

INTRODUCTION TO THIS ISSUE

This issue of the Journal is devoted to papers arising from a two-week conference on stochastic differential equations at the University of Alberta in July, 1972.

The conference was sponsored by the Rocky Mountain Mathematics Consortium. It was made possible by financial support from the National Research Council of Canada and from the University of Alberta.

There were four principal series of talks:

1. Lectures by Frank Spitzer and Richard Holley on Markov random fields, with applications to statistical mechanics. Much of this is presented in Holley's article in this issue. Readers should also refer to Spitzer's book, *Random Fields and Interacting Particle Systems*, published by the M.A.A.

2. Lectures by Wendell Fleming on the perturbation theory of diffusion processes and Ito integrals, with applications. This material is presented in full in Professor Fleming's article.

3. Lectures by Mark Kac on probabilistic methods in quantum mechanical scattering theory. These were videotaped, and then written up by Jack Macki and Reuben Hersh. We tried to keep the informal and personal flavor of Professor Kac's talks.

4. Lectures by Richard Griego, Reuben Hersh, Tom Kurtz and George Papanicolaou on the theory and applications of random evolutions. This topic is surveyed in my article in this issue.

In addition, one-hour lectures were given by many of the participants. Four of these have become articles for this issue:

- von Moerbeke's survey of optimal stopping of random processes, which leads to unconventional free boundary problems for the heat equation.

- Dudley's results on relativistic Markov processes, which may be relevant to the cosmological problem of the red shift and the 'expanding universe'.

- Sawyer's exposition of Skorokhod's powerful embedding principle, by which Brownian motion serves as a universal model for the most general random process.

- Griego's application of the Kallianpur-Robbins limit theorem to random evolutions, which yields a new type of singular perturbation theorem for an abstract Cauchy problem.

Also in this issue is Kac's stochastic solution of the telegrapher's equation. This is reprinted from his 1965 lectures in Dallas at the Mag-

nolia Petroleum Company. These lectures have been out of print for several years, and the material on the telegraph equation is not contained in any other of Professor Kac's publications. This work has often been referred to in recent articles on random evolutions and it seemed useful to make it easily available. It is reprinted here by permission of the Mobil Research and Development Corporation.

These articles cover a wide range of problems and viewpoints. Still, they are all motivated by physical models, and they all involve the use of stochastic tools to study dynamical systems. The discerning reader will find a rich variety of surprising and unexpected connections between problems in differential equations and problems in random processes.

I would like to take this final opportunity to thank Professor Jack Macki of the University of Alberta for his unfailing energy and good spirits, and Father Courtney of St. Joseph's College for his friendly and much appreciated hospitality.

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