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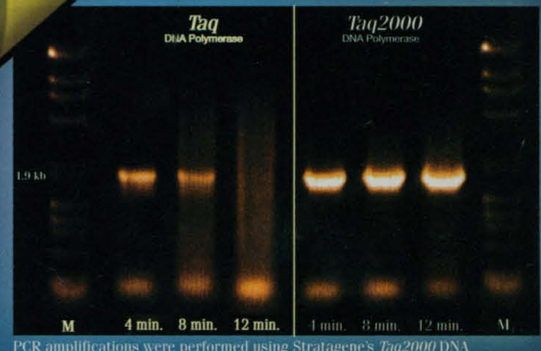

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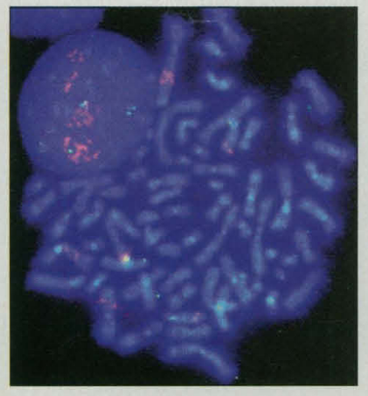
890

God in the laboratory



965

Coactivator associated with breast and ovarian cancer

NEWS & COMMENT

RESEARCH NEWS

PERSPECTIVES

RESEARCH ARTICLES

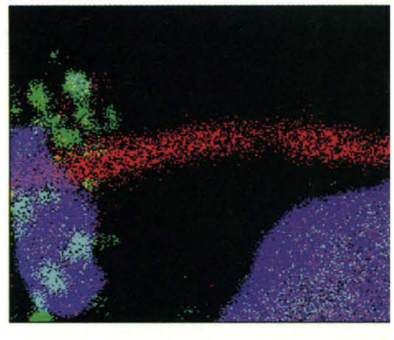
DEPARTMENTS

■ **SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005.** Periodicals Mail postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Domestic individual membership and subscription (51 issues): $105 ($58 allocated to subscription). Domestic institutional subscription (51 issues): $260. Foreign postage extra: Mexico, Caribbean (surface mail) $55; other countries (air assist delivery) $90. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. IPM #1069624. **Printed in the U.S.A.**

COVER

Lymphocyte migrating through a 3-micrometer pore of a filter (green) and making close contact with a monolayer of cultured human intestinal cells (blue). Culturing of these intestinal epithelial cells with Peyer's patch lymphocytes led to the differentiation of the cell monolayer into M cells, specialized cells that transport particles and bacteria from the interior of the gut to the lymphoid tissue. See page 949 and the related Perspective on page 910. [Image: G. Fischer and L. Lafitte]

REPORTS



933

Trapped in a tiny tube

◩ Indicates accompanying feature

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Expression cloning without cells
www.sciencemag.org/feature/data/techsight/tech_intro.shl

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- **b** The act of duplicating geographical topographies.
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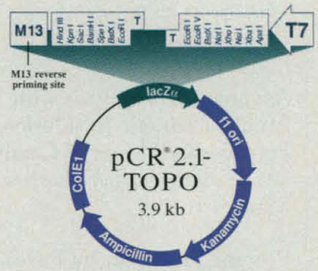

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THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Ocean plumbing

A key control on Earth's climate is the pattern of flow and mixing in the oceans; understanding how mixing varied in the past is critical for interpreting causes of past climate change. Christensen *et al.* (p. 913; see the Perspective by Alberéde, p. 908) present detailed records of lead isotopes in the ocean extending back to about 50 million years ago obtained from two iron-manganese crusts in the Pacific Ocean. Changes in the lead isotope values seem to correspond to broad changes in the oxygen isotope composition of foraminifera (which reflect climate changes) and may reflect the pattern or intensity of ocean mixing.

■

Tiny gas cylinders

Fullerenes can be synthesized so that they trap rare gas atoms. Now carbon fibers, when subjected to high pressures and temperatures, can also irreversibly trap inert gases. Gadd *et al.* (p. 933) show that when carbon fibers are exposed to argon gas at high pressure and appropriate temperature conditions, the tubes seal after the gas has entered. The gas remains trapped in the tubes at high pressures, even after the outside pressure is released to atmospheric pressure. These fibers, which have an outer diameter of about 0.1 micrometer, thus form very small, high-pressure gas cylinders.

■

Readily resolving chiral compounds

Pure enantiomeric compounds (all right- or left-handed versions of the same molecule) are important building blocks for organic synthesis. Synthetic methods, however, often produce both forms, and separations can be time-consuming and waste material. Tokunaga *et al.* (p. 936) report on a catalytic method for resolving enantiomers of an important class of compounds, terminal epoxides. A recyclable chiral cobalt catalyst was used to resolve racemic mixtures of these molecules into epoxides and 1,2-diols of nearly a single handedness (usually greater than 98 percent resolution). The only reagent consumed was water.

Connect the quantum dots

Semiconductor devices use transistors to switch the flow of electrons, but difficulties with leakage currents limit the ultimate size of even field-effect transistors. A quantum-mechanical approach is to encode logic states by the position of individual electrons on interconnected quantum dots (quantum-dot cellular automata, or QCAs). Orlov *et al.* (p. 928; see the news story by Glanz, p. 900) experimentally constructed a basic QCA cell from four aluminum quantum dots. Each pair is connected by tunneling barriers, and the two pairs are capacitively coupled. Transfer of an electron between the input pair of dots switches the position of an electron on the output pair.

■

Insulin-like signals in worms

In *Caenorhabditis elegans*, harsh conditions can cause the worms to halt the normal reproductive development and enter a "resting" or dauer state. This process is controlled by a neuroendocrine pathway consisting of genes from the DAF family. Mutations in these genes causes abnormal dauer formation or, in some cases, longevity. Kimura *et al.* (p. 942; see the news story by Roush, p. 897) have now shown that one of the *daf* genes, *daf-2*, is an insulin receptor-like molecule. Such homology has not been seen before in worms and indicates that this insulin-like signaling pathway cooperates with the other *daf* pathway (which is a transforming growth factor–β-like signaling pathway) to control this fundamental developmental process.

■

No place to hide

Identifying factors that regulate fish populations has proven difficult, in part because of problems in obtaining accurate catch data. Hixon and Carr (p. 946) have approached the question experimentally: They translocated live coral reef heads to new locations to construct 32 similar habitats. These were populated with different densities of damselfish, exposed to two types of predators, reef-resident and transient piscivores, and the mortality rates of the damselfish assessed. In the presence of either one of the predator types, damselfish mortality was not density-dependent but both predators together caused density-dependent mortality. Transient predators attack in the waters above the reef, while resident predators attack within the reef structure.

■

Genetics and AIDS

A major endeavor in HIV (human immunodeficiency virus) research has been to discover the underlying mechanisms that allow some "long-term survivors" to resist disease 10 to 20 years after HIV-1 infection or to allow some highly exposed individuals to remain uninfected. Although a deletion in the chemokine receptor molecule CCR5 and certain human leukocyte antigen haplotypes have been associated with survival, they can only explain a small proportion of the cases. Smith *et al.* (p. 959) have found a mutation in another chemokine receptor, CCR2, that, when considered with the deletion in CCR5, explains the ability of about 25 percent of long-term survivors to avoid AIDS.

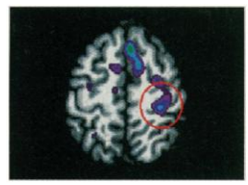
Making M cells

Most of a mammal's immune system is not in the bloodstream and its associated lymph nodes, but rather, it is intimately associated with the gut. Regions of the gut that contact this tissue contain specialized transport cells called M cells. Kernéis *et al.* (p. 949; see the cover and the Perspective by Madara, p. 910) established an in vitro culture system to convert gut epithelium into M cells by coculture with lymphocytes, particularly B cells.

■

Pinpointing pain

How do we feel pain? Rainville *et al.* (p. 968) dissociate and monitor the physical aspects of



exposure to hot water from the affective response by functional brain imaging. Under conditions where the somatosensory cortex is unaltered, activation in the anterior cingulate cortex is modulated by hypnotic suggestion, linking this frontal lobe pathway to the emotional reaction to pain.

■

Telomerase family tree

Telomerase, a ribonucleoprotein enzyme, replicates chromosome ends, or telomeres. The catalytic protein subunit, recently identified in a ciliate and in bakers' yeast, contains reverse transcriptase (RT) motifs. Nakamura *et al.* (p. 955; see the Perspective by Eickbush, p. 911) show that this subunit is conserved in fission yeast and humans. From building evolutionary trees, they conclude that telomerases form a discrete subgroup of RTs, probably of ancient origin.

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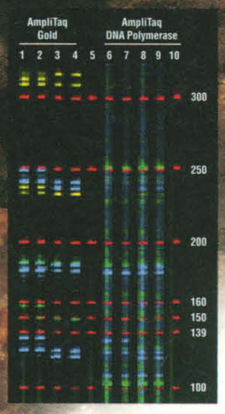
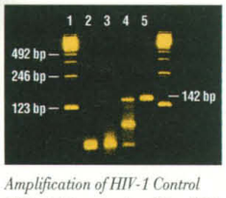


Co-amplification of 8 human STR loci. L1, 2: male control DNA; L3, 4: female control DNA; L5: AmpliTaq negative control; L6, 7: male control DNA; L8, 9: female control DNA; L10: negative control.



Amplification of HIV-1 Control DNA. L2: 0 copies, AmpliTaq DNA Polymerase, No Hot Start; L3: 10 copies, AmpliTaq DNA Polymerase, No Hot Start; L4: 10 copies, AmpliTaq DNA Polymerase, manual Hot Start; L5: 10 copies, AmpliTaq Gold.

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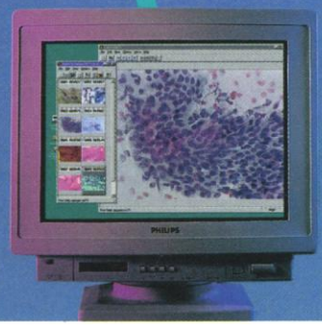

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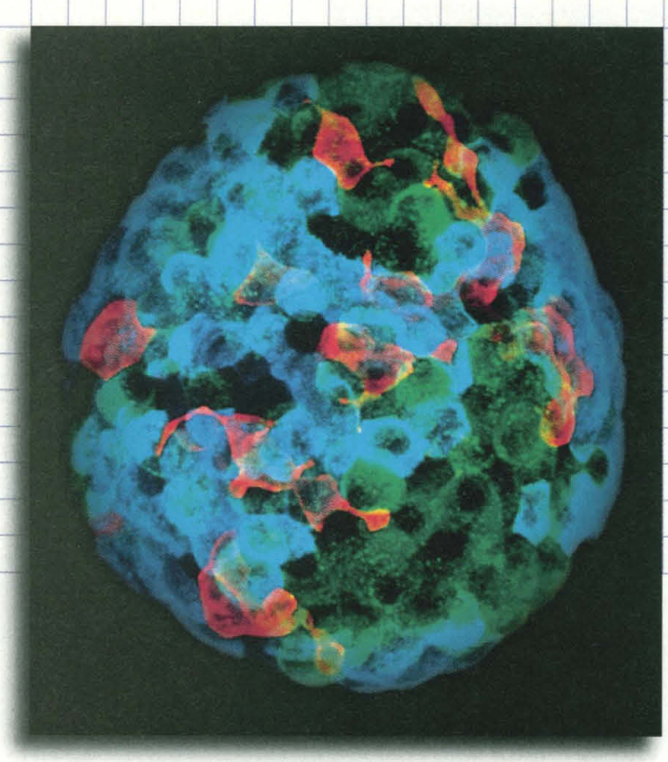
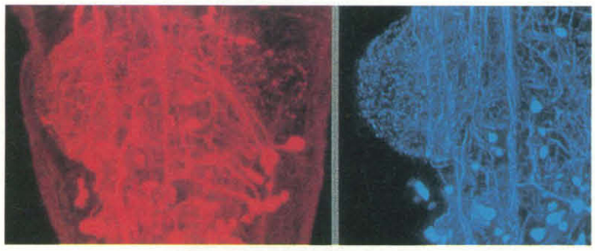
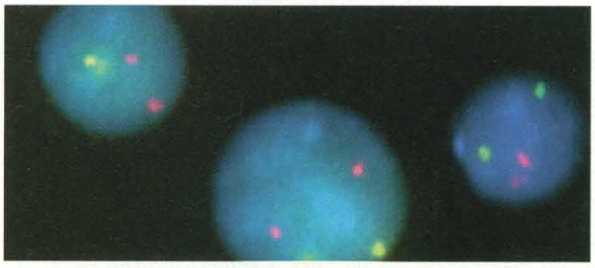


Three colour confocal laser scanning microscope analysis of islet from neonatal rat pancreas. FITC anti-insulin (green), Cy™3 anti-somatostatin (red), and Cy5 anti-glucagon (blue).



Whole insect embryos directly labelled with Cy3 dye (red) and Cy5 dye (blue). Image courtesy of Dr. T.C. Brelje, University of Minnesota Medical School.



FISH image of DNA probes binding to centromeric α-satellite repeat sequences in interphase nuclei. Chromosome Y (green), chromosome X (yellow), and chromosome 17 (red). DAPI counterstain.

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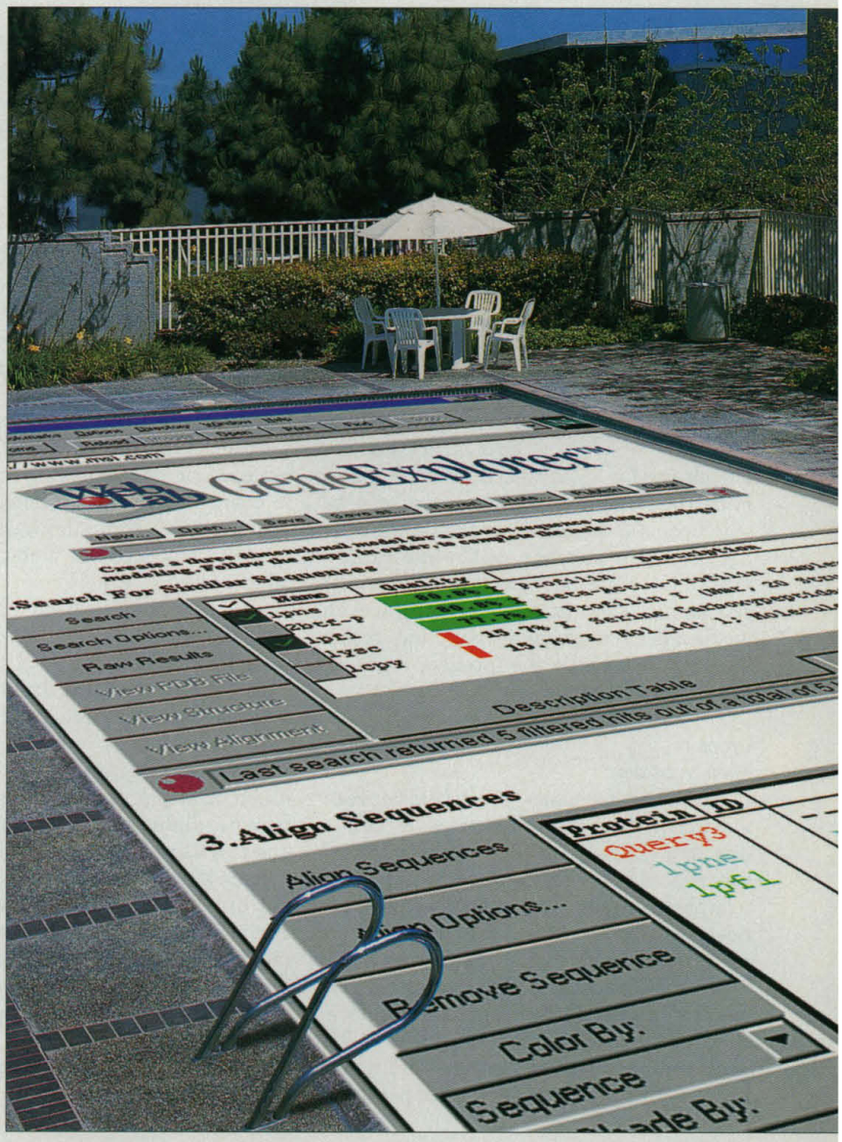

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