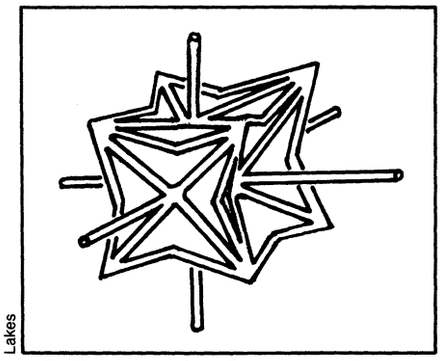
## Putting the squeeze on foam

Stretch a rubber band, and the band gets longer and thinner. Squeeze a sponge in one spot, and it bulges somewhere else. That's the way practically all spongy, porous materials behave. Now a biomedical engineer has created a flexible foam that does the opposite. His novel foam structures expand laterally when stretched and contract when squeezed.

"This whole business is a bit counterintuitive," says Roderic Lakes of the University of Iowa in Iowa City. "A lot of people think it should be impossible to do that. However, once you have the idea, it's not all that difficult to execute." His report appears in the Feb. 27 SCIENCE.

This foam's properties depend not on the material's chemistry but on its structure. Each cell in the material looks somewhat like a distorted cube whose faces have been pushed in to give it the appearance of a collapsed, 24-sided polyhedron (see diagram). If each face had a little tab, then pulling tabs on opposite sides of the cube would also force the remaining sides to spring outward. The actual cell structure found in the new foam works in the same way but is much more convoluted and contains ribs that are bent and protrude into the cells.



Lakes

So far, Lakes has found ways to make these "reentrant" foams, as he calls them, from polyester, silicone rubber and even copper metal. In the case of polymers, the method involves squeezing the material while it's hot, then cooling it to freeze in the required structure.

The new foams turn out to be tougher and more resilient than conventional foams made from the same material. "It is anticipated," says Lakes, "that reentrant foams may be used in such applications as sponges, robust shock-absorbing material, air filters and fasteners."

Would such a foam make a good novelty item for kids to play with? Probably not, says Lakes. "Children don't have enough experience to think that if things are stretched they should always get skinnier." They wouldn't find the new foam's behavior surprising. — *I. Peterson*

## A super-supercomputer

A supercomputer system that NASA calls "the world's most advanced," intended to aid tasks ranging from the design of high-speed aircraft to the study of galactic evolution and world weather patterns, was declared operational on March 9 at the space agency's Ames Research Center at Moffett Field, Calif. Known as the Numerical Aerodynamic Simulator (NAS), it is driven — for the present — by a Cray 2 supercomputer capable of conducting 250 million computations per second, a number expected to rise to 1 billion when a second central processor is added later this year, and to 10 billion within a decade. This will be accomplished, according to NAS officials, by striving to "always acquire the fastest available supercomputer at any given time, provided it is at least four times more powerful than a computer already in place."

About 90 percent of NAS's research is expected to pertain to aeronautics. Of the system's available computer resources, some 55 percent is to be allotted to NASA, 20 percent to the Department of Defense, 5 percent to other government agencies, 15 percent to commercial users such as aircraft companies that want to keep proprietary rights to their results, and 5 percent to universities. The system can be operated from workstations throughout the United States. □

## Star dust in the sky with diamonds

Diamond dust, created within gases escaping from a dying star, may be strewn throughout space. The evidence for this startling picture is embedded in microscopic diamonds recently found for the first time within several types of meteorites. These diamonds are probably older than the solar system, say Edward Anders and Roy S. Lewis of the University of Chicago and their colleagues. Their report appears in the March 12 NATURE.

The group's initial goal was to identify the fine-grained type of carbon contained in many primitive, stony meteorites. After a series of purification steps, the researchers ended up with a powdery, white residue. Tests showed that the powder consisted largely of tiny diamond grains, typically 50 angstroms in diameter, each of no more than a million or so carbon atoms arranged in a diamond lattice. Because these grains also carry traces of xenon gas having a distinctive proportion of isotopes, the researchers concluded that the diamonds must have come from outside the solar system and were not created in the shock generated when meteorites crash into the earth (SN: 6/13/81, p.376).

Anders hypothesizes that the diamonds were probably created billions of years ago during the dying years of a red giant star. At that stage, the huge star would be losing enormous amounts of gas. That gas would expand and cool, causing materials such as carbon to condense. Centuries later, when the star finally exploded as a supernova, it would eject high-velocity ions, including charged xenon atoms, which would overtake the escaping diamond grains and become embedded in the dust. This debris might then have mixed with the material out of which the solar system was much later born.

"Diamonds may be made on an enormous scale in the universe," says Anders. "This is what I find so mind-boggling." Adding to the excitement, he says, is that materials scientists recently had developed a laboratory process for growing diamonds from low-pressure gases — before they had any indication that it also happens in outer space (SN: 8/23/86, p.118).

Materials scientists could learn something from the stars, says Anders. "Red giants are fairly well behaved and well understood," he says. "You can look up the temperature, pressure and chemical composition of a red giant atmosphere and try to duplicate it in the laboratory." — *I. Peterson*

## Goodbye, Pioneer 9

A little space probe called Pioneer 9, which was launched on Nov. 8, 1968, into a vast, sun-circling orbit, has finally been given up for dead — nearly four years after it was last heard from.

Having spent almost a decade and a half monitoring the solar wind, cosmic rays and other phenomena, the craft broadcast its last successful message to earth on May 15, 1983. Why it stopped is unclear — a short-circuit, perhaps, or a meteorite impact? — but engineers at the NASA Ames Research Center kept trying to bring it back to life, periodically sending computer commands when the probe, earth and the sun were in proper positions, and listening with increasingly sensitive receivers for any hint of a response. The final attempt, involving 80 separate command sequences, was made on March 3, with no result.

Still at work, however, are similarly equipped Pioneers 6 through 8, as well as Pioneers 10 and 11, on their way out of the solar system after becoming the first craft to visit Jupiter and Saturn, and Pioneer 12, in orbit around the planet Venus. "We're sorry to lose Pioneer 9," says engineer Robert Jackson, "but it had its day in the sun." □