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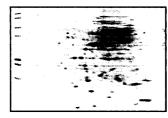


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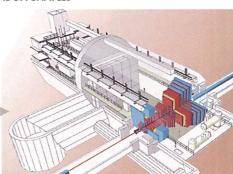
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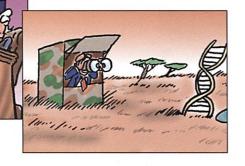
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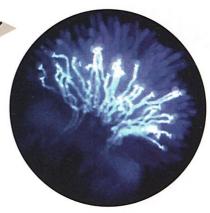
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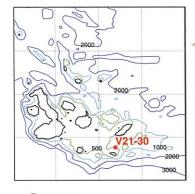
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Meltwater stream flowing into a moulin in the ablation zone of the Greenland Ice Sheet. Accelerations of ice flow in summer are closely related to variations in air temperature and surface melting, and indicate that meltwater quickly travels through 1000 m of ice and enhances basal sliding. These observations reveal a mechanism for dynamic response of ice sheets to climate change. [Photo: R. J. Braithwaite]



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SCIENCE EXPRESS

Steering Attosecond Electron Wave Packets with Light

R. Kienberger et al.

Electron packets generated by attosecond x-rays can be placed into the deceleration or acceleration regions of an intense laser light field, which allows their energy and direction to be controlled.

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Predictive Identification of Exonic Splicing Enhancers in Human Genes W. G. Fairbrother, R.-F. Yeh, P. A. Sharp, C. B. Burge

A combination of computational and experimental approaches is used to identify ESEs, short oligonucleotide sequences that increase the joining of exons to build mRNA.

Chemical Synthesis of Poliovirus cDNA: Generation of Infectious Virus in the Absence of Natural Template J. Cello,

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Infectious, full-length poliovirus cDNA can be synthesized and replicated in a cell-free system solely using the sequence as instructions.

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science's next wave

career resources for scientists

CANADA: Chalking It Up L. McKarney

Why a Ph.D. scientist switched to secondary school teaching, and how he went about it.

US: Project Management for Scientists S. Portny and J. Austin Manage your laboratory just as you manage your research—boldly, but methodically.

MISCINET: Preparing an Effective Personal Statement E. Sanchez

To get into the graduate school of your choice, you'll need a personal statement that demonstrates your depth and your breadth.

SINGAPORE: A Career in Science Education J. Wong

An overview of science education in Singapore, with details on the training opportunities available.

UK: From Physics to Biology—Ladders and Snakes E. Pain

A Research Councils workshop helps physics Ph.D.'s find the ladders that lead to career opportunities in the life sciences.

EUROPE: Recognition and Encouragement K. Urquhart

The European Life Science Organization's Early Career Award, presented for the second time last week in Nice, is designed to boost the careers of all young life scientists in Europe.

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Mating undermines the immune system and might shorten life.

Eyes on Epo R. J. Davenport

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signal transduction knowledge environment

Perspective: Multivesicular Bodies and Multivesicular Endosomes—The "Ins and Outs" of Endosomal Traffic P. D. Stahl and M. A. Barbieri

Receptor signaling complexes are directed to vesicular structures that can transport them for degradation or for release at the cell membrane.

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THIS WEEK IN Science

Most of the existing routes for forming

nanowires rely on some intrinsic trick to

coax the material to grow from atoms or

edited by Phil Szuromi

molecules in one direction. Tang et al. (p. 237) show that for

CdTe and CdSe, nanoparticles can spontaneously assemble into

wires when their protective coating is removed when they were

placed in water. Wires were grown with diameters of only sev-

An analysis of the remains of harbor seals (Phoca vitulina)

by Jensen et al. (p. 209) show that an outbreak of morbil-

livirus-caused distemper has begun, which could lead

to high mortalities like those of the devastating outbreak

eral nanometers but lengths approaching 1 micrometer.

Lining Up

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And in Brevia ...

in 1988.

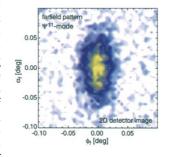
Old ENSOs Running Hot and Cold

The El Niño-Southern Oscillation, or ENSO, is a highly energetic tropical Pacific climate event. Two studies address how ENSO has varied, in some ways against expectations, between warm intervals and glacial periods in the recent past. During the last glacial period, a series of millennial-scale climate reversals, called Dansgaard/ Oeschger (D/O) events, punctuated the cold background state. If the D/O events were connected to ENSO, the conventional wisdom would predict less intense ENSO events during glacial periods. Stott et

al. (p. 222; see the Perspective by Lea) measured magnesiumcalcium ratios and oxygen isotopic compositions of planktonic foraminifera from a sediment core near eastern Indonesia. The salinity of surface sea water in the western tropical Pacific varied in step with D/O events, which is, in fact, consistent with more frequent and more intense ENSO episodes during the colder phases of the last glacial period. Models suggest that ENSO is sensitive to changes in solar insolation caused by variations of Earth's orbit. However, detailed paloeclimate records from the eastern equatorial Pacific Ocean, the region most affected by ENSO, have been lacking. Koutavas et al. (p. 226) examined welldated marine sedimentary records obtained near the Galápagos Islands of sea surface temperature (SST) variations during the last 30,000 years. An El Niño pattern dominated the cold periods, and a La Niña pattern was prevalent in the middle Holocene; SST in the area of the Galápagos Islands was only slightly more than 1°C cooler during the Last Glacial Maximum than today. These findings challenge existing notions for global modes of past and future climate variability.

Getting X-rays Spot-On

Coherent x-ray beams tend to be rather wide, which requires samples to be homogenous over an appreciable beam width. To overcome this constraint, microbeam profiling techniques based on pinholes are often used, but such techniques typically produce beam widths of almost a micrometer. Pfeiffer et al. (p. 230; see the Perspective by Metzger) now show that a periodic array of nanometer-wide wires of



polymer with a metal cladding can be used to produce a coherent source of x-rays just several tens of nanometers in diameter.

Clues for Memory Retrieval

The recall of memories often hinges on partial cues, such as an odor jogging a spatial memory. To study the cellular and molecular basis of this socalled pattern completion or partial cue recall, Nakazawa et al. (p. 211) have made inducible knock-out mice in which the N-methyl-D-aspartate subtype of glutamate receptors were missing in the recurrent synapses of the CA3 pyramidal neurons of the hippocampus. These animals could form and recall spatial memories normally, but could not recall a spatial memory in

response to partial cues. This impairment was reflected in deficient responses of hippocampal place cells, which code the locations of objects in the animal's environment. This deletion of a neurotransmitter receptor in one cell type and the behavioral effects implicates the CA3 recurrent synapses in the recall of memories from partial cues.

Faster Ice Flows

In most models of continental ice sheet dynamics, the effects of climate change propagate from the surface of the ice to its base on time scales of hundreds to thousands of years. Nonetheless, Zwally et al. (p. 218; see the cover) have observed short-term variations in the ice velocity near the equilibrium line of the Greenland Ice Sheet that are correlated to the intensity and timing of summertime surface meltwater production. Warmer summers over the interval from 1996 to 1999 led to greater accelerations and faster advancement of ice toward the edge. Ice-sheet basal sliding appears to be enhanced by rapid migration of surface meltwater to the ice-bedrock interface.

Putting Fat to the Fire

Leptin acts as a central regulator of body weight, but how this hormone exerts its multiple metabolic effects is not fully understood. In a microarray analysis of liver tissue from leptin-treated mice, Cohen et al. (p. 240) found that leptin strongly represses expression of the gene encoding stearoyl-CoA desaturase-1 (SCD-1), a microsomal enzyme required for biosynthesis of monounsaturated fats. When mice carrying an SCD-1 mutation were crossed with ob/ob (leptin-deficient) obese mice, the doublemutant progeny consumed a similar amount of food as parental ob/ob mice but showed a 40% reduction in fat mass and a 75% increase in energy expenditure. The authors attribute these effects to enhanced fatty acid oxidation in the liver and suggest that SCD-1 may be a useful target for obesity therapies.

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CONTINUED ON PAGE 155



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Making Plants Cross

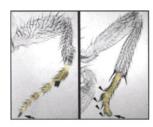
Self-incompatibility is a common condition in plant species that ensures out-breeding. It is thought that self-incompatibility is the ancestral condition and that mutation of genes in the S locus have created self-fertile species. Nasrallah et al. (p. 247) tested this idea by transforming the self-fertile species Arabidopsis thaliana with S locus genes from the self-incompatible species Arabidopsis lyrata. This transformation resulted in A. thaliana plants that were self-incompatible. Thus, A. thaliana has all but the S locus genes needed to produce the self-incompatibility response.

Grounded by Gene Network Interruptions

Polyphenism is the ability of a single genome to produce alternative morphologies in response to an environmental cue, such as winged versus wingless worker ant castes. It is generally thought that the loss of wing development in worker ants occurred in the common ancestor of extant ants. By using what is known about the genetic network for wing development in the fruit fly, Abouheif and Wray (p. 249; see the Perspective by Robinson) now examine wing polyphenism by dissecting the genetic and developmental control of winglessness among sterile ant castes. Gene expression in winged reproductive ants is similar to that seen in *Drosophila*. However, in soldiers and workers, there is more variation between castes and between species in expression patterns. The developmental networks that pattern wings have been interrupted in workers at different points in different lineages, and even produce different castes of the same species.

Kin over Klan

In cooperative animal societies, individuals help with the provisioning and upbringing of offspring who are not their own. Most studies of the evolution of cooperative breeding systems in birds have shown that male helpers commonly contribute more than females. For birds, two possible explanations are that males invest more because they are, on average, more closely related to their sibling's offspring than to their partner's, or that males tend to stay in their natal group while females disperse. Clutton-Brock et al. (p. 253) use a cooperative mammal, the meerkat, to test between these alternatives; in meerkats, it is the females who tend to stay in their natal group. The authors show that the sex differences in helping behavior derive from the direct benefits to survival and breeding success that helpers derive from raising young in their natal group, caused by the sex differences in dispersal.



The Legwork of Signaling

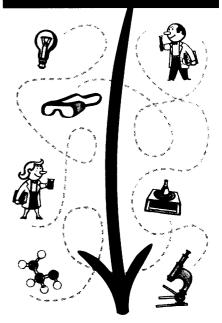
The fruit fly leg is a complex structure with 10 segments. Studies of Drosophila appendage development have identified several of the components that are needed to establish the dorsal-ventral (DV) and the proximal-distal (PD) axes of the leg. Signaling by wingless (wg) and decapentaplegic (dpp) operate in the developmental program for both of these axes. However, genetic studies by Galindo et al. (p.

256) show that wg and dpp are not sufficient to explain all of the subsequent patterning events in the PD axis. The tarsus segment, an evolutionarily ancient part of the insect leg, is defined by a dpp/wg-independent phase of distalless and dachshund activity combined with a distal gradient of epidermal growth factor receptor-Ras signaling.

Last Gasps for Cells

Without oxygen, cells in the brain and the heart die, but they do so by an ill-defined mechanism distinct from the well-studied apoptosis (programmed cell death). In this so-called necrotic cell death, DNA damage activates the enzyme poly(ADP-ribose) polymerase-1 (PARP-1). Yu et al. (p. 259; see the Perspective by Chiarugi and Moskowitz) show that in an unexpected parallel to apoptosis, PARP-1 causes translocation of AIF (apoptosis inducing factor) to the nucleus, where it launches the cell on its death spiral by causing chromatin fragmentation. In true apoptosis, the key step is AIF translocation to the mitochondria, where it initiates the release of cytochrome c that, in turn, activates destructive proteases called caspases. Similar AIF action in mitochondria also occurs in necrosis, but it is a later, nonessential step.

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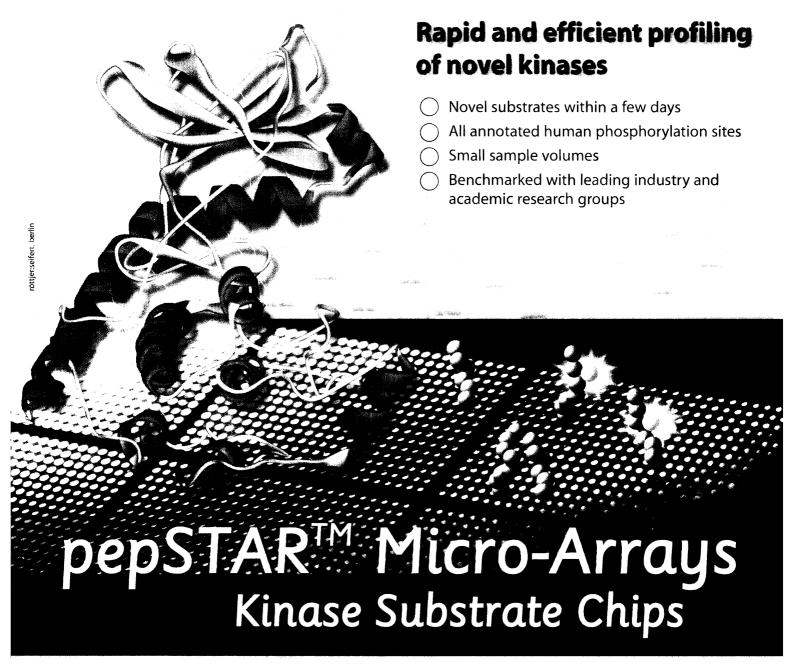
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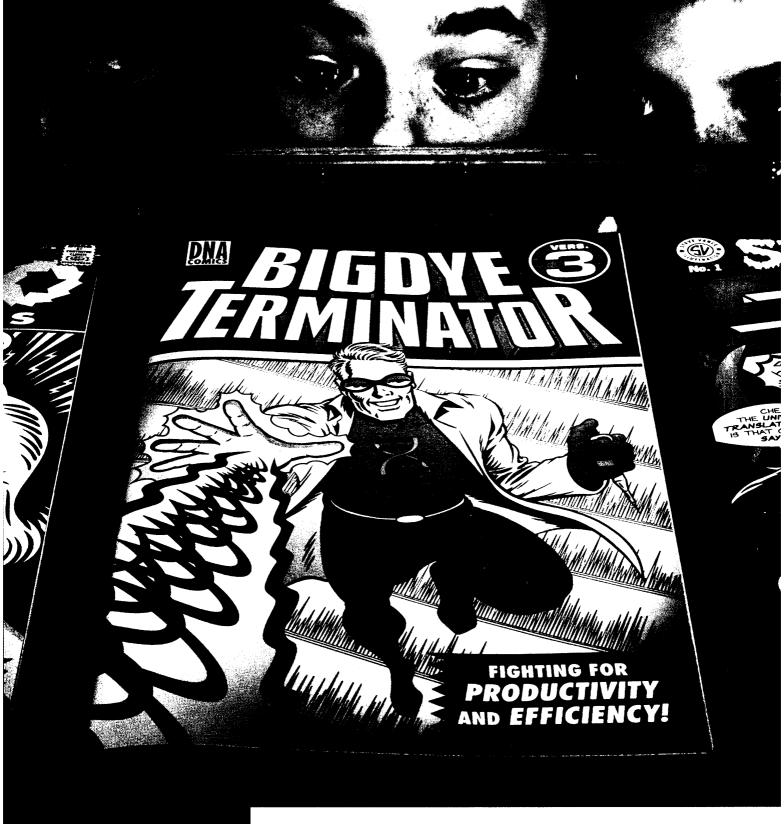


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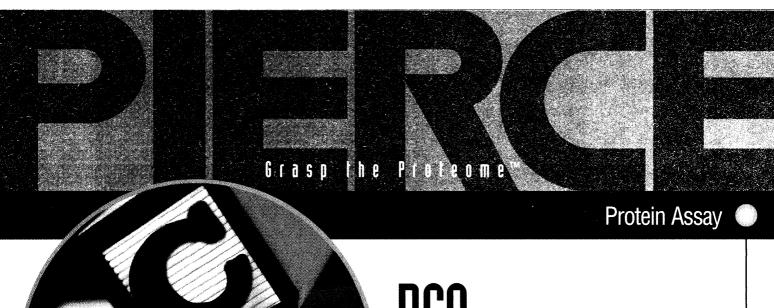
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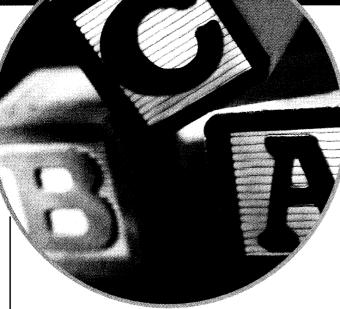




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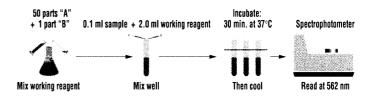
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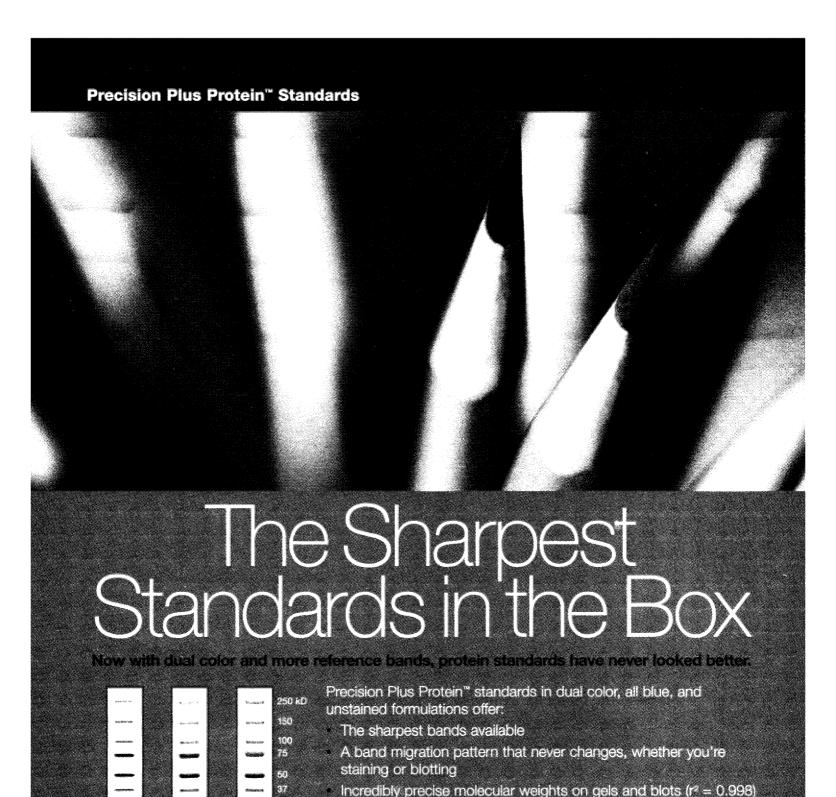




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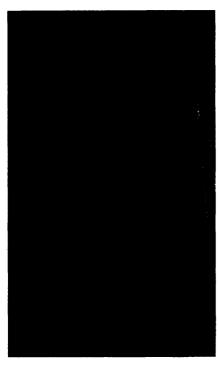
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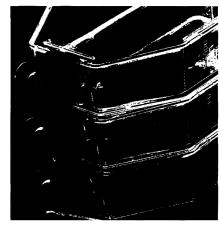




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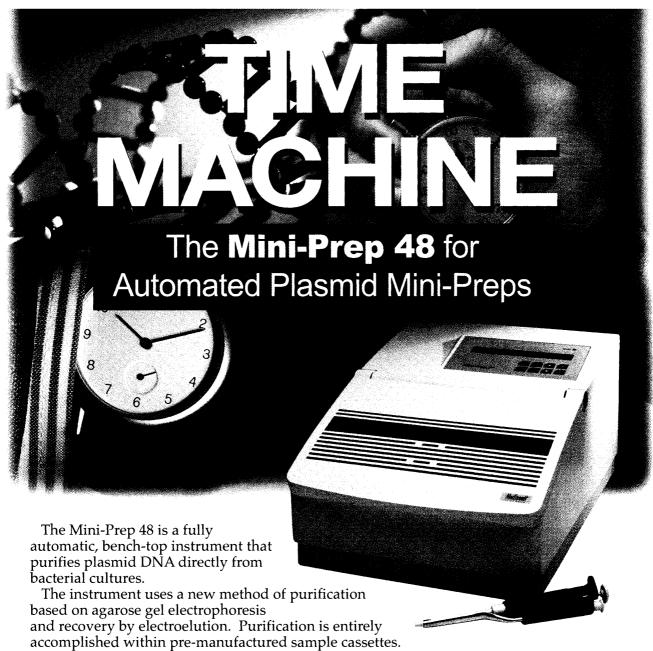
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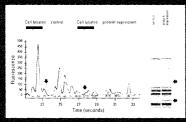
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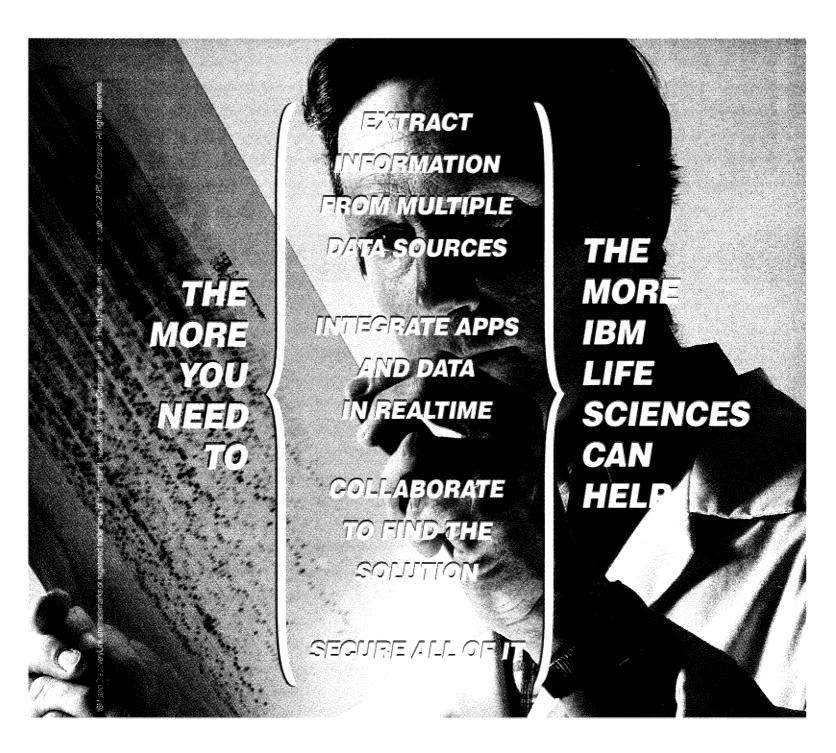
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We've merged to cure cancer faster

Announcement

The Cancer Research Campaign and Imperial Cancer Research Fund have merged to create one organisation: Cancer Research UK.

The new organisation has been established to protect and promote the health of the public by research into the nature, causes, diagnosis, prevention, treatment and cure of all forms of cancer, and combines the strengths of the former organisations whose areas of activity will continue to be supported.

Cancer Research UK will fund a wide range of activities within the UK, including basic research, epidemiological studies, education and psychosocial research, clinical research and trials and translational research. A range of funding mechanisms will be used to help link these activities, and the organisation will take a particular interest in the training and development of clinical and laboratory researchers.

The new organisation will promote collaboration with research partners around the world and will work closely with UK national bodies, such as the recently established National Cancer Research Institute, to help meet the objectives of the organisation.



For information on research groups, research funding and research vacancies, please consult the science and research section of the website:

http://science.cancerresearchuk.org

Dr Paul NurseInterim Chief Executive,
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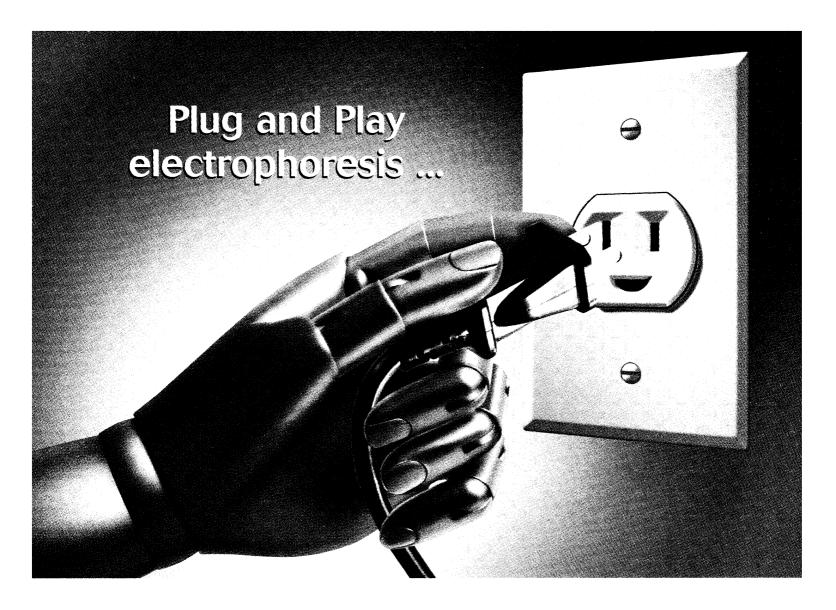
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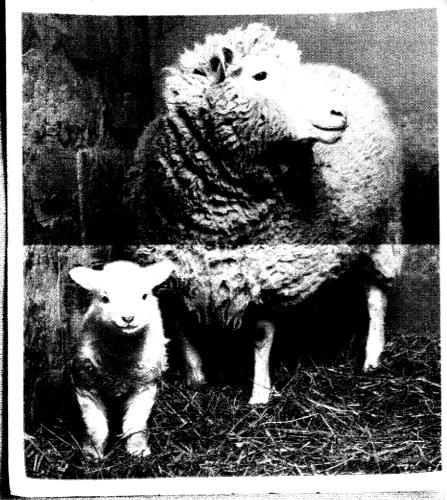
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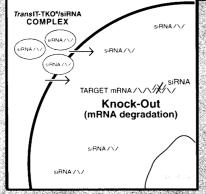
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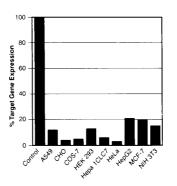








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