

In This Issue



Developmental Diversity

On the cover — sea urchins (*Strongylocentrotus purpuratus*) dine on kelp in an aquarium at Caltech's Kerckhoff Marine Laboratory, where they are part of a larger population providing a steady supply of eggs for research in developmental biology. Sea urchins produce thousands of eggs at a time, which develop synchronously into mature larvae in three days — features that make them extremely well suited for such studies.

Developmental biologists investigate the processes by which complex organisms with many kinds of cells develop out of a single cell — how the genes in a cell are expressed differentially to determine the fates of the cell's progeny. The new techniques of genetic engineering are bringing scientists closer and closer to the answer to this fundamental question.

One of the great strengths of developmental biology at Caltech is the coexistence of multiple approaches to this fundamental question, including the use of experimental subjects ranging from fruit flies to birds to a common weed. "From Cell to Organism: Discovering the Mechanisms of Development," beginning on page 2, discusses some of these approaches. A recent \$12.5 million grant from the Lucille P. Markey Charitable Trust is supporting much of the work.

Mars Missionary

Bruce Murray and Mars go back a long way. As a member of the imaging team of the Jet Propulsion Laboratory's Mariner missions in the 1960s and 70s, he participated in obtaining the first close-up pictures of the Martian surface. He was also head of the imaging team for the Mariner 10 flyby of Venus and Mercury and from 1976 to 1982 was director of JPL, during the triumphant Voyager missions to Jupiter and Saturn.

When Murray returned to his position of professor of planetary science, which he has



held since 1968, he also returned to Mars. In his article, "The Poles of Mars: A Key to Understanding Earth's Ice

Age," he discusses some of his current research and the reasons he believes the U.S. should continue to be a spacefaring nation — first stop, of course, Mars. The article, which begins on page 10, was adapted from his Seminar Day talk last spring.

Murray's degrees are all from MIT (SB 1953, SM 1954, PhD 1955) in geology. He has been at Caltech since 1960.

Computer Course

Four years ago Steve Koonin originated a course — Advanced Computational Physics Laboratory — that teaches Caltech students to use computers to solve highly complex physics problems. Now, about a third of Caltech's physics majors elect the popular course, and it has also been adopted at several other universities (including Yale and MIT) in the U.S. and West Germany. Koonin has written a textbook on the subject — with a floppy disk containing the necessary software.

Koonin discusses his course



in "Teaching Computational Physics," beginning on page 17. The article was first published last fall in IBM's magazine *Perspectives in Computing* (Vol. 6, No. 2), and Koonin also spoke

on the subject at the February 1987 meeting of the American Association for the Advancement of Science. A graduate of Caltech (1972), he received his PhD from MIT in 1975, the same year he returned to join the Caltech faculty. He is currently professor of theoretical physics.

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