

**Fernholz LT, Morgenthaler S, Stahel W, editors. Statistics in Genetics and in the Environmental Sciences. Basel-Boston-Belin: Birkhäuser, 2001. 200 pages; ISBN 3-7643-6575-7; price: 70.20 €**

**Series:** Trends in Mathematics, a series devoted to the publication of volumes arising from conferences and lecture series focusing on a particular topic in mathematics and its applications.

**Field of medicine:** Medical/environmental statistics, biostatistics, and applied mathematics.

**Format:** Hardcover.

**Audience:** Statisticians working with applications in genetics and environmental sciences, as well as those interested in a broader field of biomedicine and ecology. The researchers in the field of genetics, biometrics, and environmetrics without high degree of expertise in statistics and computational methods can also benefit from reading the book.

**Category:** The book is a compilation of presentations given on a workshop held in Ascona, Switzerland, in May 1999, and includes 12 papers refereed by a panel of experts and editors of the volume. The Workshop was jointly organized by the Swiss Federal Institutes of Technology in Lausanne and Zürich and hosted by the Centro Stefano Franscini in Ascona. The Foreword written by all three editors is followed by two lists of names and affiliations (partly overlapping): the list of authors and coauthors (25 names), and the list of participants (43 altogether, 12 from Switzerland, 10 from USA, 6 from Argentina, 5 from Canada, 4 from Belgium, 2 from Australia and Germany, 1 from Mexico, and 1 from the Netherlands).

**Purpose:** The Birkhäuser series Trends in Mathematics is devoted to the publication of volumes arising from conferences focusing on a particular topic in any field of mathematics. The purpose of this book is to make current scientific developments in application of mathematics/statistics in genetics and in the environmental sciences available to the community as soon as possible.

**Content:** Topics of the articles in this volume range from human and agricultural genetic DNA research to risk assessment of exposure, to carcinogens and chemical concentrations in the environment, to space debris and atmospheric chemistry. Also included are some articles focused on theoretical background and estimation procedures general and flexible enough to be applied in many practical situations. Roughly speaking, one third of the book is of much more theoretical mathematical/statistical content and

the other two thirds deal with particular problems in genetics and environmetrics. The most interesting and useful contributions are two new models, a model for the risk assessment of low dose lifetime exposures to carcinogens and a stochastic model of carcinogenesis. These two contributions may be quite interesting to a general medical readership, as they have been undoubtedly most challenging for the reviewer of the book. The model of risk assessment of exposures to carcinogens introduced a new framework suitable for the estimation of risk from lifetime exposures to low levels of carcinogens. These estimations are usually based on results of animal bioassays, which use much higher doses than those humans are exposed to in the environment. A stochastic model of carcinogenesis starts from the already well-known model of carcinogenesis as a multistage process which includes initiation, promotion, and progression, and derives the age-dependent risk of acquiring a malignant cell from mutation probabilities and additional assumptions about growth conditions for normal and mutated cells. The analysis of data from the viral DNA microchips and methods used in the selection of superior genotypes in plant breeding programs may be interesting to a more specialized readership, although the results could be adapted for problem solving and decision making in other genetics areas.

**Highlights:** This book highlights the crucial role mathematics and statistics play in life sciences. The selected papers included in this volume will enable the readers to recognize the potential of statistics in diverse scientific disciplines, such as genetics and environmental sciences. The articles in the volume will help the readers not only to focus on the central role of statistics in specific areas, but also to extrapolate the results for further applications. The book is a testimony to the importance and potentials of mathematics and statistics in different scientific disciplines.

**Limitations:** Like any other collection of papers, this book makes current developments in a certain field of science available to the community and archives them for reference, but it does not give a systematic overview of the field.

**Related Readings:** For a more complete and systematic insight in the applications of mathematical and statistical methods in genetics and in the environmental sciences, I recommend Kotz and Johnson's

Encyclopedia of Biostatistics (in six volumes) published in 1998. Recently published Biostatistical Genetics and Genetic Epidemiology (2002) by Elston RC, Olson JM, and Palmer L, based on articles from that encyclopedia, is available for the readers interested in genetics. Also, the field of environmental sciences seems to be more heterogeneous in scope and quality and includes larger set of books concerning the different topics and aspects of the environmental research.

**Commentary:** Mathematics and statistics are often applied in different scientific disciplines, and the most challenging ideas and theories arise from the real problems in science. In fact, the most innovative theoretical research arises from the needs of applications in diverse fields. It is not rare that the essential theoretical research grows from real problems and the results obtained are directly applicable to the problems initiating that research.

Jadranka Božikov

**Newble D, Cannon R. A Handbook for Medical Teachers (4th revised edition). Dordrecht: Kluwer Academic Publications, 2001. 222 pages; ISBN 0-7923-7092-9; price: US\$ 40.00**

**Field:** Medical education.

**Format:** Hardcover.

**Audience:** Medical teachers, medical students, professionals engaged in the development of medical courses, and all teachers in higher education.

**Purpose:** To help professionals in medical education develop skills for effective teaching and meet students' needs. The book also provides information on how to organize teaching of different medical subjects and to acquire teaching skills needed in different settings. Authors help the reader understand the possibilities and necessary considerations with regard to planning, organizing, teaching, and evaluating different medical courses.

**Content:** The book is divided in ten chapters. The introduction to each chapter informs the reader about the importance of the topic and gives a brief overview of the chapters' content.

The first chapter describes students' learning process and how to improve students' learning by implementing student-centered methods of teaching instead of conventional methods. Educators are informed that their assumptions about students may not be accurate and that difficulties students experience in their learning may stem not only from psychosocial problems or lack of studying but from specific ways they study and learn. The orientation that authors provide in teaching, organizing courses, and conducting assessments can prove useful in the facilitation of successful learning process. In the second chapter, the authors continue to elaborate student-centered learning methods. Recognizing the fact that teaching large groups makes a significant part of overall teaching, the authors suggest to move away as much as possible from the traditional way of lecturing large groups of passive students and to apply strategies that induce

more active learning. A range of techniques is offered, which will engage students enthusiastically in active learning, provide them with immediate feedback, and build a productive and scholarly relationship. The third chapter provides information on small group teaching – often the most rewarding experience for teachers and students alike. Careful planning, skills in group management, understanding of group dynamics, and application of a wide range of small group techniques are presented as necessary elements for a successful work with such groups. Chapter four is most useful and practical. Authors give clear, short, and very useful guidelines on how to make a presentation or a poster for a conference. The reader can find similarities between giving a lecture and presenting a paper, but also significant differences between the two ways of conveying the message that need to be kept in mind. Although this chapter may appear to be out of place in a book about education and teaching, one has to remember that most medical teachers, at least sometimes, will find themselves in a situation where they will have to make a presentation at a scientific meeting. Whereas the first four chapters were general in nature, chapter five enters the specific field of medical education, looking at ways of improving clinical teaching and addressing the issue of practical and laboratory-based teaching. This is particularly important since this aspect of teaching is rarely, if ever, covered in “teach the teachers” courses. Chapter six provides important and critical concerns in systematic planning of a course. The reader can learn how to forge educationally sound and logical links between planned intentions, course content, teaching and learning methods, and the assessment, while taking into account students' characteristics. Still, the authors acknowledge that curriculum planning is very complex and involves more than just educational

considerations. Chapter seven covers the issue of problem-based learning, a broadly accepted and implemented unconventional method of teaching in many well-established medical schools worldwide. Although the rationale behind the problem-based learning exceeds the scope of this book, practical implications and strategies are given, providing enough information for teachers faced with teaching a problem-based course. Chapter eight helps the teacher ensure that the assessments he or she is involved with are conducted in a fair and accurate way. At the beginning of this chapter authors provide background information about the purposes of assessment and principles of education measurement. Later in the chapter they describe different forms of assessment in detail, enabling the teacher to select an appropriate method. New technologies as tools in medical education are covered in Chapter nine. In this chapter, the authors give updated information from the previous edition of the book in terms of rapid development of information technology, then offer introductory ideas on using information technology and, finally, give principles of good practice that apply to all technologies. The last chapter provides information and resources that can assist teachers in evaluating and improving their teaching as well as learning skills of

their students. The book ends with an appendix containing the list of books, journals, and medical education organizations as well as information on training opportunities and other sources of information on medical education.

**Highlights:** The book gives many practical examples, which give direct insight into procedures and strategies for planning courses and teaching. Also, visual organization of the book is an illustrative example of how material can be presented in a light, easy-to-digest, and yet informative fashion. Ideas elaborated in the text are given in short and structured manner in figures that appear throughout the book, along with examples. Such visual organization helps the reader quickly find important information. It also breaks the plain text, making it more dynamic and stimulating for reading and memorizing.

**Limitations:** The only limitation is that a publication of this scope cannot completely cover the broad field of medical education. However, it gives clear directions for more detailed reading and studying.

**Related reading:** Every chapter ends with a list of related readings, making it easy to find additional and deeper information on specific topic covered in a chapter.

Darko Hren

**Losa GA, Merlin D, Nonnenmacher TF, Weibel ER, editors. Fractals in Biology and Medicine. Volume III. Basel: Birkhauser Verlag AG; 2002. 375 pages; ISBN 3-7643-6474-2; price: € 98**

**Field of medicine:** Internal medicine, diagnostics, and molecular biology.

**Format:** Hardcover.

**Audience:** Researches in the fields of medical sciences, molecular biology, and biomathematics.

**Purpose:** To give an overview of implementation of fractal geometry in medicine. This volume contains oral and poster contributions presented at the 3rd International Symposium on Fractals in Biology and Medicine, held in Ascona, Switzerland, March 8-11, 2000.

**Content:** Most contributions focus on biomedical research problems and application of fractal geometry in describing and measuring biological objects (cells, tissues, and organs) or complex metabolic processes and diseases. The proceedings of similar topics have been grouped in four chapters. The first chapter is devoted to the fractal design of biological structures and functions. Five presentations discuss

fractal structures in different organs and processes in the body. Using the principles of fractal geometry, the authors investigated the parenchyma growth during organogenesis, fractal dimensions of epithelium-connective tissue interface in a carcinogenesis model, and the relation of lung geometry and requirements for optimizing oxygen diffusion. The lung was the first organ where fractal reasoning was applied. H. Kitaoha from Osaka Medical School applied the 3D model of human airway tree based on the fractal branching algorithm to represent not only processes in adult stage, but also during the fetal growth. The fractal morphology was used to investigate the processes on subcellular structures to understand apoptosis of breast cancer cells and chromatin. The whole fractal theory is presented in understandable way, with mathematical expressions well explained.

The second chapter is about fractal structures in tumor and diseases. The fractal parameters are the tools for investigating breast cancer, mammary fibro-

adenomas, and prostatic cancer. Several articles are devoted to processes determining fractal dimensions of different tissues. The fractal approach in speech investigation allows quantifying the differences in roughness of the voice in normal and pathological states. Several contributions show how powerful fractal dimensions are as a tool for measuring the disorganization of the trabecular network in osteoporosis. Fractal geometry analysis of bone marrow tissue performed in hyperplasia and refractory anemia resulted in increased fractal dimension, whereas in acute leukemia, the fractal structure was completely lost. A very good theoretical article at the end of the chapter contains some remarks on the fractal dimension applications in nuclear medicine, explaining critically the usefulness of the fractal analysis in medical diagnostic procedures. Because the fractal analysis does not always describe images in the same way as human observer does, the application of fractal dimension in medical diagnostic may be used only with great caution and proper understanding of mathematical and physiological principles.

The third chapter, devoted to the organization and evolution of living systems, is the most interesting and the shortest one. Fractal geometry is used in building different physiological and structural models in biological evolution.

The fourth chapter, dealing with modeling, greatly differs from the above subjects. The contributions in this chapter deal with fractals in architecture in a very persuasive manner and should be read from curiosity if nothing else. I would like to finish this re-

view with Galileo's remark quoted in one of the contributions:

*"Philosophy is written in this grand book (I mean universe) which stand continuously open to our gaze, but which cannot be understood unless one first learns to comprehend the language in which it is written. It is written in language of mathematics, and its characters are triangles, circles and other geometric figures, without which it is humanly impossible to understand a single world of it; without these, one is wandering about in dark labyrinth."*

**Highlights:** The book provides an overview of fractal geometry approach in biological systems. The researches in molecular biology and biophysics could gain the knowledge of possible use of fractal geometry in their fields and acquire a critical approach to it.

**Limitations:** As a book of congress proceedings, it contains unlevelled contributions with overlapping themes, as well as different interpretations of the same problem. Nevertheless, it can help physicians gain a more critical view of some mathematical topics. I have enjoyed reading the contributions, but a bit too much of mathematical explanations could be an obstacle to physicians. However, the presentations are comprehensive without having a full understanding of mathematical procedures. It is amazing how all processes and structures in our body can be presented by fractal geometry and its regularity.

Jasminka Brnjas-Kraljević