tent. Devoting twice the number of pages to these topics, Brehm and Mullin render the preferred treatment for this difficult chapter.

All things considered, the text by Brehm and Mullin might be preferred if longer reading assignments are feasible and a more limited elegance is no handicap.

An excellent textbook for a one-semester course, closely approximating this reviewer's classroom presentation, is *Modern Physics* by Raymond A. Serway, Clement J. Moses and Curt A. Moyer (Saunders College Publishing, Philadelphia, 1986). The remaining three textbooks will be compared to this benchmark work. I prefer the book by Serway, Moses and Moyer as a comprehensive, no-nonsense and up-to-date presentation.

The text by Beiser is a good second choice, having less range in coverage but covering its limited topics well. Beiser generally uses fewer equations accompanied by derivations and relies more on verbal descriptions with informative figures. Particularly noteworthy are the sections devoted to the hydrogen atom, many-electron atomic species (and the periodic table), the hydrogen and more complex molecules and band theory. Brief but adequate treatment is given to quantum statistics and elementary particles. There are a reasonable number of worked out problems and the text contains about 400 questions and problems. All in all, Beiser's book is a very workable text.

The Sandin text is paler and thinner than the two texts discussed above. It caters to those wishing a less demanding coverage and would be inappropriate for schools with a rigorous curriculum. The discussion of elementary particles is brief to the point of complete inadequacy. Nuclear physics does not fare much better. Derivations are hurried at best. Although there are many questions and worked out problems, they are mostly very simple "plug-in" types.

The text by Ohanian is a curious mixture of a few things treated with some authority and others treated with no particular distinction. For example, the first chapter contains an excellent classical derivation of the Maxwell distribution of molecular speeds in a gas but this is amidst a lot of elementary clutter on waves. The section on special relativity relies on space-time grids and world lines that mystify rather than clarify, but contains an interesting discussion of relativistic kinematics. The general methods of quantum mechanics are adequately treated, but a number of more properly illustrative examples are relegated to the end of the chapter as assigned problems. The text is weak on the discussion of semiconductor devices. It is barely acceptable on nuclear physics and elementary particles. Users of this textbook had better be prepared to supplement the book with additional lecture material.

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Principles of Statistical Radiophysics

S. M. Rytov, Yu. A. Kravtsov and V. I. Tatarskii

Vol. 1: Elements of Random Process Theory
Springer-Verlag, New York, 1987. 253 pp.

Vol. 2: Correlation Theory of Random Processes
Springer-Verlag, New York, 1988. 232 pp. $79.00 hc ISBN 0-387-16186-4

Vol. 3: Elements of Random Fields
Springer-Verlag, New York, 1989. 239 pp. $99.00 hc ISBN 0-387-17829-5

Vol. 4: Wave Propagation Through Random Media
Springer-Verlag, New York, 1989. 188 pp. $81.00 hc ISBN 0-387-17828-7

The term "radiophysics" as used mostly in the Russian and European technical literature refers to the general theory of both linear and nonlinear oscillations and waves. The four-volume *Principles of Statistical Radiophysics* by S. M. Rytov, Yu. A. Kravtsov and V. I. Tatarskii discusses various fluctuation phenomena in electronic systems (both linear and nonlinear), random fields and random propagation of waves.

Rytov is a renowned expert in the theory of fluctuations in electromagnetic fields who in 1953 developed a theory of thermal electromagnetic fields based on a generalization of the fluctuation–dissipation theorem to distributed systems. M. C. Levin and Rytov published this theory in 1967 in *Theory of Equilibrium Thermal Fluctuations in Electrodynamics* (in Russian). Much of the content of that book is covered in a chapter of the third volume of *Principles, Elements of Random Field Theory.* Kravtsov is an expert in the quasioptical theory of EM propagation and, in particular, propagation in random media. Tatarskii, a major contributor to the theory of wave propagation in randomly inhomogeneous media, is the author of *Wave Propagation in a*

Turbulent Medium (McGraw–Hill, New York, 1961) and the more recent *The Effects of the Turbulent Atmosphere on Wave Propagation* (IPST, Jerusalem, 1971).

About 30 years ago I took a course on random processes from Rytov at the Moscow Physical–Technical Institute; its clarity and elegance were greatly enjoyable. He has taught this course for many years and has published its contents as the textbook *Statistical Radiophysics*. The second Russian edition of that book became the basis for *Principles*.

Principles is supposed to be a textbook for graduate and undergraduate students who are already familiar with probability theory and for researchers who are not familiar with the theory of random functions. Each chapter is followed by problems. The detailed analysis required for their solution will help students master the theory; very often the problems also serve to expose additional aspects of theory, in the best tradition of the books of Lev Landau and Evgenii Lifshitz. Unlike many other Russian technical books *Principles* is not overloaded with mathematical rigor and "fine print" and includes only the material that is really important for physicists and engineers. The physical examples are quite representative and were chosen based on their intrinsic physical interest and their relevance to applications, as well as their suitability for illustrating mathematical methods. The English translation does not always follow the terminology adopted in the Western technical literature; fortunately the reader can still clearly understand the essential content.

Volume 1 familiarizes the reader with the underlying theoretical technique. The authors first introduce the physical concept of probability and consider the Bernoulli problem and various probability distributions. This is followed by a presentation of the theory of random pulses and the central-limit theorem. The main portion of the book deals with the theory of random functions; the treatment includes Markov and stationary processes, the theory of momenta, an introduction to correlation theory, probabilistic convergence and ergodicity. The theory uses such advanced tools as the Smoluchowski, Einstein–Fokker–Planck and Kolmogorov–Feller equations, as well as stochastic differential equations. Fluctuations in the Thomson oscillator, rotational Brownian motion and random refraction of an optical ray are used to illustrate the theory.

Volume 2 deals exclusively with correlation theory of random functions. It is illustrated with a wide range of physical examples and applications, from white noise and blackbody radiation to the correlation theory of coherence. The spectral theory of random actions in dynamic systems (both linear and nonlinear) follows, and the volume ends with a discussion of the fluctuation–dissipation theory and the theory of some nonstationary processes (for example, the flicker effect).

Volume 3 addresses excitation, propagation and scattering of random electromagnetic fields. The topics covered include excitation of fields by random sources and diffraction of plane waves on a chaotic screen. A significant portion of the book, written by Rytov, deals with electromagnetic fields of thermal origin. In particular, he discusses equilibrium thermal fluctuations in dissipative systems and gyroscopic materials, the generalized Kirchhoff's law, thermal radiation in antennas and the fluctuation–dissipation theorem for fields. This volume concludes with a chapter on scattering theory in the approximation of small perturbations and single scattering.

Volume 4, written mostly by Tatarskii and Kravtsov, treats wave propagation in randomly inhomogeneous media. The part written by Tatarskii is largely based on his well-known results on electromagnetic wave propagation in turbulent atmospheres. To treat large-scale inhomogeneities he uses the method of smooth perturbations based on the parabolic wave equation in the case of small perturbations, and the Markovian approximation and higher-order coherence functions in the case of large perturbations. In the most general case—that of arbitrary-scale inhomogeneities—multiple scattering becomes important, this case is treated by use of Feynman diagrams. The chapters by Kravtsov examine waves in bulk and at rough surfaces by means of geometrical optics methods, which can be a powerful tool for dealing with large-scale random inhomogeneities.

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Electrophotography and Development Physics

L. B. Schein
Springer-Verlag, New York, 1988. 271 pp. $54.00 ISBN 0-387-18902-5

Just over 50 years ago Chester Carlson combined the photoconductivity