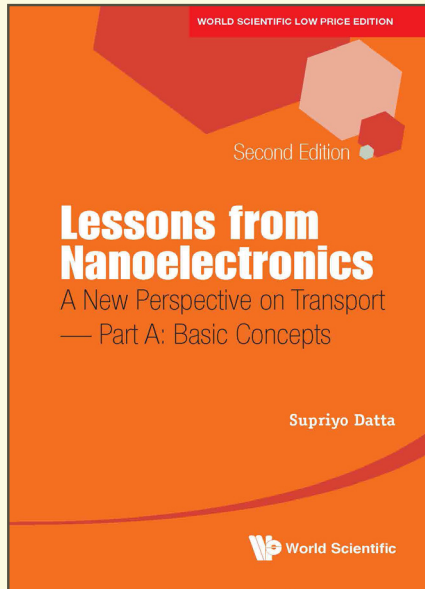


# Lessons from Nanoelectronics, 2nd Edition

## A New Perspective on Transport – Part A: Basic Concepts



By **Supriyo Datta**  
(Purdue University, USA)

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### ABOUT THE BOOK

Everyone is familiar with the amazing performance of a modern smartphone, powered by a billion-plus nanotransistors, each having an active region that is barely a few hundred atoms long. The same amazing technology has also led to a deeper understanding of the nature of current flow and heat dissipation on an atomic scale which is of broad relevance to the general problems of non-equilibrium statistical mechanics that pervade many different fields.

This book is based on a set of two online courses originally offered in 2012 on nanoHUB-U and more recently in 2015 on edX. In preparing the second edition the author decided to split it into parts A and B titled Basic Concepts and Quantum Transport respectively, along the lines of the two courses. A list of available video lectures corresponding to different sections of this volume is provided upfront.

To make these lectures accessible to anyone in any branch of science or engineering, the author assume very little background beyond linear algebra and differential equations. However, the author will be discussing advanced concepts that should be of interest even to specialists, who are encouraged to look at his earlier books for additional technical details.

### READERSHIP

Students and professionals in any branch of science or engineering.

### CONTENTS

- Preface
- Acknowledgments
- List of Available Video Lectures
- Constants Used in This Book
- Some Symbols Used
- Overview
- **What Determines the Resistance:**
  - Why Electrons Flow

- The Elastic Resistor
- Ballistic and Diffusive Transport
- Conductance from Fluctuation
- **Simple Model for Density of States:**
  - Energy Band Model
  - The Nanotransistor
- **What and Where is the Voltage Drop:**
  - Diffusion Equation for Ballistic Transport
  - Boltzmann Equation
  - Quasi-Fermi Levels
  - Hall Effect
  - Smart Contacts
- **Heat and Electricity:**
  - Thermoelectricity
  - Phonon Transport
  - Second Law
  - Fuel Value of Information
- **Appendices:**
  - Derivatives of Fermi and Bose Functions
  - Angular Averaging
  - Current at High Bias for Non-Degenerate Resistors
  - Semiclassical Dynamics
  - Transmission Line Parameters from BTE

## ABOUT THE AUTHOR

**Supriyo Datta** received his Bachelor of Technology from the Indian Institute of Technology, Kharagpur in 1975 and his MS and PhD from the University of Illinois at Urbana-Champaign in 1977 and 1979 working on ultrasonics. Since 1985 he has focused on current flow in nanoscale electronic devices and the approach pioneered by his group for the description of quantum transport, combining the non-equilibrium Green function (NEGF) formalism of many-body physics with the Landauer formalism from mesoscopic physics, has been widely adopted in the field of nanoelectronics. This work is described in his books *Electronic Transport in Mesoscopic Systems* (Cambridge 1995) and *Quantum Transport: Atom to Transistor* (Cambridge 2005). His latest book *Lessons from Nanoelectronics: A New Perspective on Transport* (World Scientific 2012) makes the insights gained from nanoelectronics accessible to a broad audience irrespective of their specialization. Datta is also known for several important conceptual proposals that have subsequently been demonstrated experimentally in diverse areas including molecular electronics, negative capacitance devices, and spin electronics.

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