Nanotechnology and Microelectronics: Global Diffusion, Economics and Policy tackles some of the main challenges – technological, economic and cultural – that we are facing and will face during the coming decades.

Rapid scientific discovery and new progress show the great potential of a large number of applications and commercial opportunities, also enabled by the development of appropriate tools to look at and form matter at the small scale with atomic resolution. These tools include design, modelling, computer simulations, engineering, manufacturing and characterisation at the appropriate scale. Materials embed, contain and bring knowledge forward down the value chain. By realising advanced materials via the assembly and manipulation of atoms and molecules, we are able to develop and -where needed- maybe even re-invent industrial sectors. Innovation acme is probably nowadays in the information and communication technologies, first of all in microelectronics.

Electronics has been a key driver of the scientific and technological progress that made a major contribution to social and economic growth worldwide starting since the middle of the 20th century. Notable success stories such as mobile telephones and multimedia applications, digital media, computing and networking (especially the internet), cleaner production processes, safer vehicles, more performing medical systems… they all illustrate the crucial innovative role that microelectronics played.

With the internet the concept of a centre and a periphery of the world has begun to fade, bringing closer the so-called developed, emerging and developing nations. There is a dynamics between on the one hand the efforts to harvesting the benefits promised with nanotechnology and on the other hand to avoiding a possible substantial “nano divide” between countries, particularly from the so-called North and South of the World.

It seems that a new race has started. Nanotechnology and microelectronics re-opened a major competition in terms of industrial output, commerce and services that seemed somehow stagnated 20 years ago. Yesterday’s winners will not necessarily be those of tomorrow. Evidently, it is not really a matter of “sharing the pie” of financial gains, but to realise an even “larger pie”, from which all economic actors can benefit. It will be crucial to the vitality and attractiveness of economic systems (at a regional, national or supra-national levels, such as the European or African Union); they will have to transform the outcome of research into jobs, economic growth and a better quality of life. The optimum points of equilibrium between, quality and quantity, efficiency and flexibility, processes and products, mass production and product individualisation have to be constantly verified if not re-conceived.

A global system approach needs to be ever prominent and synergies should be sought, where appropriate. With its 7th Framework Programme for Research (FP7 - the scheme for funding scientific research and technological development up to 2013), Europe opened the doors to broad-ranging international cooperation. FP7 is a unique case world-wide in terms of its scope and dimension.
The world is one; there are challenges that we tackle more efficiently and effectively together. For this, we need to create a common and level playing field and share fundamental knowledge and best practices. This book will surely help.

*This Foreword expresses the opinions of the Author and not necessarily those of the EU and it does not engage the Commission in any manner

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Renzo Tomellini was born in 1960 and graduated in chemistry “cum laude” in Rome, in 1986. He worked in Italy as a researcher at the Centro Sviluppo Materiali, a research centre corporate within steel industry. He was also a visiting researcher in Germany and France. His further education included management and business administration, leadership, European law and regulations. His career within the European Commission started in 1991, when he was scientific/technical responsible for ECSC steel research projects. Between 1995 and 1999 he was managing the ECSC-Steel research and technological development programme. In 1999 he became the assistant to the director of Industrial Technologies in the Research Directorate-general. Amongst others, he prepared for the provisions to bring to its end the ECSC Treaty and to launch the new research fund for coal and steel (see the Nice Treaty). Meanwhile, since 1999 he promoted initiatives in nanotechnology. Until summer 2008 he has been Head of the Unit “Nano- and Converging Sciences and Technologies” and chaired the European Commission’s interservice group “Nanosciences and Nanotechnologies”, which he initiated in February 2000. He is currently Head of the Unit “Value-added Materials”. He deposited 4 patent applications (a new source for atomic spectroscopy and some innovative sensors), published some 50 articles, drafted 4 standards on analysis and measurements, edited 12 books and 2 as co-author, created 2 newsletters and 3 webpages, and realised 4 films on science and research issues. He gives university courses on knowledge management to post-graduates.