

Biomedical Calculations: Principles and Practice

R. F. Burton. Chichester: John Wiley, 2008.

ISBN 978-0-470-51910-3 (hardback) £70.

ISBN: 978-0-470-51911-0 (paperback) £22.50. 310 pp

The ability to 'do' calculations is an essential skill of the biomedical scientist. It is not a skill that is easily come by and requires an appropriate context for learning, and regular practice to maintain. The fact that biomedical 'arithmetic' also involves physical units, often several at a time, tends to cause more problems, as relatively easy manipulations of numbers get tied up with decisions about what to do with the units. This fact has, at his own admission, caused problems for the author, who admits to a 'light bulb' moment when he realised that "once you get the units right, the calculation is much more easily understood". The first section of the book, then, looks at unit analysis and takes the reader through several calculations, in each case spelling out the units for clarity.

Part 2, a much larger section, deals with units of length, area, volume, mass, moles and equivalents. The first chapter in this section discusses the Systeme International (SI) and units thereof, together with prefixes for larger and smaller units. The author then relates these to the biomedical context, where SI units are not strictly applied (e.g., use of litre [L] and mL rather than dm^3 and cm^3). Each chapter goes through calculations in a clear and understandable fashion, often pointing out pitfalls along the way. Problems are set at the end of each chapter (except the first), with answers and explanations provided in an appendix.

Chapter 3 looks at percentages and how they can mislead, using examples such as percentage body fat, 'low fat' foods and heat loss from the body. Chapters 4 and 5 look at composite units such as density, specific gravity, specific volume, and concentration, the last having a chapter to itself. Chapter 6 then takes up the theme of unit analysis, but with more complicated problems such as determining the concentration of haemoglobin per litre of erythrocytes, given the molecular mass of haemoglobin, the mass of haemoglobin per litre of blood and the percentage (by volume) of blood occupied by erythrocytes. This chapter also introduces another theme – introducing a little bit of algebra, namely, 'Let X be the unknown', to show how this can help with rearranging equations to solve problems. Chapters 7 and 8 take the reader through the calculations required when making up solutions and when diluting from stock solutions, and in calculating drug doses. In my experience, many students have real problems both in calculating concentrations and in working out dilution factors, and I think these chapters will be a great help.

Part III of the book is concerned with graphical representation and formulae and equations used in biomedical science (chapter 10), areas, volumes and masses (chapter 11), and with body size, build, fatness and muscularity (chapter 12). Part IV introduces the concept of time, and looks at frequency, velocity and acceleration, using renal clearance to provide examples. Part V introduces force, pressure, energy, work and power, using relevant examples to illustrate (chapters 14 and 15). Chapter 16 considers heat and temperature, including the temperature coefficient

(Q_{10}), heat capacity and specific heat. Chapter 17 looks at gas mixtures, partial pressures and dissolved gases (e.g., dissolved oxygen and carbon dioxide in plasma).

The last section of the book (Part VI) contains all the topics and concepts that involve logarithms. There is an invaluable introduction to logs, to show just what they represent, and looks at graphs with logarithmic scales. However, the very brief discussion of 'natural' logs revolved around how to interconvert, rather than giving some explanation of what they actually mean and why they are used. The following chapters in this section look at exponential time courses, semi-log plots, the Nernst equation, pH, equilibrium constants, the Henderson-Hasselbalch equation, dose response curves, buffering and acid-base balance.

The book has several appendices, concerned with basic mathematical language (useful, for example, to remind yourself of the order of operations or the rules relating to indices); non-metric units; additional notes not required in the main text; and, thankfully, the answers to the problems posed, showing how they are calculated.

I really liked this book and the approach the author has taken. It will certainly be useful for biomedical scientists and for those teaching potential biomedical scientists, either at university or during training in the laboratory. The paperback price should not put this book beyond the reach of students. It will also be a welcome reference book for those requiring either a 'refresher' or reassurance that they are correct in their calculations.

M M Dawson

Enterprise for Life Scientists: Developing Innovation and Entrepreneurship in the Biosciences

D. Adams, J. Sparrow eds. Bloxham: Scion, 2007.

ISBN 978 1 904842 36 1. £24.99. 250 pp.

This easily portable volume is an excellent primer for undergraduates learning about enterprise or for anyone interested in the commercial exploitation of their research. A wide variety of experts has produced a comprehensive account of the nuts and bolts of intellectual property protection and exploitation, which is aimed specifically at life scientists through a series of relevant case studies to illustrate the various processes involved.

The book comprises 10 chapters, each laid out in a modern style with the case studies and a series of interesting notes differentiated from the main text for ease of reading. Clear diagrams and summary tables are used to illustrate the points discussed and each chapter can stand on its own, as a comprehensive introduction to that topic or as part of an integrated guide to the entire process of commercial exploitation.

The book begins with chapters on 'Knowledge and Technology Transfer' and 'Creativity and Innovation' and then leads on to one that discusses the protection of ideas (intellectual property) before separate chapters on how ideas are researched and communicated. A useful guide to setting up a business follows, including a separate chapter on writing a business plan, which is a critical stage for anyone

trying to start a business. Then follows a thorough treatment of the thorny issue of raising finance, before ending with separate chapters on regulation in the biosciences and on ethical issues.

As anyone who has been involved in commercial developments in bioscience (or indeed other areas of technology) will know, the content of these chapters is important at different stages during the exploitation of intellectual property rights, whether through licensing or even business start-up. Therefore, this book will be of use to a wide readership, especially as researchers and other academics are unlikely to have come across many of the concepts and processes of commercialisation in their early careers. Thus, they are in a similar position of ignorance to most undergraduates. So, whether used as an undergraduate text or as a postgraduate primer, this book will prove useful to the technical innovator and budding entrepreneur. The former will understand the important processes and procedures of commercial exploitation, and the commercial reasons for them, while the latter will learn how to move from science to commerce.

As post-industrial countries try to develop as knowledge-based economies, this guide will help to train a new generation of students. In years to come, this book could be seen as the catalyst that helped UK taxpayers earn a return on their investment in research and development by virtue of the help provided to its technical innovators and budding entrepreneurs, helping them to protect and exploit intellectual property.

M J Dempsey

Microscope Image Processing

Q. Wu, F. A. Merchant, K. R. Castleman. Oxford : Academic Press, 2008.
ISBN 978-0-12-372578-3. £49.99. 548 pp.

This book is a specialised publication, especially useful as an excellent reference tome for those working in image analysis and measurement fields such as confocal microscopy, widefield imaging and related techniques. However, it would probably not be the first book you would reach for if you were new to the field of digital image processing.

This is a multi-author book divided into 18 chapters. Each chapter follows a similar style, commencing with an introduction and ending with a useful summary of important points to complete the chapter. There is a recognised tendency to use jargon throughout the text, but the authors' inclusion of a glossary at the end of the book helps the reader become familiar with the rather cryptic terminology. Extensive in-text referencing is found in each chapter, with many of the works referred to published after 2000.

A noticeable exception to the more recent referencing occurs in chapter 2, where the authors discuss the fundamentals of microscopy, starting from a very historic viewpoint in the first century AD. The origin of the word 'lens' is explained – it alters ones view of lentils! After a very entertaining and informative beginning, the chapter, as with following chapters, becomes less exciting reading for those who struggle with mathematical formulae.

Having armed oneself with the knowledge of how a microscope works, chapter 3 then explains how to digitise

correctly the image produced by that microscope. Chapter 4 guides one through the process of image display, reminding the reader that although a lot of image analysis is concerned with the data produced from the image, the direct observation of the image can also yield important information.

By chapter 5 we are no longer reading about images but are dealing with the manipulation of pixels. Chapter 6 explains how and why one would need to enhance the image to produce more accurate analytical results. The following chapters go on to explain methodology in different areas of image processing (wavelet, morphological, image segmentation, object measurement, fluorescence imaging, multispectral imaging, three-dimensional imaging and time-lapse imaging). The chapter on fluorescence imaging summarises adequately the techniques used to investigate the localisation of proteins and their interactions. Chapter 16 introduces the reader to autofocusing, which is an essential component of automated microscope image analysis where a high throughput of samples is required without the attendance of a researcher. This concept of high-throughput and workload management is explored further in chapter 18.

Lacking throughout the text is the use of colour images. With the exception of the inviting cover and the chapter on fluorescence imaging, any plates provided are in black and white. This is a little disappointing in a text about microscope image processing.

The early chapters of this text will be useful reading for those who wish to gain a more detailed knowledge of the field of microscope image processing. However, the remainder of the text is more suited as a thorough reference work and practical guide for those already working in the field.

C Ainley

Diabetes and Cancer: Epidemiological Evidence and Molecular Links

K. Masur, F. Thevenod, K. S. Zanker eds. Basel: Karger, 2008.
ISBN 978-3-8055-8640-5. \$148. 148 pp.

The text focuses on common molecular and clinical features of cancer and diabetes supported by epidemiological evidence. The complex interdependency of both diseases on common cellular and hormonal mechanisms is explored fully. There is an excellent review of the role of nutritional factors, including dietary supplements, in influencing the progression of diabetes, as well as the cellular shift from oxidative phosphorylation to glycolysis in cancer cells – the Warburg effect. There is also a look ahead to future avenues for research and to common approaches to treatment and prevention.

This is a very well constructed set of review articles at the frontier of thinking in this important field. It is written in an accessible way for the specialist and generalist alike and its relative brevity (148 pages) belies its depth of content. It will be an important reference source to university and clinical libraries and will be valuable to a range of health professionals.

P G McKenna