Challenges and Opportunities for Transformative Research at NSF

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This talk will include a brief background and the vision and mission of the National Science Foundation (NSF). The National Science Foundation (NSF) is an independent federal agency created by Congress in 1950 "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense…" With an annual budget of about $6.06 billion, we are the funding source for approximately 20 percent of all federally supported basic research conducted by America's colleges and universities. NSF's goals--discovery, learning, research infrastructure and stewardship--provide an integrated strategy to advance the frontiers of knowledge, cultivate a world-class, broadly inclusive science and engineering workforce and expand the scientific literacy of all citizens, build the nation's research capability through investments in advanced instrumentation and facilities, and support excellence in science and engineering research and education through a capable and responsive organization. We like to say that NSF is "where discoveries begin."

There has always been great emphasis on transformative research at NSF. Many of the discoveries and technological advances have been truly revolutionary. In the past few decades, NSF-funded researchers have won more than 170 Nobel Prizes as well as other honors too numerous to list. These pioneers have included the scientists or teams that discovered many of the fundamental particles of matter, analyzed the cosmic microwaves left over from the earliest epoch of the universe, developed carbon-14 dating of ancient artifacts, decoded the genetics of viruses, and created an entirely new state of matter called a Bose-Einstein condensate. NSF also funds equipment that is needed by scientists and engineers.

NSF also funds equipment that is needed by scientists and engineers but is often too expensive for any one group or researcher to afford. Examples of such major research equipment include giant optical and radio telescopes, Antarctic research sites, high-end computer facilities and ultra-high-speed connections, etc.

Another essential element in NSF's mission is support for science and engineering education, from pre-K through graduate school and beyond. The research we fund is thoroughly integrated with education to help ensure that there will always be plenty of skilled people available to work in new and emerging scientific, engineering and technological fields, and plenty of capable teachers to educate the next generation.

The challenges and opportunities within the current NSF disciplinary, interdisciplinary, and cross-cutting research programs, e.g., CDI, IGERT, MRI, NNI, and ARI etc will be discussed. Some of the current areas of emphasis in the Directorate for Engineering will be presented including Cognitive Engineering; Competitive Manufacturing; Complexity in Engineered and Natural System; Energy, Water and the Environment; and Systems Nanotechnology. This will be followed by brief discussion of a specific topic that discusses challenges and opportunities for collaborative work between the scientists, engineers, and the medical community.

Dr. Rajinder P. Khosla

Dr. Rajinder P. Khosla joined the National Science Foundation in October 1996 and is currently the Director of the Electronics, Photonics, and Device Technology (EPDT) Program in the Electrical, Communications and Cyber Systems (ECCS) Division in the Engineering Directorate. He served as an Acting Director of the ECCS Division (January 2000-February 2002) and was on a special assignment as an Embassy Fellow (March 2002-June 2002), to study the state of Nanotechnology research in Japan, at the US Embassy in Tokyo on behalf of the NSF and the US State Department.

Dr. Khosla worked at Eastman Kodak Co. from 1966-96. He was the General Manager of the Microelectronics Technology Division at Kodak from 1985-95, and was responsible for the research, development, manufacturing and marketing of solid-state imagers and support IC's.

Dr. Khosla received his Ph.D. in Solid State Physics from Purdue University in 1966. In 1974-75, he was on an Academic award from Kodak as a Visiting Scientist in the Department of EE&CS at the University of California, Santa Barbara. In the fall of 1989, he attended the Harvard Business School for the Advanced Management Program. He was an Executive-on-Loan at Cornell University during 1995-96 to develop industry/university relations.

His areas of expertise are "Nanoelectronic Device Design, Modeling, Simulation, and Processing Technologies; Applications of Micro/nanotechnologies in Biology and Medicine; Micro/Nano Electro Mechanical Systems (MEMS/NEMS); Biosensors, Image Sensors and Sensor Systems; Engineering Systems on a Chip.

Dr. Khosla is a Fellow of the IEEE, Fellow of the American Physical Society and a Fellow of the Optical Society of America. He was awarded the 1990 IEEE Frederick Philips Award for R&D technical management. He is the Distinguished Alumnus of the College of Science at Purdue University.