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BOOK REVIEWS

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LEO BREIMAN, *Probability*. Addison-Wesley Publishing Co., Reading, 1968. ix + 421 pp. $13.50

Review by G. KALLIANPUR

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This is not an easy book to review. The first impression it produces is a good one, but later one begins to have one's doubts.

For a book supposedly within the intellectual reach of a graduate student making his first acquaintance with advanced probability theory, it covers a vast amount of territory going all the way from the introduction of the "bell-shaped curve" to a modern treatment of one-dimensional diffusion processes. It begins with a survey of the traditional problems of probability theory—the laws of averages, weak and strong, and the central limit theorem for coin tossing. The mathematical setup for the calculus of random variables is given in Chapter 2. The next seven chapters discuss independence, conditional probability and expectation, martingales, stationary processes and the ergodic theorem, Markov chains, convergence in distribution, and the one-dimensional central theorem. Chapter 10 deals with the renewal theorem. The multidimensional central limit theorem, curiously enough, is treated separately in Chapter 11. The remaining five chapters (12–16) are concerned with topics in stochastic processes: Brownian motion, invariance theorems, martingales (continuous parameter) and processes with stationary independent increments, Markov processes (pure jump case), and diffusions.

The book has many features which I find attractive, in particular, the author's obvious determination to bring to the forefront the probabilistic content of the proofs. Measure theory is appropriately quarantined in a 14 page appendix. There is a freshness about the treatment of such (by now) time-honored topics as independence and martingales. For instance, the discussion on independence includes an account of the more contemporary work on the recurrence and equi-distribution of sums. Also, to my knowledge this is the first graduate text on probability that has a chapter on invariance theorems.

The treatment of weak convergence is excellent. All the ideas needed for the convergence of measures in metric spaces are introduced but, surprisingly, confined to finite dimensional distributions. The more general setup would have permitted a fuller discussion of invariance theorems and at the same time would have brought home to the student the fact that these problems are not conceptually different from the more classical results in the chapter on the central limit theorem.

My chief criticism is that the author attempts too much. One gets the feeling of being hurried from topic to topic as though on a conducted tour with an impatient guide. Almost every important development in the subject finds a place in the book. The cramming of so many diverse topics in a little under 400 pages (excluding the appendix) is bound to prove distracting to the student struggling to learn (and learn well) some of the basic achievements of the theory. In these circumstances, it is perhaps unavoidable that the proofs occasionally do not go into essential details and consequently have an informal air about them. Despite their intrinsic importance, some (possibly all) of the chapters dealing with the ergodic theorem, stationary Gaussian processes, and, above all, the chapter on diffusion could be omitted to make room for a more concentrated discussion of the remaining topics.

To sum up, I think most of the author's probabilist colleagues will find the book interesting, but many might have misgivings about using it as a text.