

# Science

23 November 2001

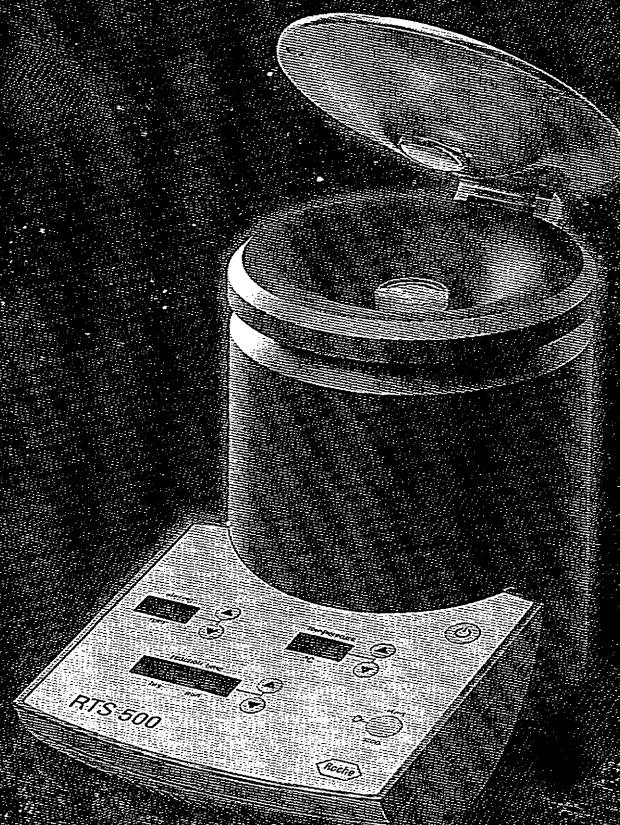
Vol. 294 No. 5547

Pages 1605-1776 \$9



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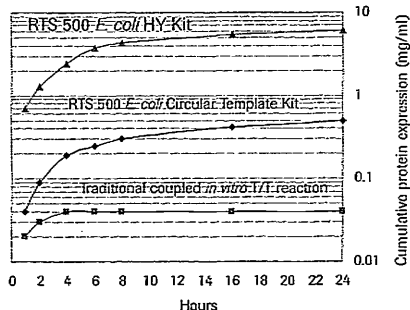
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GFP expression (mg/ml, log scale) using the RTS 500 *E. coli* HY Kit and RTS 500 *E. coli* Circular Template Kit, versus a traditional coupled *in vitro* transcription/translation reaction (T/T).

\* The Rapid Translation System currently consists of: RTS 500 Instrument (3.75 kg), the RTS 500 *E. coli* HY Kit, the RTS 500 *E. coli* Circular Template Kit, and the RTS 100 *E. coli* HY Kit (dedicated instrument not required).

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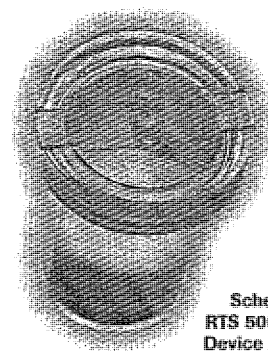
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Schematic of a RTS 500 Reaction Device containing approximately 5 mg/ml of GFP following a 24-hour reaction.

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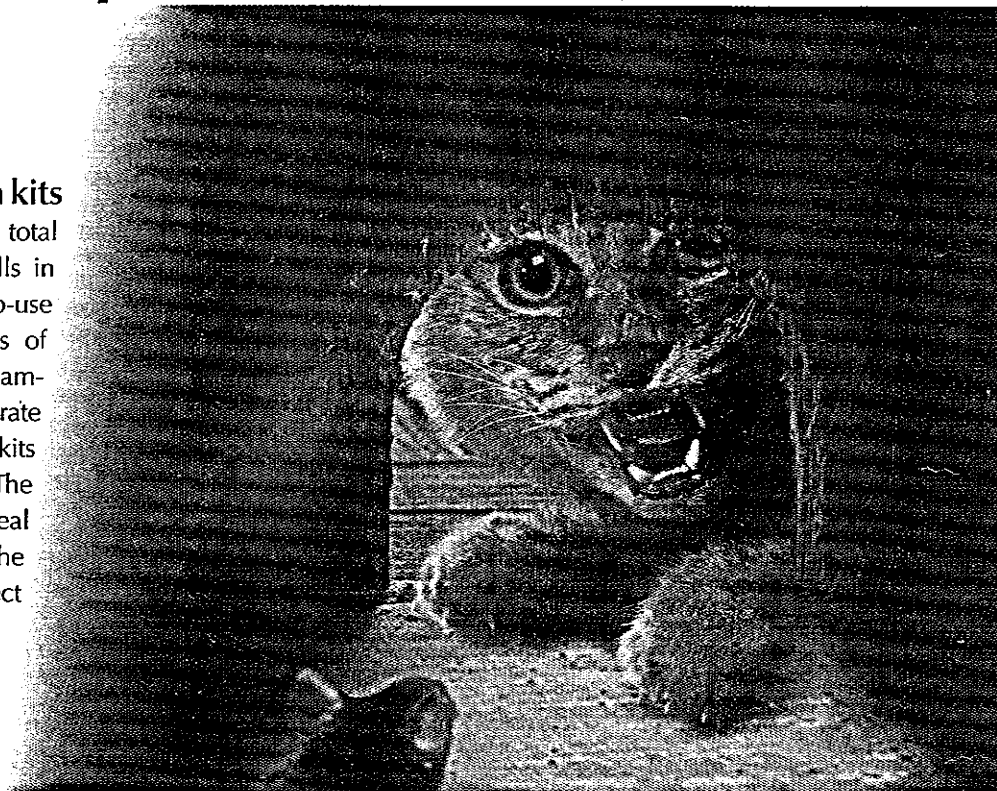
Product	Cat. No.	Pack Size
RTS 500 Instrument	3 064 859	1 instrument
RTS 500 <i>E. coli</i> Circular Template Kit	3 018 008	5 reactions
RTS 100 <i>E. coli</i> HY Kit	3 186 148	24 reactions
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RTS 500 <i>E. coli</i> HY Kit	3 246 949	5 reactions



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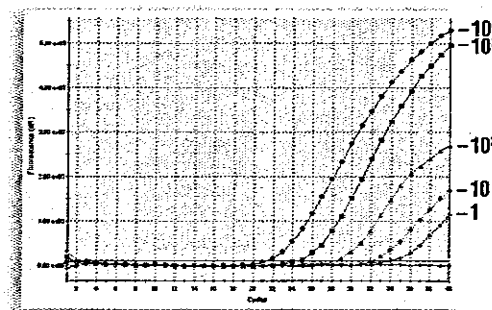
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# Science

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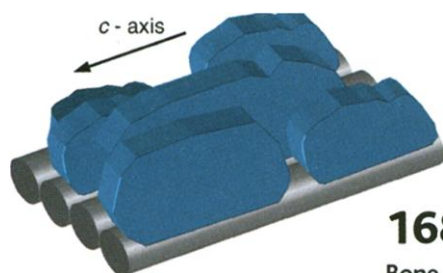
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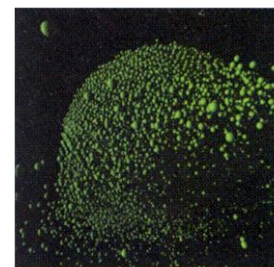
1723 **A Genomic-Systems Biology Map for Cardiovascular Function** M. Stoll, A. W. Cowley Jr., P. J. Tonellato, A. S. Greene, M. L. Kaldunski, R. J. Roman, P. Dumas, N. J. Schork, Z. Wang, H. J. Jacob

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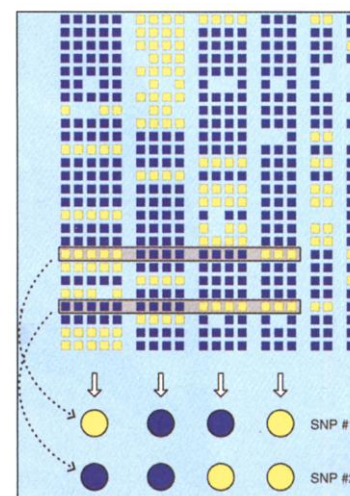
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## COVER 1696

Simulated image of the disruption of a 100-km asteroid. Collisions between large asteroids generate as many as 50,000 kilometer-sized fragments, some of which will eventually reaccumulate to form aggregates. [Image: P. Michel and P. Tanga]



## 1719

**Genetic variations in human chromosome 21**

**New on Science Express**

The basis of genetic imprinting



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## Remarkably Selective Iridium Catalysts for the Elaboration of Aromatic C-H Bonds

J.-Y. Cho, M. K. Tse, D. Holmes, R. E. Maleczka Jr., M. R. Smith III

Iridium catalysts have been developed that both mediate borylation of carbon-hydrogen bonds in aromatic feedstocks and allow subsequent carbon-carbon bond formation with aryl halides in situ.



## Dnmt3L and the Establishment of Maternal Genomic Imprints

D. Bourc'his, G.-L. Xu, C.-S. Lin, B. Bollman, T. H. Bestor

Dnmt3L, a component of the maternal gametic methylation machinery, is required for the establishment of imprints.

## The Potential Size and Duration of an Epidemic of Bovine Spongiform Encephalopathy in British Sheep

R. R. Kao, M. B. Gravenor, M. Baylis, C. J. Bostock, C. M. Chihota, J. C. Evans, W. Goldmann, A. J. A. Smith, A. R. McLean

1663 Age-cohort analysis suggests that few UK sheep are infected with BSE.  
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## SPECIAL FEATURE

### Science Functional Genomics [www.sciencegenomics.org](http://www.sciencegenomics.org)

#### Evolution of a Killer K. E. Beauregard

Genomics illuminates the deadly potential of anthrax, and how to fight it.

## science's next wave

[www.nextwave.org](http://www.nextwave.org)

career resources for scientists

### US: Jumping Off the Academic Bandwagon, Part 2—Landing a Job

H. Sawyer

After some ups and some downs, our academic refugee eventually found a position that plays to her strengths.

### Singapore: Coming to Life

J. Wong

A glimpse of what's happening in the Singapore life sciences scene right now... and what's coming next.

### UK: Making Medicine a Work of Art

K. McQuone

As a left brain/right brain person, the author has found her niche in the world of medical illustration.

### Germany: The Sixth Framework Program—Big Changes for Europe's Young Scientists?

E. von Ruschkowski

The EC's Sixth Framework Program for Research and Development will replace the current program in 2003. Will the anticipated changes impact young researchers?

### Canada: Canadian Diaspora, Part 4—Postcards from Scotland

G. Dellaire

Insights into the virtues of doing a postdoc in Britain, and ideas for Canadians looking to find gainful employment back in Canada.

## KNOWLEDGE ENVIRONMENTS

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### More Than a Sum of Our Cells

K. Hopkin

When our cells throw in the towel, are our bodies close behind?

## science's stke

signal transduction knowledge environment

[www.stke.org](http://www.stke.org)

### Perspective: The Cbl Family—Ubiquitin Ligases Regulating Signaling by Tyrosine Kinases

A. Sanjay, W. C. Horne, R. Baron

Structural and biochemical mechanisms underlying the Cbl ubiquitination activity.

### Perspective: $\beta$ -Arrestin and Mdm2, Unsuspected Partners in Signaling from the Cell Surface

G. J. Strous and J. A. Schantl

Mdm2, a ubiquitin ligase for G protein-coupled receptors.

### GrantsNet

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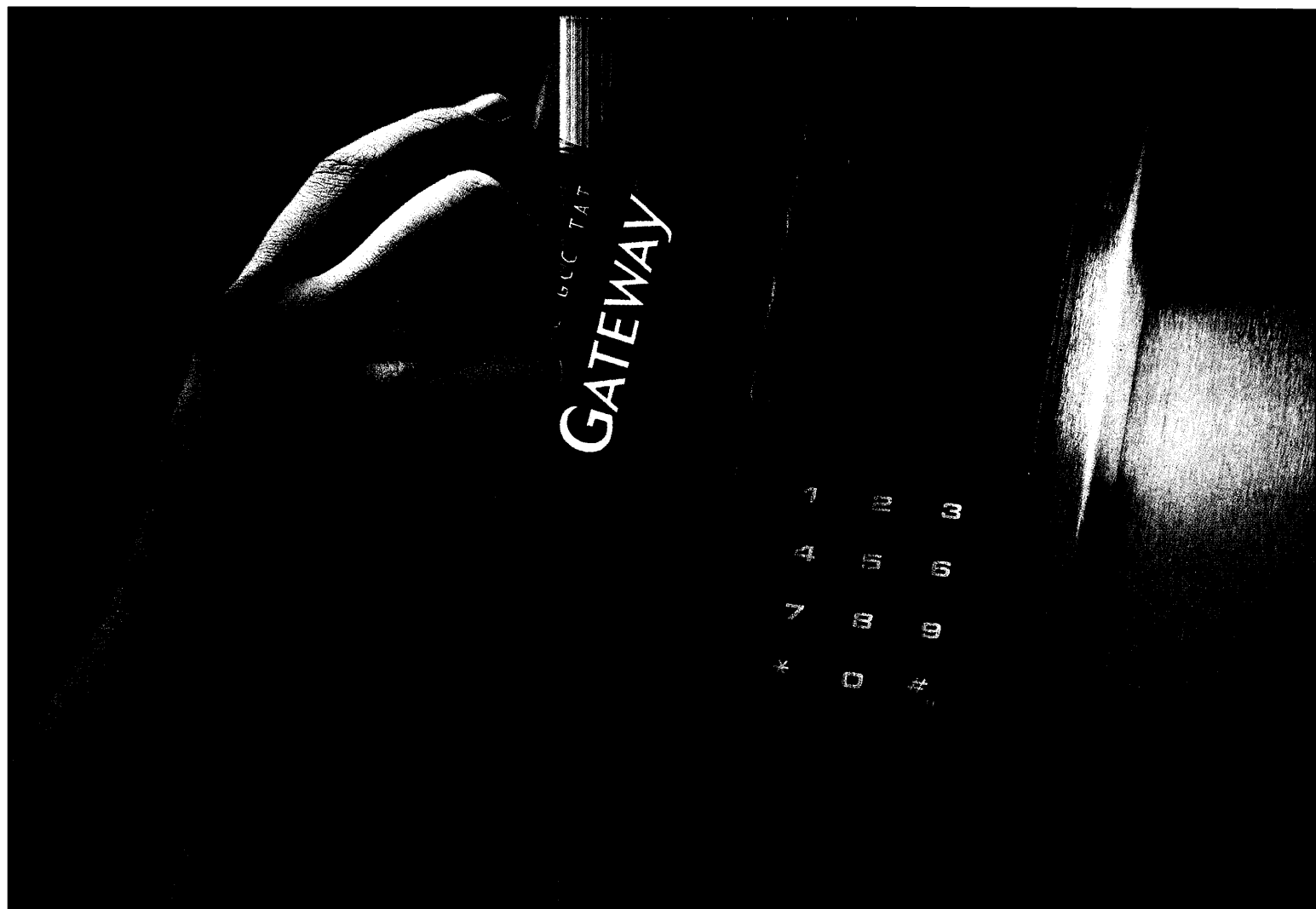
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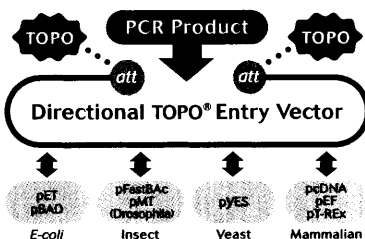


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# THIS WEEK IN Science

edited by Phil Szuromi

## Parallel Assembly

Designs for artificial bone scaffolds have generally focused on the remineralization issue—getting hydroxyapatite (HA) to grow at the organic-inorganic interface. However, bone is a complex mineral assembly with many higher levels of organization that contribute to its mechanical properties. Hartgerink *et al.* (p. 1684; see the news story by Service) designed a peptide amphiphile (PA) to use as a scaffold material that incorporated separate units for rigidity, HA adsorption, and cell adhesion. By varying pH to control the assembly and cross-linking of the PA, the authors were able to promote mineralization of HA as a series of parallel sheets. The HA could be redissolved by changing the pH, which weakens the linkages in the PA assembly.

## A Tale of Two Strategies

The net CO<sub>2</sub> uptake by forests can be estimated in two ways, either by measuring local changes in the concentration of CO<sub>2</sub> of air (a method called "eddy covariance flux") or by taking inventories of biomass gain or loss. These approaches have not always agreed in the past, and the differences between them have resulted in conflicting estimates of regional carbon budgets, such as for North America. Barford *et al.* (p. 1688) compared 9 years of eddy flux measurements of carbon uptake in Harvard Forest to traditional inventory estimates and found close agreement between the values, an important validation of the eddy flux method. The substantial uptake at Harvard Forest is mostly due to prior land use. Climatic variations account for seasonal and interannual variations in CO<sub>2</sub> uptake.

## Asteroids Near and Far

The Lincoln Near-Earth Asteroid Research (LINEAR) project has been identifying and cataloging near-Earth asteroids (NEAs) over a small portion of the sky for several years. Stuart (p. 1691) used this data to estimate the size and shape of the NEA population for the full sky based on detection probabilities. He finds that the number of 1-kilometer-diameter asteroids should be about 1200 and that the population is more highly inclined to the ecliptic than previously thought. Asteroid families are thought to form by major collisions in the main belt, and their perturbed members make good candidate sources for NEAs. Michel *et al.* (p. 1696; see the cover) show that large family members can be made by gravitational reaccumulation after the main collision, which can explain the presence of large and small asteroids in observed families. Bottke *et al.* (p. 1693) show that these newly created asteroid families can spread out due to a thermal force called the Yarkovsky effect. Their simulations match observations of asteroid family distributions. Interestingly, the simulations also place some members on the edge of resonances, that is, regions that can eject main belt asteroid into near-Earth orbits.

## 1700 Truly Global Impact

The Cretaceous-Tertiary (K-T) extinction event is attributed to a massive bolide hitting the Yucatan peninsula of Mexico. In North America, there is evidence of massive deforestation by an impact winter or wildfires. Now, Vajda *et al.* (p. 1700; see the Perspective by Flannery) have found evidence for deforestation in New Zealand associated with an iridium anomaly. Thus, the impact event was global in its effects and caused significant terrestrial devastation in the Southern Hemisphere.

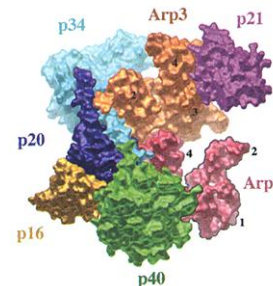
## Do Not Disturb Too Much

What causes the high species richness of trees in tropical rain forests? Arguments have increasingly focused on the role of disturbance, in the form of gaps in the canopy created by dead and fallen trees, in helping to maintain this richness. In a survey of selectively logged and unexploited forests in French


Guiana, Molino *et al.* (p. 1702) assessed the effects of larger scale impacts of logging in tropical forests compared to the smaller disturbances caused by naturally occurring canopy gaps. Their findings provide support for the hypothesis that intermediate levels of disturbance produce maximum species richness.

## Pushing Ahead

The leading edge of motile eukaryotic cells is pushed forward by a branched actin filament network. The seven-subunit Arp2/3 complex initiates the growth of branches on the sides of older filaments but only when activated by Wiskott-Aldrich syndrome protein (WASP). Robinson *et al.* (p. 1679; see the Perspective by Weeds and Yeoh) have determined the crystal structure at 2.0 angstrom resolution of the Arp2/3 complex. The two actin-related proteins (Arps) are not appropriately oriented to form two subunits of an actin helix, which explains why the complex is inactive. The authors propose that nucleation-promoting factors such as WASP, actin filaments, and adenosine triphosphate act by favoring the active conformation of the Arp2/3 complex.



## Muscling In on Atrophy

Muscle atrophy that occurs when physical activity is decreased results from enhanced breakdown of muscle protein by the ubiquitin proteasome pathway, but the precise molecular mediators are unknown. Using gene expression profiling methods and subsequent analyses of knockout mice, Bodine *et al.* (p. 1704) identified two muscle-specific ubiquitin ligases (enzymes that target protein substrates for proteolysis by the proteasome), called MAFbx and MuRF1, that are required for skeletal muscle atrophy. Identification of these proteins may lead to new therapies aimed at preventing the loss of muscle that often accompanies illness and aging. 

## Lesser Extent of the vCJD Epidemic

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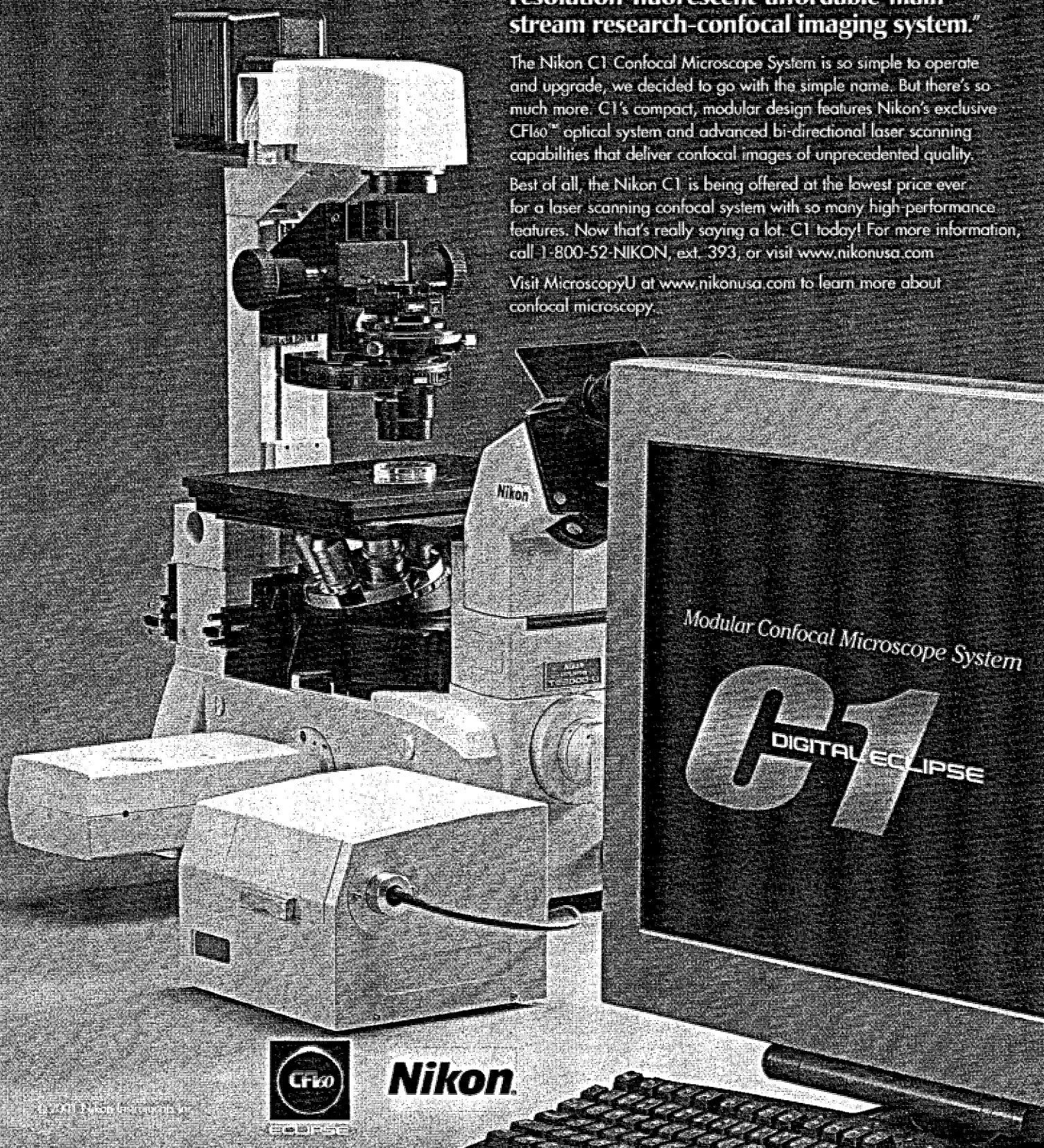
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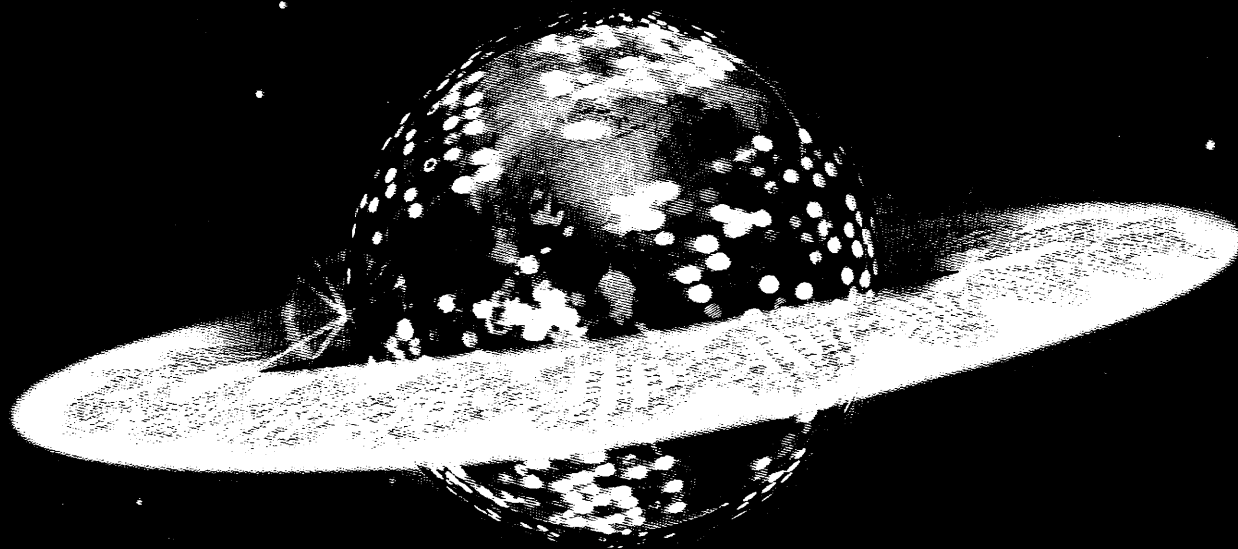
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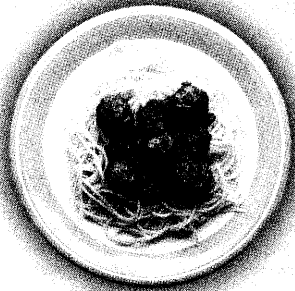
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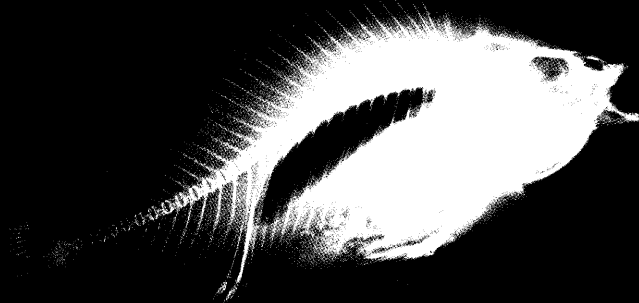
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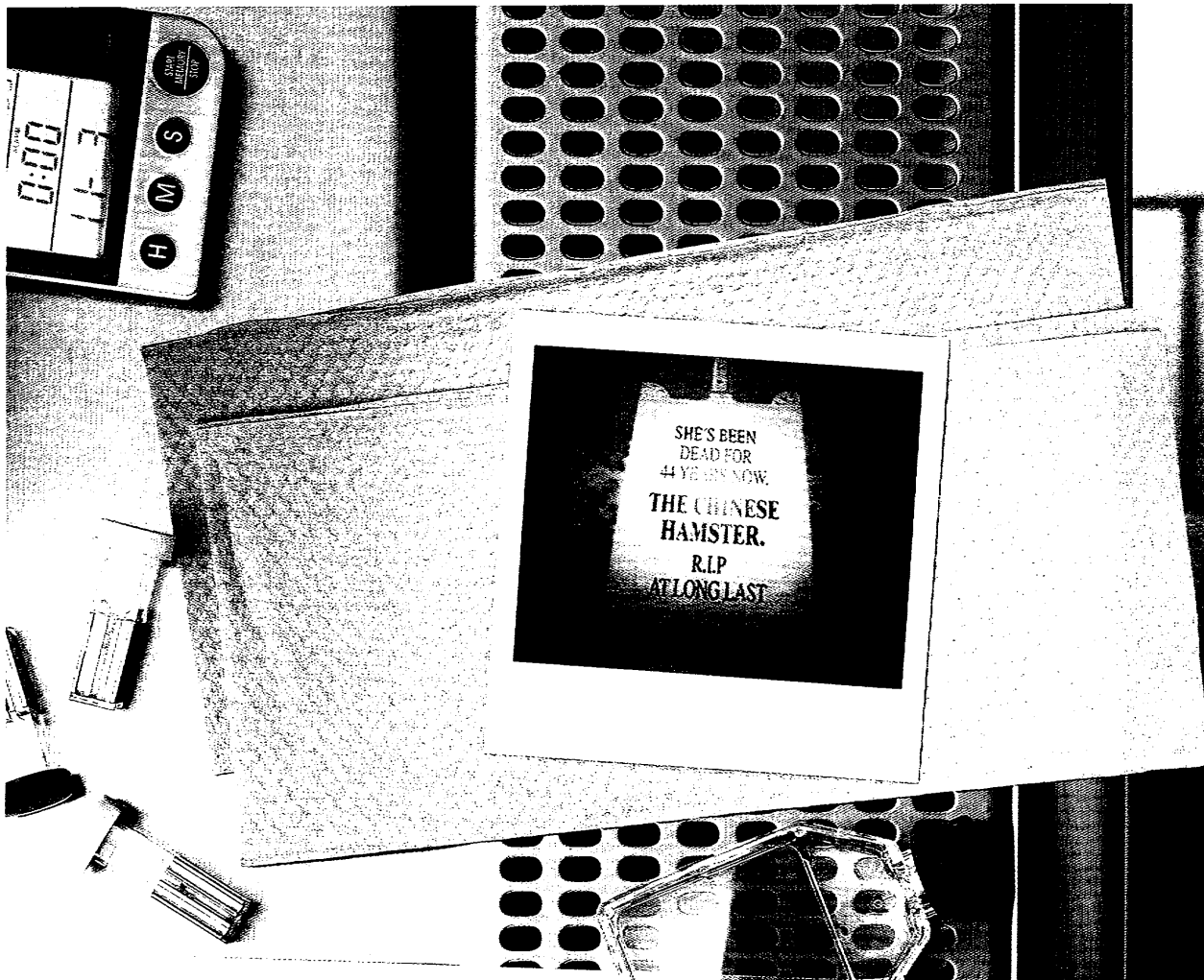
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(eNOS). Recent studies indicate that AMPK and Akt/PKB phosphorylate eNOS at the Ser1177 site, which activates the enzyme. Phosphorylation at the Thr495 site in the calmodulin binding sequence by PKC inhibits eNOS activity. Type 2 diabetes mellitus exhibits metabolic deficiencies that could be attributed to the malfunction or inactivity (e.g., lack of exercise) of the AMPK signaling pathway, thus presenting a possible link and therapeutic target for this pathology.

Here is a great paper on this topic:

*Kemp et al.: J. Biol. Chem. 276: 17625, 2001.*

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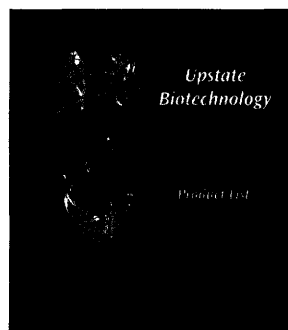
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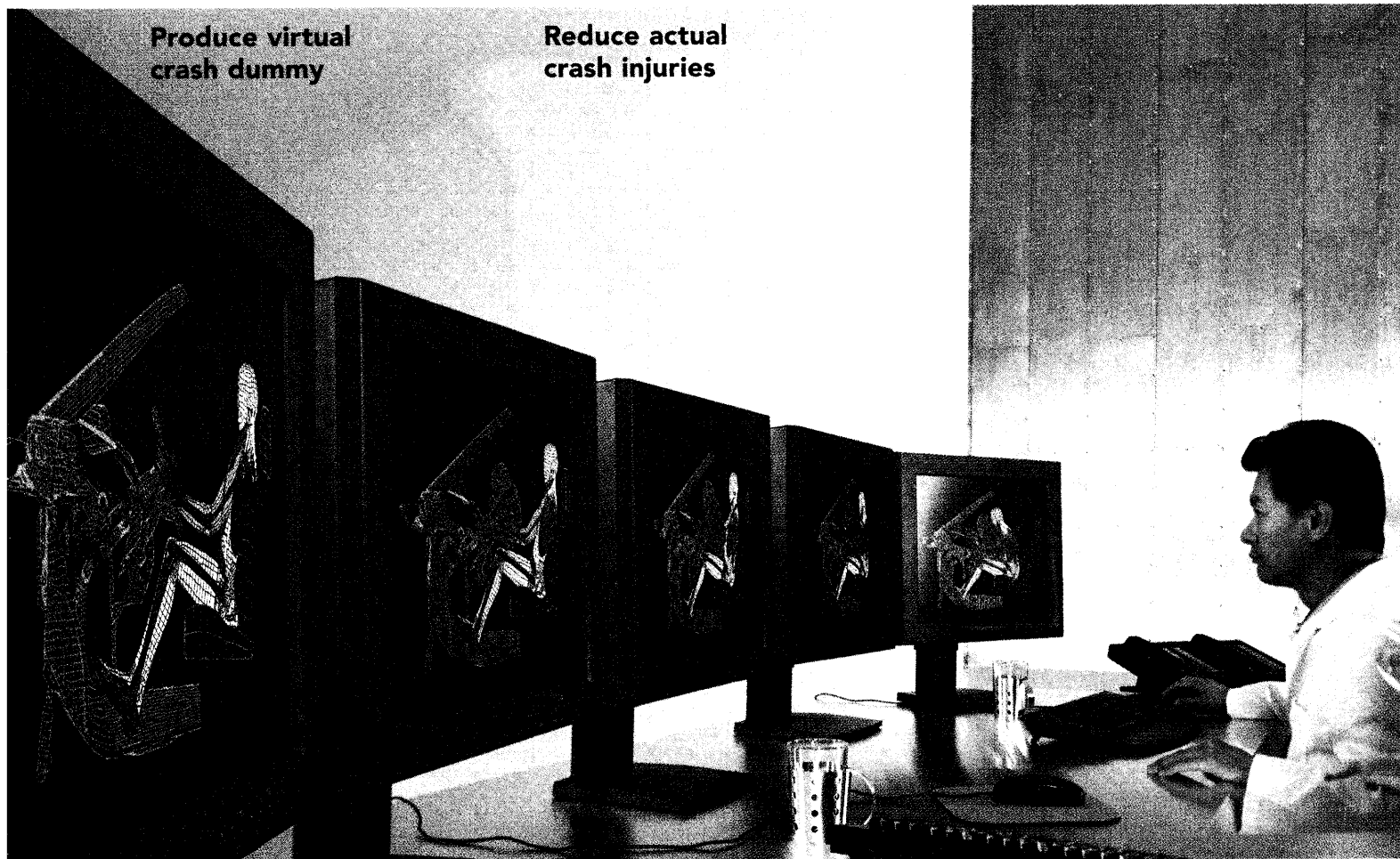
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