

Preface

Microelectronics technologies have reached a new stage in their development: the ultimate miniaturization of transistors is in sight as gate lengths approach atomic dimensions, the interconnect bottleneck is posed to limit circuit speeds, new material sets are being introduced into microelectronic manufacture at an unprecedented rate, and alternative technologies to mainstream CMOS are seriously being considered in many cases off financial, not performance, grounds.

It is against this backdrop of technology change that the series Nano and Giga Challenges in Microelectronics is being launched. Spawned by a meeting of the same name held in Moscow in 2002, the series is intended to provide tutorial and expository articles on advanced technology problems related to micro- and nano- technology development. The articles capture the flavor and excitement of the Nano and Giga meeting (future meetings are planned, with the next to be held in St. Petersburg in 2004) with the articles solicited from leading researchers in representative subject areas. Each chapter is intended as a self-contained introduction to an advanced research topic ranging from microelectronics materials to molecular electronics, and extending through to nanoelectronic circuit architectures.

The book's intention is to act as an introduction for engineers and researchers wishing to obtain a fundamental knowledge and a snapshot in time of the cutting edge in technology research. As a natural consequence, the Nano and Giga Challenges is also a useful reference also for the "gurus" wishing to keep abreast of the latest directions and challenges in microelectronic technology development and future trends. The combination of viewpoints

presented within the book can help to foster further research and cross-disciplinary interaction needed to surmount the barriers facing future generations of technology design. This book also serves as a companion to the special issue of the journal Microelectronics Engineering, which documents the technical papers presented during the Nano and Giga 2002 meeting.

It is a great pleasure for the Editors of Nano and Giga Challenges to present these collected chapters, and we thank each of the authors of this volume for sharing their insights and expertise and the sponsors of NGCM2002 for their gracious support: Digital DNA Lab Motorola, Russian Research Center Kurchatov Institute, US Department of Energy - Nuclear Cities Initiative, Nunn & Turner Foundation - Nuclear Threat Initiative, Moscow State University, International Science & Technology Center, Elsevier Science, European Office of Aerospace Research and Development United States Air Force, Russian Federal Nuclear Center (VNIIEF), Russian Foundation for Basic Research, US Office of Naval Research, KINTECH Kinetic Technologies, and Ohio Supercomputer Center are gratefully acknowledged.

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