Foreword

It is a great honor and pleasure, serving as a Professor of Environmental Studies, an environmental specialist, a director of Clarion University Sustainability Institute, and as the Provost and Vice President for Academic Affairs, to contribute this foreword for *Nanotechnology and Microelectronics: Global Diffusion, Economics and Policy*. This comprehensive collection, which brings together experts from different fields to address issues germane to nanotechnology, is timely and relevant in the world that we live in today. Our divided world of the industrialized and the non-industrialized is on the verge of a transformation that is unequivocal. The authors of the following chapters cover topics that are collapsed into six sections: (1) Foundations and Science, (2) Technology Transfer and Innovation, (3) Industry, Policy, and Experiences, (4) Ethics, Regulation, and Environment, (5) Lessons from Agricultural Technology, and (6) Regional Developments. It is certainly because of the breadth and depth of the book and its multidisciplinary approach to the subject of nanotechnology that this book fills an important gap in the literature. It is my expectation that it would encourage strong voices from all sectors of the world, particularly from the developing countries that might be left out in the development of nanotechnology and suffer the negative consequences of the technology. The good news is that if managed properly, nanotechnology could be beneficial to both the developed and the developing countries.

I must emphasize the point that involving authors from multidisciplines has made this work rich in approach and rigorous in analysis. In writing this foreword, my comments are focused on the benefits, cost, and risk issues of investing in nanotechnology. As an environmentalist, I am always interested in the environmental impact of new technologies on ecosystems and humanity. The fundamental concepts surrounding nanotechnology deals with the deformation of materials by an atom or by impacting the material by a molecule. Such deformation brings into the environment an uncertainty which is unpredictable with regards to the possible consequences. Nanotechnology also involves the processing of materials which brings both positive and negative consequences. The creation of new materials through processing usually results in many useful new materials which enhance advancements in genetics, information technology, biotechnology, and robotics. More importantly, processing of materials results in exponential economic growth. The separation and consolidation of material leads to new materials that benefit humanity in the fields of engineering and medicine. Cures for cancer and other illnesses are quite possible. But it must be stressed, that it is quite possible that the new materials can cause new diseases and exacerbate existing health problems. The nano-particles must be studied and health and environmental impact analyses are imperative as the world moves forward with this great technology which rivals the industrial technology age. The invention and advancement of cluster science and scanning tunneling microscopes have resulted from investment in nanotechnology. The production of devices in parallel could enable the cost of devices to be cheaper and as such, provide consumers with cheap
material. Although further applications of nanotechnology require the arrangement or manipulations of nanoscale components they have not been fully researched; tangible results have been received economically through the sale of nanotubes and nanowires.

Before providing a brief summary of the significance of the chapters by the authors in this volume, I would like to reiterate the sentiments offered by many scientists around the world who claim that despite the economic and technological gains of the nanotechnology, caution must be exercised on how fast the world is moving with the technology and what investments are being made in the technology. Rearranging the fundamental building blocks of nature inexpensively does pay tremendous dividends, but caution must be exercised in the proliferation of technology when it is used to produce weapons of mass destruction that might fall in the hands of terrorists and unstable governments. The use of nanotechnology in food, clothing, cosmetics, tooth fillings, paints, and other products have been brought to the world’s attention with regard to the possible impacts of the nano-particles that are in the products. The side affects must be understood in order to inform the public. There is no doubt that through nanotechnology progress has been made in the early detection of prostate cancer and the positive results of nanotechnology are leading to investment by national and international laboratories to invest in the technology. Universities around the world are establishing new programs to expand research and teach new technology related courses. Governments, such as Indonesia, are investing in this “technology of the future.” Understanding nanotechnology is leading to the re-examination of the natural phenomena that happens in biological science. Biological processes offer us the opportunity to observe nature’s manufacturing process which can be translated into our attempts to build materials that can be useful for our civilization and life on earth in general.

The chapters in this book provide voices from the North and South of the world. They provide discussion of the significance of technological innovation in developing countries and the connection to economic development. There are significant trends emerging in the North; the South must position itself in such a way as to take advantage of such development and growth. Nanotechnology must be approached with a thorough knowledge of the ethics that must accompany expansion and adaption on a global basis. Technology transfer is an important aspect of this book and it is here that it must be stressed that building a true partnership between the North and South is necessary to have a successful transfer of technology and knowledge in order to have a sustained nanotechnology in developing countries.

The proliferation of information technology in Africa and other developing countries has led to some improvements in the economic vitality of developing countries. The implication of policy implementation must be understood and steps must be taken.

I thank Dr. Ndubuisi Ekekwe, the editor of this book, for asking me to write this foreword. I sincerely compliment the authors on an excellent job and wish them continued success in their scholarly research efforts. They have worked in a true collaborative spirit to put together a very important and holistic approach to understanding and thinking about a global perspective on nanotechnology particularly, as it relates to developing countries and the transfer of technology from the North.

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