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8 August 1997
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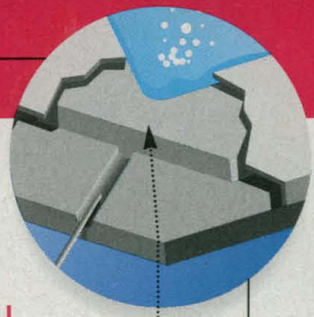

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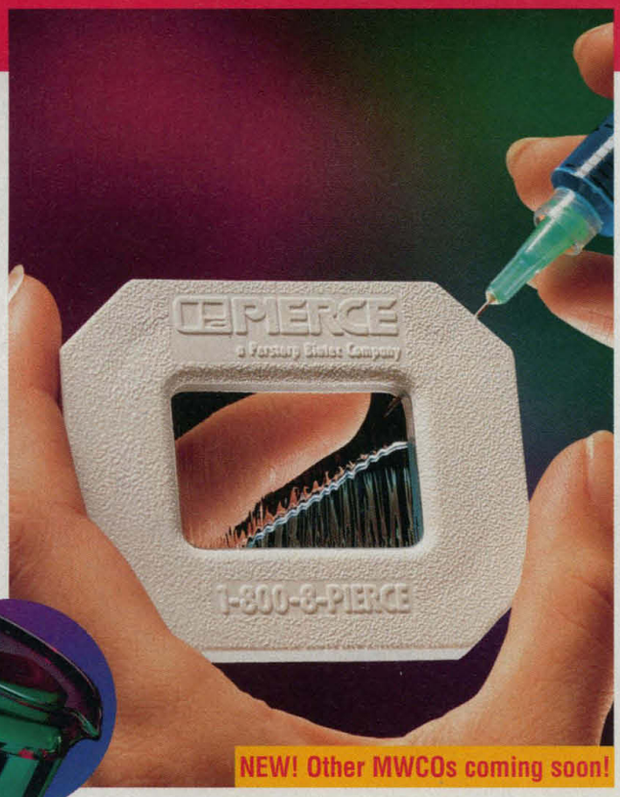

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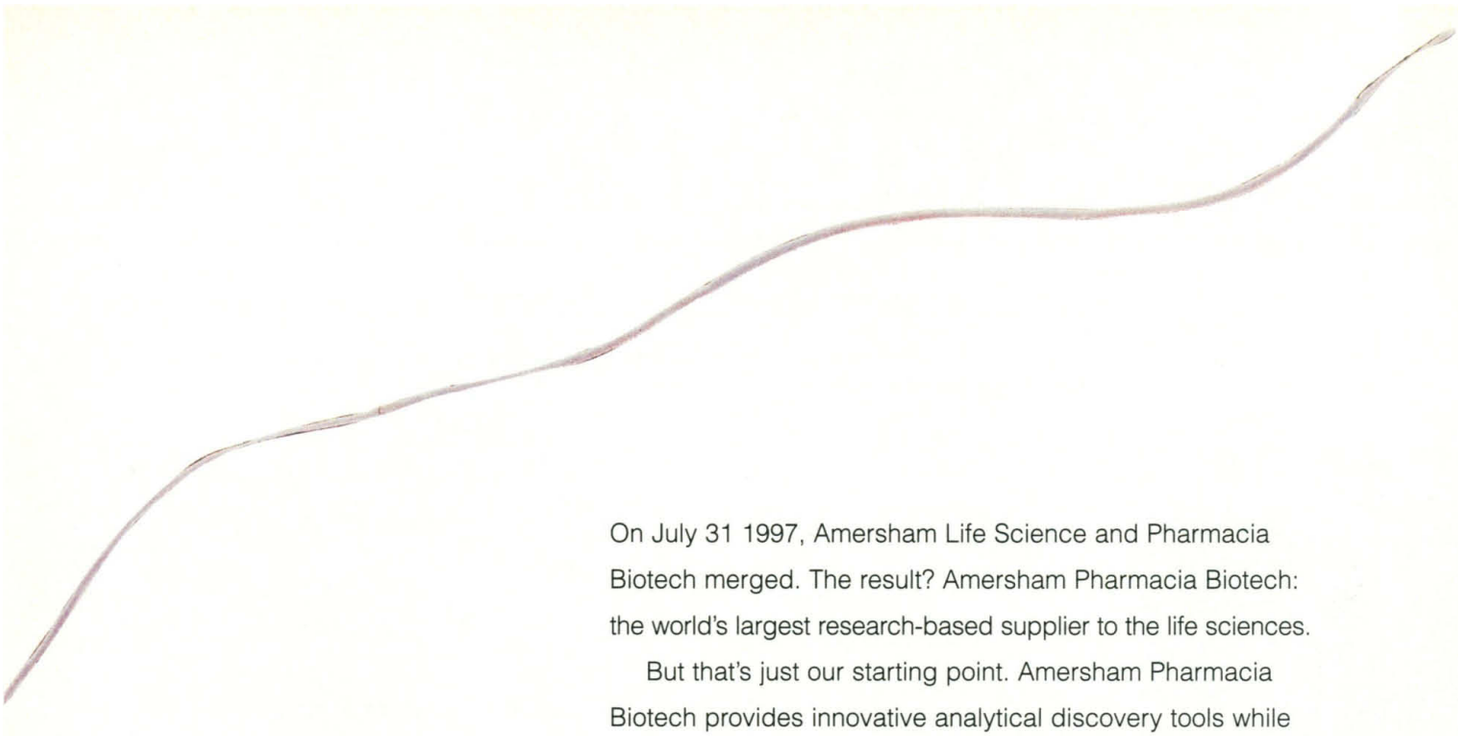

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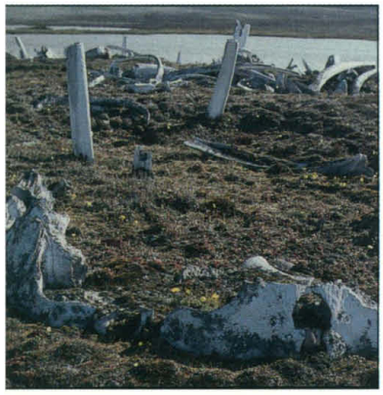

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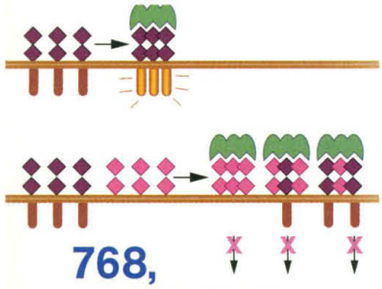
Heavy metal culture



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A decoy for cell death

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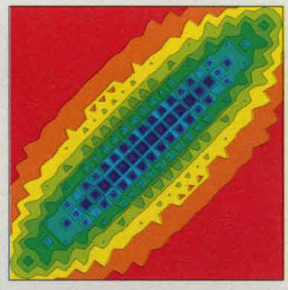
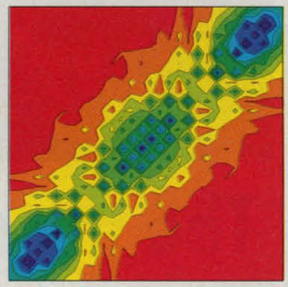
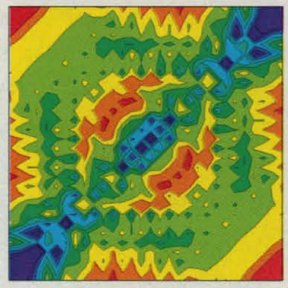
COVER

High-ranking female chimpanzee Fifi with her seventh surviving offspring Fred at Gombe National Park, Tanzania. Although dominance hierarchies are not conspicuous in chimpanzees, data from 25 years of observation show that high-ranking females have significantly higher infant survival, more rapid maturation of their daughters, and higher lifetime reproductive success than low-ranking females. See page 828 and the related Perspective on page 774. [Photo: Steve Patch, Jane Goodall Institute]

TECHNICAL COMMENTS







781
Dynamic approaches to optical spectroscopy

◩ Indicates accompanying feature

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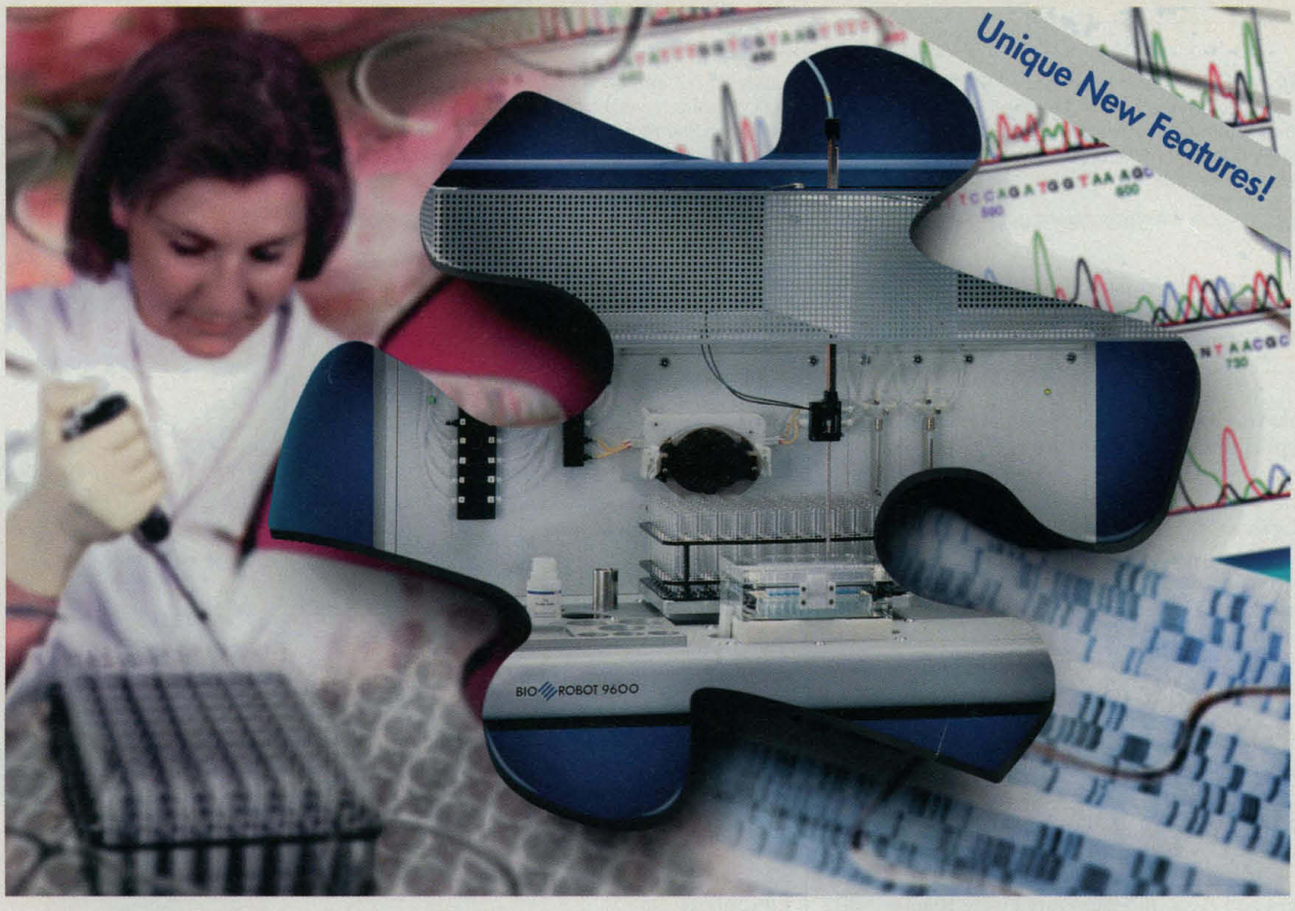

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edited by BROOKS HANSON

Tuberous sclerosis gene

Tuberous sclerosis complex (TSC) is an autosomal dominant disease in which multiple tumor-like growths develop in the nervous system and other organs. About half of the familial TSC cases are caused by mutations in *TSC2*, a gene on chromosome 16p13 that encodes a GTPase activating protein. Van Slegtenhorst *et al.* (p. 805) have identified the *TSC1* gene on chromosome 9q34, which is responsible for most of the remaining familial cases. The *TSC1* gene encodes a 130-kilodalton hydrophilic protein with a potential coiled-coil domain but has no strong homology to proteins of known function.

Small but stable

At small sizes, metal oxides often form phases that are not the thermodynamically stable bulk phases. Simulations have indicated that at these small sizes, there is actually a switch in thermodynamic stability, but experimental evidence has been lacking. McHale *et al.* (p. 788) performed an experimental study on the thermodynamic stability of different phases of alumina and show that the stable bulk phase, corundum, becomes thermodynamically less stable than γ-alumina at small sizes.

Pressured exchange

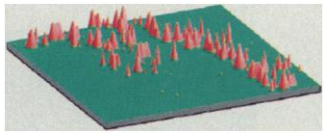
Fractionation of isotopes has generally been considered to depend on temperature but not pressure. However, Driesner (p. 791; see the Perspective by Sheppard, p. 775) shows that the fractionation of hydrogen and oxygen isotopes in water-mineral reactions does depend on pressure, and for fractionation of hydrogen isotopes, particularly at conditions close to the critical region of water, the effect is large. Calculation of the effect allows seemingly disparate experimental determinations of mineral-water fractionation curves for hydrogen isotopes to be rectified.

Mixed dates for carbon and methane

Radiocarbon measurements of organic carbon have been too crude to identify ages of different compounds (biomarkers), and thus the age may reflect a mixture of carbon from several sources. This difficulty is critical in assessing the burial of organic matter, a key term in the carbon budget, as noted in a Perspective by Freeman (p. 777). Eglinton *et al.* (p. 796) were able to analyze individual biomarkers in organic carbon from the Black Sea, a stratified basin, and the Arabian Sea, where upwelling is important. The results show that distinct biomarkers can have ages as much as 10,000 years apart. Zimov *et al.* (p. 800) also use radiocarbon dating to show that methane emitted from high-latitude Siberian lakes is predominantly fueled by carbon deposited during the last glaciation.

Seamount dates

Volcanic activity on the ocean floor forms seamounts, but only a few have been dated, so it has been difficult to infer the magmatic histories. Wessel (p. 802) presents an approach to obtain



pseudo-ages for Pacific plate seamounts using gravity data, seamount shapes, and the age of the oceanic crust on which they formed. The data imply that smaller seamounts tend to form on younger crust and that many seamounts formed during the latest Jurassic and Cretaceous.

Death decoy

One way to activate a cell's intrinsic death pathway is for "death" receptors on the cell surface to receive an external signal. A family of ligands, including the protein TRAIL, bind to a family of related receptors. Pan *et al.* (p. 815) and Sheridan *et al.* (p. 818; see news story by Gura, p. 768) identified two more receptors that bind to the TRAIL ligand. The first is similar to the known receptor for TRAIL and seems to be an effective mediator of the death signal. But the other receptor lacks a transmembrane domain, may insert into the membrane through lipid linkages, and blocks cell death. Binding TRAIL without being able to send the standard death signals may cause the decoy receptor to act as a sink for the ligand.

Why practice makes perfect

As a motor task is practiced, the movements become automatic and are consolidated in memory. Shadmehr and Holcomb (p. 821) find that the brain regions active during task performance shift from the prefrontal cortex, which is responsible for short-term or working memory, to the premotor and parietal cortices and the cerebellum, which together support the preparation and execution of a learned sequence of movements.

Rank and reproduction

The stereotype of the noncompetitive female chimpanzee is dismissed by the long-term study by Pusey *et al.* (p. 828; see the Perspective by Wrangham, p. 774). More than 30 years of observations of the population at the Gombe National Park in Tanzania have revealed considerable variation on female reproductive success, much of it accounted for by differences in dominance rank. Higher rank means higher infant survival, faster maturing daughters, and more rapid production of young. This effect is likely affected by access to a better food source rather than to direct aggression between females.

Aging assay

The molecular basis for the limited life-span of somatic cells, a characteristic thought to underlie some of the physiological effects of aging, has been unclear. Brown *et al.* (p. 831) overcame these difficulties and used targeted homologous recombination to remove both copies of the gene encoding the cyclin-dependent kinase (Cdk) inhibitor p21 in normal (not immortalized) human fibroblasts in culture. Cells lacking p21 (which normally functions to inhibit cell division by inhibiting Cdks) have a prolonged cellular life-span.

Flight plans

Some fruit flies (*Drosophila*) travel large distances in their search for food (rovers), while others prefer to find their food closer to home (sitters). Osborne *et al.* (p. 834) report that this behavior is controlled by two alleles in the *foraging* gene, which codes for a cyclic guanosine monophosphate (cGMP)–dependent protein kinase (PKG). Sitter flies have less PKG messenger RNA and enzymatic activity than rover flies. This is a rare example of a single gene link to a behavior. An analogous example in humans may be a polymorphism in the serotonin transporter, which has been proposed to underlie variation in anxiety.

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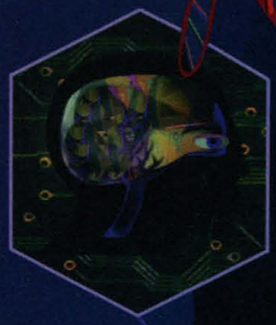

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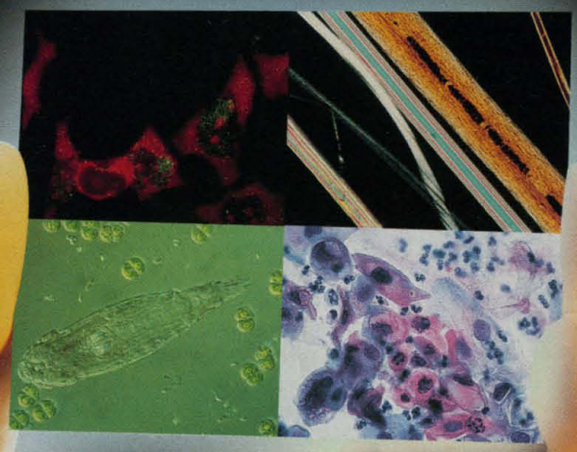

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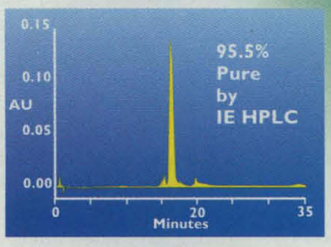

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