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NSF Funds First Nanoscale Center for Learning and Teaching

Arlington, Va.--With a five-year, \$15,000,000 grant to Northwestern University, the National Science Foundation is funding the nation's first Center for Learning and Teaching in Nanoscale Science and Engineering (NCLT). The center, under the direction of Northwestern professor of materials science and engineering, Robert P.H. Chang, will develop scientist-educators who can introduce nanoscience and nanoengineering concepts into schools and undergraduate classrooms. Additionally, it will play the key role in a national network of researchers and educators committed to ensuring that all Americans are academically prepared to participate in the new opportunities nanotechnology will offer.

The NCLT is a partnership between Northwestern University, Purdue University, the University of Michigan, Argonne National Laboratories, and the Universities of Illinois at Chicago and Urbana-Champaign. Drawing on the strengths of the various partners in nanotechnology, instruction-materials development, educational assessment, and student cognition, the NCLT will create modular education materials designed to integrate with existing curricula in grades 7-12, and to align with national and state science education standards. Each module will be based on topics from nanoscience and nanoengineering, selected and developed by an interdisciplinary team including scientists, engineers, education researchers and graduate students, and practicing teachers. Expanded versions of the modules will be targeted at community colleges and undergraduate institutions and will eventually serve as the core of semester-long courses in nanotechnology.

For professional development activities and curricular testing, the Midwestern lead institutions will collaborate with additional partners locally and nationally. Undergraduate course materials will be field-tested and evaluated at multiple sites, including 5 minority-serving institutions: Alabama A & M University, Fisk University, Hampton University, Morehouse College, and the University of Texas at El Paso. Middle-school and high-school modules will be field-tested in the classrooms of award-winning science teachers across the country.

According to Chang, the center's initial nano education modules will focus on materials science and engineering. "At the nanoscale", Chang said, "materials science connects ideas from the biological, physical and earth sciences. Our modules will emphasize the role of nanoscale properties and structure in determining the behavior of the substances—from plastics to semiconductors to metals—that drive our technological society, and the possibilities nanoscale control offers for new materials." Chang's plans expand on his experience with the Materials World Modules project, an ongoing NSF-supported effort to introduce topics from materials science to students in grades 7-12. Chang says the NCLT project is "both the biggest challenge of my life and a unique opportunity to serve. We hope to reach at least 1 million students

spread across all 50 states."

Three core activities are common to all NSF Centers for Learning and Teaching:

- training graduate students,
- providing professional development programs for teachers from schools and community colleges, and
- researching educational strategies and techniques, and their effectiveness.

At the NCLT, these activities will be organized around the production and testing of the nanomaterials modules. Collectively, they will increase the number of K-12 educators prepared in content, instruction and assessment methodologies, while helping the center prepare American students for broad participation in nano-enabled research, development and industrial opportunities.

Dr. Mihail Roco, NSF's senior advisor for nanotechnology, notes that the Center for Learning and Teaching in Nanoscale Science and Engineering shows how the NSF is committed to working with the U.S. educational system to ensure that the societal benefits of nanotechnology are broadly and equitably distributed. NSF has supported systemic changes to introduce nanotechnology early in a student's education since 2001, first by funding programs to develop new curricular materials and later through the Nanotechnology Undergraduate Education program and expanded high school programs. In FY 2004, NSF is supporting about 8,000 students, graduate students, and teachers in nanotechnology-related projects. According to Roco, "The NCLT's goal is to become a national resource for nanoscale science and engineering education including training of teachers, coordinating the exchange of materials and ideas and promoting synergies among nano educators throughout the United States."

"This project brings together researchers and educators," Roco continued, "capitalizing on the convergence of science and technology at the nanometer scale. The education leaders the NCLT produces will create a better pipeline for young students interested in nanotechnology itself and in interdisciplinary science and engineering. Because of its connection to broad communities throughout the country, its partnerships, and its clearinghouse role for educational programs, this NCLT will have an even broader societal impact than the educational activities at previous topical centers."

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