BOOK REVIEWS

Correspondence concerning reviews should be addressed to the Book Review Editor, Professor Jack Kiefer, Department of Mathematics, Cornell University, Ithaca, New York 14850.

RICHARD BELLMAN (editor), *Stochastic Processes in Mathematical Physics and Engineering*. American Mathematical Society, Providence, 1964. viii + 318 pp. $7.60 ($5.70 to members).

Review by M. ROSENBLATT[1]

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There are many problems in which randomness arises naturally or else is thought to be a convenient artifice to introduce because of the complexity of the context dealt with. A number of these problems come to mind readily—wave propagation in random media, information retrieved from messages corrupted by noise, optimization problems when dealing with systems involving random parameters, et al. Most of the papers in this symposium volume discuss a number of mathematically posed problems of this type that have arisen from questions in physics or engineering. Most of the papers unfortunately do not discuss the physical background of the problems though sufficient references are sometimes found to current relevant literature. An exception is to be found in the papers (of Twersky, Hoffman and Keller) on wave propagation in random media.

Very often the new problems posed are of the following character. Let us say that in an original deterministic context one is led to consider the solution of a differential or integral equation. Now in the present context the coefficients of the differential equation or the kernel of the integral equation become random processes. Questions of existence and uniqueness arise as they do in the deterministic context. But assuming these resolved, there is the much more difficult question of qualitative characterization of the solutions. In the paper of Bharucha-Reid there are some general results on "random operators" that are mentioned. However, in this generality the results intuitively seem to be basically restatements of counterparts for deterministic operators with the "randomness" scarcely influencing the character of the theorems obtained. One can scarcely expect much more without some specialization. Bharucha-Reid also refers in passing to a very interesting special class of problems in which important work has been carried on recently. Bellman's article refers to these problems in more detail—in fact, he carried out some early work in this area. Consider independent, identically distributed random $k \times k$ matrices M_j, $j = 1, 2, \cdots$. What can one say about the limiting behavior of the random product $T_n = M_n \cdots M_1$

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