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This book describes in details the theory of the electron transport in the materials and structures at the basis of modern micro- and nano-electronics. It leads and accompanies the reader, through a step-by-step derivation of all calculations, from the basic laws of classical and quantum physics up to the most modern theoretical techniques, such as nonequilibrium Green functions, to study transport properties of both semiconductor materials and modern low-dimensional and mesoscopic structures.

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Several methods have been developed for investigating them from a theoretical point of view. Here we discuss Boltzmann transport theory, (1) which is physically transparent, Kubo formulas, (2) which are more general but less easy to evaluate, and the Landauer-Buttiker formalism, (3,4) which is particularly useful in mesoscopic and ballistic systems. To keep the mathematical complications to a minimum, we concentrate on the behavior of a 2D electron gas (2DEG) in zero applied magnetic field.

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My aim in this thesis is to review the theoretical techniques to treat electron transport in molecular scale junctions. The theoretical approach includes two main techniques, Density Functional Theory (Ch. 2), which is implemented in the SIESTA code [43] and the non- equilibrium Greens function formalism of transport theory (Ch. 3). Both of

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The electron transport system is present in the inner mitochondrial membrane of mitochondria. It also refers as " Electron transport chain " and " ETS " in abbreviated form. ETS involves a transfer of electrons through a series of protein complexes from higher (NADH +) to lower energy state (O 2), by releasing protons into the cytosol.

~~What is Electron Transport System? Definition, Components ...~~
The high energy intermediates (NADH and FADH 2) formed as a result of reduction are carried to the electron transport chain (ETC). These high energy intermediates are in fact the carriers of electrons. The electrons of NADH and FADH 2 are donated to the electron transport chain. As the electrons move down the ETC, a large amount of energy is released that is used to produce the electrochemical gradient across the inner mitochondrial membrane.

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The Marcus Theory of Electron Transfer. The Marcus Theory of Electron Transfer. A great many important aspects of biology and biochemistry involve electron transfer reactions. Most significantly, all of respiration (the way we get energy from food and oxygen) and photosynthesis (they way plants make the food and oxygen we consume) rely entirely on electron transfer reactions between cofactors in proteins.

~~The Marcus Theory of Electron Transfer~~
The electron transport chain involves a series of redox reactions that relies on protein complexes to transfer electrons from a donor molecule to an acceptor molecule. As a result of these reactions, the proton gradient is produced, enabling mechanical work to be converted into chemical energy, allowing ATP synthesis.

~~Electron Transport Chain - Definition and Steps | Biology ...~~
The electron transport chain (ETC) is a series of complexes that transfer electrons from electron donors to electron acceptors via redox (both reduction and oxidation occurring simultaneously) reactions, and couples this electron transfer with the transfer of protons (H + ions) across a membrane.The electron transport chain is built up of peptides, enzymes, and other molecules.

~~Electron transport chain - Wikipedia~~
Daaoub A. Theory of electron transport through single molecules.Lancaster University, 2020. 148 p. https://doi.org/10.17635/lancaster/thesis/1017

~~Theory of electron transport through single molecules ...~~
In recent years, efforts to understand electron transport at the molecular scale have intensified, driven by the desire to understand the quantum nature of electrical conductance at such length scales and by the need to design molecular-scale devices for switching, sensing and energy harvesting. The aim of this thesis is to investigate theoretically electrical properties of molecules placed between nanogap electrodes.

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Theory of electron transport in FeRh-based natural magnetic multilayers) I. Turek) Institute of Physics of Materials, Acad. Sci. CR, Ziˇzkova 22, CZ–61662 Brno, Czech Republic J. Kudrnovsky, ´ V. Drchal) Institute of Physics, Acad. Sci. CR, Na Slovance 2, CZ–18221 Praha 8, Czech Republic P. Weinberger Center for Computational Materials Science, Technical University of Vienna ...

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This book originated out of a desire to provide students with an instrument which might lead them from knowledge of elementary classical and quantum physics to moderntheoreticaltechniques for the analysisof electrontransport in semiconductors. The book is basically a textbook for students of physics, material science, and electronics. Rather than a monograph on detailed advanced research in a speci?c area, it intends to introduce the reader to the fascinating ?eld of electron dynamics in semiconductors, a ?eld that, through its applications to electronics, greatly contributed to the transformationof all our lives in the second half of the twentieth century, and continues to provide surprises and new challenges. The ?eld is so extensive that it has been necessary to leave aside many subjects, while others could be dealt with only in terms of their basic principles. The book is divided into ?ve major parts. Part I moves from a survey of the fundamentals of classical and quantum physics to a brief review of basic semiconductor physics. Its purpose is to establish a common platform of language and symbols, and to make the entire treatment, as far as pos- ble, self-contained. Parts II and III, respectively, develop transport theory in bulk semiconductors in semiclassical and quantum frames. Part IV is devoted to semiconductor structures, including devices and mesoscopic coherent s- tems. Finally, Part V develops the basic theoretical tools of transport theory within the modern nonequilibrium Green-function formulation, starting from an introduction to second-quantization formalism.

Suitable for advanced undergraduate and graduate students of physics, this classic volume by a prominent authority in this field provides an account of some simple properties of metals and alloys associated with electron transport. Topics include some bulk transport properties, electrons in solids, transport coefficients, scattering, the transition metals, and the resistivity of concentrated alloys.

This book contains the first systematic and detailed exposition of the linear theory of the stationary electron transport phenomena in semiconductors. Arbitrary isotropic and anisotropic nonparabolic bands as well as p-Ge-type bands are considered. Phonon drag effect are taken account of in an arbitrary nonquantizing magnetic field. Scattering theory is discussed in detail with account taken of the Bloch wave functions effect. Transport phenomena in the quantizing magnetic field are studied as well as the size effects in thin films. Band structures of the semiconductors and semiconductor compounds of interest are also considered.The main part of the book deals with the three important problems: charge carrier statistics in a semiconductor, classical and quantum theory of the electron transport phenomena. All the theoretical results considered as well as the validity conditions are presented in the form which may be directly used to interpret experimental data.

Discovery of new transport phenomena and invention of electron devices through exploitation of these phenomena have caused a great deal of interest in the properties of compound semiconductors in recent years. Extensive re search has been devoted to the accumulation of experimental results, par ticularly about the artificially synthesised compounds. Significant ad vances have also been made in the improvement of the related theory so that the values of the various transport coefficients may be calculated with suf ficient accuracy by taking into account all the complexities of energy band structure and electron scattering mechanisms. Knowledge about these deve lopments may, however, be gathered only from original research contributions, scattered in scientific journals and conference proceedings. Review articles have been published from time to time, but they deal with one particular material or a particular phenomenon and are written at an advanced level. Available text books on semiconductor physics, do not cover the subject in any detail since many of them were written decades ago. There is, there fore, a definite need for a book, giving a comprehensive account of electron transport in compound semiconductors and covering the introductory material as well as the current work. The present book is an attempt to fill this gap in the literature. The first chapter briefly reviews the history of the developement of compound semiconductors and their applications. It is also an introduction to the contents of the book.

A macroscopic description of electron transport in semiconductors has recently been developed (M.G. Ancona and H.F. Tiersten, Phys. Rev. B35-II, 7959 (1987)) in which the equation of state of the electron gas was generalized to permit a dependence on the gradient of the gas density. This generalization leads to a macroscopic theory - density-gradient theory - which is often expressible as a generalized diffusion-drift description and which is capable of describing quantum transport phenomena associated with carrier confinement and tunneling. The original paper contained a derivation of this description from well known principles of classical field theory but only in a very condensed form. It is the purpose of the present report to supplement the earlier paper by giving the detailed derivations. As in the original paper two methods of derivation are presented: One is a variational approach which follows the work of Toupin while the other uses a balance law approach pioneered by Green and Rivlin. Keywords: Electron transport, Semiconductors. (MJM).