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Nanotechnology from Discovery to Mass Use: 2000-2020

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Summary

Twenty years is the estimated time scale to develop nanotechnology from basic interdisciplinary concepts in 2000 to create a general purpose technology with mass use by 2020. A global scientific and societal endeavor was set in motion by the nanotechnology vision formulated in the report “Nanotechnology Research Direction” (NSTC 1999, Springer 2000) that inspired the National Nanotechnology Initiative (NNI) and other national and international R&D programs. This presentation outlines the outcomes in the last ten years, what has worked and was not, the 2010 R&D programs of about \$18 billion underpinning about \$300 billion products incorporating nanotechnology worldwide, and most importantly how we prepare now for the future. These topics are summarized in a recent report “Nanotechnology Research Directions for Societal Needs in 2020” (NSF/WTEC report, Springer 2010, www.wtec.org/nano2/). The report aims to redefine the R&D goals for nanoscale science and engineering integration, and to establish nanotechnology as a general-purpose technology. It will be imperative over the next decade to focus on four distinct aspects of nanotechnology development: better comprehension of nature and communication leading to knowledge progress; technology, economic and societal solutions leading to material progress; international collaboration on sustainable development and quality of life leading to global progress; and people working together for equitable governance leading to moral progress.

Three National Nanotechnology Initiative programs on nanoelectronics, solar energy conversion and storage, and sustainable nanomanufacturing will be discussed as an example for changing the focus of nanotechnology research and development about 2010.