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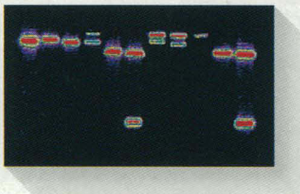

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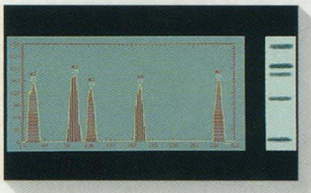

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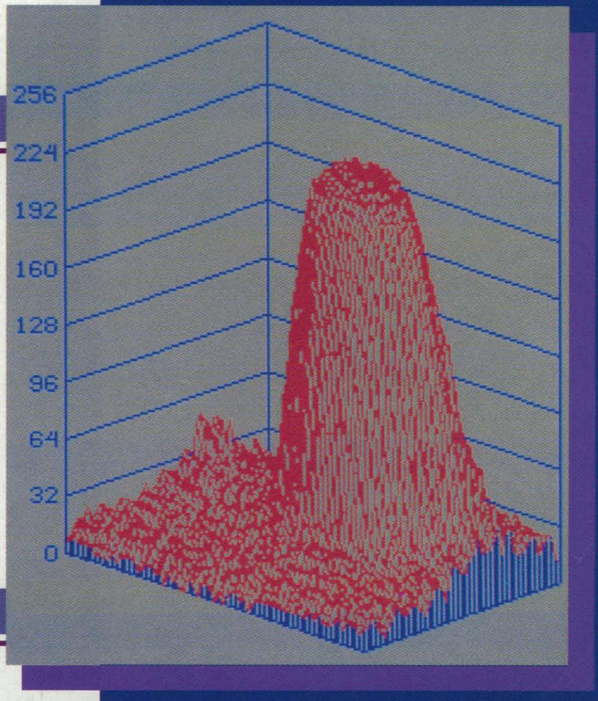

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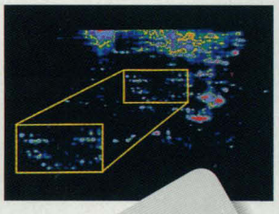

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2. Bauer, J.C., and Fox, J.S. (1991) *Strategies* **4**: 6-7

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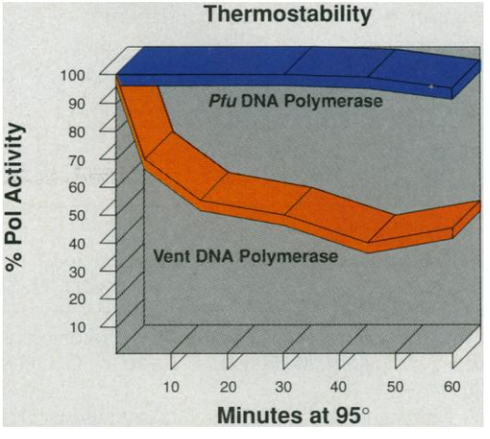

Figure 1: Thermostability of *Pfu* and Vent DNA Polymerases at 95°C.
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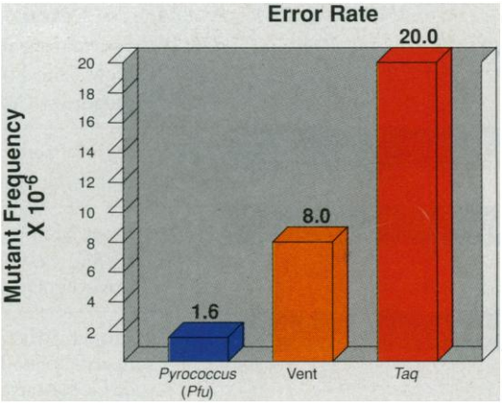

Figure 2: Polymerase fidelity was measured by modification of an assay described by Kohler *et al* (1991) *Pro. Natl. Acad. Sci. USA*, in press. Error rates reflect mutations per nucleotide incurred in the *lacI* gene during DNA synthesis. Vent is derived from *Thermococcus litoralis* and was obtained from New England Biolabs. *Pfu* is derived from *Pyrococcus furiosus* and is sold by Stratagene. *Taq* polymerase is derived from *Thermus aquaticus* and was obtained from Cetus Perkin Elmer.

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1. Bryant, F.O. and Adams, M.W.W. (1989) *J. Biol. Chem.* 264:5070-5079.
2. Fiala, G. and Stetter, K.O. (1986) *Arch Microbiol.* 145:56-61.
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4. Chien, A., Edgar, D.B. and Trela, J.M. (1976) *J. Bac.* 127:1550-1557.

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COVER Marbled salamanders (*Ambystoma opacum*) are among the many amphibian species that breed at Carolina bays, natural wetlands of the southeastern Atlantic Coastal Plain. *Ambystoma opacum* is one of the amphibian species that has been monitored daily at a protected wetland, Rainbow Bay in South Carolina, for the past 12 years by investigators at the Savannah River Ecology Laboratory. See page 892. [Photographed by David E. Scott, Savannah River Ecology Laboratory]

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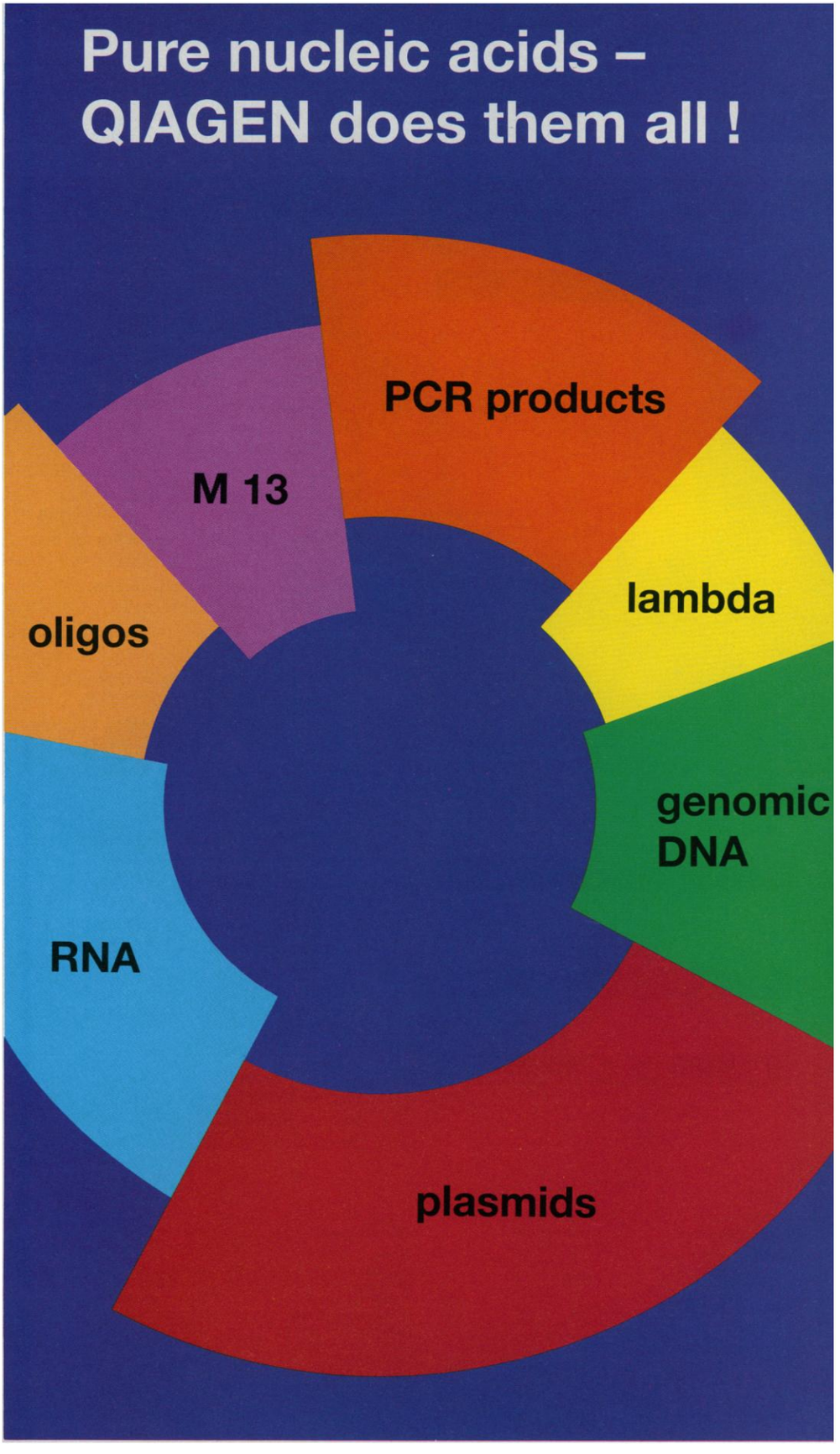

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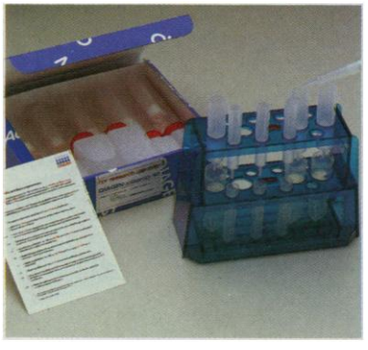

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This Week in
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Nanoscale impacts

When a projectile smashes into a solid surface, it can bounce off the surface, stick, become implanted, or shatter. These different outcomes reflect differences in how the impact momentum is distributed between surface and projectile. Beck *et al.* have used cluster-beam techniques for studying what happens when tiny crystalline objects—alkali-halide clusters of various sizes—collide with soft graphite or hard silicon surfaces, both of which are chemically inert with respect to the clusters (page 879). The momentum and the angle of impact as well as the size of the clusters could all be controlled; different combinations produced different fragmentation patterns in the clusters and differences in how the impact energy was deposited. At low energies, the clusters scattered on impact. At higher energies the crystals turned molten and then evaporated. This cluster-beam technology should be useful for the fabrication of new types of surfaces and for studying impact phenomena; impacts on the nanoscale may even provide clues to the physical features of macroscale impacts.

Amphibian census

A 12-year study of amphibians at a breeding pond in South Carolina provides some much-needed data on the extent of natural variation that can occur in populations of frogs and salamanders over the long term (page 892). Amphibians have been considered useful bioindicators of the health of the environment. So when reports appeared that numerous amphibian populations around the world were declining in number or disappearing altogether, scientists became concerned that there might be some general or global factor that was killing them. The Rainbow Bay study shows that there can be wide population fluctuations from year to year without there being a crisis. Every day for more than a decade Pechmann *et al.* counted females that came to the pond to breed and also juvenile recruits. (In an average year the pond fills in the winter with a meter of water but dries out in spring or summer.) Some of the variation could be accounted for by differences in annual rainfall and the occurrence in some years of drought conditions. But many factors figure into accurate assessments of population trends, and these are discussed by the authors and by Wake in a perspective (page 860).

Systemin

When a leaf is damaged by a predator, certain defensive genes of the plant are activated. One substance that can turn on two of the wound-inducible plant genes is a small palindromic polypeptide that has been isolated from tomato plant leaves (page 895). Pearce *et al.* named the polypeptide systemin, because, after it was placed on the wounded leaves of young plants, it was found to circulate throughout the plant in the phloem. The amino acid sequence of systemin was determined, and a copy of the 18–amino acid natural molecule was produced. Both natural and synthetic systemin activated the genes that produce proteinase inhibitors I and II, which accumulated in the leaves. Previous studies have shown that, in addition to their activation by wounding, these proteinase inhibitors can be activated by a range of nonprotein substances, including oligosaccharides and plant hormones (abscisic acid and methyl jasmonate). The functions of the polypeptide systemin in plants may be analogous to those of peptide hormones in animals, which activate a variety of signal transduction pathways.

Positive selection

T lymphocytes differentiate in the thymus. The cells with αβ receptors on their surfaces must encounter self antigens in the thymus in order to differentiate properly; that is, they are "positively selected" by antigens. Positive selection has now been shown to be a requirement for the differentiation, maturation, and exit from the thymus of a population of T cells that bear γδ receptors as well (page 903). Wells *et al.* studied this phenomenon in genetically engineered mice that produced γδ-bearing cells but that lacked the self antigens with which these receptors react. Normal numbers of the γδ-bearing cells appeared in the thymus during early development, but the cells did not mature, did not respond in vitro to assays that assessed the effectiveness of their γδ receptors, and did not travel to the peripheral lymphoid organs. Although the experiments evaluated only one subset of γδ-bearing cells, the similarity of these results with those of αβ-bearing cells suggests that positive selection in the thymus may be a general requirement for all T cells regardless of the types of receptors they bear.

Immunosuppressor's target

Immunosuppressive drugs poison the immune system's helper T cells. They do this by interfering with the transduction of important intracellular signals. The molecular targets of two structurally similar immunosuppressive agents, rapamycin and FK506, were studied by Heitman *et al.* in a yeast cell system that is relatively simple and can be manipulated genetically (page 905). When exposed to rapamycin, sensitive yeast cells stopped growing. Rapamycin's target inside the cells was a widely distributed protein called FKBP. This protein was also the target for FK506, which, in competition experiments, could block the rapamycin effect. Two other genes that promote the toxicity of rapamycin were also identified, and genetic studies suggested that their products interact with the toxic complex. FKBP is present in T cells and other human cells; whether rapamycin binding will be suppressive in any given cell type may depend on whether proteins besides the target FKBP—perhaps homologs of the two proteins identified in yeast—are also available in the cell.

■ RUTH LEVY GUYER

VITAL NEW INFORMATION FOR LIFE SCIENCE RESEARCHERS

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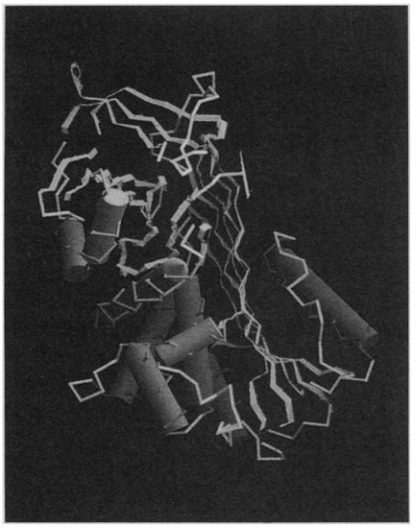

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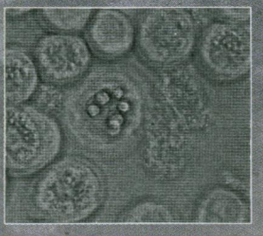

Figure 1. Infected Sf9 insect cells showing viral occlusions.

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