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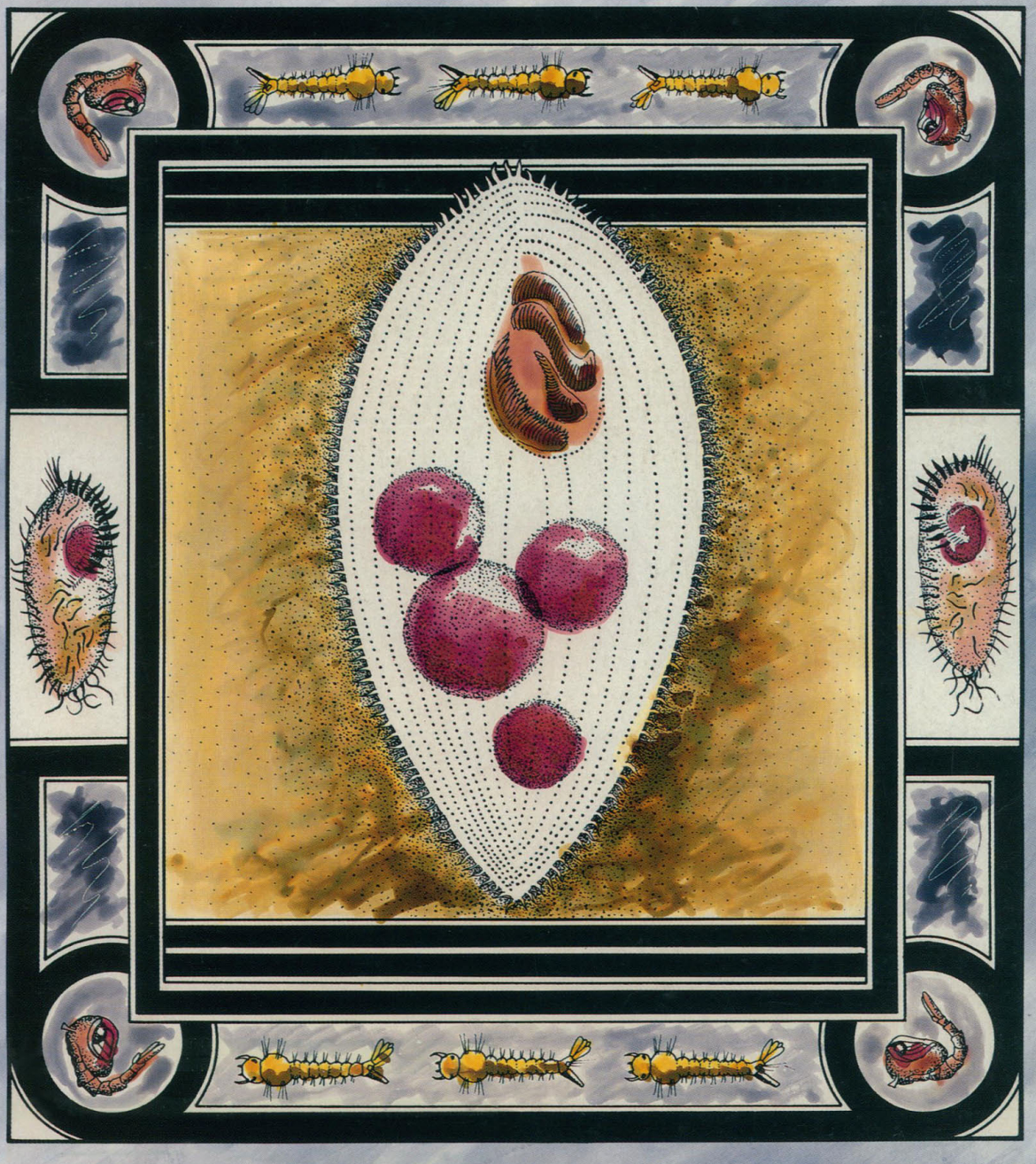
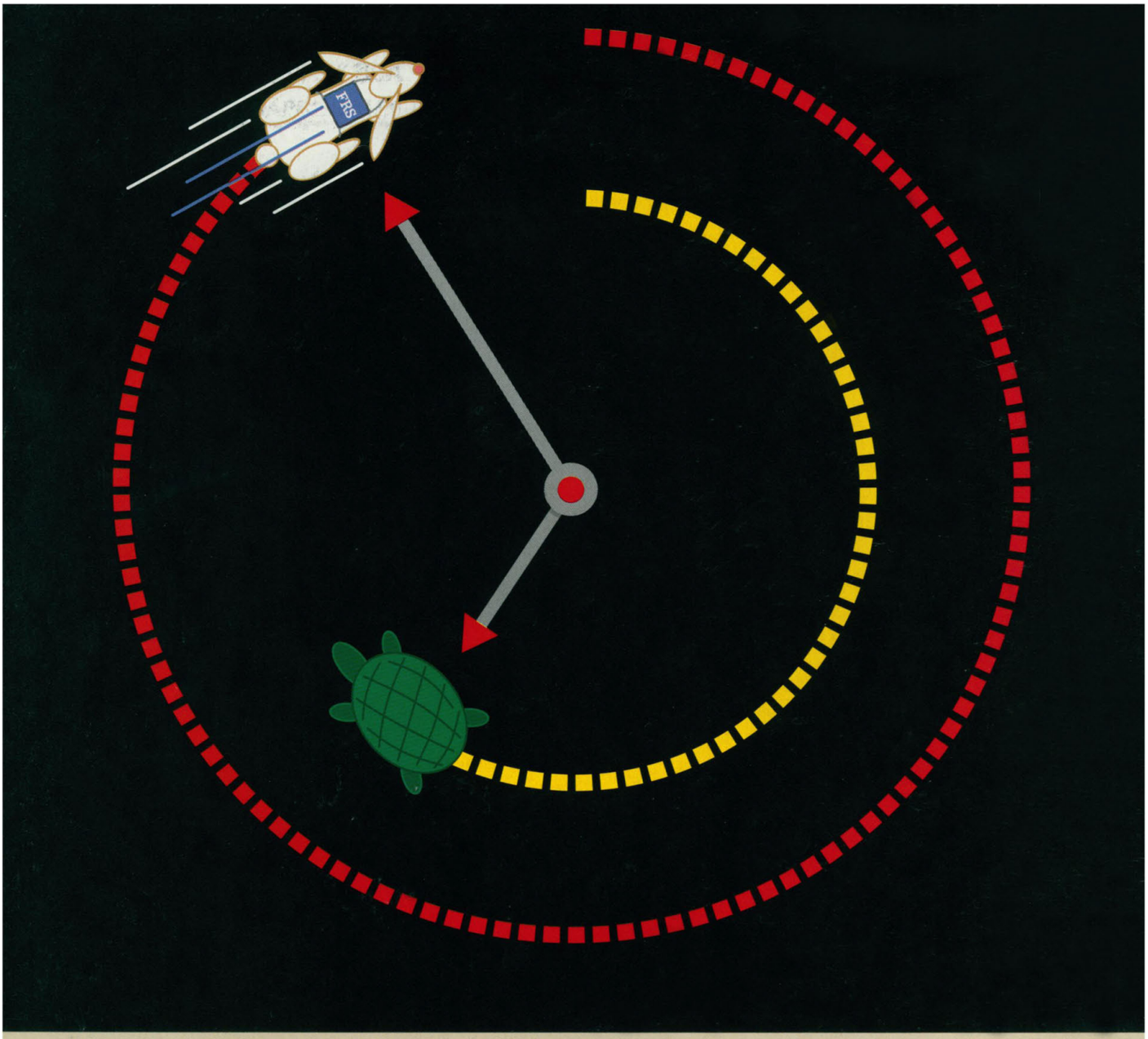
VOL. 253 ■ PAGES 109–240





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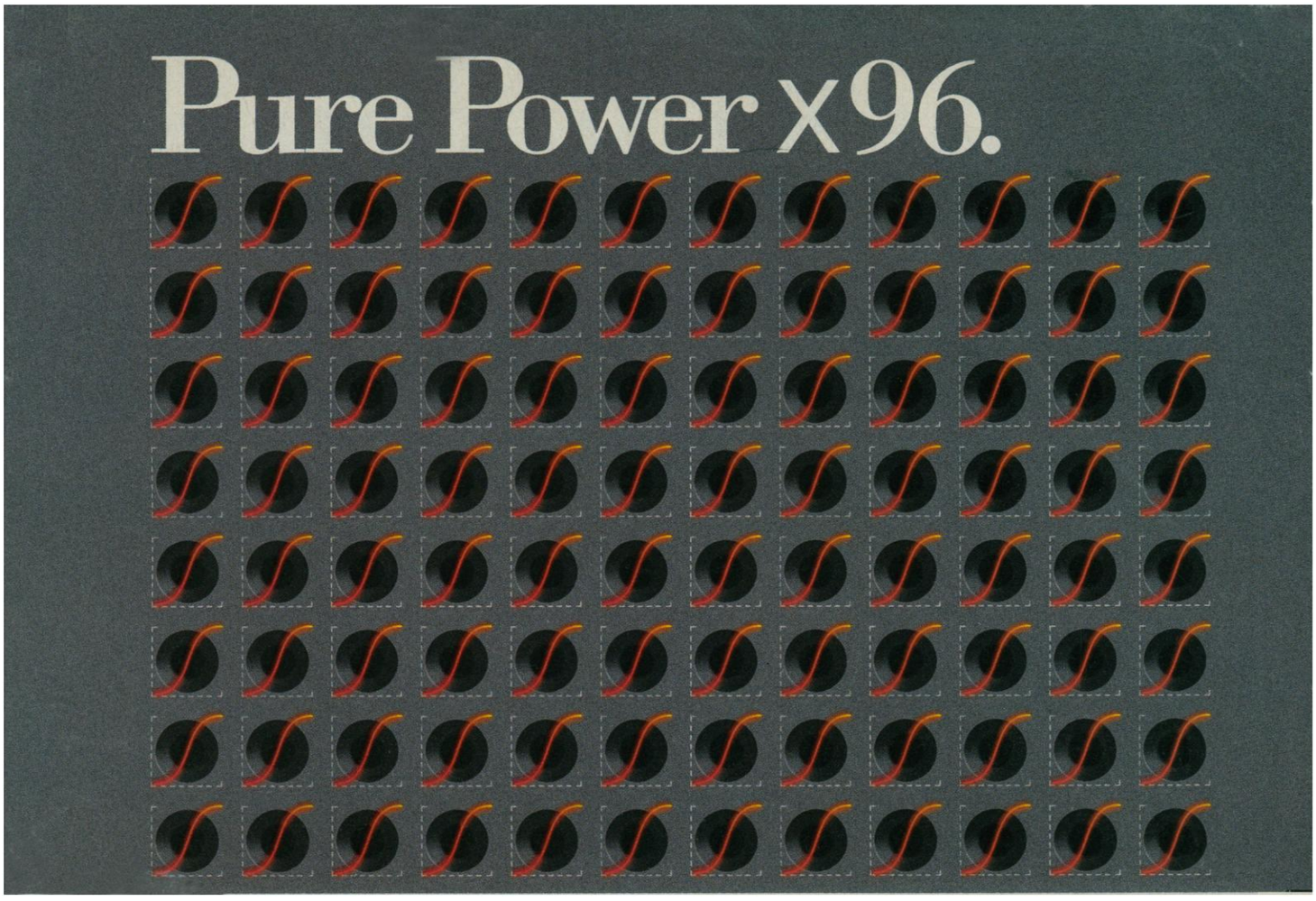

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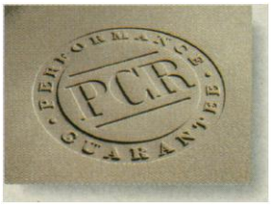

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■ The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objectives are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, to advance education in science, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

COVER The parasitic ciliate *Lambornella clarki*, flanked by free-living protozoa and surrounded by larvae and pupae of its mosquito host, *Aedes sierrensis*. The impact of fatal *L. clarki* infections on host populations in treeholes varies with food availability and can result in greater host abundance and fecundity when resources are scarce. See page 185. [Illustration by Jan O. Washburn; color tinting by Julie Cherry]

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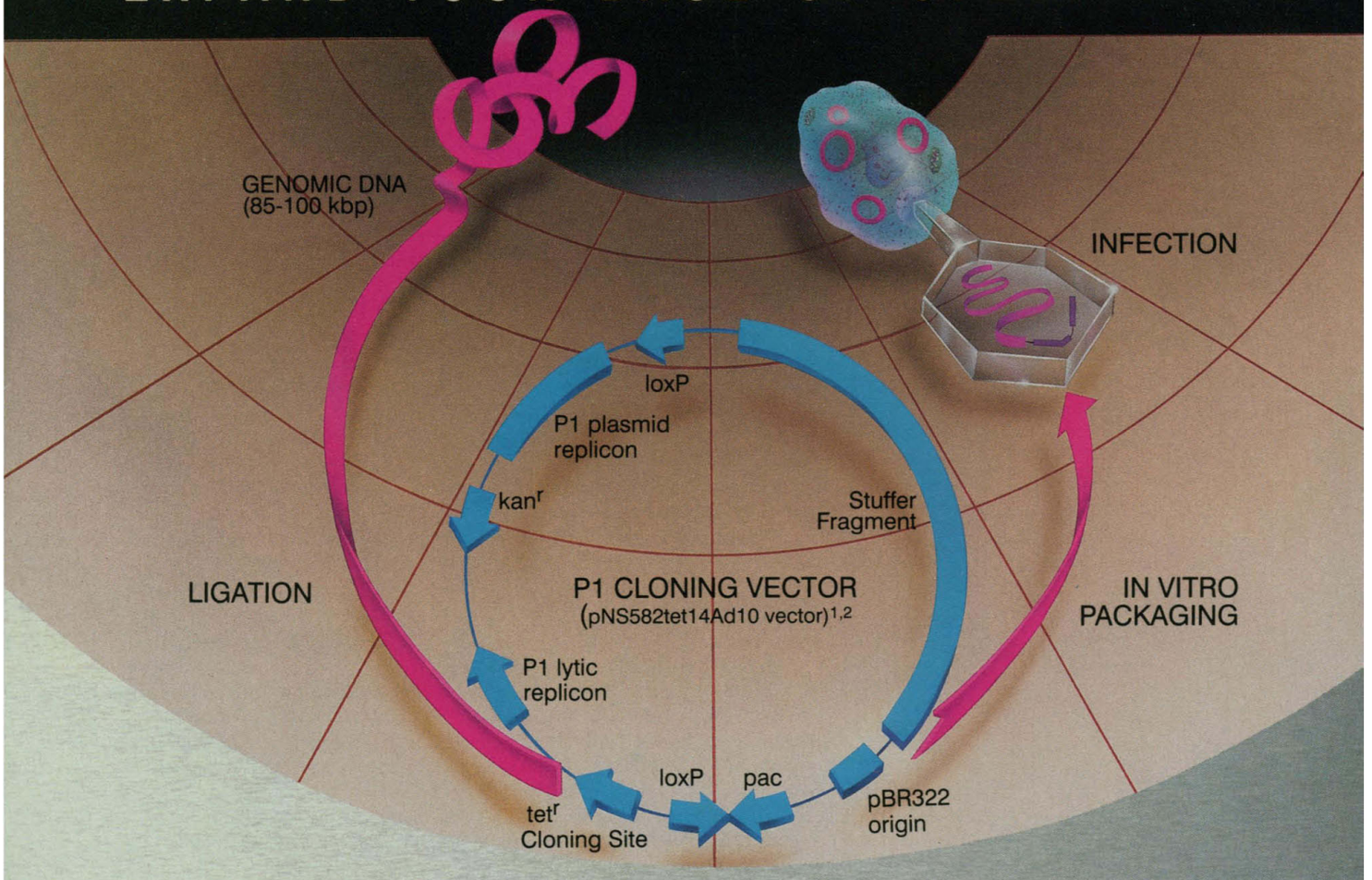

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This Week in
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Developing nanoelectronics

Plucking a covalently bound silicon atom off a surface and redepositing it elsewhere on the surface was once the stuff of futurist technology; the technologic future has arrived. Lyo and Avouris demonstrate how, with the tip of the scanning tunneling microscope, atoms or clusters of atoms on a silicon surface can be manipulated (page 173). The nanoscale technology is expected to aid in the development of novel semiconductors and in the preparation of locally doped materials. The atomic "engineering" involves field-induced desorption, which combines electric field effects with chemical interactions between tip and sample. Single silicon atoms or clusters of some tens of atoms are picked up from the surface and moved to another location at room temperature. The scanning tunneling microscope not only makes the construction of new surfaces possible but is one of the best instruments for studying the topographic features of the newly created surfaces.

Mosquito survival

Relations among parasites and their hosts (cover) are not simple to predict; many environmental factors come into play and affect the survival equation. For example, *Aedes sierrensis* mosquitos are subject to fatal parasitic infections by the protozoan *Lambornella clarki*, but under some conditions, notably limited food supplies, populations with infections can actually produce more and in some cases larger adult mosquitos than do populations that are uninfected (page 185). This surprising outcome was observed by Washburn *et al.* who compared survival and fitness of adults that developed from infected and uninfected mosquito populations in both laboratory and manipulated field settings. When the mosquitos developed with an adequate food supply, individuals from uninfected populations survived the best. When food was scarce, not only were survivors from infected populations more fit but they were as or more abundant than survivors from uninfected populations. The fatal infections in the population apparently worked to increase the per capita food supply. Effective biological control of mosquitos, therefore, will have to take into account how resource availability and other environmental parameters work to shift the balance in host-parasite relations.

Mosquito invasion prospects

Automobile tires serving as breeding chambers have been responsible for the introduction of *Aedes albopictus* mosquitos from Asia into North America. These mosquitos have the potential to be a public health hazard if they act as vectors for pathogenic viruses. How likely is it that they will establish themselves in the same habitats—treeholes and tires—in America that they inhabited in Asia? What will be their effect on indigenous mosquito populations? Livdahl and Willey examined growth patterns of competing mosquito populations in containers in which conditions in water-filled treeholes and tires were simulated (page 189). Their calculations suggest that *Aedes albopictus* and the local American mosquito *Aedes triseriatus* should be able to coexist in treeholes for long periods of time, but, in tires, *Aedes albopictus* should outgrow and force the extinction of *Aedes triseriatus*. Both species are filter-feeders and browsers and studies of their nutritional requirements will establish whether direct competition versus nonoverlapping preferences can account for the different expected outcomes in the two habitats.

Getting organized

Spemann's organizer, or the dorsal blastopore lip of the gastrula-stage *Xenopus laevis* frog embryo plays a key role in the arrangement of the organism's body. This organizer recruits cells to form the body axis; if a second dorsal blastopore lip is transplanted into an embryo, a secondary body axis can develop. Although it is clear what the dorsal blastopore lip does, little has been known about molecular events that bring about its effects. Blumberg *et al.* looked in dorsal blastopore lip tissue for evidence of genes that contain homeoboxes (page 194); homeoboxes encode homeodomains, which allow proteins to interact with DNA; homeodomains therefore are important in regulatory events in developing cells. Four genes containing homeoboxes were cloned from messenger RNA molecules. The most abundant gene, named *goosecoid*, has similar DNA-binding specificity to the fruit fly gene *bicoid*, which participates in pattern formation in the fruit fly. The authors suggest a sequence of molecular events involving these and other genes that may serve to ensure and direct the development of a correct body plan.

Recognition in natural killing

It has been unclear how natural killer (NK) cells are able to recognize their targets. A study by Liao *et al.* makes a strong case for a role for the major histocompatibility class I antigens in the recognition process (page 199). Killing of cells and by cells from mice that are genetically deficient in class I molecules was studied. When target cells from these animals encountered normal NK cells, lysis occurred. This contrasts with the lack of a lytic response that is observed when target cells that bear class I molecules interact with normal NK cells. These results suggest that when class I recognition does not take place the lytic program of the NK cells can be activated. The class I deficiency also affected the activity of the NK cells of the deficient mice: these cells had a diminished, although not absent, lytic effect on various test target cells. The results provide new clues to how the NK cells work and explain why, in mice, matching of donor and host major histocompatibility antigens has not been effective in ensuring successful bone marrow transplants.

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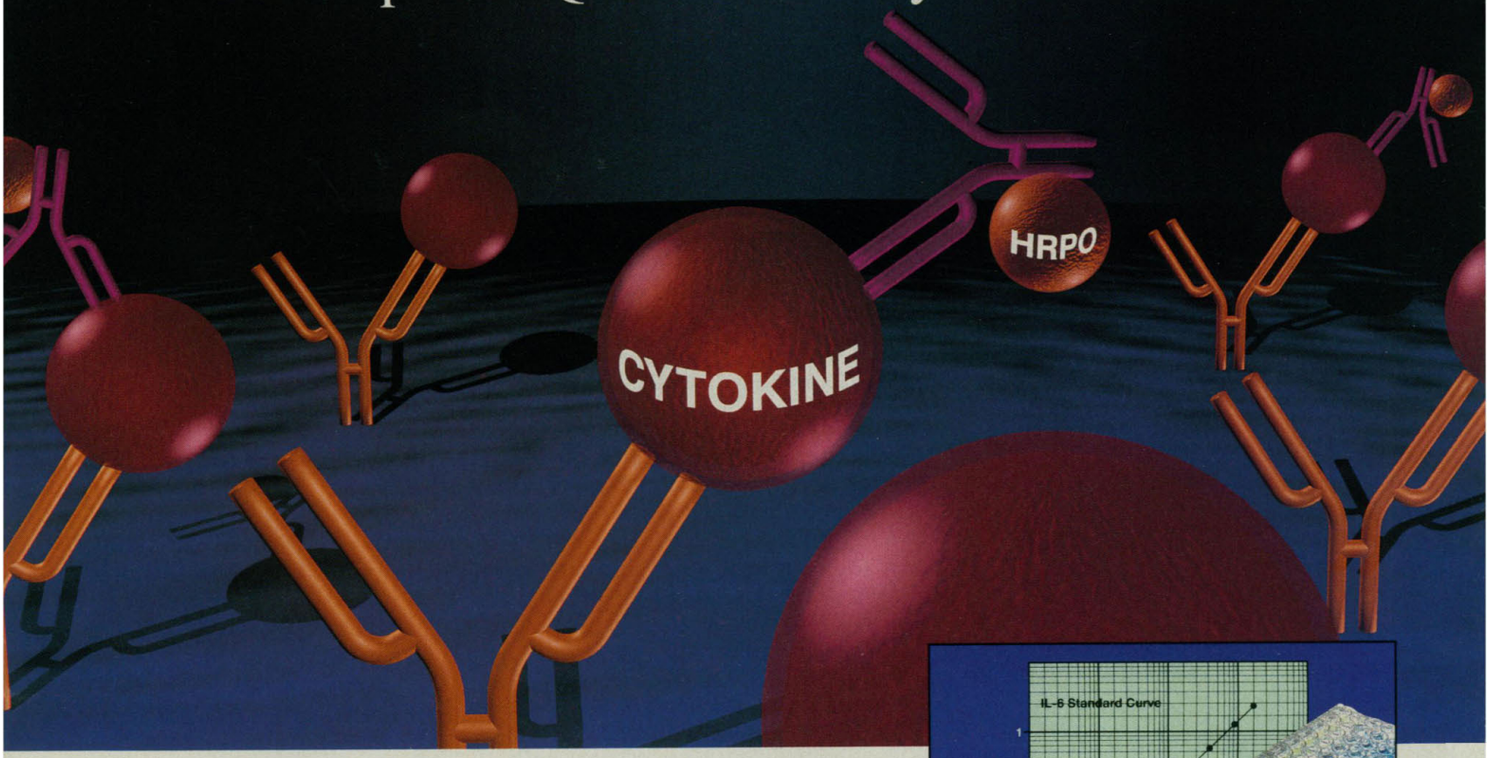

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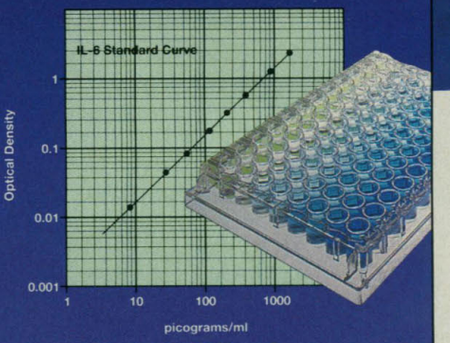

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Accepted applicants will have the opportunity to present their research to AAAS members in a one-on-one poster session at the Annual Meeting, and their abstracts will be published in the Annual Meeting *Program*. In addition, a panel of distinguished scientists will evaluate the poster presentations. The students with the best presentations in their fields will receive cash awards and be recognized during the AAAS awards ceremony at the Annual Meeting.

For complete instructions on how to submit abstracts, watch for the "Call for Papers" in the 6 September 1991 issue of *Science*, or write: AAAS Meetings, Dept. SM, 1333 H Street, NW, Washington, DC 20005. (Deadline for abstracts is 1 November 1991.)

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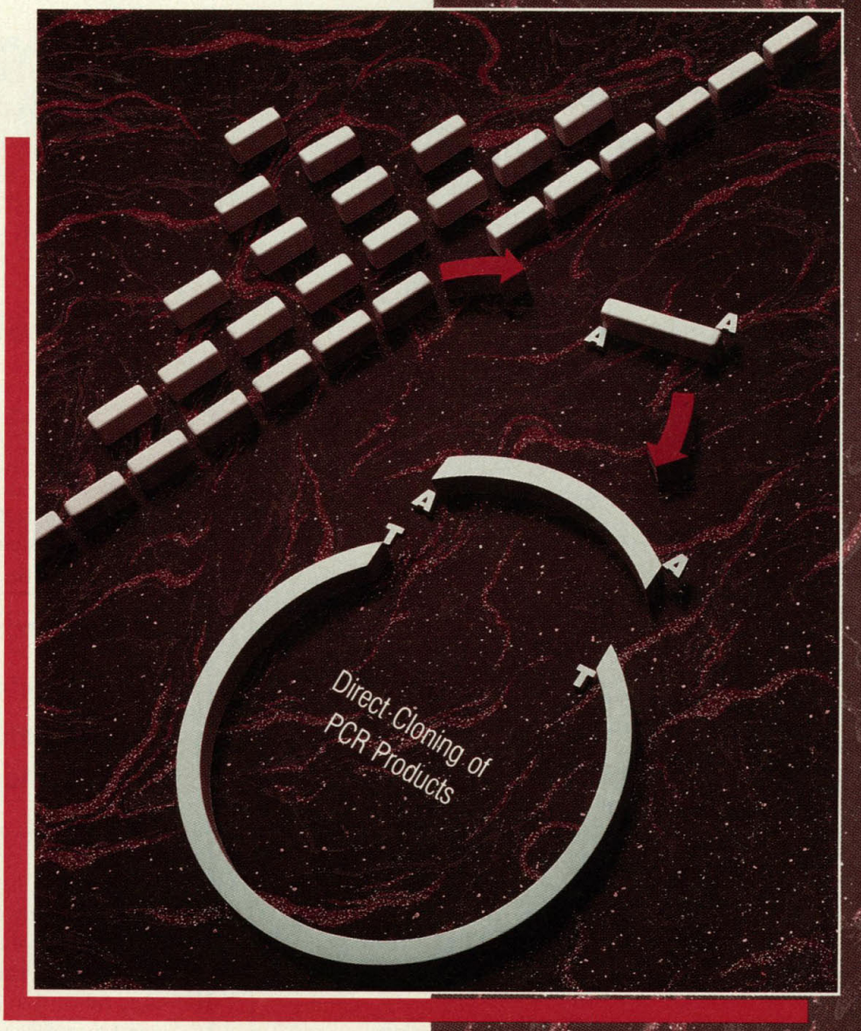

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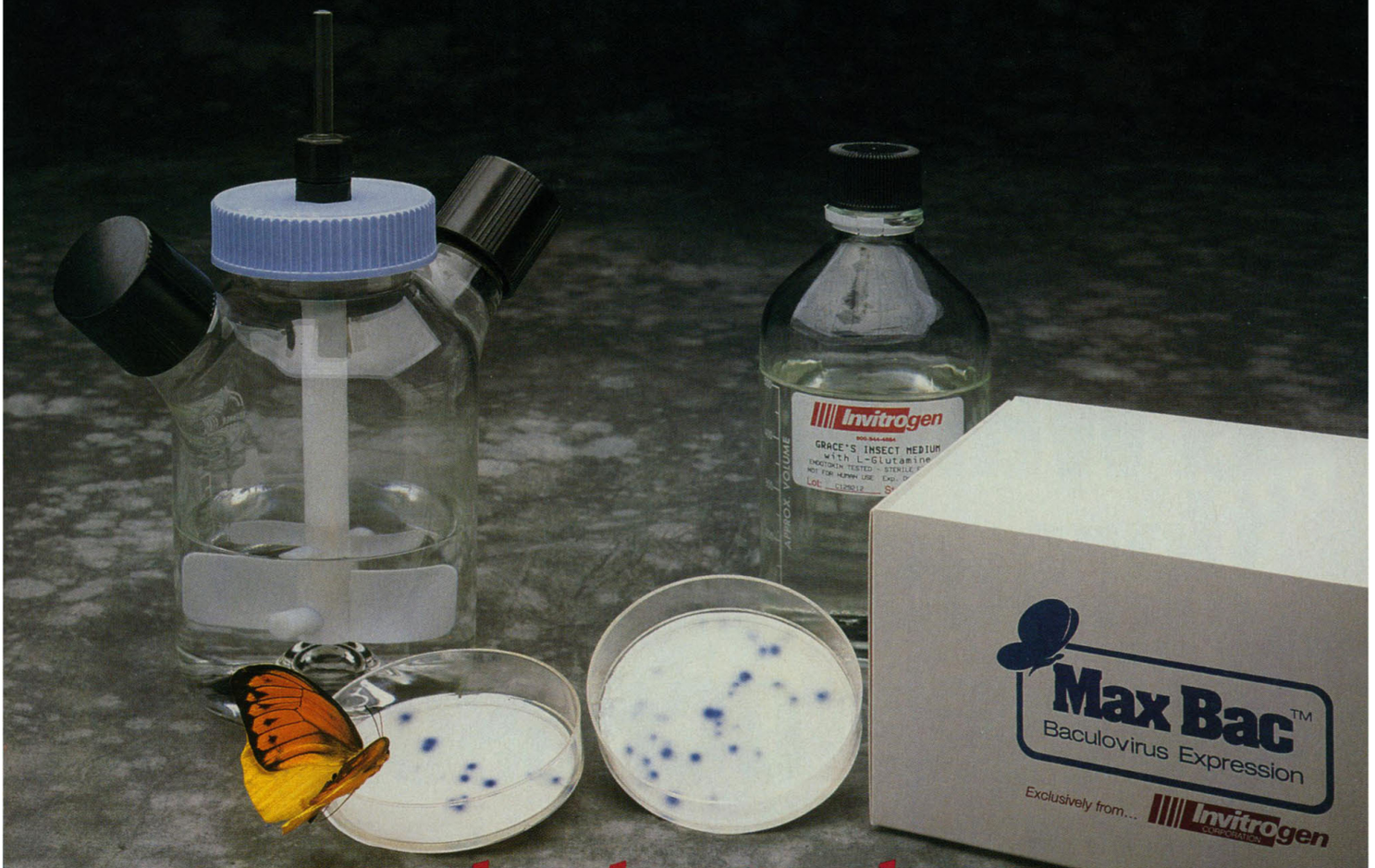

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Figure 1. Infected Sf9 insect cells showing viral occlusions.

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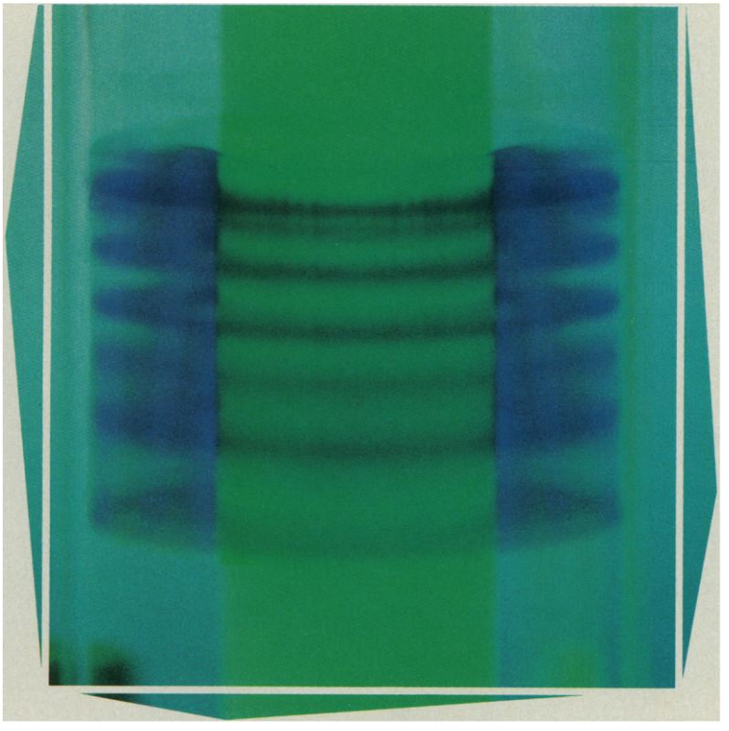

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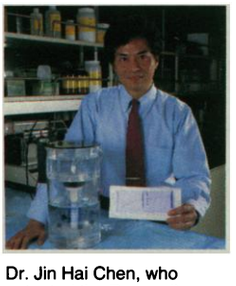

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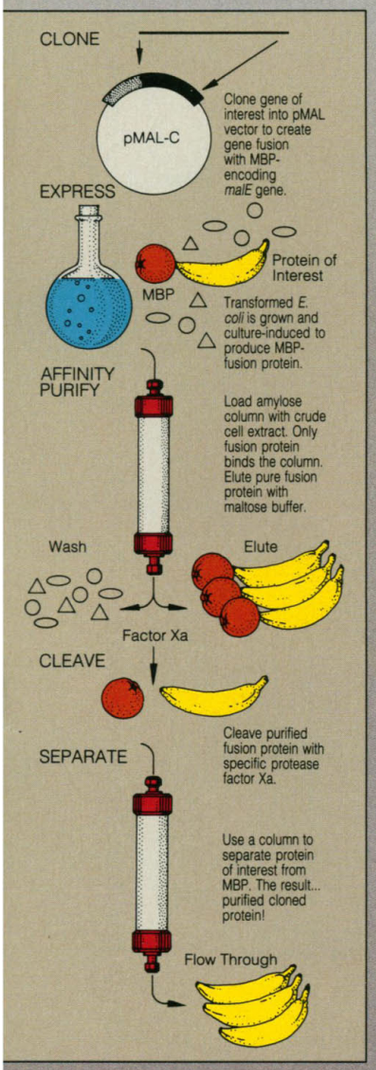

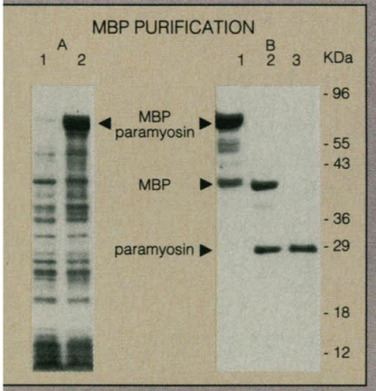

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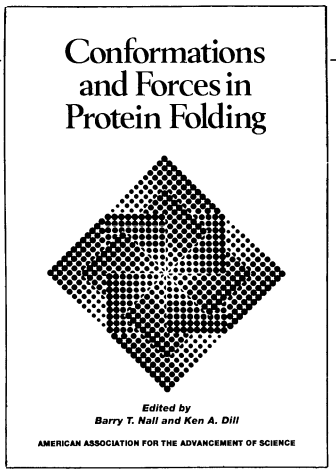
Conformations and Forces in Protein Folding



Barry T. Nall and Ken A. Dill, editors

Protein folding, the self-directed transition from disorganized chains to highly ordered and functional biological structures, is of increasing practical concern for the biotechnology industry and for interpreting DNA sequences. In the biological sciences folding is of major importance in the "self-assembly" process that produces the protein catalysts that facilitate and regulate cellular chemistry. Folding plays a role in such diverse cellular processes as macromolecular transport and assembly, targeting of proteins to intra- or extracellular locations, and in vivo stability of proteins.

Several aspects of folding addressed include forces and interactions important to protein stability and function, methods for determining proteins, studies of alterations in structure in mutant proteins, mechanistic investigations of the folding process, and analyses of auxiliary factors that modify or catalyze protein folding.

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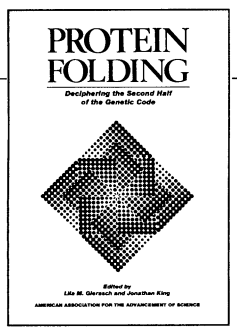

Protein Folding: Deciphering the Second Half of the Genetic Code

Lila M. Gierasch and Jonathan King, editors

1990; 342 pp.; indexed and illustrated; color plates #89-18S — softcover; $39.95 (members $31.95); ISBN 0-87168-353-9

"Readers of the book will get a vivid impression of the diversity of systems under study and of the impressive variety of techniques employed in folding research." —Trends in Biochemical Sciences