Lessons from Nanoscience: A Lecture Note Series
World Scientific Publishing Company
Series Editors: Mark Lundstrom and Supriyo Datta, Purdue University

Nearly fifty years ago, in his Foreword to *Frontiers in Physics: A Lecture Note and Reprint Series,* David Pines wrote about the problem of coherently communicating recent developments in active fields of research, about how difficult it was even for experts to keep up, and how confusing it was for students. Those words still ring just as true, but have acquired an added degree of urgency in today's interdisciplinary world where both students and experts are constantly challenged to absorb and apply concepts outside the comfortable disciplinary boundaries that define their graduate training. With this in mind, we are launching a Lecture Note Series, defined by a few core themes.

Firstly, we are not looking for an even-handed survey of recent developments. Instead we encourage authors to present a definite "point of view" (borrowing a phrase from Pines) that helps explain and unify the new phenomena being discovered. We believe it is the unique viewpoint of the authors of many of the Frontiers in Physics volumes that makes them relevant even to today's readers, half a century later.

Secondly, research articles and even textbooks are typically written with a specific disciplinary training in mind. Instead, our intent is to help communicate across disciplines by being accessible to anyone with a bachelor's degree in science or engineering. We realize this is a tall order, but we are encouraged by another effort half a century ago in the early days of transistor technology when the Semiconductor Electronics Education Committee (SEEC) integrated basic physics, materials science, devices and circuits into a curriculum that educated a generation of students who went on to lead the semiconductor revolution.

The most distinctive theme of this series, however, is motivated by a development that is uniquely contemporary, namely the rise of modern nanotechnology which has blurred the lines that traditionally separated the microscopic from the macroscopic. To meet the challenges and opportunities afforded by the ability to engineer materials and devices on a length scale as small as several nanometers (atomic distances are ~ 0.2 nm), we need an integrated approach that embeds modern atomistic thinking directly into the models used for non-equilibrium systems like transistors, energy conversion devices and bio-sensors, to name a few.

The title of this lecture series, "Lessons from Nanoscience" is intended to convey this vision of not just communicating the developments in nanoscience, but using them to re-think old and familiar subjects. Some of these viewpoints may not yet be in final form. We hope this series will provide a forum for them to evolve and develop into the textbooks of tomorrow that train and guide our students and young researchers as they turn nanoscience into nanotechnology.

This series owes a great debt to several people and organizations without which it would not have taken shape. The Network for Computational Nanotechnology, funded by the U.S. National Science Foundation, supported the "Electronics from the Bottom Up" (EBU) initiative, the genesis of this lecture note series. The Intel Foundation also provided critical support for the development and dissemination of EBU resources.

We are pleased to have World Scientific Publishing Company (WSPC) as a partner in this initiative. The tireless efforts of our editor, Zvi Ruder are greatly appreciated. To make these notes readily available to students, WSPC is producing low-cost version of the lecture notes. The authors also aim to complement the printed lecture notes with online lectures and supplementary materials from the series authors. Those interested should visit: http://nanohub.org/topics/LessonsfromNanoscience

Mark Lundstrom and Supriyo Datta
Purdue University, May, 2011