Book Reviews

Decreusefond, L., Öksendal, B., Üstunel, A. S. (Eds.): *Stochastic Analysis and Related Topics*. Proceedings of the 7th Silivri Workshop (Progress in Probability). 249 pp. Birkhäuser, Boston Basel Berlin, 2001. Hardcover DM 298,–.

This book contains survey articles on heat kernels on infinite dimensional manifolds, Hausdorff measures on the Wiener space, short time asymptotics of diffusion processes, large deviations of diffusions, stochastic integration with respect to the fractional Brownian motion, Stokes' formula for the Brownian sheet, and logarithmic Sobolev inequalities on the Wiener space. Methods from stochastic analysis turn out to be a powerful tool for various subjects in applied mathematics.

F. Haslinger, Wien

Reiss, R. D., Thomas, M.: *Statistical Analysis of Extreme Values*, 2nd ext. Ed. 443 pp. Birkhäuser, Basel Boston Berlin, 2001. Hardcover DM 116,–.

The subject of this book is the investigation of maxima of observed data, for example maximum temperature or water discharges within a month or a year, and exceedances of the observed data over a prescribed threshold. Parametric families of distributions are introduced with the intention to fit them to the observed data. The choice of these families is justified by certain limit theorems. Various statistical procedures are presented, which can be used for the selection of appropriate parametric models and for the estimation of parameters. Besides numerous data-based examples, the book contains special chapters about flood frequency analysis, insurance, and finance. Also five longer case studies are included. The book is accompanied by the statistical software Xtremes 3,0 (Academic Edition).

F. Hofbauer, Wien

Bleher, P. M., Its, A. R. (Eds.): *Random Matrix Models and Their Applications* (Mathematical Sciences Research Institute Publications, Vol. 40). 448 pp. Cambridge University Press, Cambridge, 2001. Hardcover £45.00.

The theory of random matrices arose from nuclear physics, from the study of resonance patterns of particles. Making several simplifying assumptions, it seems that the statistical behaviour of the eigenvalues and eigenvectors of randomly chosen (large) matrices will give statistical information on these resonance patterns. Thus, the theory of random matrices was born, and it seems to be of importance in many other fields, most prominently in the distribution of the zeroes of the Riemann zeta function. As the above formulations indicate, many of the apparent implications and connections of random matrix theory to other fields are not (yet) made rigorous. Therefore it has been an exciting recent advance when the long standing problem of determining the statistical behaviour of the longest increasing subsequence in a random permutation was solved by J. Baik, P. Deift and K. Johansson, thereby making use of distributions known from random matrix theory, the tie between the combinatorial problem and random matrix theory having been subsequently directly set up by A. Okounkov. The Baik–Deift–Johansson theorem has set off an avalanche of research activity, at the intersection of combinatorial analysis, asymptotic analysis, Riemann–Hilbert problems, infinite-dimensional representation theory and harmonic analysis, and random matrix theory. In spring 1999, a semester on ''Random Matrix Models and Their Applications'' was held at the M.S.R.I., Berkeley. The present book contains a collection of outstanding research papers and several survey papers by the

participants in this program. Except for a few exceptions, the collection reflects, addresses, and continues the above described advances. In particular, (almost) all the authors that were at the forefront of these research developments contribute to this volume. It must be highly recommended.

C. Krattenthaler, Wien

Bürger, R.: *The Mathematical Theory of Selection, Recombination, and Mutation* (Mathematical and Computational Biology). XI, 409 pp. Wiley, Chichester New York Weinheim, 2001. Hardcover £ 65.00, US $ 105.00.

Among all biomathematical subjects, population genetics is the one with the highest level of sophistication, and the largest set of results. This is due in part to the long tradition in this field, drawing on the contributions of luminaries like Fisher, Haldane, Wright, Kimura and Kolmogoroff; and in part to the clear and rigorous laws governing genetic systems. The mechanisms, in this field, are much better understood, and more universal, than in most other fields of biology. On the other hand, the effects of segregation, selection, mutation and recombination are often difficult to disentangle, creating daunting mathematical problems as soon as several genetic loci are considered. Reinhard Bürger, one of the foremost experts in the field for the past two decades, has written a monograph which can work both as a text-book and as a reference book for mathematical geneticists. The book is extremely impressive, covering many of the most recent and advanced results, and will probably be in use for many years to come as the standard text in the field. After a very concise and elegant introduction into the basics of population genetics, it covers in depth the theory of selection at more than one locus, mutation-selection models, the evolution of quantitative traits and the action of selection and genetic variation in large populations. A considerable part of the results are due to the author. This book, summing up a wealth of recent results, is widely hailed as an extremely valuable contribution to the most 'grown up' branch of mathematical biology. If people ask what mathematics can do in biology, just show them Bürger's book.

K. Sigmund, Wien

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