BOOK REVIEWS

R.-D. Reiss, M. Thomas: STATISTICAL ANALYSIS OF EXTREME VALUES. Birkhäuser-Verlag, Basel-Boston-Berlin, 2007. ISBN 978-3-7643-7230-9, xvii+511 pages, 128 figures, price EUR 59.90.

The third edition of this successful book can be understood as a recollection of its first appearance ten years ago (the second edition was in 2001). To recommend such a book seems rather inutile at first sight. Nonetheless, a short description of its contents is necessary for new readers and the enumeration of carried out changes can be useful for those who are acquainted with the previous editions.

The book has six sections. The basic extreme value methodology is treated in the first three sections entitled sufficiently descriptively as Modeling and Data Analysis, Statistical Inference in Parametric Models and Elements of Multivariate Statistical Analysis. Extended sections (in comparison with the previous editions) of these introductory chapters devote attention to goodness-of-fit tests, super-heavy tailed distributions, jack-knife method, partial reduction of multivariate questions to univariate ones and to tail dependence/independence problems. The new subchapters of the second chapter are Extreme Value Statistics of Dependent Random Variables, Conditional Extreme Analysis, and Elliptical and Related Distributions.

The following three chapters are devoted to applications: Topics in Hydrology and Environmental Sciences, Topics in Finance and Insurance, and Topics in Material and Life Sciences. Here again new problems are included, namely the whole chapter on environmental problems and, further, subsections on prediction of the serial conditional value-at-risk (VaR) and on stereology of extremes (covering the problem of maximum inclusion size).

A useful part of the book is also a CD with MS Windows Application Academic Xtremes 4.1, StatPascal and Xtremes User Manual as a pdf file. The Appendix with First Steps toward Xtremes and StatPascal with the description of Xtremes software (Windows98 or NT4 or their newer versions are required) closes the book. More than 300 references are scattered either in the individual chapters and the most important of them are in the Bibliography section; about one tenth of citations appeared after the year 1999.

It should be pointed out that the purpose of the book from its very origin has been the application of the extreme value techniques and not the presentation of the underlying probabilistic theory. Consequently, it is targeted at applied statisticians and as such can be deeply recommended.

Ivan Saxl

T. Aste, D. Weaire: THE PURSUIT OF PERFECT PACKING. Second edition. Taylor & Francis, New York-London, 2008. ISBN 978-1-4200-6817-7, 200 pages, price £ 28.99.

In 1900, David Hilbert presented a list of 23 problems which he hoped would guide mathematical research in the twentieth century. The 18th Hilbert problem poses the following question: How can one arrange most densely in space an infinite number of equal solids of a given form. The book by Aste and Weaire gives in 20 chapters an elementary survey on this and other packing problems that are of importance in physics, mathematics, chemistry, biology, and engineering.

In the beginning of the 17th century Johannes Kepler conjectured that the cannon ball arrangement of spheres is the densest one with packing fraction $\pi/\sqrt{18}$. Recently, Thomas Hales announced that he has a computer based proof of the Kepler conjecture. One section of the book is thus devoted to the acceptance of the Hales' proof which was done in noninteger computer arithmetic.

Voronoi cells and the construction of the associated dual Delaunay triangulations are presented in two and three dimensions. Some connections with the Kepler's semiregular tilings of the plane by regular polygons are given. It is also shown that the shape of honeycombs is not optimal. The bee's design can be improved, with a saving of 0.4 % of the surface area of the wall, by using a different arrangement of facets which was discovered by L. Fejes Tóth.

Several chapters are devoted to the Plateau minimal surface problem, bubble structures, and their applications. For instance, bubble structures were used to construct the Olympic station in Beijing. The edges of the foam are represented by huge steel beams, 90 kilometers in all.

One chapter deals with packing in modern crystallography including the so-called quasicrystals. In 1974, Roger Penrose discovered a nonperiodic tiling of the plane by two rhombic tiles. He was inspired by a finite nonperiodic tiling proposed by Kepler in 1619.

In Apollonian packing one starts with three mutually touching circles and inserts in the hole between them a fourth circle which touches all three. Then the same procedure is iterated. In this way, the Apollonian packing is a classical example of a fractal.

Sphere packings in higher dimensions have lots of applications in group theory, theoretical physics, numerical solution of integrals, theory of communication, etc. Special attention is paid to sphere packing in the magic dimensions 4, 8, and 24, where the so-called kissing numbers are known. For instance, in 24 dimensions each sphere kisses 196 560 neighbors in the Leech lattice (well-known from error-correcting codes). It is also mentioned that a disordered packing can be denser than any known lattice packing in dimension 56 and higher.

Another packing problem is due to J. J. Thompson. *What is the arrangement of N point electrical charges on a sphere, which minimizes the energy associated with their interactions?* There are some surprising answers. For instance, if $N = 8$ we do not find the obvious arrangement in which the charges are at the corners of a cube, but rather a twisted version of this. Another interesting question was stated by the biologist Tammes: Given a minimal distance between them, how many points can be put on the sphere?

The book contains a lot of illustrations, almost no formulae, and no theorems. Therefore, it is accessible to a wide spectrum of readers.

Michal Křížek