

The Business of Nanotechnology—Translating Innovation into Economic Reality

Alain E. Kaloyeros

*College of Nanoscale Science and Engineering
The University at Albany, SUNY, Albany, NY 12222*

AKaloyeros@UAMail.Albany.edu

<http://www.albany.edu/directory/kaloyeros.html>

Abstract: The evolution of disciplined human exploration has led to the establishment of nanotechnology as the primary enabler for innovation and education in science and engineering in the 21st Century. With its ability to control the formation of individual building blocks of matter at the molecular level, atom by atom, to form physical, biological, and chemical systems with customized properties and precise functionalities, nanotechnology is transforming and reshaping the research, educational, and economic landscapes.

The importance of nanoscale know-how to the U.S. research, pedagogical, and business agendas is captured in the multi-billion dollar National Nanotechnology Initiative (NNI), signed into law by the U.S. President in 2004, which proclaims nanotechnology as “leading to the next industrial revolution.” The NNI also calls for the creation of the “laboratory and human resource infrastructure in universities and in the education of nanotechnology professionals” to prepare future generations of U.S. citizens to compete in the global economy of the 21st century. These conclusions are echoed by the U.S. Commission on National Security/21st Century in its Report entitled Roadmap for National Security: Imperative for Change. The report states that: “We also face an unprecedented opportunity. The world is entering an era of dramatic progress in bioscience and materials science as well as information technology and scientific instrumentation. Brought together and accelerated by nanoscience, these rapidly developing research fields will transform our understanding of the world and our capacity to manipulate it.”

As a result of this nanotechnology enabled revolution, U.S. institutions of higher learning are facing a paradigm shift in the nature and breadth of their traditional portfolio of research, education, and economic outreach programs. The increasingly more complex technical requirements and prohibitively higher development and commercialization costs associated with emerging generations of nanotechnology innovations—are causing a radical transformation in the scope and magnitude of university-based R&D activities. Individual research projects managed by a single principal investigator are quickly becoming a thing of the past. They are being replaced with inter-disciplinary, multi-investigator, vertically and horizontally integrated R&D enterprises which require a state-of-the-art infrastructure, and which can only be successfully executed through leveraging of public and private funds and resources. Corresponding educational programs are also mirroring this radical transformation.

This presentation introduces a case study of the nanotechnology revolution in the area of nanoelectronics technology development and commercialization. Relevant opportunities and challenges are presented and discussed with emphasis on translating innovation into economic reality.

Dr. Alain E. Kaloyeros is Vice President and Chief Administrative Officer of the College of Nanoscale Science and Engineering, Professor of Nanosciences and Nanoengineering, Professor of Physics of the University at Albany-State University of New York. He was also recently appointed President of Albany NanoTech, a private not-for-profit corporation created by the SUNY Research Foundation to support high technology development and deployment throughout New York State by coordinating nanotechnology programs within the SUNY system.

Dr. Kaloyeros received his Ph.D. in Experimental Condensed Matter Physics from the University of Illinois, Urbana-Champaign in 1987. Dr. Kaloyeros has authored and co-authored over 135 articles and contributed to seven books on topics pertaining to the science and technology of advanced nanoelectronics and nanooptoelectronics ultrathin film materials, atomic layer vapor phase deposition processes, and nanoscale x-ray, electron, and photon-based characterization and metrology. He holds 12 U.S. patents. He is a past recipient of the NSF Presidential Young Investigator (PVI) Award, the NSF Research Initiation Award (RIA), the Albany Foundation 1995 Academic Laureate Award, the 1999 Citizen of the University Award, the 2002 Outstanding Inventor Award of the Research Foundation of the State University of New York, the R&D 100 Award for one of the Most Technologically Significant Inventions of 2001, and the 2003 Excellence in the Pursuit of Knowledge Award of the Research Foundation of the State University of New York. He is also in the 2004 AcademicKeys Who's Who in Sciences Higher Education.