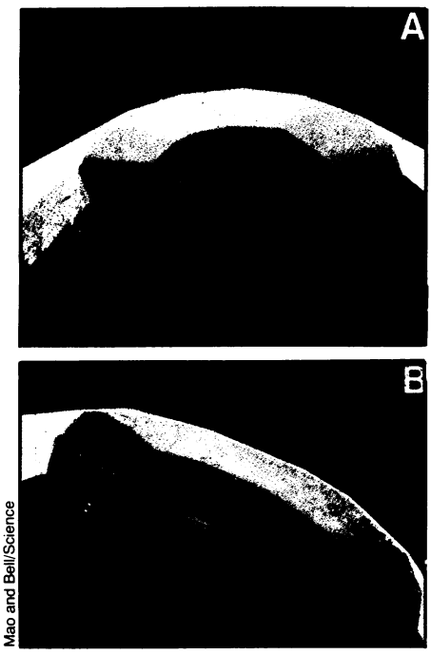
Even a diamond has to give sometimes

The generation of extremely high static pressures is a specialty of certain laboratories where geophysics or solid state physics is of particular interest. Every once in a while the specialists in this kind of experiment, which is very delicate in spite of the involvement of tremendous forces, extend themselves with a new record. In the June 9 SCIENCE, H. K. Mao and P. M. Bell of the Carnegie Institution of Washington report the highest pressure yet generated (at room temperature), 1.72 megabars. (One megabar is a million times atmospheric pressure.)

The experiment was done in a diamond-window pressure cell, in which the forces are transmitted to the pressurized sample by diamonds above and below it. Diamonds are used because of their extreme resistance to deformation under pressure so that they faithfully transmit the forces applied to the sample. The pressurized sample was a metal composite with ruby crystals embedded in it. The pressure was measured by noting the change in the fluorescence wavelength of the ruby as the pressure deformed it. "This is the highest sustained pressure ever generated under static conditions where the pressure in the sample itself was measured," Mao and Bell state. "This maximum pressure is almost 3.5 times higher than the highest pressures reported by other laboratories in which continuous internal calibration was employed."

Geophysically this pressure corresponds to a depth in the earth of about 3,000 kilometers, which is within the earth's core. So the techniques of the experiment can be applied to geophysical problems involving the boundary between the mantle and the core. There is as well a wide range of physical and chemical problems of the nature of matter under high pressure for which they can be used.

Diamond, it is frequently said, is the hardest substance available, but under pressures of more than a megabar even it gets runny. At pressures around 1.7 megabars the center of the diamond pressure face changed color from clear to brown. The cell was left at a pressure of 1.7 megabars for 18 hours, and the brown color remained. The pressure was gradually released (to avoid cracking), and the brown disappeared as the pressure went from 1.0 to 0.8 megabar. Examination of the diamonds when the pressure was completely off showed no obvious cracks, but evidence of flow deformation in the area that had been brown: One of the pressure surfaces had changed from flat to concave. So the ancient Greek was right: Given the proper pressure, *panta rhei,* all things flow. □



Mao and Bell/Science

We have ways of making you yield. The flat face of a diamond anvil flowed into a permanent concave shape under 1.7 megabars pressure.

Lyme arthritis: Tick carried

A tiny tick, *Ixodes scapularis,* has been implicated in what may be the first form of insect-carried arthritis in the United States.

For three years Stephen E. Malawista, Allen C. Steere and John A. Hardin of Yale University have sought the cause of a joint disorder called Lyme arthritis (SN: 6/19/76, p. 389). The disease was named for the area around Lyme, Conn., where it was first found in late 1975. It begins as a hard red spot, often on the thigh, armpit or buttock. The spot spreads to form a ring sometimes spanning a 20-inch diameter. Fatigue, chills, fever, headache and stiff neck often accompany the lesion. Arthritic symptoms, most often in the knee or shoulder, may develop weeks after its appearance. The disease is usually not severe or lasting, but researchers have noted recurrent arthritic attacks and, in a few cases, inflammation of the brain and linings, temporary paralysis of some nerves and heart palpitations.

The researchers suspected an insect vector soon after the disease was noted, they report in the April 1978 HOSPITAL PRACTICE. Other forms of insect-carried arthritis have been found in Africa and Australia. The Lyme disease occurs during the bug-infested summer months, May to September. Most victims live in forested areas along Long Island Sound from Massachusetts to New York. Outdoor-playing children are most often affected.

Other evidence narrowed the culprit to a tick. The lesion strongly resembles European tick-caused rashes. It occurs on body areas that favor a crawling insect, and several patients reported tick bites at the site of the lesion. More recently, entomologists noted a large crop of *Ixodes scapularis* on animals in the study area. Then one patient, an environmentalist, brought in the creature that bit him — an *Ixodes scapularis.*

Various culture and serologic techniques have failed to isolate the microorganism responsible, but the researchers believe now that they have the carrier they will be more successful. □

Spacelab astronauts chosen by scientists

In January, the National Aeronautics and Space Administration announced the selection of 35 new astronaut candidates for the space shuttle program. Besides including the first women and (with one exception) blacks in the astronaut corps, the group included the first 20 candidates not required to meet piloting qualifications. Those 20 will be trained as "mission specialists" (the other 15 will be pilots), concerned with the shuttle's intended work in orbit rather than just "driving the truck."

The latest group of shuttle-riders, announced last week, departs even further from what used to be the standard NASA selection procedure. They were, in fact, not even selected by NASA at all, but by the scientists for whose experiments they will be responsible. The newcomers will train for work aboard Spacelab, the European-built, multi-disciplinary research module that will be used on several flights to convert the shuttle's entire payload bay into an orbiting laboratory.

The two Americans in the group are space physicist Michael L. Lampton of the University of California at Berkeley and vestibular researcher Byron K. Lichtenberg of the Massachusetts Institute of Technology. They were chosen by the Investigators Working Group, composed of scientists representing themselves and other Spacelab researchers. Three other candidates were selected by the European Space Agency: Ulf Merbold, a West German working in crystal lattice defects at the Max Planck Institute in Stuttgart; Claude Nicollier, a Swiss-born astronomer now at the European Space Technology Center in the Netherlands; and Wubbo Ockels, a Dutch nuclear physicist.

All five will train for the first Spacelab mission, now aimed for December 1981, with two of them — probably one American and one European — selected a few months beforehand to actually make the flight. □