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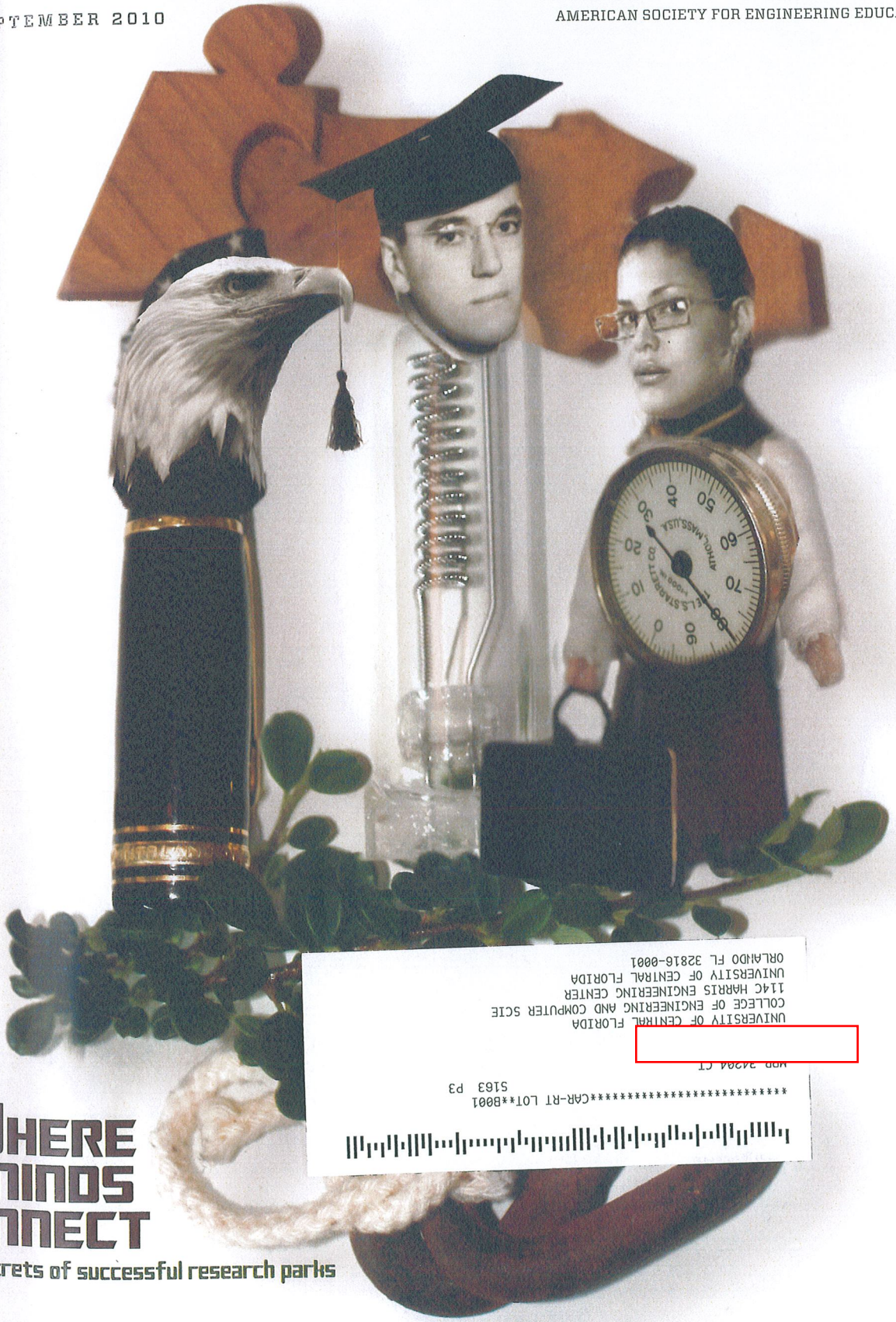

WHERE MINDS CONNECT

Secrets of successful research parks

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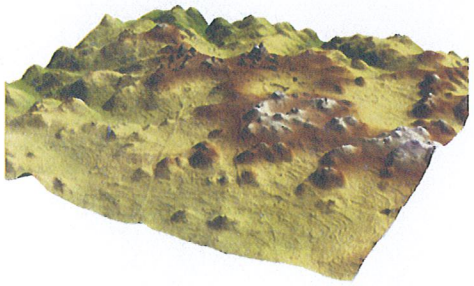
PRISM SEPTEMBER 2010

LASER MEASUREMENT

A City Revealed

FOR 25 YEARS, archaeologists Arlen and Diane Chase of the University of Central Florida have been hacking through dense tropical forest in Belize in Central America, to map out the ancient city of Caracol, which reached its heyday between A.D. 550 and 900 when it was home to some 115,000 Maya. But in 2009, NASA made their work both easier and more accurate, through the use of lidar, an airborne, laser-based remote sensing technology. Developed in the 1970s to map the Earth's atmosphere, tree canopy, and ice fields, lidar (light detecting and ranging) sends out pulses of laser light, which, once they hit their targets or the ground, reflect back to measuring instruments. The technology took off in the past two decades as GPS became available, along with stronger, faster computers needed to crunch the data and spit out 3-D maps. In just four days in spring 2009, a small, lidar-equipped airplane flying a half mile over the thick Belize forest did more mapping of Caracol than the Chases had achieved over the previous quarter century. The 3-D images it produced of the once-sprawling city over an 80-square-mile area included palaces, small homes, boulevards, industrial areas, slums, and suburban mansions. "We were blown away," Diane Chase told the *New York Times*. Lidar is helping other researchers cut through thick jungle vegetation in areas ranging from Mexico to North Africa to Cambodia's Angkor Wat region. This is one space-age technology that archaeologists can really dig. –TG



CARACOL ARCHAEOLOGICAL PROJECT

IMAGING TECHNOLOGY

Biopsy in 3-D

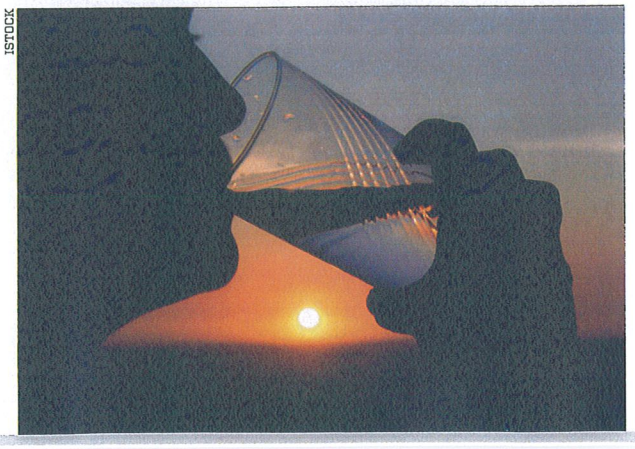
RESEARCHERS AT Yale University's School of Engineering and Applied Science have developed a new 3-D imaging technique that could greatly improve the imaging of biopsy samples. Called multi-photon microscopy, it uses an optical clearing solution that renders tissue transparent to optical light. Yale's team was able to scan mouse organs, including the brain, kidney, and testicles, and create 3-D models of them. They use photons to naturally excite the fluorescent cells within tissues, and the fluorescence displays itself in different colors. For example, lung collagen shows up as green, elastin as red. Traditional microscopy techniques require cutting tissue into thin slices, staining them with dyes, and then rebuilding them to make 3-D models. But that the process destroys the tissue, and no more additional information can be extracted from the sample. Says Michael Levene, associate professor and team leader of the new technology: "It's like creating a virtual 3-D biopsy that can be manipulated at will. And you have the added benefit that the tissue remains intact, even after it's been imaged." –TG

WATER PURIFICATION

We'll Drink to That

ONE OF THE pressing needs in a disaster area is potable water, which is often in short supply. Many natural disasters occur in areas where there is plenty of seawater, but current desalination technologies require vast amounts of dependable electricity – also typically lacking in a disaster. Now, MIT researchers, working with colleagues in South Korea, are developing a mini-desalination system that would use only as much power as a conventional light bulb. The system separates out salt – and some dangerous microbes, including viruses and bacteria – by electrostatically repelling them from an ion-sensitive membrane. It's a microscopic technique, with each device producing only very small quantities of sweet water. But a 1,600-unit array atop an 8-inch wafer could produce 15 liters of water an hour. Jongyoon Han, an electrical engineering associate professor, and his post-doc, Sung Jae Kim, tested with excellent results a basic unit with seawater that was deliberately polluted with small plastic particles, proteins, and human blood. Ninety-nine percent of the salt and contaminates were removed. They expect it will take two more years before the device can be commercialized.

Meanwhile, the Dutch start-up Voltea has developed another ion-based desalination system on an industrial level. Dissolved salt divides into positive and negative ions, and Voltea's desalination cell draws them out using electrodes. The company claims its system uses half the power needed by other desalination technologies, and only 5 percent of the water it processes is lost. Sweet stuff. –TG



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