



## SATELLITES

## Details, Details

**O**UR PLANET MAY BE an orb, but it's not perfectly round, so gravity varies slightly from location to location. And that presents challenges for GOCE, the low-orbit satellite launched by the European Space Agency to map "with unprecedented detail" the Earth's gravity field. Hovering a mere 150 miles above us, GOCE skims along the bumpy edges of the Earth's atmosphere. It needs to be completely free of drag to take its precise measurements, so ESA engineers designed it with a unique electric ion propulsion system that uses the inert gas xenon as its propellant. It produces just the right amount of gentle thrust to keep drag at bay. Now halfway through its two-year mission, GOCE began taking its sensitive readings of the Earth's gravitational pull in September. Its findings will give researchers a better understanding of ocean currents, which are directed by gravity and affect air temperatures. The information should help improve climate change computer models. You don't have to be a Newton to know how important that is. —TG

## GOVERNMENT RESEARCH

## DARPA Reaches Out

**R**EGINA DUGAN, a mechanical engineer and the new director of the Defense Advanced Research Projects Agency (DARPA), is on a round of visits to major research universities in a bid to re-establish ties that became frayed during the Bush administration. "It is our goal to strengthen this partnership," she says. As of mid-October, she had been to Texas A&M, Virginia Tech, Berkeley, UCLA, Stanford, and Caltech. Funding for basic research shrank under her predecessor, Anthony J. Tether, who had invested in artificial intelligence, pushed the agency toward more classified programs, and tightened the period for research financing, according to the *New York Times*. "It sounds like a lot of that is changing now," Peter Harsha, who represents academic institutions in Washington, tells the newspaper. —TG



## 3-D PRINTING

## Desktop Manufacturing

**R**APID PROTOTYPING is a fast-growing industry that enables companies to create models and prototypes of products and parts quickly, cheaply, and with little or no waste, using a process called additive manufacturing. It's also called 3-D printing because many of the machines use forms of inkjet and aerosol jet printer technologies. Models are fashioned one thin layer at a time, guided by 3-D CAD software. Larger, more complex machines can create actual parts, a type of rapid manufacturing. Boeing has used the technology to produce airplane parts; and companies as diverse as Timberland, Black & Decker, and Sony Ericsson use it to make prototypes. The printers aren't cheap, of course — they range from around \$10,000 to \$1 million — but 3-D technology is catching on. At the University of Michigan, a student team used it to build a solar-powered car, Infinium. Using the printers and scanners of their sponsor, Z Corp., a maker of inkjet-based 3-D printers, the students were able quickly to produce prototypes of the parts they designed. And those parts are pretty smooth: Infinium is five times more aerodynamic than a Corvette. —TG

