

NEWS

For immediate use

Sept. 25, 2002 -- No. 508

UNC, other universities will help NASA develop space-age materials

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CHAPEL HILL -- Imagine materials used in spacecraft and other applications that could repair themselves similarly to the way cuts heal on a sugar maple tree or a skateboarder's knobby knees, except more quickly. Or change shape somewhat without the great weight that hydraulic systems add.

Science fiction? So far yes, but scientists and officials at the National Aeronautics and Space Administration believe such near miracles one day will become reality. To spur their development, NASA has awarded a consortium of research institutions grants that should total \$30 million within 10 years to create new materials that might revolutionize civil aviation and space travel.

The award will establish an Institute for Biologically Inspired Materials (IBIM) to investigate and design functional ways of simulating repair mechanisms used by plants, animals and other organisms. Participating institutions are the universities of North Carolina at Chapel Hill and California at Santa Barbara, Princeton and Northwestern universities and ICASE, a research institute operated at the NASA Langley Research Center in Virginia.

"Achieving such results will require expertise from many specialties," said Dr. Edward Samulski, Boshamer and Distinguished professor of chemistry and leader of UNC's part in the effort. "Each institution brings a strong background in different aspects of the project, which spans several disciplines.

"It's a rather ambitious thing to design materials that can not only recognize when they've been damaged but can indicate the exact site and take steps to repair it," Samulski said. "In a sense, it's at the fringes of science fiction. These so-called 'self-healing' materials could be critical to space exploration, because a meteor particle even as small as a grain of sand could puncture the hull of existing space vehicles."

Besides conducting research and developing technology, the institute will begin an education and training program along with the North Carolina Agricultural and Technical State University in Greensboro, N.C.

Representatives gathered for their first workshop and planning session Wednesday, (Sept. 25) on the Princeton University campus.

The institute's mission is to boost understanding of natural phenomena and translate its findings into new materials that mimic the extraordinary structural and self-repairing properties of such substances as bone or seashells, Samulski said. These biologically inspired materials could adapt to changing conditions and are expected to help make air- and spacecraft lighter, stronger and more reliable.

"Our goal is to bring more 'smart' functions into spacecraft materials," said Dr. Ilhan Aksay, a Princeton professor of chemical engineering who leads the institute. "Some of these functions already exist in biology."

Researchers also expect to develop partnerships with businesses that will translate laboratory discoveries into products for U.S. industry. NASA selected the consortium's proposal from among more than 100 submissions, Aksay said.

The program in bio-inspired materials is part of a broader NASA effort to expand its ties to academia by establishing seven university-based institutes, each of which will develop an area of technology of "long-term strategic interest to the agency and the nation." While two of the institutes will focus on bio-inspired materials, the other five will work on propulsion, reusable launch vehicles and other challenges.

New composites of organic and inorganic compounds will get special attention through the IBIM institute.

"This is very exciting since it started with a group of us sitting around up at NASA contemplating and discussing the exquisite beauty nature uses in making materials that can repair themselves," Samulski said. "NASA is convinced that by brainstorming with top universities and front-line researchers in material sciences that it can come up with new concepts that will enable the next generation of space generation.

"It also is exciting for us here at Carolina since it recognizes the fact that UNC faculty are world leaders in some important areas of chemistry and physics," he said.

Other participating researchers at UNC in theory and mathematical modeling are Drs. Michael Rubinstein, professor of chemistry, and M. Gregory Forest, professor of mathematics and applied math, who will work on impacts and polymer self-healing. In synthesis, Drs. Royce W. Murray, Kenan professor of chemistry, and Samulski will investigate sensors, non-carbon nanotubes and "smart" composites. Drs. Eugene A. Irene, professor of chemistry; Richard Superfine and Yue Wu, associate professors of physics and astronomy; and Otto Z. Zhou, associate professor of materials science; will focus on characterization of conducting polymers, "smarter" nanotubes and composites.

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More information about the NASA-funded institutes is available at <ftp://ftp.hq.nasa.gov/pub/pao/contract/2002/c02-n.txt>

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