Argonne NATIONAL LABORATORY

News Release

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Argonne teams with Chicago research universities to form Illinois Center for Advanced Tribology

ARGONNE, Ill. (Oct. 30, 2008) – The U.S. Department of Energy's (DOE) Argonne National Laboratory has teamed with the University of Illinois at Urbana-Champaign (UIUC), the University of Illinois at Chicago (UIC) and Northwestern University to form the Illinois Center for Advanced Tribology (ICAT), which will develop solutions to technical issues related to transportation, health and systems that operate in extreme environments.

Tribology is the science and technology of friction, lubrication and interactive surfaces in relative motion that are evident in virtually everything that moves, including human beings.

"ICAT members bring together complementary, and in some cases unique capabilities to resolve critical wear and lubrication issues in the development of advanced alternative energy technologies and biomedical implants and improve functionality and longevity of systems that operate in extreme environments," said George Fenske, manager of Argonne's tribology section. "Through the center, we plan to develop new materials, coatings, surface texturing and lubricants that, when integrated together, make robust tribological systems that provide reliable and durable performance under extreme conditions."

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The push for alternative transportation fuels like ethanol, biofuels and hydrogen, for example, come with very different sets of friction, wear and lubrication challenges that you don't encounter with conventional vehicles and fuels, said Jane Wang, a professor of mechanical engineering at Northwestern. "Biofuels, even E-85, can cause corrosion and wear to surfaces they come into contact with," she said. "In the case of hydrogen-powered vehicles, new lubricant formulas are needed for the smooth operation of moving parts since hydrogen fuel cells, which require a pure environment, prohibit the use of oil-based lubricants."

ICAT also plans to play a significant role in improving the durability and long-term health risks of replacement joints, because more active older people require them and an increasing number of younger people get them, said Michael McNallan, a professor and associate dean in UIC's College of Engineering. "While current artificial joints have relatively good wear resistance," he said, "wear still occurs, and that is of particular concern when it comes to younger people who must rely on artificial joints implants for several decades. We want to develop biomaterials with *in-vivo* tribological behaviors. Our goal is to help develop 'joints for life.'"

Meanwhile, mechanical systems that operate under extreme loads, temperatures and speeds, like those found in military field operations in the Middle East, face premature failure as a result of poor lubricity. According to Andreas Polycarpou, a professor in UIUC's Department of Mechanical Science and Engineering, "Thermal degradation of base fluids and additives are accelerated at high temperatures, and oil viscosity is poor at high temperatures and further aggravated by the presence of sand. So one of the many innovations we plan to make is the development of self-healing surfaces; such technology would be highly desirable for extreme-condition applications."

ICAT will enable its partner organizations to respond more quickly to requests for research proposals, Fenske explained, because they will not have to develop a work agreement for each request they want to respond to. The center will also solicit research funds from their parent organizations and private and industrial sources, as well as respond to proposals from the State of Illinois and federal agencies such as DOE, the Department of Defense, the National Science Foundation, the National Institutes of Health and the Department of Agriculture.

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