Early detection of Alzheimer's disease could be done with noninvasive optical methods. Two years ago, researchers discovered that the exact same β-amyloid peptides (Aβ) that are a hallmark of Alzheimer's disease also appear in the eye's lens and its surrounding fluid. Where those proteins collect in the eye, they form amyloid deposits similar to those in the brain. The researchers also discovered that Aβ in the lens produces a very unusual cataract, formed in a different place than common cataracts (which are not at all associated with Alzheimer's). The next step was revealed in October, at the Frontiers in Optics meeting of the Optical Society of America in Tucson, Arizona. Lee Goldstein, who is leading the research at Brigham and Women's Hospital in Boston, presented a pair of optical tests that can noninvasively detect Aβ in the lens. Using quasi-elastic light scattering, the first test—now in clinical trials—employs low-power IR laser light to detect proteins in the lens's supranucleus, the part uniquely susceptible to the unusual Alzheimer's cataracts. The second, complementary test—now in advanced development—uses a technique Goldstein and colleagues call "fluorescence ligand scanning." In FLS, special eye drops contain molecules that bind specifically to Aβ and then fluoresce. Such tests may not only improve patients' chances to start treatment earlier, but could also speed development of new Alzheimer's drugs. —BPS

Thin-film solar cells made from colloidal semiconductor nanocrystals. In recent years, much effort has been put into lowering the manufacturing cost of photovoltaic (PV) cells, used to convert sunlight into electricity. One route has been the development of thin plastic films of PV material. Although relatively easy to produce, the organic components of such films respond well only in a narrow range of the Sun's spectrum, have poor carrier mobility, and degrade quickly when exposed to air. Conventional semiconductor PV cells are more efficient and durable but also much more expensive to make. A group led by Paul Alivisatos (Lawrence Berkeley National Laboratory and University of California, Berkeley) has now begun to combine the best of both worlds. Using rod-shaped particles of cadmium telluride, the team made a colloidal solution that they spin-cast into a thin film on a suitable substrate. A second film, of similarly prepared rod-shaped cadmium selenide colloidal particles, was overlaid. The resulting bilayer was an electrical insulator in the dark, but when it was exposed to sunlight, its conductivity rose by a factor of a thousand. The new inorganic films already match the 3% efficiency of organic PV films, have a broad spectral response to sunlight, and are stable in air. (I. Gur et al., *Science* **310**, 462, 2005.) —SGB

Walking molecules. Ludwig Bartels and his colleagues at the University of California at Riverside, guided by theorist Talat Rahman of Kansas State University, have created a molecule—called 9,10-dithioanthracene (DTA)—with two thiol "legs" configured in such a way that only one "foot" at a time can rest on the substrate. Activated by either heat or the nudge of a scanning tunneling microscope tip, DTA will pull up one foot, put down the other, and thus walk in a straight line across a flat surface. The planted foot not only supports the body of the molecule but also keeps it from veering off course. In tests on a standard copper surface, such as the kind used in manufacturing microchips, the molecule has taken 10 000 unidirectional steps without faltering. The researchers now plan to develop a DTA-based molecule that can convert thermal energy into directed motion like a molecular-sized ratchet. (K.-Y. Kwon et al., *Phys. Rev. Lett.* **95**, 166101, 2005.) —PFS

Hanbury Brown–Twiss interferometry for ultracold atoms. Nearly 50 years ago, the HBT effect demonstrated that photons emitted from a thermal source unexpectedly showed intensity correlations, often called photon bunching. Unraveling the correlations allowed astronomers to measure the sizes of stars. In the coherent light emitted by lasers, such photon bunching is absent. (For more, see page 19 of this issue.) Two groups have now demonstrated the HBT effect for bosonic atoms rather than for photons. At the Institute of Optics in Orsay, France, a team of physicists used a 0.55-μK gas of metastable helium atoms. The scientists released a tiny cloud of the atoms from a magnetic trap; some of the atoms became insensitive to magnetic fields and fell 47 cm to a microchannel plate detector where their individual positions and arrival times were recorded. By accumulating and analyzing data from about 1000 repetitions of the experiment, the physicists found the expected correlations. At higher temperatures, the cloud was larger and the correlation length too small to resolve with their detector. At colder temperatures, the helium gas became a Bose–Einstein condensate and the correlations abruptly vanished, also as expected. The other group, at ETH Zürich, used an atom laser from a BEC of rubidium-87 atoms. The atoms fell 36 mm into a high-finesse optical cavity where single atoms were recorded and the absence of bunching was observed, just like in an optical laser. When the Swiss group made the beam quasi-thermal, HBT correlations showed up in their data. (M. Schellekens et al., *Science* **310**, 648, 2005; A. Öttl et al., *Phys. Rev. Lett.* **95**, 090404, 2005.) —SGB ■