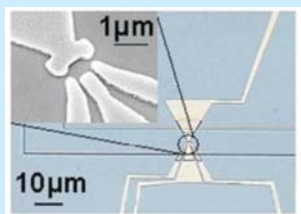


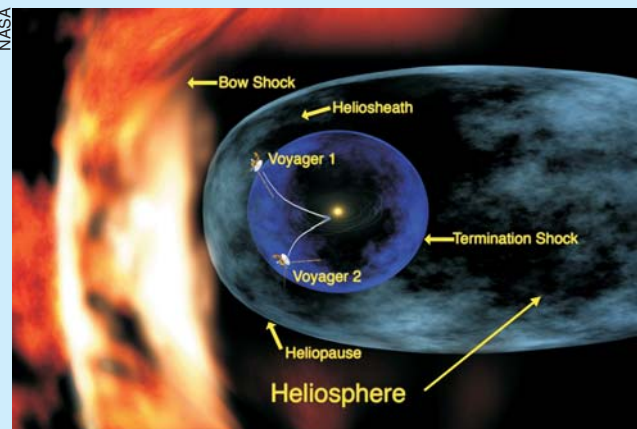
Counting terahertz photons. Scientists at the University of Tokyo and the Japan Science and Technology Corporation combined a quantum-dot photon detector (shown here) with a scanning confocal optical system to demonstrate exquisitely sensitive THz microscopy. Previously, such far-IR photons—with energies of about 4 meV—could only be seen in large numbers. The researchers scanned the quantum-dot probe



across the face of a quantum Hall device and obtained images with a spatial resolution of 50 μm . (The radiation itself has a wavelength of 132 μm .) Furthermore, the power emitted from the surface was as low as 10^{-19} watts (about 100 photons

per second), arising from a few electrons oscillating at THz frequencies. According to researcher Kenji Ikushima, the technique's high sensitivity will soon facilitate the study of a single molecule shaking, rattling, and rolling at THz rates. (K. Ikushima et al., *Appl. Phys. Lett.* **88**, 152110, 2006.)—PFS

The misshapen solar system. Having traveled far beyond the planets in their 28.5-year journey, NASA's two *Voyager* spacecraft are providing new information on the heliosphere, the teardrop-shaped bubble that separates the solar system from interstellar space (see the diagram for an orientation). At the May meeting of the American Geophysical Union and several other geoscience-related societies, Edward Stone of Caltech reported that the heliosphere is deformed, with the teardrop's rounded edge bulging at the top (the northern hemisphere of the solar system) and



squashed at the bottom (the southern hemisphere). Robert Decker of the Johns Hopkins University Applied Physics Laboratory explained that the asymmetry can be due to a weak interstellar magnetic field (about 10^{-5} the strength of Earth's field) pushing on the southern hemisphere. The interstellar field even squashes the termination shock, the boundary at which the rapidly traveling solar wind slows down abruptly and piles up. *Voyager 2*'s measurements indicate that the southern part of the termination shock might be up to a billion miles closer to the Sun than the northern part. *Voyager 1*

has already ventured beyond the termination shock into the heliosheath, where the solar wind slows as it presses against the ionized interstellar gas. Stone guesses it could be another 10 years (3–4 billion miles) before the two spacecraft pass through the heliopause and enter interstellar space, heading toward the Sun's hypothesized bow shock. The spacecraft have about another 15 years of power left in them. (See <http://www.agu.org/meetings/ja06> for abstracts from session SH21A.) —BPS

Noncontact friction. One can think of contact friction as being a sort of micro-velcro process—atomic “hills” on a surface scrape past atomic “valleys” from another surface. To observe noncontact friction between two surfaces separated by more than 1 nm, Seppe Kuehn and his colleagues at Cornell University use a single-crystal microcantilever that is 0.25 mm long and only a few thousand atoms thick. Brought vertically downward toward a surface and set in motion like a pendulum, the cantilever will slow down because of the friction it feels from the surface beneath it. It turns out, surprisingly, that the noncontact friction force depends on the chemistry of the sample. By studying that chemical dependence in various polymer materials, the Cornell scientists directly detected friction due to the weak electric-field fluctuations from molecular motion in the samples. The work was motivated by recent efforts to achieve single-molecule magnetic resonance imaging, which requires the detection of very small forces and has been hindered by noncontact friction. (S. Kuehn, R. F. Loring, J. A. Marohn, *Phys. Rev. Lett.* **96**, 156103, 2006.) —PFS

Thermoacoustic trap for medflies. The Mediterranean fruit fly (*Ceratitis capitata*) is a worldwide pest that infests hundreds of different fruits and other crops and had an estimated \$1.5 billion impact during its last infestation in California. Traps play a big role in both detecting and eradicating an infestation in an area. To selectively target female flies, researchers in recent years have experimented with playing recorded broadcasts of buzzing males. The required outdoor sound levels, however, call for an amplifier–loudspeaker system that is large, expensive, and easily damaged in harsh weather. At last month's meeting of the Acoustical Society of America, Steven Garrett and Kent Lau of the Pennsylvania State University unveiled a different method based on thermoacoustics (for a primer, see the article in *PHYSICS TODAY*, July 1995, page 22). The characteristic sound of the male medfly's wing-fanning vibrations has a dominant fundamental tone at about 350 Hz, a weak second harmonic, and amplitude modulations of roughly 25% at about 20 Hz. Garrett and Lau designed a trio of thermoacoustic sound generators to approximate the mating call. Similar to the one shown here, each uses an ordinary test tube that contains a ceramic heat-exchanging substrate and a heater coil. Two of the test tubes differ only slightly in length; combined, they produce a 20-Hz beating amplitude modulation around the desired fundamental tone. The third produces the higher pitched second harmonic. The researchers are now testing their cheap, weatherproof, and compact medfly mating-call mimic. (Abstract 1pAB11 at <http://asa.aip.org/asasearch.html>.) —SGB

