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Quantum optics is the field of physics describing the interaction of individual photons with matter, but in recent years it has expanded beyond pure physics to become an important driving force for technological innovation. This book starts with an elementary description of the underlying physics and then builds up a more advanced treatment. The theory begins with the quantum description of the simple harmonic oscillator, and is subsequently extended to provide the tools required to discuss coherent states, the interaction of light with atoms, entangled states, quantum noise and dissipation, linear optical amplifiers, and the fundamental issues associated with Bell's theorem. There is an equally strong emphasis on experimental methods. A quantum description of lenses, mirrors, beam splitters, Y-junctions, circulators, and stops is applied to a collection of important experiments in linear optics. A description of the most important methods of primary photon detection is followed by an explanation of heterodyne and homodyne techniques. Spontaneous down conversion and quantum tomography are discussed, together with important experimental applications. These experimental and theoretical considerations come together in a chapter briefly discussing quantum noise and its suppression in telecommunications; the limitations and possibilities for quantum cloning; the principles and techniques of quantum cryptography; and the physical basis for quantum computing