BOOK REVIEW

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WIENER, N., SIEGEL, A., RANKIN, B. AND MARTIN, W. T. *Differential Space, Quantum Systems, and Prediction*. The M.I.T. Press, Cambridge, 1966. x + 176 pp.; $7.50.

Review by H. SALEHI

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For many years it was felt that there is a natural association between the Brownian motion processes and differential space, the prediction theory of stationary stochastic processes and quantum concepts based on the statistical-mechanical differential-space approach. In this book an attempt has been made by the authors to make this association clear. The main part of the book is largely devoted to tracing Wiener's contributions to the Brownian motion process, prediction theory, the factorization problem and his work in the many applications, including the work on quantum theory. We would certainly recommend the book to all persons interested in these subjects. But for those who are not familiar with this area, it would be preferable to read from the well known works by Doob (*Stochastic Processes*) and von Neumann (*Mathematical Foundation of Quantum Mechanics*). What follows below is designed to reveal to the reader the wide scope of this book.

Chapter 1 is an introduction to the remaining chapters. The most important aspect of this chapter is the introduction of probability functional spaces, a generalization of probability spaces. As the authors point out the notion of complete additivity is neither assumed in a probability functional space nor does it follow immediately that the complete additivity can be derived from the postulates of a probability functional space. This lack of complete additivity allows certain computable constructions for random variables, as well as the possibility of certain probabilistic treatment of an individual system in quantum mechanics. The construction method in mathematics is emphasized and examples of the constructional approach are found throughout the book.

Chapter 2 concerns the Brownian motion process and differential space. First a method for constructing the Browian motion process is given. It is then shown that the Brownian motion process, so constructed, is a separable and measurable process. The authors then go on and prove the usual properties of the Brownian motion process such as the continuity and non-bounded variation properties of sample functions almost everywhere. Finally, the relation of the Brownian motion process to noise and information theory, heat conduction in physics, certain phenomena in astromony, etc. are discussed.