Watch Us Move
Homeland security requires a new kind of population map.

Chicago’s Sears Tower has a population of zero—at least, according to the U.S. Census Bureau. But it terms with daytime occupants, people who may need evacuation or medical attention in a disaster. LandScan USA, a system in development at Tennessee’s Oak Ridge National Laboratory, will help planners prepare for such emergencies by keeping track of population distribution.

LandScan began as a global project for the Department of Defense. Using geographic information and satellite images, Oak Ridge’s Eddie Bright and colleagues created a world population distribution model down to 1 square kilometer. Before the September 11 attack, says Budhendra Bhandari, who directs research on the U.S. project, government agencies showed only moderate interest in the work. But now, he says, “they even want rush hour versus non-rush hour estimates.” The modeling is done with algorithms based on analysis of an area’s topography and infrastructure. For example, “if you take the slope and nighttime light in an area,” says Bhandari, “you can begin to estimate the likelihood that people would be there.”

So far, the team has modeled 29 counties. They hope to refine their models to go-square-meter areas—smaller than most city blocks. Should they succeed, their work will have just begun. “Populations change, buildings turn into parking lots,” says Bhandari. “And we come up with new methods. It’s constantly improving and changing.”—Sunny MacKo

ELEPHANT LOVE SECRETS REVEALED!
Elephant mating rituals are like a food fair. Bulls meander about sipping their trunks in puddles of female urine and tugging. When a female is in heat, her urine contains a potent sex pheromone; when a male gets a whiff, he will attempt to mount her. Recently, Beth Basis of Oregon Health and Science University and Dolen Prestwich of the University of Utah made an important discovery, figuring out how this pheromone gets to the bull’s brain. They expected to find a molecule that transported the pheromone. Instead, they discovered a protein in the male’s mucous that maps up other odors so that the sex pheromone stands out. After a minute or so, the protein binds the sex pheromone too, probably providing the “stop” signal that turns the male elephant off—and gives the female a much-needed rest.—Gunnar Steins

nanotechnology
TEENY ANTENNAS
BOMBSNIFFLING DOGS AND XRAY screening may one day be replaced by infinitesimal silver antennas. Using mathematical simulations, researchers at Purdue University in West Lafayette, Indiana, have shown that arrays of these antennas could be used as chemical sensors, thousands of times more sensitive than current technology. The antennas, each about 10 nanometers wide (one millionth of a centimeter), would consist of chains of spherical silver particles. In one simulation, Vladimir Shalaev and colleagues demonstrated a highly effective detection system made up of thousands of nanoantennas arranged in fractal, or self-repeating, patterns. An actual detector, which Shalaev estimates is still three years away, could be tuned to pick up the electromagnetic call sign of an individual molecule—as opposed to the hundreds of molecules sought by current devices. The key to accuracy: plasmons, collections of electrons poised on the surface of the nanoantennas that can enhance a faint incoming signal as much as 100,000 times. This strengthened signal would be transmitted to a receiver that could then identify potentially harmful residue.

Shalaev says nanoantennas could also assist in applications ranging from medical imaging to computer circuits.—Greg More