

NSF awards Cornell \$18 million to develop a new source of X-rays

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ITHACA, N.Y. -- The National Science Foundation (NSF) has awarded Cornell University \$18 million to begin development of a new, advanced synchrotron radiation x-ray source, called an Energy Recovery Linac (ERL). The ERL, based on accelerator physics and superconducting microwave technology in which Cornell's Laboratory of Elementary Particle Physics (LEPP) is a world leader, will enable investigations of matter that are impossible to perform with existing X-ray sources.

"The X-ray beams produced by the new source will be roughly a thousand times better in brightness, coherence and pulse duration than currently is possible," said Sol Gruner, Cornell professor of physics, who is the principal investigator of the ERL project.

The NSF award to Cornell funds prototyping of critical components of the ERL at Cornell's Wilson Synchrotron Laboratory. According to Maury Tigner, LEPP director and co-principal investigator on the project, the design of the prototype is nearly completed. Scientists from the Thomas Jefferson National Accelerator Facility, a U.S. Department of Energy facility in Newport News, Va., worked with Cornell on the initial design. Prototype construction and testing is expected to be completed in 2008. Cornell then will seek funding for a full-scale ERL facility.

The facility will be a major upgrade of Cornell's current national-user synchrotron radiation facility, The Cornell High Energy Synchrotron Source (CHESS), which provides service to scientists and technologists from around the world, as well as for many departments at Cornell. The ERL will have value across the board, Gruner said, from research in biology and medicine to materials science and nanotechnology development.

The extreme brightness produced by the ERL's synchrotron radiation will make it possible to determine the structure of cells and biological molecules that cannot be determined with current sources; this is information that is essential to the pharmaceutical industry. The ERL also will make possible new study of advanced materials on a nanoscale, giving more insight into how to make stronger metals and composites, better drug delivery systems and more efficient optoelectronics. And the very fast pulses will make it possible to follow the structural changes that happen during important chemical reactions, both of life and chemical manufacturing processes.Cornell constructed the world's first beam line to study synchrotron radiation in the early 1950s. Today, CHESS, which is directed by Gruner, is one of five national hard X-ray synchrotron radiation facilities funded by the NSF and the National Institutes of Health and is the only such facility in the United States located on a central university campus.

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