or six years by the Rochester conferences organized by Leonard Mandel and Emil Wolf. Over the last three conferences, the focus has moved from the pioneering work of R. Hanbury Brown and R. Q. Twiss, Tito Arecchi, Roy Glauber, Mandel and Wolf on photon statistics and coherence of optical sources toward applications of photoelectron counting distributions, neosemiclassical radiation theories, resonance fluorescence, photon antibunching, optical bistability, optical nonlinear dynamics and squeezed states in turn.

Active researchers and graduate students in this field will no longer need to cull background material on statistics in quantum optics from a variety of texts and conference proceedings. Jan Perina's new text offers this resource, while expanding upon his earlier *Coherence of Light* to include the treatment of nonlinear field–matter interactions.

One gains the sense in reading *Quantum Statistics of Linear and Nonlinear Optical Phenomena* that a diligent student of the field and contributor in many branches has shared his private working compendium of facts and figures—complete with details, applications and references. For the informed reader, the book is a delightful guided tour; for the interested and disciplined student, it provides both detail and the best entry into the research literature. Apart from a few texts on photoelectron counting and detection, this represents the first major monograph in the 1980s to deal with the revolutions in quantum optics in this decade. No longer is the field defined by quantum coherence functions, a quantized radiation field, coherent states and the statistics of laser radiation. Detailed modern treatments must include nonclassical states of the radiation field that are referred to as photon antibunching and squeezed states.

The book contains a marvelous collection of background material, careful derivations of the conventional and modern formalisms, and such a wondrous wealth of references to previous work that one may generally disregard the author's apologies for an incomplete bibliography. The dense packing of material makes this monograph best suited as a reference for experts or the basis for a guided tutorial for graduate students. The reader is escorted through conventional topics such as quantized fields, optical correlation, coherent states, photocounting, master equations, turbulent media and quantum statistics in nonlinear interactions. Historical pitfalls such as the definition of an uncertainty principle between the variances of the photon number and phase operators are addressed directly and the foundation is carefully laid for the recent exciting developments in the creation of squeezed states.

The book reaches early 1983 in its references, and while it anticipates the discoveries of the last four years with discussions and references to theoretical work on squeezed states, it does not cover the more recent and exciting experiments. Nevertheless, it lays the groundwork solidly and, unlike the chapters or texts of the 1970s, this text presents a thoroughly modern view of the field and provides a basis for searching the current literature and conference proceedings to find the latest details. To build on this background one would have to turn to the proceedings of the 1983 Rochester conference and then turn to *Laser Physics III* of the New Zealand summer school series, the Glauber festschrift of 1986 and the proceedings volume of the next Rochester conference, which is but a few short years away.

The comprehensive detail of the text will make it difficult for the general reader to use, but it is the best reference to back such popular introductions as Les Allen and Peter Knight's *Concepts in Quantum Optics*. I recommend the book highly for research libraries and the shelves of quantum optics experts. It will gain a greater following if a second edition incorporating the more recent work on squeezed states, the quantum statistics of optical nonlinear dynamics and other developments is issued within a few years.

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Atoms in Strong Light Fields

N. B. Delone and V. P. Krainov
339 pp. Springer-Verlag, New York, 1985. $49.00

This book constitutes a guided tour through a number of topics in the interaction of strong lasers with atoms. N. S. Delone is a pioneer of experimental multiphoton physics of atoms while V. P. Krainov, a well-known theorist, has made a number of contributions to the theory of intense-field phenomena. The strong fields considered in the book are due to laser beams with intensities up to 10^{14} W/cm^2 at near-infrared to ultraviolet frequencies. But as the authors aptly point out, radiation that couples two atomic or molecular levels resonantly is already strong at 100 W/cm^2. Thus the feature that runs through all topics in this book is the nonlinear dependence on the field intensity whatever the precise range of that intensity may be. Strong-field

resonance fluorescence, multiphoton ionization and strongly coupled multilevel systems are examples. None of the topics are treated thoroughly or exhaustively. After all is said and done, however, the reader has acquired a good idea of what these strong-field phenomena are and how to think about their physical implications.

Although nonlinear optics is mentioned more than once, the text does not deal with what most people would understand by nonlinear optics. It does discuss the formal quantum mechanical description of nonlinear susceptibilities of isolated atoms but does not dwell upon important aspects of nonlinear optics such as, phase matching.

Delone and Krainov intended to deal with atoms only. However, they have cast the discussion almost entirely in terms of a one-electron atom; only toward the end do they attempt some general remarks on the strong-field behavior of multielectron atoms. I do not mean this as a negative comment but rather as a warning to the reader who because of the title seeks an explanation of the recently much discussed phenomena of the excitation and ionization of multielectron atoms. This is a good and useful book. For the novice, it is a very good introduction to the main phenomena and their formulation. For the expert, there are useful sections that summarize research results quite succinctly. The discussion of tunneling and its connection to multiphoton ionization is one example.

A reader will need a good background in nonrelativistic quantum mechanics and the interaction of radiation with atoms to obtain maximum benefit from the book, although the authors summarize the necessary background material. They even include a short chapter on laser theory, which is convenient but not necessary because for the rest of the book, the laser is nothing more than a source of strong, more or less monochromatic, more or less coherent radiation. Many aspects of quantum optics are intimately connected with strong-field (nonlinear) interactions. The necessary connections (photon statistics and so forth) are explained in one of the chapters but the reader who is especially interested in this aspect will have to go to the references.

The title of the book should not deter the molecular physicist or chemist from exploring it. Given the rapid expansion of multiphoton interactions into chemical physics (and physical chemistry), some of the sections may be just the right introduction to the jargon and the physics (or chemistry) it represents.

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book note

A Skeleton in the Darkroom: Stories of Serendipity in Science.
Gilbert Shapiro. 160 pp. Harper and Row, New York, 1986. $13.95

It is reassuring that even in this age of highly organized and directed research, many great scientific discoveries remain surprises, for only the unexpected has the power to radically alter the direction of scientific thought. Gilbert Shapiro offers brief, vivid accounts of seven such instances, four of which date from the current era.

His choice of examples is almost unexceptionable: x rays, electromagnetism, penicillin, cosmic microwave background radiation, the J/psi meson, the impact hypothesis of Cretaceous extinctions and pulsars. Only the impact hypothesis may be out of place, since it remains conjectural.

These *tales* (for that is their literary genre) may serve the lecturer as a source of enlivening historical anec-