraminifera (forams) with which they were deposited. Ohkouchi *et al.* (p. 1224; **X** see the Perspective by McCave) compared radiocarbon ages of alkenones and those of forams isolated from Late Quaternary sediments from the Bermuda Rise (northwestern subtropical Atlantic). On average, the alkenones are 4200 years older than the forams coexisting in their sediment cores. The alkenones in these cores are likely mixtures of local and transported products, and the authors conclude that alkenones may not accurately reflect SSTs at any single site. The reliability of the magnesium-calcium (Mg/Ca) ratio of seawater as a proxy for sea surface temperatures depends on a knowledge of any changes in this ratio over geological time. Dickson (p. 1222; see the news story by Kerr) measured the Mg/Ca ratio of fossil crinoids, which belong to the same phylum as starfish and sand dollars, in samples that have been protected from diagenesis by the formation of a protective mineral envelope of calcite and dolomite that developed during alteration. The Mg/Ca ratio of seawater has varied between its present

1219 Detached and Reversed in Tibet

About 50 million years ago, India collided with Eurasia, and the oceanic slab associated with India was subducted beneath Eurasia along a north-dipping thrust fault. The collision created a much thicker continental crust, a large plateau, and the highest mountain chain on Earth, the Himalayas. Kind *et al.* (p. 1219) provide high-resolution seismic images of the Tibetan plateau in the crust and upper mantle. Their work shows that the subducted oceanic slab has become detached from the Indian continental crust subduction. The subduction may in fact have stalled and reversed, so that the Eurasian continent is now being underthrust beneath India along a south-dipping thrust fault.

And in Brevia ...

The juvenile stages of eukaryote seaweeds take advantage of signaling molecules (*N*-acyl-homoserine lactones) produced by prokaryotic marine biofilms, according to Joint *et al.* (p. 1207).



value of 5.2 and less than 2 during the past 500 million years. These findings confirm the controversial claim that large changes in the major ion composition of the oceans have occurred over the course of the fossil record.

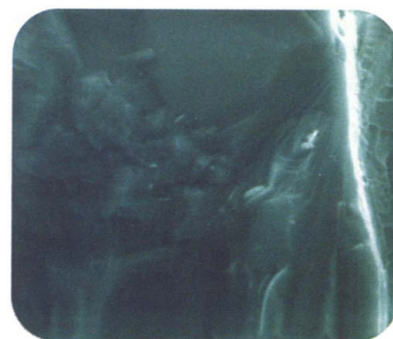
Cells in 3D

Cryoelectron tomography (cryo-ET) can provide three-dimensional images of unfixed and unstained cellular structures embedded in vitreous ice at resolutions of a few nanometers. Now Medalia *et al.* (p. 1209; see the news story by Goldman) have applied cryo-ET to intact eukaryotic cells. Looking at the highly motile cells of *Dictyostelium discoideum* at 5- to 6-nanometer resolution, they visualize the ribosome-decorated endoplasmic reticulum, identify the 26S proteasome, and

directly visualize branches and cross-links in the cytoplasmic actin network. As higher resolution is achieved, cryo-ET has the potential to bridge cellular and molecular structural studies.

Stressed Out

If stressed, brittle materials should either fail if sufficient force is applied, or retain their original strength, independent of the number of stress cycles the material undergoes. Why, then, does polycrystalline silicon, a brittle material, suffer from cyclic fatigue? Kahn *et al.* (p. 1215) fabricated samples with intrinsic residual stresses and found that environmental effects do not enhance the static failure. After a low number of cycles, the failure depends critically on the ratio of tensile to compressive stresses and occurs through subcritical crack growth during each cycle. Environmental factors become important for high-cycle fatigue.



The Long and the Short of Evolution

Sperm morphology is one of the most rapidly diverging traits as species differentiate. The extreme variation in sperm length

You must remember this...



1975/76



1978



1979



1980/81



1981/82



1982/83



1983/84



1985/86



1986/87



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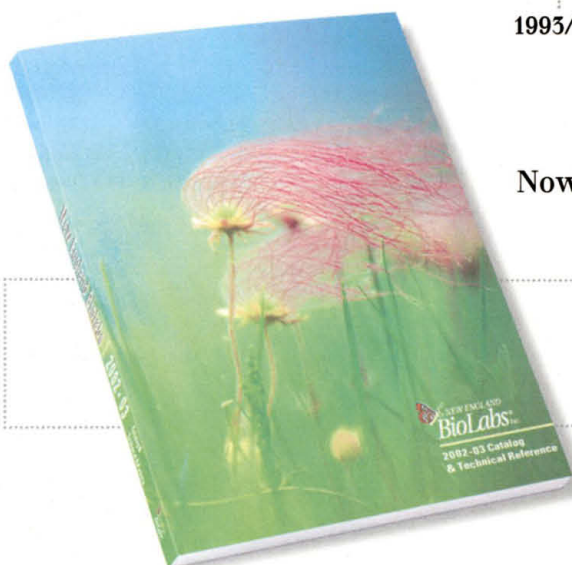
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across the genus *Drosophila* make it an ideal system for studying how this evolution occurs. Miller and Pitnick (p. 1230) show that sperm morphology and female reproductive tract morphology interact competitively in *Drosophila melanogaster* to determine differential male fertilization success. An experimental study shows that sperm length evolution is driven by the evolution of the female reproductive tract.

Anticipating Outcomes

The use of theoretical ecological models to help prioritize the outcomes of conservation efforts is the subject of two reports (see the Perspective by Côté and Reynolds). Kolar and Lodge (p. 1233) analyzed fish species that have invaded the North American Great Lakes in order to identify characteristics common to successful alien invasion species. They develop a general quantitative approach to species-specific ecological risk assessments and make specific predictions as to the future threat posed by species now native to the Ponto-Caspian basin in Eurasia in terms of their establishment, spread, and impact in the Great Lakes. Lens *et al.* (p. 1236) examine the relative effects of habitat fragmentation and deterioration on rainforest birds in Kenya. They report correlations between the tendency for species to breed in habitat fragments and those same species' abilities to colonize patches and tolerate degraded patches. They combine these findings with historical museum data to address the effects of declines in habitat quality through measurements of morphological fluctuating asymmetry, a measure of the effects of stress. The authors conclude that the characteristics of individual species can be used to predict habitat occupancy with a high degree of confidence.



Gleanings About the Grain

Plant meristems function as undifferentiated sources for cells that go on to form shoots, inflorescence, and flowers. In maize, the grain develops out of a series of increasingly defined meristems. Chuck *et al.* (p. 1238) analyzed a maize mutation known as *branched silkless 1 (bd1)* and show that it affects the identity of spikelet meristems and causes indeterminate branches to form instead. Similarities between the maize *bd1* gene and

genes in other grasses suggest early evolution of the distinctive grain inflorescence architecture.



Picking a Signaling Pathway

How is specificity gained when numerous genes are regulated by a single transcription factor in response to diverse stimuli? Hoffmann *et al.* (p. 1241; see the Perspective by Ting and Endy) examined how a transcription factor called nuclear factor- κ B (NF- κ B) is differentially controlled by three different isoforms of an inhibitor protein called I κ B. They combined computational modeling with biochemical data that they obtained from genetically engineered cells that express only one I κ B isoform. During the cell's exposure to a stimulus, a bimodal and temporal signal processing mechanism determines which I κ B-NF- κ B pathway and downstream target genes get activated.

Plasticity in the Adult Brain

In the brain, chondroitin sulfate proteoglycans (CSPGs) are important elements of the extracellular matrix. In the adult, they form perineuronal nets, particularly concentrated around inhibitory interneurons. These nets are thought to play an important part in the inhibitory mechanism that ends the critical period during development. Pizzorusso *et al.* (p. 1248; see the Perspective by Fox and Caterson) showed a correlation between the development of perineuronal nets and the end of the critical period. They also demonstrated that the extension of the critical period by dark rearing is accompanied by delayed maturation of perineuronal nets. Finally, enzymatic degradation of CSPGs in adult animals restored plasticity. These findings directly confirm that the mature extracellular matrix is a crucial factor in the regulation of experience-dependent plasticity.

CREDIT: CHUCK ET AL

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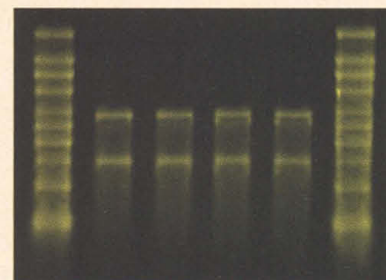


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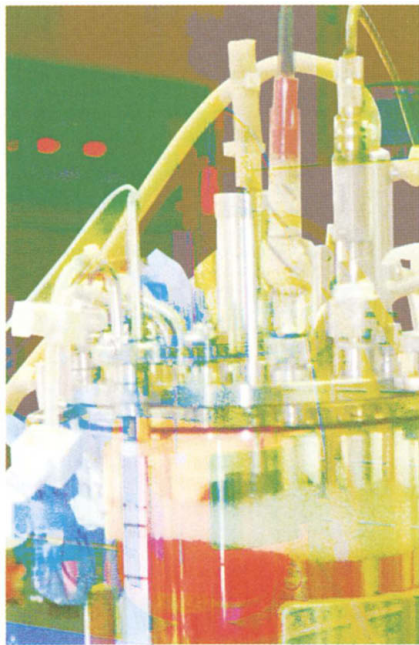
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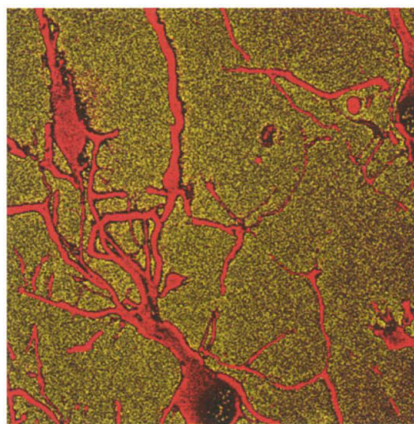


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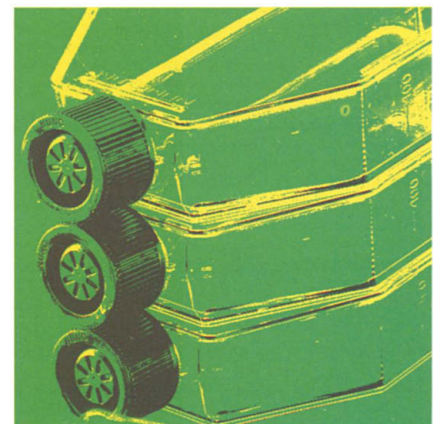


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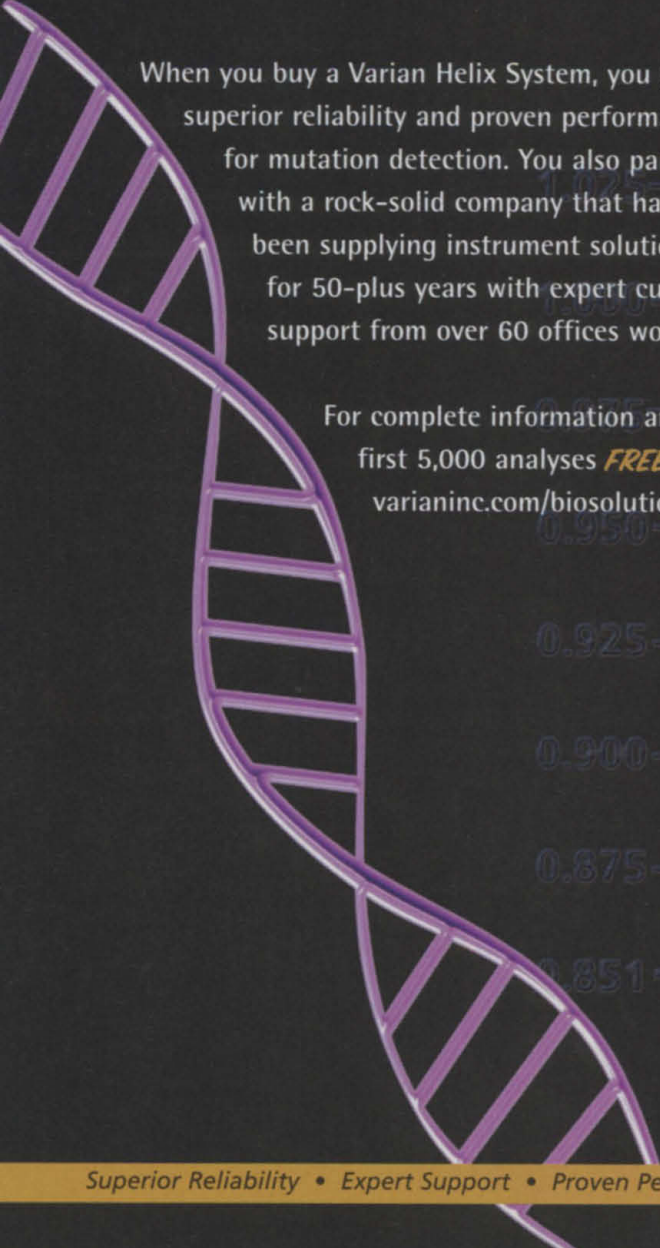
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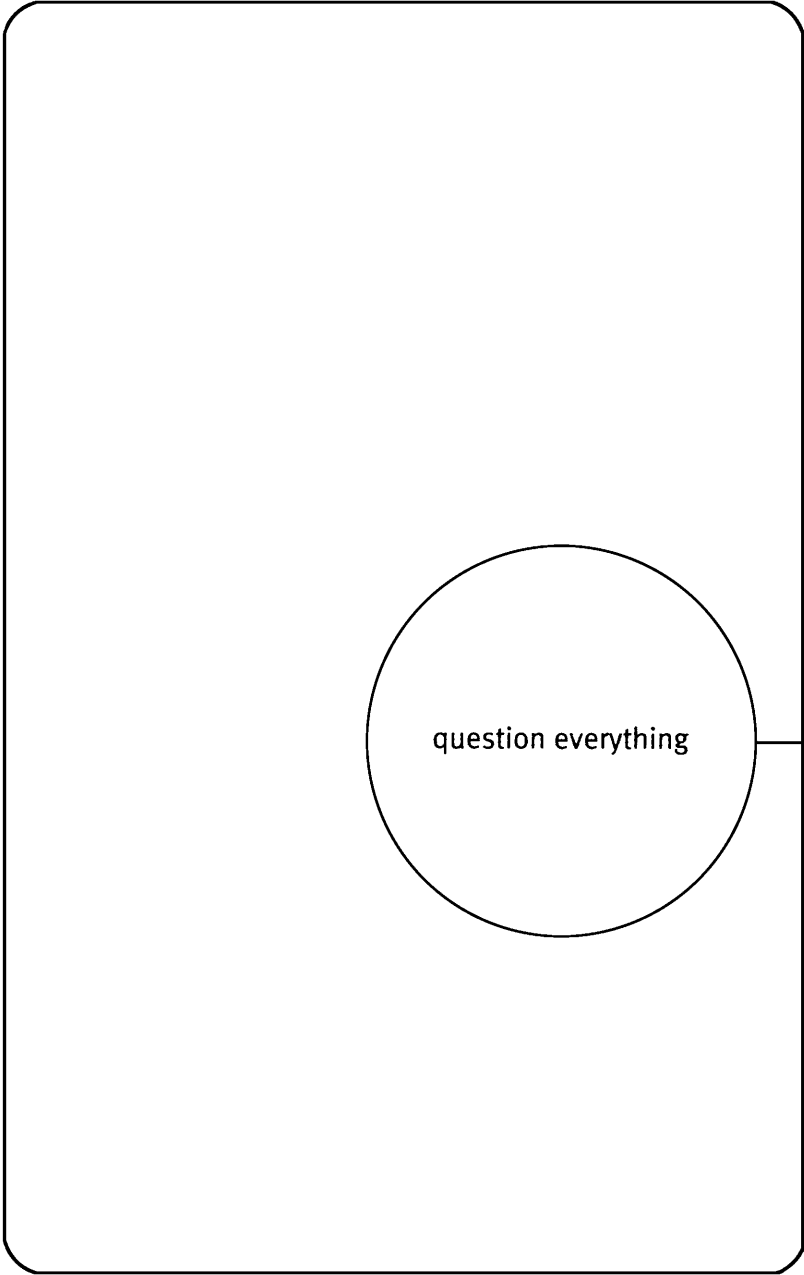
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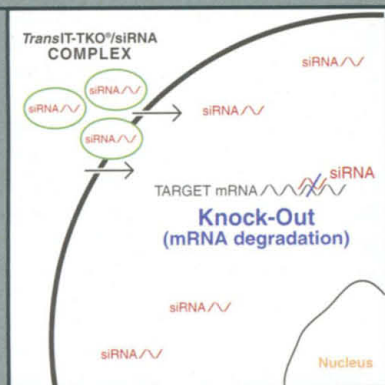
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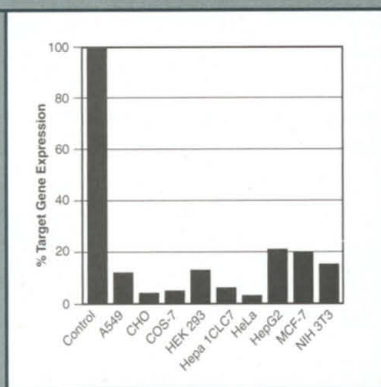
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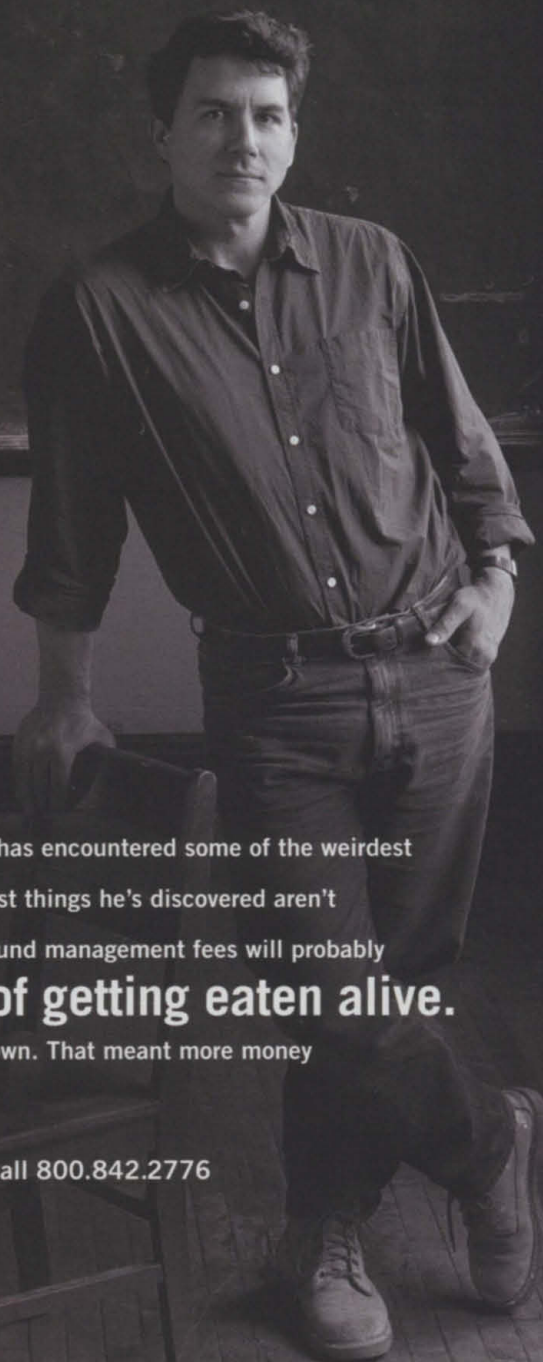
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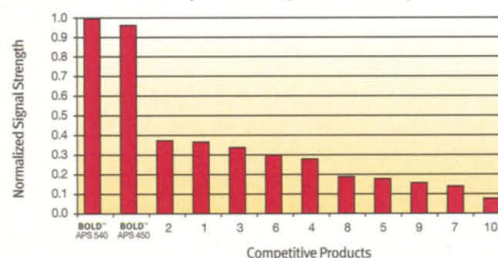
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