Quantum Processes in Semiconductors

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This book sets out the fundamental quantum processes that are important in the physics and technology of semiconductors in a relatively informal style that graduate students will find very attractive. The fifth edition includes new chapters that expand the coverage of semiconductor physics relevant to its accompanying technology. One of the problems encountered in high-power transistors is the excessive production of phonons and the first new chapter examines the
hot-phonon phenomenon and the lifetime of polar optical phonons in the nitrides. In the burgeoning field of spintronics a crucial parameter is the lifetime of a spin-polarised electron gas, and this is treated in detail in the second of the new chapters. The third new chapter moves from the treatment of
bulk properties to the unavoidable effects of the spatial limitation of the semiconductor, and to the influence of surface states and the pinning of the Fermi level.

As with previous editions the text restricts its attention to bulk semiconductors. The account progresses from quantum processes describable by density matrices, through the semi-classical Boltzmann equation and its solutions, to the drift-diffusion description of space-charge waves, the latter appearing in the contexts of negative differential resistance, acoustoelectric and recombination instabilities. Besides being a useful reference for workers in the field, this book will be a valuable
text for graduate courses.

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