interest, including environmental issues important to lawyers. The needs of lawyers account for the inclusion of material on the spotted owl *Strix occidentalis caurina* and the Mount Graham red squirrel *Tamiasciuris hudsonicus grahamensis* (both subjects of much legal dispute in the United States) but the rationale behind other choices, such as the biology of mammalian infanticide, is obscure.

In any case, the authors and editor have succeeded in making the material accessible to the nonspecialist reader. The writing is generally clear and to the point and each article is followed by a glossary to assist those unfamiliar with the topic as well as by a short bibliography. The encyclopaedia should be helpful to government officials and lawyers, if they learn of its existence. But despite its illustrious advisory board, I doubt if most conservation biologists will find it essential because they are familiar with other sources for most of the topics discussed.

In sum, *A Primer of Conservation Biology* and *Principles of Conservation Biology* would serve our hypothetical student well, while *Conservation Biology in Theory and Practice* and the *Encyclopedia of Environmental Biology* would be less useful. Although the authors of all four works are clearly committed to conservation, Meffe and Carroll are putting their money where their mouths are. Recognizing that conservation requires money as well as scientific insight, they and their publisher have promised to donate a third of the royalties from their text to major conservation organizations. They challenge other authors and publishers of works on ecology and conservation biology to do the same. I hope their challenge is met. □

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Seeing the light of day (at last)

Peter Knight

Optical Coherence and Quantum Optics. By Leonard Mandel and Emil Wolf. *Cambridge University Press: 1995. Pp. 1,166. £30, $49.95.*

BEFORE the invention of the laser, one could rightly describe optics as being concerned with the manipulation of electromagnetic noise: natural light derived from the independent emission of many uncorrelated photons from atomic sources excited at random. The laser changed all that. For the first time, stimulated emission of radiation gave us a light source with coherence: that is, a predictable and controlled behaviour.

Leonard Mandel and Emil Wolf were the pioneers in the study of the statistical properties of light, starting well before the advent of the laser with their examination of the ground-breaking intensity correlation experiment of Hanbury Brown and Twiss on photon bunching. This, their long-awaited monograph on quantum optics, is the culmination of decades of study of the fluctuating nature of light and especially of its quantum properties. (Long-awaited indeed: the book was promised in the preface of the famous text of Max Born and Emil Wolf on classical optics in the 1950s, and I well remember seeing the initial stages of this book as a postdoc in Rochester more than 20 years ago.) Wolf was the originator of many of our fundamental ideas of coherence, and with Mandel was the founder of the experimental study of nonclassical light and the first to generate laboratory sources of light of totally quantum origin such as anti-bunched light and the correlated twin beams of light from parametric amplifiers. Well, the wait was well worthwhile: they have delivered a masterly treatment of the subject, one that will delight professionals and students alike.

The book begins with a detailed account of the stochastic nature of light fluctuations and the coherence properties of light. The opening chapters describe how the mathematical theory of random processes, and especially Fokker–Planck and Langevin equations, can be applied to light fields; temporal and spatial coherence are described in terms of correlation functions. These are then related to spectra and applied to propagating light in radiometry and to light scattered from random media. Fundamental concepts of field quantization are treated next, with due weight given to the basic building blocks of optical fields; the number states with precise numbers of photons, and the coherent states that most closely resemble classical fields of well-defined amplitude and phase. Until recently, fundamental quantum properties of light were masked by environmental fluctuations so that for most purposes a careful semiclassical theory of light agreed in entirety with quantum treatments until new developments in the 1970s required fully quantized theories; underlying this agreement is the "optical equivalence principle" that relates semiclassical and quantum treatments.

The central part of the book contains a careful analysis of the quantum theory of light, the nature of photons and their generation from atomic sources, ranging from single atoms in resonance fluorescence to laser oscillators and amplifiers. As one would expect from these authors, the treatment is a seamless fusion of high-level theoretical and experimental ideas, with a particularly good treatment of quantum noise in open optical systems and of the quantum theory of the laser. Finally, the last sections of the book deal with entirely nonclassical features of the kind of light fields generated recently, such as the phase-dependent noise of squeezed light, that justify the label 'quantum' in quantum optics. The text concludes with a discussion of the highly correlated two-photon states produced by parametric amplifiers and used to such effect by Mandel and others to demonstrate the optical consequences of nonlocality in quantum mechanics described by Bell's inequalities.

The level struck by the authors is right for students as well as professionals, and combines rigour with clarity and thoroughness. The authors concentrate on fundamental concepts and theoretical understanding, but throughout the book they bring out the links with experiments and the real world. The book is beautifully produced. When most serious monographs seem to be priced at extraordinary levels, it is a real delight to see the modest price of this text, which is bound to be a classic and moreover one that students and young researchers will be able to afford. □

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New in paperback

The Fourth Discontinuity: The Co-Evolution of Humans and Machines by Bruce Mazlish. Yale University Press, £9.50. "Mazlish's book is most useful as a work of reference: a brief encyclopaedia of what various historical figures have already written on the subject". Harry Collins in *Nature* **367**, 606 (1994).

Essential Reproduction by Martin H. Johnson and Barry J. Everitt (4th edition). Blackwell Science, £19.50.

Transition Metal Oxides: An Introduction to their Electronic Structure and Properties by P. A. Cox. Oxford University Press, $39.95.

A Treatise on the Theory of Bessel Functions by G. N. Watson, Cambridge University Press, £19.95, $29.95. "... a monument of erudition... a rigorous mathematical treatment of all types of Bessel function", wrote L. M. Milne-Thompson in *Nature*.

Thirteen: The Apollo Flight That Failed by Henry S. F. Cooper. John Hopkins University Press, $13, £11. First published in 1972.