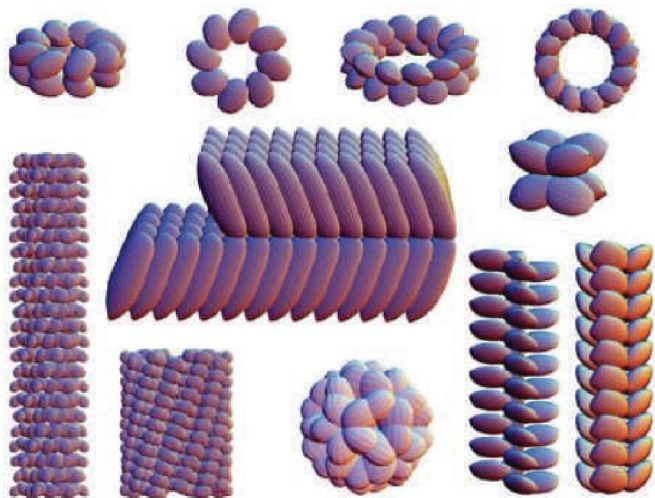


PAT TOENSMEIER



U.S. AIR FORCE OFFICE OF SCIENTIFIC RESEARCH

1 Tiny Antennas Researchers at the University of Minnesota are looking for new materials that will permit construction of antennas for micro air vehicles (MAV). The work focuses on identifying and determining the properties of "objective structures." These are molecular structures whose atoms assemble in certain ways and exhibit collective properties like ferromagnetism and ferroelectricity that are essential for antennas, says Prof. Richard D. James, who leads the program called "GameChanger." Because of its size (a few centimeters to half a meter), it will be necessary to use part of a MAV as an antenna. So, the materials James identifies must also be structural. He developed a formula to find objective structures and a version of quantum mechanics to predict their properties. Materials studied so far include nanotubes and fiber- and sheet-like structures. (The image is a stylized view of molecules in objective structures.) James' team can make simple predictions of properties, but much work remains. Funding is by the U.S. Air Force Office of Scientific Research. ■

ON THE EDGE

2 No Wii-strictions Video-gaming controls could make robots easier to operate, and their operators safer on battlefields. That's one conclusion from the use of a wireless Nintendo Wii remote control on a PackBot robot from iRobot Corp. Configured by engineers at the Energy Dept.'s Idaho National Laboratory, the Wii makes robot control more intuitive. The result, says Orin Hoffman, director of third-party development for iRobot, is operators spend significantly less time manipulating a remote control and more time monitoring their surroundings. Since PackBots are often used for bomb detection in combat zones, situational awareness among operators is critical. The Wii control has a 3-axis accelerometer that detects motion. It links via Bluetooth to a computer that translates hand motions into commands. A slight hand movement sends the robot in the same direction as the gesture. When combined with a payload of software and sensors, robots learn to navigate safely and require only supervisory control. "The real goal is to increase the intelligence of the robot to safely offload more tasks from the operator," Hoffman says. There are no plans yet to build PackBots with Wii controls. ■



U.S. AIR FORCE

3 Radar Lock As more conflicts are waged in urban areas, the ability to detect and track targets is vital. But urban clutter raises havoc with conventional radar. A researcher at Colorado State University developed a system for urban use that reportedly yields a 10-fold increase in detection and tracking capabilities. Prof. Edwin Chong says the system has three components: radar waveforms designed for urban areas; receivers that detect and process the signals; and the ability to transmit different waveforms to adjust for clutter. Chong says the system is based on waveform-agile radar. This is not a new concept, of course, but what is different is how Chong's radar receives and processes signals and adjusts waveforms. Another feature is sensor management. Signals are picked up, analyzed and transmitted by a network of sensors throughout an area. Coordinating the data flow is critical to developing accurate locations of targets and eliminating mistakes and threats to soldiers in follow-up operations. Chong's work has been done with ground-based radar, but airborne systems are feasible. The Defense Advanced Research Projects Agency is funding the work. ■



iROBOT