14 June 2002

Science

Vol. 296 No. 5575
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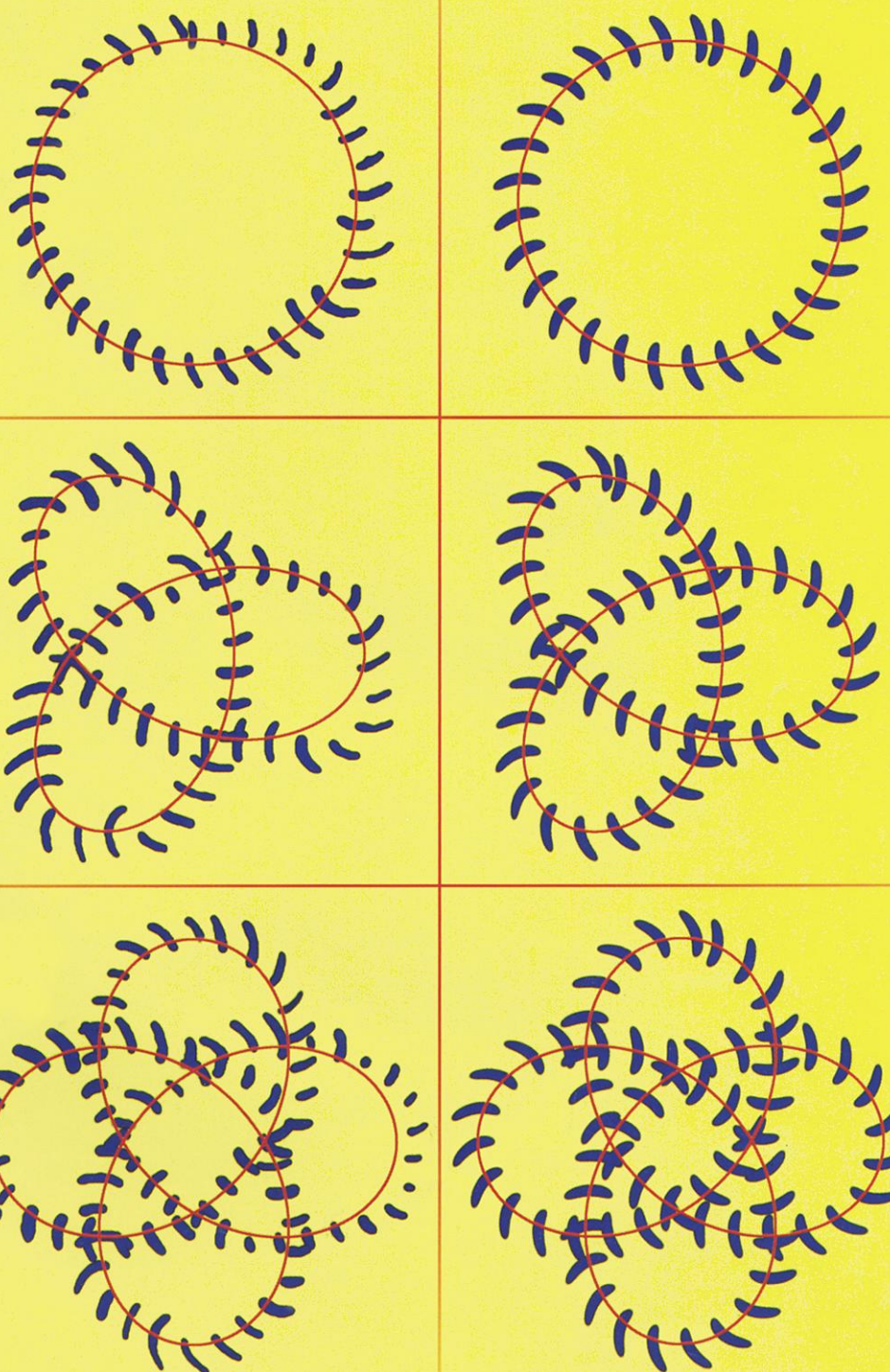

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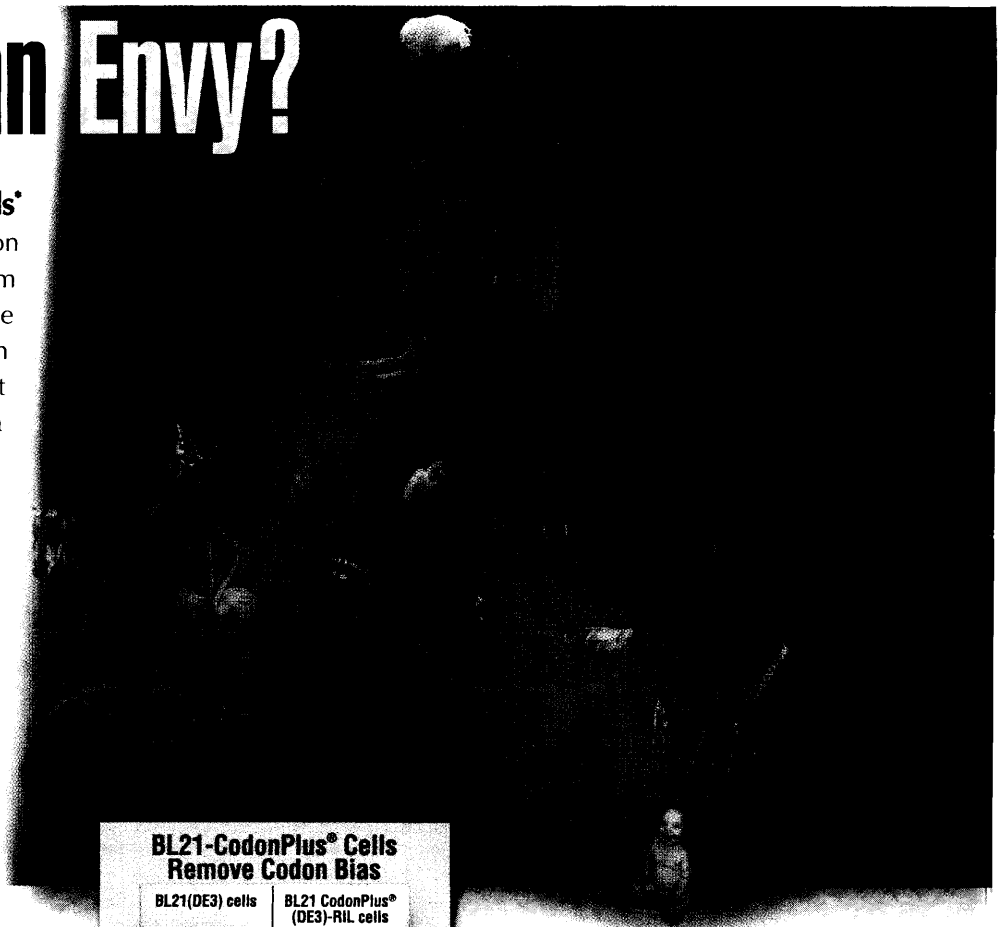

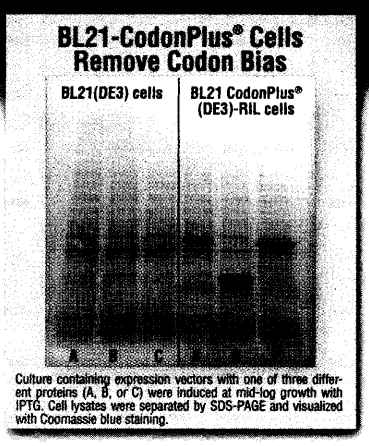

Culture containing expression vectors with one of three different proteins (A, B, or C) were induced at mid-log growth with IPTG. Cell lysates were separated by SDS-PAGE and visualized with Coomassie blue staining.

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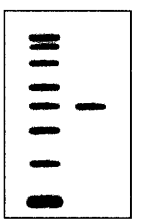

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NEWS

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Spotlight on biodefense lab

1973
What is willful intent?

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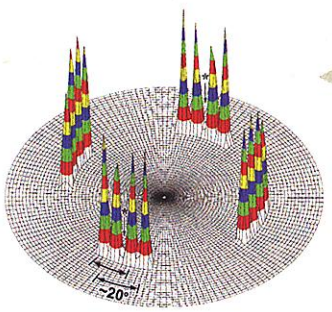
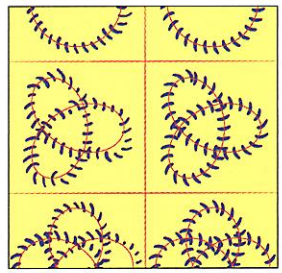
RESEARCH ARTICLE



2006
Optimally grown ferroelectric films

REPORTS



COVER 2009

Particle-like waves in an excitable medium move according to imposed excitability gradients. Normally unstable, these waves can be stabilized by feedback, with their motion controlled to yield a desired trajectory (red curves). Left and right panels show superpositions of snapshots of experimental and simulated wave behavior, respectively. [Image: T. Sakurai *et al.*]

2023
Hybrid corals boost diversity

New on *Science* Express Wnt6 as an inducer of neural crest

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Ectodermal Wnt Function as a Neural Crest Inducer
M. I. García-Castro, C. Marcelle, M. Bronner-Fraser

A Wnt signal induces neural crest tissue in the developing chick embryo.

Biallelic Inactivation of *BRCA2* in Fanconi Anemia
N. G. Howlett *et al.*

PERSPECTIVE: **D-Day for BRCA2** E. Witt and A. Ashworth

A small subset of patients with Fanconi Anemia have biallelic mutations in the breast cancer susceptibility gene *BRCA2*, which suggests a link between two key pathways in the cellular response to DNA damage.

Regulation of Hypoxic Death in *C. elegans* by the Insulin/IGF Receptor Homolog DAF-2 B. A. Scott, M. S. Avidan, C. M. Crowder

Insulin signaling functions in oxygen utilization in the nematode.

TECHNICAL COMMENTS

Global Allocation Rules for Patterns of Biomass Partitioning

Enquist and Niklas (Reports, 22 February 2002, p. 1517) quantified the allocation of plant biomass among stems, leaves, and roots for a broad range of seed plants inhabiting diverse ecosystems, and they proposed a general allometric model that predicts how these plant organs should scale in relation to one another and "helps identify the biophysical constraints acting on allocation tradeoffs in plant biology." Sack *et al.* comment that the model "falls short in a number of important respects" when applied to plants during early ontogeny, "a crucial period for plant establishment," during which biomass allocation and scaling follow rules different from those for mature plants. In response, Enquist and Niklas acknowledge that "allometric relationships for early ontogeny may be very different," but maintain that their model is robust and accurately predicts scaling relationships among leaf, stem, and root biomass for multiple plant species across several orders of magnitude.

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/296/5575/1923a

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US: The Reluctant Geneticist S. Smith

A tuba player becoming a statistical geneticist? What are the odds?

SINGAPORE: A Quest for Innovative Science A. Bongso

The founding scientist at Embryonic Stem Cell International shares the story of his scientific endeavors.

UK: Combining the Alternatives M. Gross

Cathy Prescott has done it all: academia, industry, consulting, and now venture capitalism.

GERMANY: Voicing Interest and Expectations
E. von Ruschkowski

What might Germany's young scientists expect from Europe's recently approved Framework Programme 6?

CANADA: Project Management, Part 2—Gaining Experience
M. Kashyap

Formal training is widely available, but it helps to gain informal experience, too.

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Murder on the Parkinson's Express I. Chen

A protein villain might kill brain cells by taking a neuron guardian hostage.

Ready, Set, Switch M. Beckman

Young neurons stop building transmitters and start building receivers.

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Review: Homer as Both a Scaffold and Transduction Molecule
L. Fagni, P. F. Worley, F. Ango

How the Homer proteins help localize glutamate receptors to synapses and help them signal once they get there.

Protocol: Analysis of Glutamate Receptor Surface Expression in Acute Hippocampal Slices D. R. Grosshans, D. A. Clayton, S. J. Coultrap, M. D. Browning

Measuring pools of receptors in preparations from adult brains.

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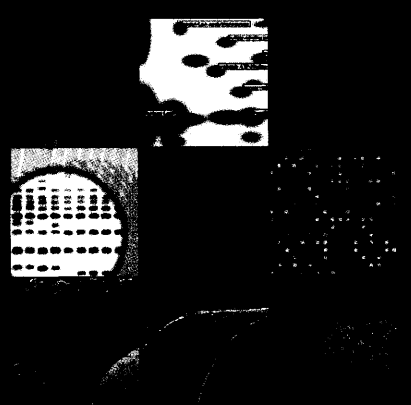

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THIS WEEK IN Science

edited by Phil Szuromi

Elements of Magnetic Logic

A magnetic-based switching architecture has been proposed to operate at much lower power consumption than conventional electronics-based circuitry. However, viable demonstrations of dynamical logical elements that can couple to similar magnetic elements have so far been lacking. Combining the motion of a magnetic domain wall in a rotating magnetic field and micropatterned magnetic wires, Allwood *et al.* (p. 2003; see the news story by Cho) demonstrate a logical NOT-gate, or inverter, by patterning thin layers of ferromagnetic permalloy. As the domain wall moved through the junction, the magnetization in the wires on either side of the junction was reversed. Scalability was also demonstrated by coupling several of these inverter junctions together to form a shift register.

Excited But Orderly

Many physical and biological systems contain an excitable medium that can support wave propagation, and several approaches have been used to control their direction. Sakurai *et al.* (p. 2009; see the cover) now demonstrate a very high level of wave front control in the chemical waves that form in the Belousov-Zhabotinsky reaction. By using feedback methods, they can use light to create gradients in the concentration of photosensitive catalysts in a thin-film gel realization of this reaction. The wave fronts can then be steered to form complex patterns.

Getting Oriented

Layered ferroelectric thin films have potential applications as dynamic random access memory (DRAM). One material that has been studied for this purpose is a La-substituted $Bi_4Ti_3O_{12}$, known as BLT. Although BLT will readily grow onto substrates, it does so with an orientation that causes the remnant polarizability to lie in the plane of the substrate. However, for DRAM applications, the remnant polarizability needs to be perpendicular to the substrate. Lee *et al.* (p. 2006; see the Perspective by Ramesh and Schlom) demonstrate the growth of BLT crystals with the preferred (100) orientation, almost to the exclusion of all other orientations.

Large Slip in the Tibetan Plateau

The collision of India into Eurasia created several parallel east-to-west trending strike-slip faults on the Tibetan plateau that accommodate some of the head-on, continent-to-continent collisions. Although there have been many large-magnitude earthquakes on these faults, geographic isolation has limited both seismic monitoring and field studies. Lin *et al.* (p. 2015) measured a 400-kilometer-long rupture zone that had as much as 16 meters of left-lateral strike-slip motion caused by the November 2001 Central Kunlun earthquake, which had a surface wave magnitude of 8.1. This study documents the importance of these strike-slip faults for accommodating some of the collision by eastward extrusion of tectonic blocks and provides vital ground truth to supplement remote geophysical modeling.

1999 The Timing Is Crucial

Plastic modification of synaptic connections that depends on the precise timing of pre- and postsynaptic action potentials has been described in several in vitro preparations. However, it is unclear if the same phenomenon can also be observed in vivo. Fu *et al.* (p. 1999) describe timing-dependent plasticity of synaptic connectivity as well as of receptive field topography in the adult cat visual cortex. They also provide psychophysical evidence that comparable effects occur in the human visual system.

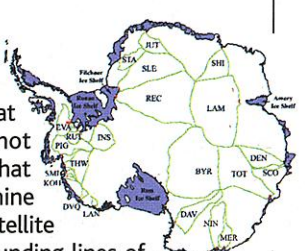
And in Brevia ...

High-surface-energy, mesoporous oxide templates have been used by Steinhart *et al.* (p. 1997) to synthesize nanotubes from many polymeric materials with uniform size and length distributions.

Coral Fates Corralled

The determination of species boundaries has been a continuous source of controversy in coral systematics. Using molecular techniques, Vollmer and Palumbi (p. 2023; see the news story by Pennisi) show that some Caribbean coral species generate morphologically distinct first-generation sterile hybrids that have little evolutionary potential but can asexually propagate effectively immortal clones. Many of these clones are sufficiently distinct to have been given their own species names, despite being evolutionary dead-ends. These results not only pave the way for more rational systematics of corals, but also have implications for evolutionary theory in general.

More Rapid Retreat



Continental ice sheets that extend into the sea, like those in Antarctica, begin to float at a location called the grounding line. Rignot and Jacobs (p. 2020) surveyed 22 glaciers that flow off the Antarctic Ice Sheet and examine their interactions with the ocean. Their satellite interferometry observations show that grounding lines often lie tens of kilometers landward of their previously estimated locations. Rapid basal melting occurs near the grounding lines of these ice shelves, and floating glacier tongues make the ice sheets vulnerable to ongoing ocean warming. The 0.2°C increase in ocean temperature that has been measured near the edges of Antarctic ice sheets during recent decades is sufficient to have increased rates of basal melting by 2 meters per year and may explain the rapid thinning observed for ice shelves in some parts of Antarctica.

Microbial Forensics

In the wake of the recent bioterrorism incidents involving the contamination of the mail with *Bacillus anthracis*, there has been renewed interest in establishing relationships among isolates of organisms with highly conserved genomes. Read *et al.* (p. 2028; see the Perspective by Cummings and Relman and the 10 May

CREDIT: RIGNOT AND JACOBS

Published online in *Science* Express

CONTINUED ON PAGE 1927

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.

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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 Nurse
Interim Chief Executive,
Cancer Research UK

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news story by Enserink) have used comparative whole-genome sequencing and polymorphism analysis to classify nine closely related isolates of *B. anthracis* that were not distinguishable with existing genotype data.

AIDing and Abetting Mutation

The proposed RNA editing enzyme, activation-induced cytidine deaminase (AID), plays a critical role in increasing antigen affinity both by switching gene segments that encode different classes of antibody and in the somatic hypermutation (SHM) of variable coding segments of the same genes. Is AID activity sufficient for generating SHM? Yoshikawa *et al.* (p. 2033) show that AID can induce mutation in an artificial reporter gene cotransfected in a non–B cell line. That AID can act autonomously of B cell–specific factors suggests further clues about its mode of function in regulating antibody mutation in B cells.

One Tyrosine Short

LAT is an intracellular adaptor protein that becomes phosphorylated on multiple tyrosine residues after T cell receptor activation. Aguado *et al.* (p. 2036) and Sommers *et al.* (p. 2040) report that a single tyrosine residue in LAT, which couples to the downstream signaling molecule phospholipase C–γ1, plays a crucial role in maintaining T cell homeostasis, regulating both early and late T cell development and differentiation. Replacement of endogenous LAT in mice with a form in which Tyr^{136} was mutated to Phe caused a partial block in early T cell development. However, over time, the mice developed a fatal lymphoproliferative disorder featuring an overabundance of a particular T_H2-type cell. One consequence of this paradoxical phenotype was an autoimmune response. The analyses suggest that while a single LAT residue may have a positive function during early T cell development, it may negatively regulate signaling pathways later on during T cell selection and differentiation of T_H2 effector cells.

Human Motor Skills and the Cerebellum

The role of the cerebellum in motor learning and performance is still controversial. Seidler *et al.* (p. 2043; see the Perspective by Hazeltine and Ivry) used functional magnetic resonance imaging and a sophisticated set of behavioral tasks and manipulations to investigate the involvement of the cerebellum in motor learning. They found that the cerebellum does not play a role in motor sequence learning. It is, however, heavily involved in the expression of information about motor sequences and thus in the modification of performance.

CREDIT: BAXTER-BURRELL *ET AL.*

Plants Coping with Stress

Plants use hydrogen peroxide (H_2O_2) as a second messenger in their responses to hormones, pathogen infection, and abiotic stresses. Baxter-Burrell *et al.* (p. 2026) have elucidated a Rop guanosine triphosphatase rheostat, RopGAP4, that fine-tunes the output of H_2O_2 in *Arabidopsis* in response to oxygen deprivation, which happens to plants when their roots are transiently flooded. The H_2O_2 signal in this case induces expression of alcohol dehydrogenase, which enables tolerance to the stressor, and RopGAP4, which represses further H_2O_2 production. As transient flooding, as well as other abiotic stressors, diminishes yield in many crops, manipulation of this Rop rheostat may be useful in developing crops better able to withstand these stressors.

Detecting a Balmy Day

Researchers have identified the receptor that senses cold temperatures (also triggered by menthol, accounting for menthol's cooling sensation) and hot temperatures (also activated by capsaicin, the "heat" in chili peppers). Both are members of a family of ion channels called transient receptor potential (TRP) channels. Peier *et al.* (p. 2046) now identify another family member, TRPV3, as a "warm" receptor. This cation-selective, outwardly rectifying channel is activated by temperatures between 33° and 42°C and is expressed in the keratinocytes and hair follicles of skin but not in neurons. Although it is not yet known how warm skin cells convey their response to temperature to the nervous system, the identification of this receptor accounts for our ability to discern pleasantly warm temperatures.

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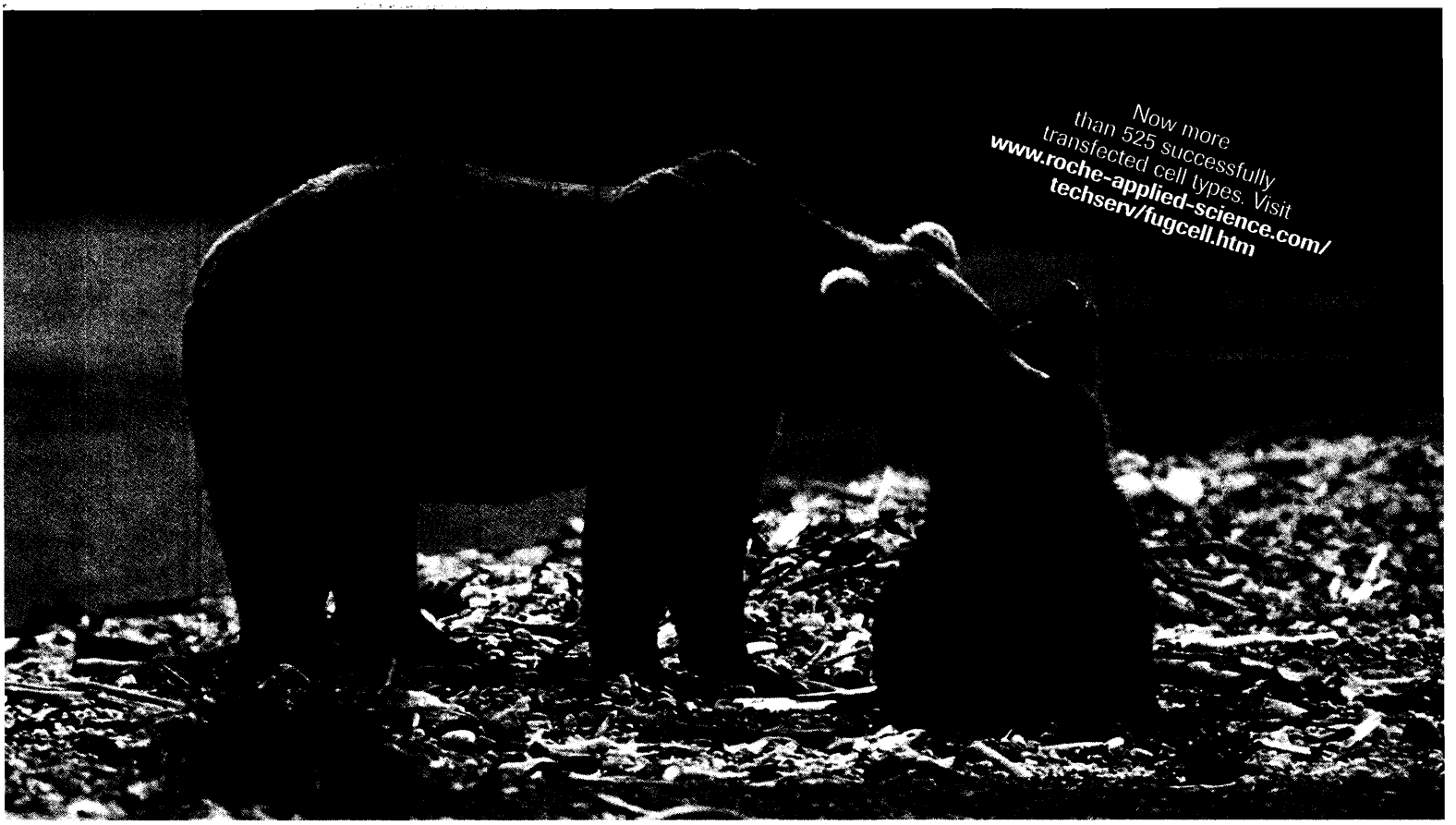

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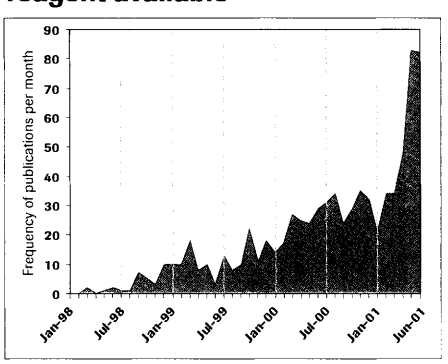

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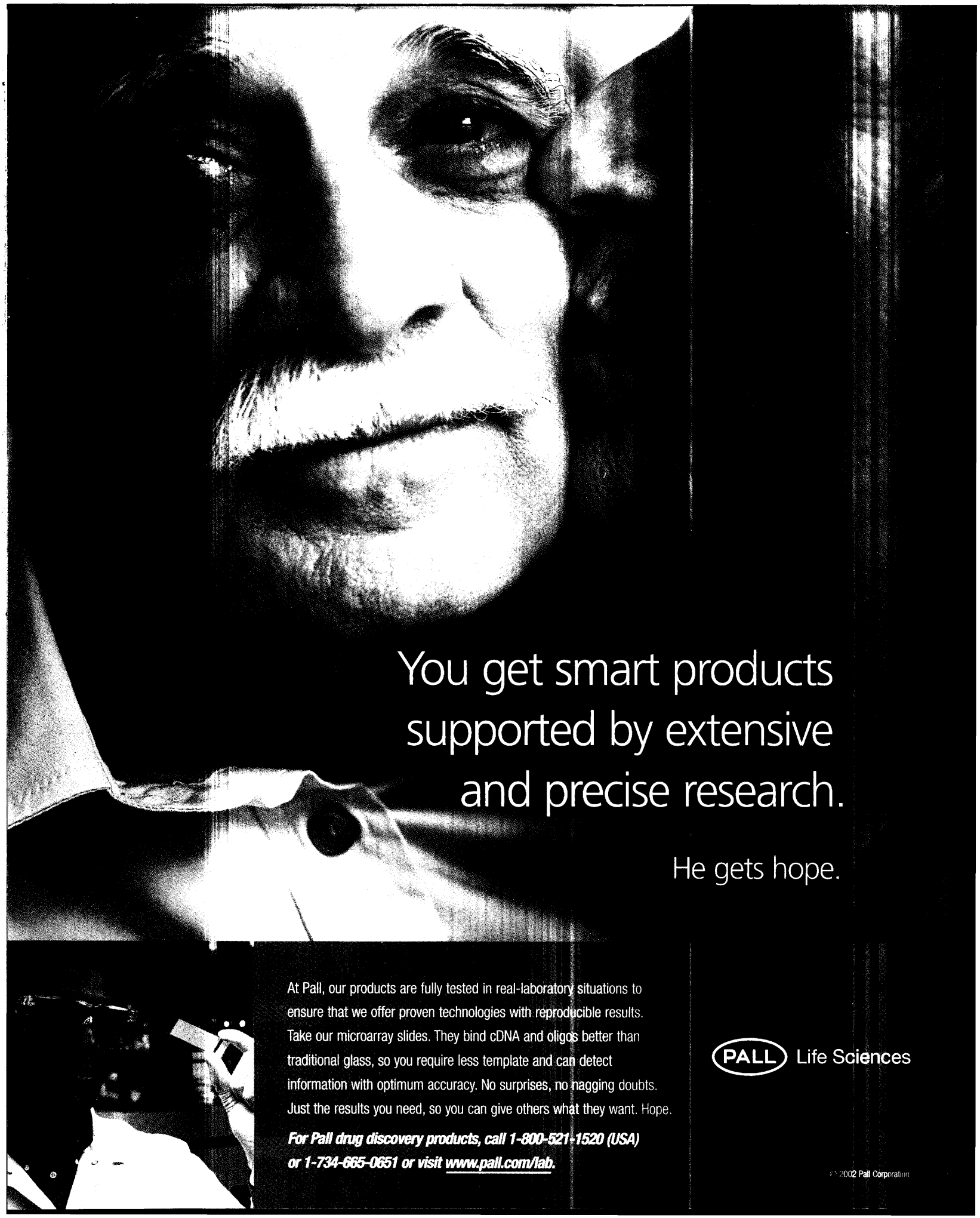
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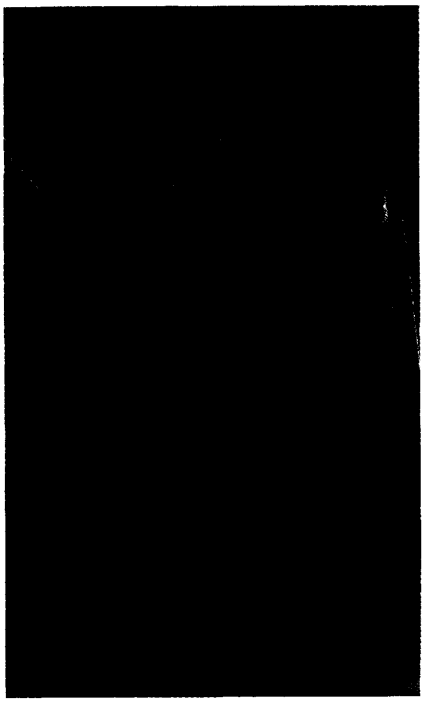

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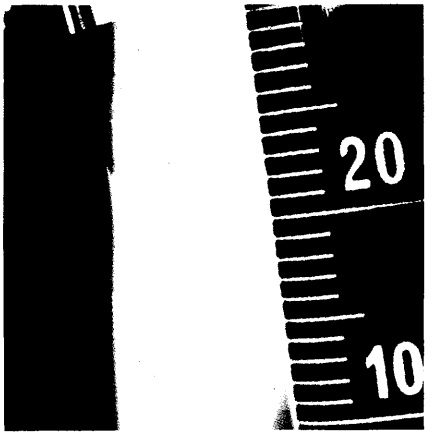

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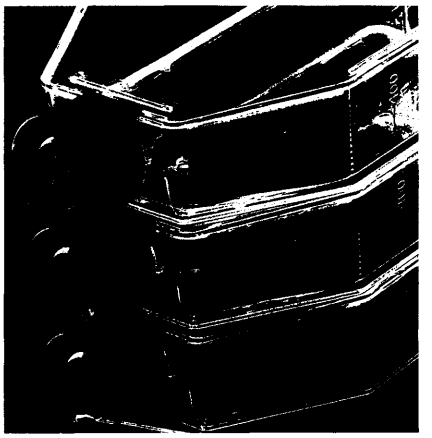

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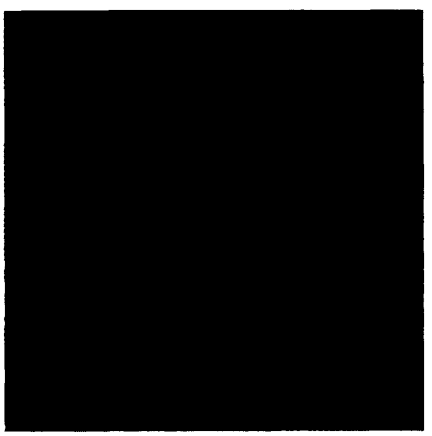

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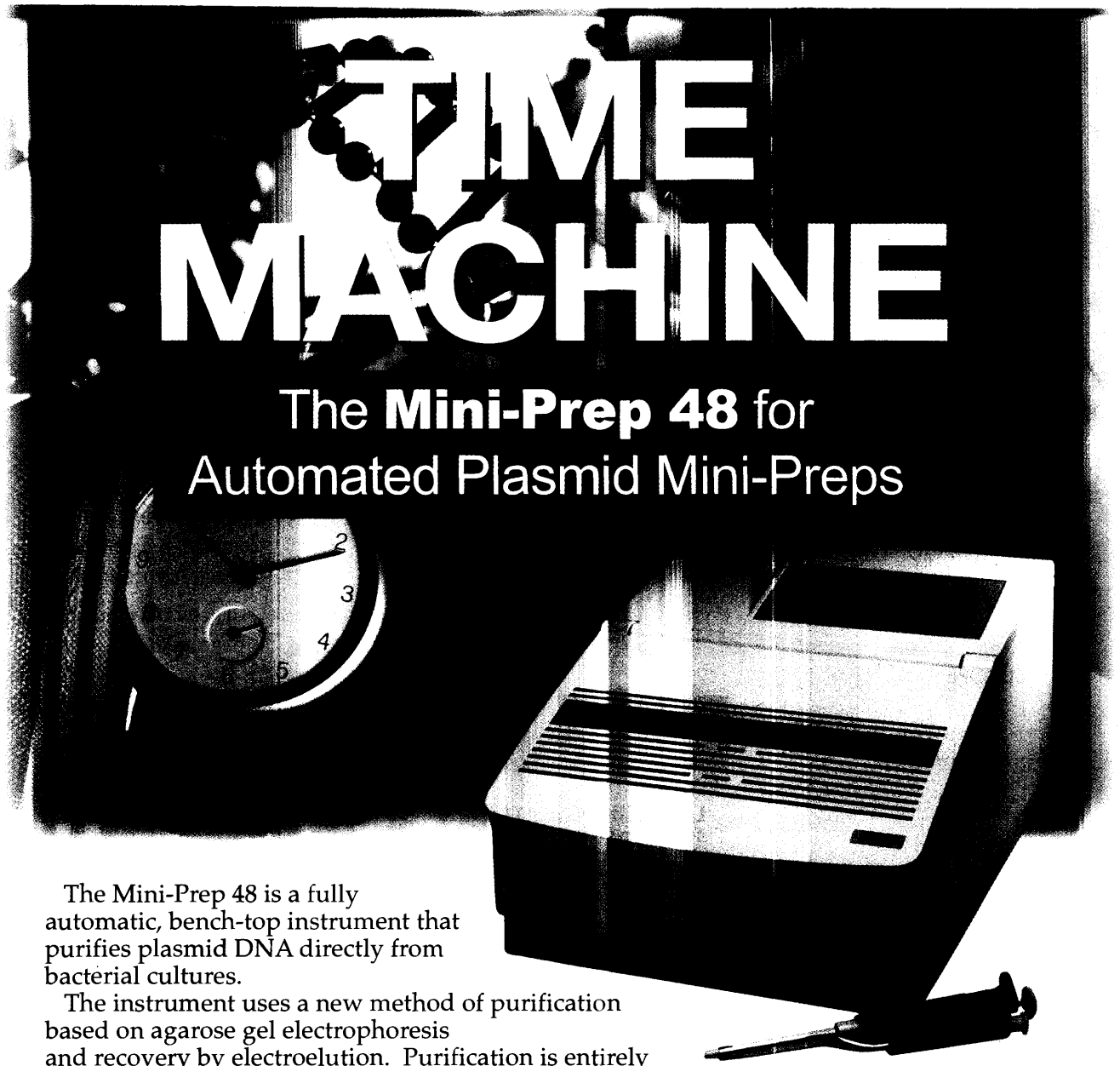

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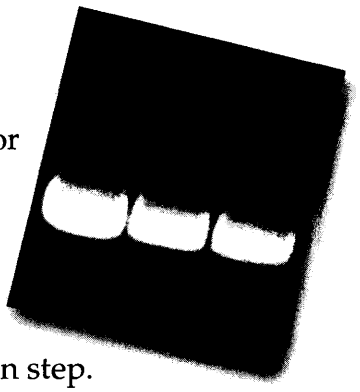

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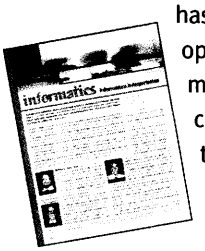

Look for the report on page 2058.

Product News:

LAB TECHNOLOGY TRENDS

SPECIAL AD SECTION IN THE 28 JUNE ISSUE

Advances in Immunology Research

This section will address recent advances in technologies and products used in immunology research. Key products used to study the immunological response will be covered.

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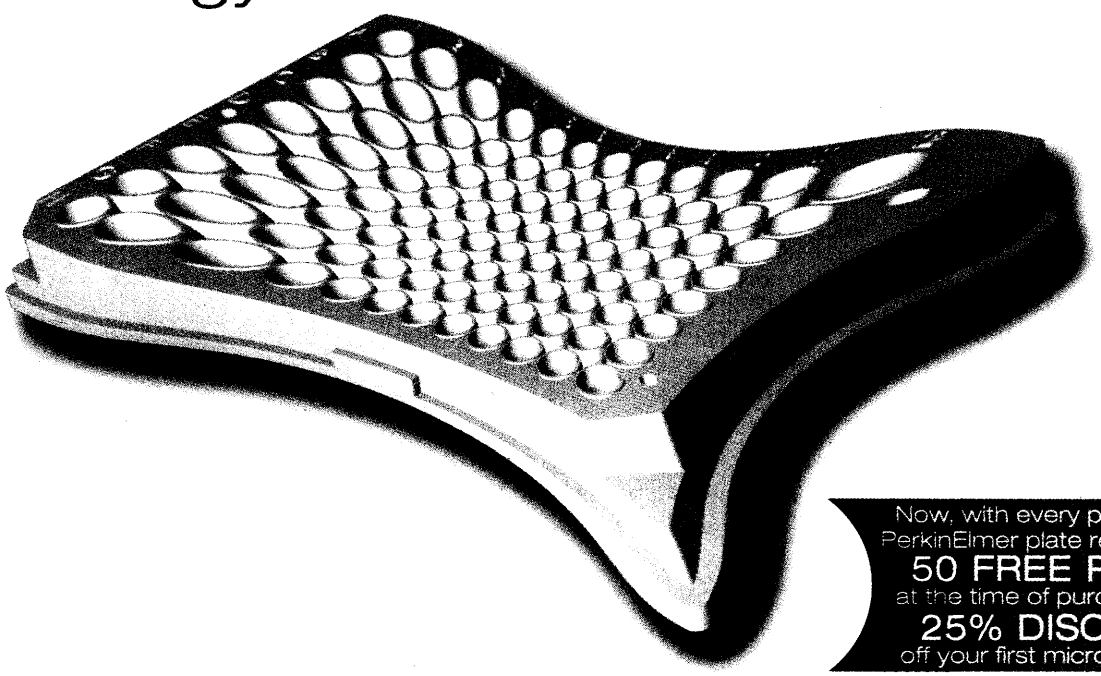

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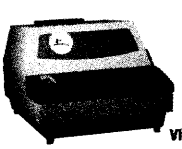

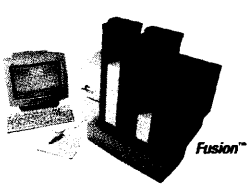

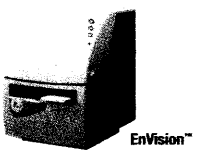

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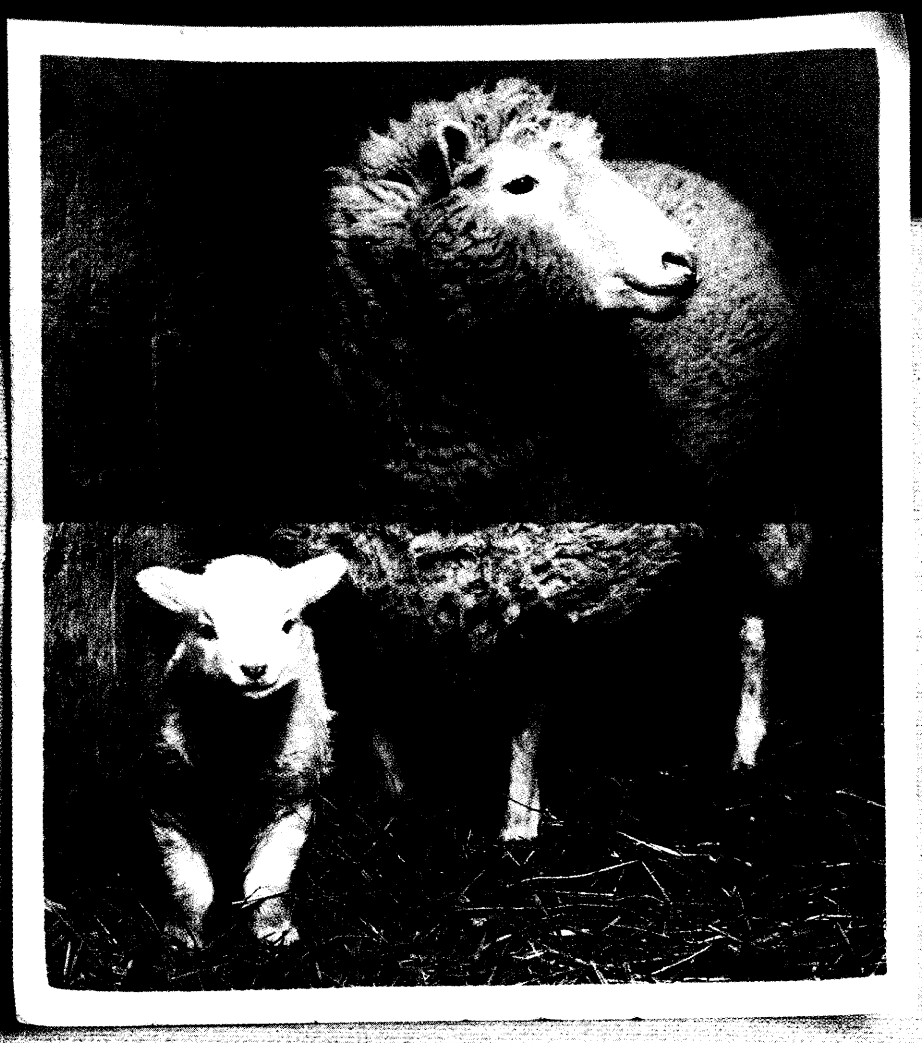

Dolly was the first mammal cloned from an adult cell, refuting the popular belief that cells from adult mammals could not be used to regenerate a whole animal.

Since Dolly the Sheep, scientists have used the techniques pioneered in Scotland to clone cattle, sheep, mice, goats and pigs.

She came to life in July 1996 near Edinburgh with a lot of help from Ian Wilmut and his colleagues at the Roslin Institute and PPL Therapeutics.

Dolly the Sheep was born in Scotland, but her fame is international. And she's just one example of Scotland's thriving and inventive biotech industry.

Scotland currently produces over 30 percent of the United Kingdom's postgraduates in genetics. It's the reason we have one of the largest biotechnology communities, as well as the largest concentration of pharmaceutical support organisations, in Europe. A list that includes companies such as Quintiles, BioReliance, Q-One Biotech and Inveresk Research.

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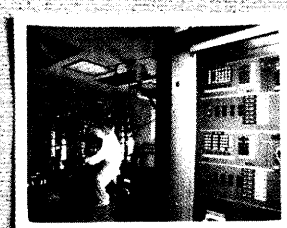

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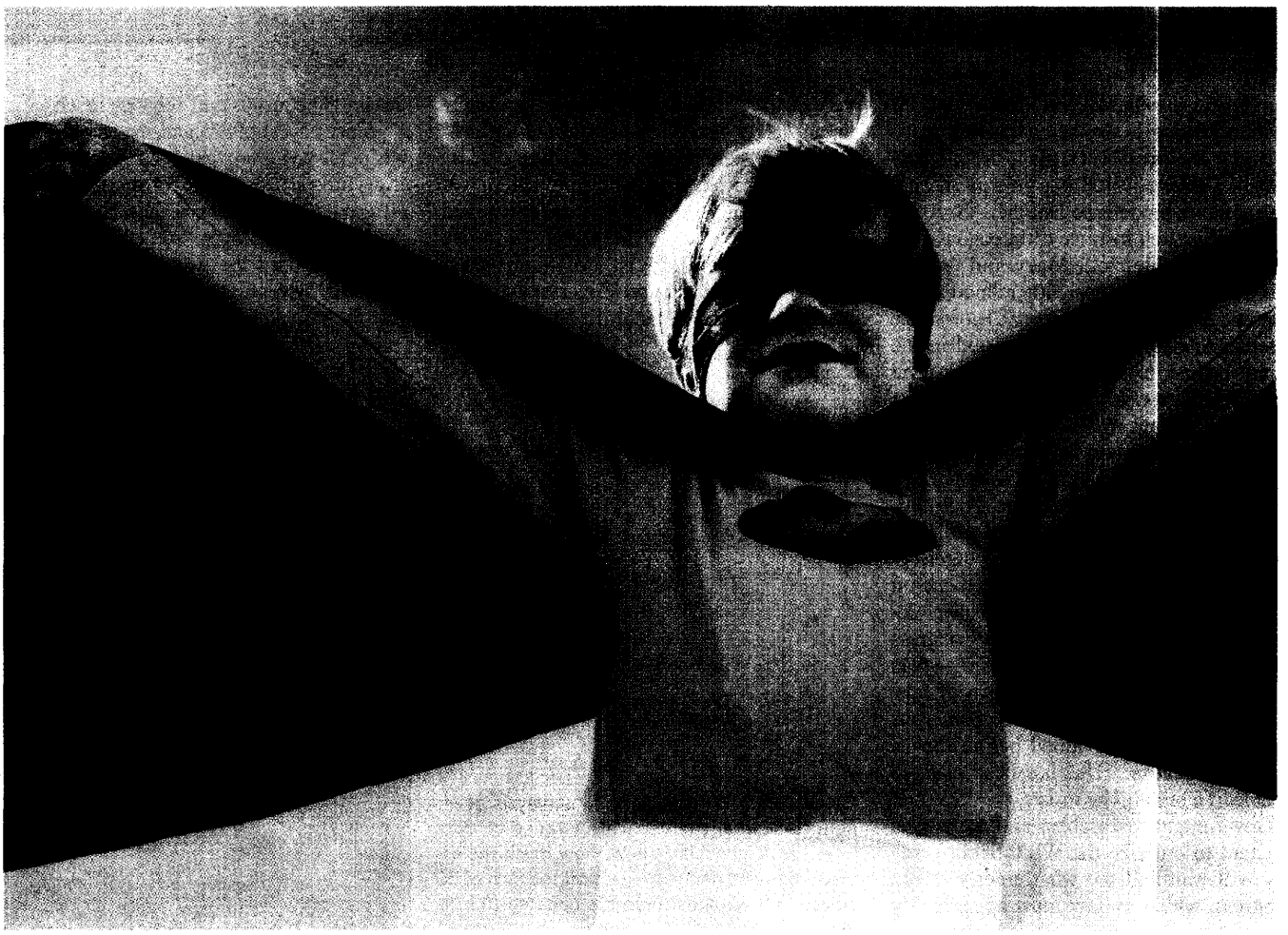

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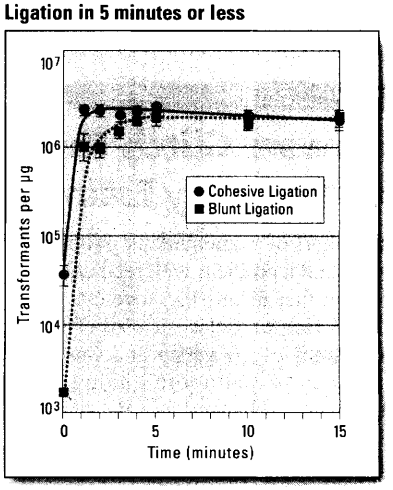

► *Using the Quick Ligation Kit protocol, blunt and cohesive inserts were ligated into LITMUS 28 vector cut with either EcoR V (blunt) or Hind III (cohesive). Ligation products were transformed into chemically competent E. coli DH-5α cells.*

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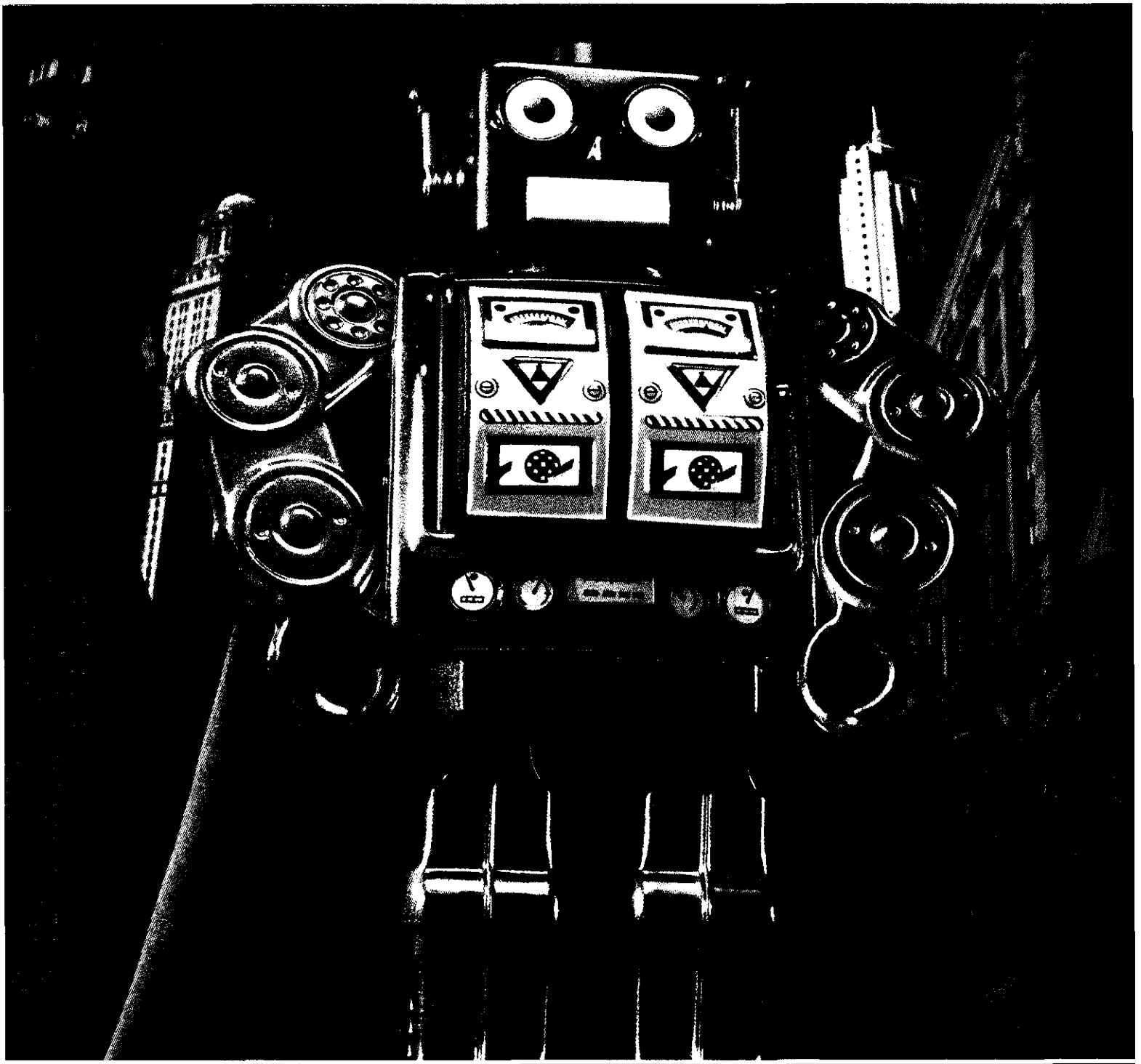
We utilize biotechnology in a responsible way to develop innovative pharmaceuticals.

So that discovery can lead to healthier lives.

Aventis

Life is a source of constant mystery. It's true for everyone, especially scientists trying to discover the nature of life itself. The decoding of the human genome will open up a completely new understanding of the actual processes of life and the causes of many illnesses. Aventis, a world-leading research-oriented pharmaceutical company will utilize these new findings for innovative pharmaceuticals, preventive vaccines and therapeutic proteins. After all, it is our long term objective not only to treat illnesses but to prevent them. So that people can lead healthier lives.



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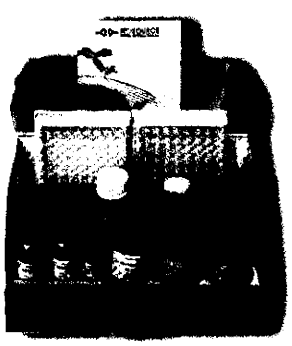

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New! Cytokine ELISA kits: **Rt IL-18 • Ms/Rt TGF-β • Hu DR-5 • Hu Trail**

Cytokine ELISA kits

DR-5	IL-2R	IL-6R	IL-13	G-CSF	LIF	TNFRII
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IL-1RA	IL-4	IL-8	IL-16	IFN-α	TGF-β	
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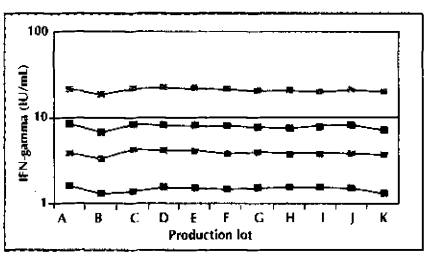
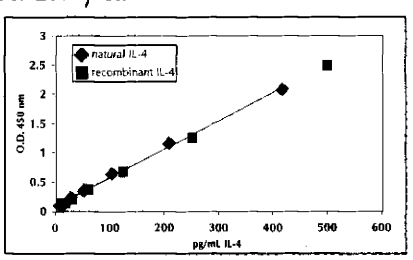


Lot-to-lot Reproducibility: Human IFN-γ ELISA (Cat. #KHC4021).



Parallelism: Monkey IL-4 ELISA (Cat. #KPC0041).

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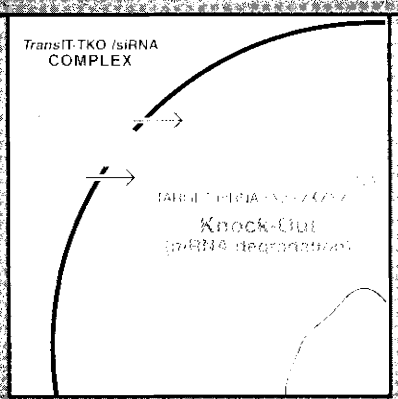
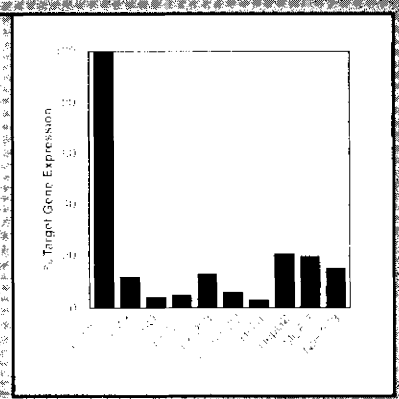
Mirus specializes in developing and manufacturing state-of-the-art nucleic acid transfer and labeling technologies for use in biomedical research and drug discovery.



TransIT-TKO® delivers siRNA to the cytoplasm where it binds to the target mRNA. The target mRNA is degraded resulting in inhibition of mRNA translation.



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* For the purpose of this prize, molecular biology is defined as "that part of biology which attempts to interpret biological events in terms of the physico-chemical properties of molecules in a cell" (McGraw-Hill Dictionary of Scientific and Technical Terms, 4th Edition).

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