Preface of the Series Editors

Stochastics has been commonly understood to comprise probability theory and mathematical statistics as well as their applications. This explanation of stochastics is essentially due to *Ladislaus von Bortkiewicz* (1868-1931). In his paper 'Die Iterationen' (1917) he defines the term *Stochastik* as follows (translation of the German original by the editors): "The investigation of empirical varieties, which is based on probability theory, and, therefore, on the law of the large numbers, may be denoted as stochastics. But stochastics is not simply probability theory, but above all probability theory and its applications, be it to general empirical varieties, be it to specific varieties."

The word stochastics and the corresponding adjective *stochastic* are of Greek origin. The Greek noun stochos means target, aim or guess and stochastikos is a person who is skilful in guessing or predicting. It was nobody other than the cofounder of probability theory, *Jacob Bernoulli* (1654-1705), who proposed the new science of stochastics more than 300 years ago. The Greek equivalent to the title of his famous book *Ars conjectandi* (published only in 1715) is $\sigma\tau o\chi\alpha\sigma\tau\iota\kappa\eta\ \tau\epsilon\chi\nu\eta$ meaning stochastic techniques. However, notwithstanding its numerous entries, a Web search does not yield a definition of the term stochastics, nor can it be found in a modern dictionary. Usually, the subject of stochastics is implicitly explained by the adjective stochastic. A similarly unsatisfactory result is obtained by looking at the aims and scopes of relevant journals, departments or academic courses. For example, in 1973, the scope of the journal Stochastics was stated as follows:

"Articles are published dealing with all aspects of stochastic systems - analysis, characterization problems, stochastic modelling and identification - and with related questions in the theory of stochastic processes. Also solicited are articles dealing with significant applications of stochastic process theory to problems in

engineering systems, the physical and life sciences, economics and other areas."

In 1979, the then editor-in-chief *M.H.A. Davies* added, in an entry to the Encyclopedia of Statistical Sciences, the following explanation:

"In practice the coverage of the journal centres around stochastic differential equations, stochastic control and optimization, and other questions related to stochastic systems. There is a bias towards 'modern' probability theory, a large proportion of the papers involving Ito calculus, martingale theory, and the like."

In a listing by subject, Taylor & Francis have their journal "Stochastics and Stochastics Reports" under the subject *Mathematics* and its subclassification *Statistics*. Indeed, none of the big publishing houses deals with the subject *Stochastics*. Apparently, 'stochastics' is used primarily as a marketing catchword, rather than to indicate a specific scientific direction.

By starting the *Sigma Series in Stochastics*, Heldermann Verlag Lemgo in cooperation with Stochastikon GmbH, Würzburg, establishes 'stochastics' as an independent, mathematically based science, the subject of which is chance and uncertainty. The series is set out to build upon Jakob Bernoulli's *Ars conjectandi sive stochastike* and to finally end "the century-old frequentist-Bayesian standoff . . .. Because the simple-minded empiricism on which both the frequentist and Bayesian pictures are founded is out of fashion", as Glenn Shafer puts it in his 1999 essay 'The Significance of Jakob Bernoulli's *Ars Conjectandi* for the Philosophy of Probability Today'.

This first volume is devoted to reviving the word 'stochastic', in its original meaning. Whilst not found in contemporary dictionaries, this meaning was described in *Zedler's Universal Encyclopedia of all Sciences and Arts*, Volume XXII, Leipzig and Halle, 1739, as follows (translation of the German original by E. von Collani):

"Stochastice = Art to Conjecture, Ars conjectandi, is a science to determine the probability of something. For example, who has more hope to win in a game than the other; the extent of hope to hit a target which is set at a given distance; how much one should arrange for the proceeding of a project, and similar things more. This art has not been investigated so far. Jakob Bernoulli has started to build up the theory, however, it is to be deplored that he could not complete it, as there is no application in moral and politics in his Ars conjectandi, which was published by his brother's son Nicolaus Bernoulli after his death, instead there are only examples of various games which were already stated by Pascal and Fermat in France. Huygens was the first to bring forward in a clear and cumbersome way these elementary teachings which were published by Frans van Schooten with his permission in his book "Exercitationibus Mathematicis"', and which Bernoulli has again published with scholarly annotations instead of an introduction. Remond de Monmort's 'Analyse sur les jeux de hasard' being increased in another edition also belongs to this area."

The *Sigma-Series in Stochastics* is open for monographs, textbooks, multiple author works and conference proceedings which contribute to the advancement of 'stochastics' as an independent natural science.

Johannesburg, Galway, July 2003   *Frank Beichelt, John Sheil*