ISSN 1756-9524 (Print)
ISSN 1756-9532 (Online)

July 2011




Reviews

A guide to publications in the Physical Sciences

The Higher Education Academy
UK Physical Sciences Centre
...enhancing the student experience in chemistry, physics, astronomy and forensic science within the university sector

Number 22
Volume 12 Issue 1

Reviews

'Reviews' is the journal of the UK Higher Education Academy Physical Sciences Centre. It is issued twice yearly in Spring and Autumn.

The journal is free of charge to academics in UK higher education institutions. The material is also published electronically on our web site.

The UK Physical Sciences Centre is funded by the Higher Education Academy (www.heacademy.ac.uk) and is part of the Academy's Subject Network.

The Centre is supported by the Universities of Hull and Surrey.

Editor

Tracey Madden
UK Physical Sciences Centre
Department of Chemistry
University of Hull
Hull HU6 7RX
Tel: 01482 465418
Fax: 01482 465418
Email: t.madden@hull.ac.uk

Editorial

Welcome to the latest and largest issue of Reviews, containing 48 reviews of books covering a range of physical science and education topics for teachers, students, researchers and general readers.

Sadly, this is the last issue of Reviews that the UK Physical Sciences Centre will publish. The Centre would like to take this opportunity to thank all our contributors over the years, the reviewers and publishers, without whose help producing this journal could not have been possible.

We hope you have enjoyed previous issues of Reviews and will find something useful in this one.

Tracey Madden
Editor

In this issue...

Book reviews...

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Academic Writing: a handbook for international students

Subject area
Study Skills, Education

Description
A guide for students of all disciplines

Author
Stephen Bailey

Publisher/Supplier
Routledge (Taylor & Francis Group)
<http://www.routledge.com/education>

Date/Edition
2011/3rd edition

ISBN
978-0-415-59581-0

Level
Undergraduate

Price
£19.99

Summary Review	
range: * poor to ***** good	
Academic content	****
Usefulness to student	****
Usefulness to teacher	*
Meets objectives	*****
Accuracy	****

The English language is derived from many other languages: old English with its Anglo-Saxon-Celtic-Germanic roots, Latin, and Norman French. In addition, some parts of the UK have distinctly Scandivanian or Spanish influences. The advent of modern global communication and international travel has brought additional influences from many parts of the world. Hence the "rules" of English grammar and usage are full of exceptions and contradictions. All of this can be confusing to native English speakers, and even more confusing to students with English as a second language. The title, **Academic Writing: A Handbook for International Students**, is a good description of this book.

Part 1, "The Writing Process" deals with those things which make academic English different from normal, "everyday" English. The assumption is that the student who uses this book can already communicate in English, so Part 1 introduces academic English: how to read academic text, how to summarise, note taking, and other excellent study skills.

Parts 2 and 3, "Elements of Writing" and "Accuracy in Writing", refine and polish the student's English skills. As in Part 1, each section has a brief introduction, followed by exercises for students to complete. Instructions are clearly set out, for example, "Read the following paragraph and complete the table", or "Complete the following comparisons and write two more."

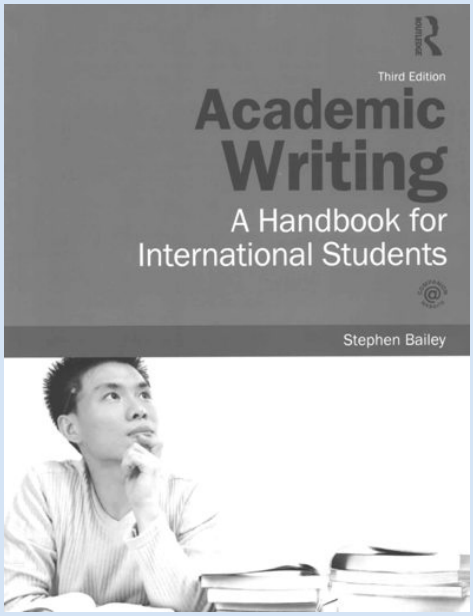
The use of examples from different disciplines is one of the book's strengths because undergraduate international students may be studying subjects from both science and non-science disciplines, or have a number of science subjects from different disciplines, especially in the first year. At the same time, there lack of focus on specifically scientific writing would be a weakness for readers of this journal. For example, there is no discussion of the use of units of measure eg, 5 mg of salt was added to 15 mL of solvent. The belief that experiments are objective and that results are independent of the experimenter, leads to a distinctive impersonal style of science writing eg acid was reacted with base to produce water and an ionic product. This feature of scientific academic writing is not covered in the book, which focuses on general academic writing.

Most of the exercises Part 4, "Writing Models", are designed to make students aware of particular features of specific types of writing such as literature reviews, reports, essays, and designing and reporting surveys, though the section on surveys does have a brief exercise on writing survey questions.

Kieran F Lim
School of Life and Environmental Sciences
Deakin University
221 Burwood Hwy
Burwood
Victoria 3125
Australia
April 2011

Continued on page 3

Academic Writing: a handbook for international students



From the publisher...

Academic Writing: a handbook for international students

By Stephen Bailey

Most international students need to write essays and reports for exams and coursework. Yet writing good academic English is a demanding task. This new edition of Academic Writing has been fully revised to help students reach this goal. Clearly organised, the course explains the writing process from start to finish. Each stage is demonstrated and practised, from selecting suitable sources, reading, note-making and planning through to re-writing and proofreading.

The book is divided into short sections which contain examples, explanations and exercises for use in the classroom or self-study. Cross-references allow easy access to relevant sections, and a full answer key is included.

978-0-415-59581-0 300pp 2011 £19.99

Continued from page 2

In a few (very few) places, the book does over-simplify the use of English. For example, the words “data” and “work” are listed as uncountable nouns, which are “not usually used with numbers or the plural ‘s’”. This ignores that data is the plural of “datum” and that there are many works of art. It was disappointing to find no exercises on spelling, which can be another problem area for international students, especially in the confusing spelling of plural forms like mouse/mice (cf. house/houses), thesis/theses, etc.

The answers to the exercises are available from the publisher’s website, as are additional resources.

The “poor” rating for usefulness to teacher should not been seen as a negative criticism of the book as it is not a textbook or reference book in the traditional sense. It is intended to be a student workbook, which develops students’ skills by working through exercises. The book succeeds in meeting this objective.

This book would be most useful for students with English as a second language, as they enter first year. Academic staff and researchers are not in the target readership and would generally not benefit from this book. ESL (English as a second language) students in second or higher years of university study would probably need more detailed books on writing in a particular discipline.

An Introduction to Advanced Quantum Mechanics

Subject area
Theoretical Physics

Description
Text book covering advanced quantum mechanics and introductory quantum field theory

Author
Hans P Paar

Publisher/Supplier
John Wiley and Sons
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2010/1st edition

ISBN
978-0-470-68675-1

Level
Final year undergraduate, postgraduate

Price
£34.95

Tony Harker
Department of Physics and Astronomy
University College London
Gower Street
London WC1E 6BT
April 2011

Summary Review

range: * poor to ***** good

Academic content	*****
Usefulness to student	****
Usefulness to teacher	****
Meets objectives	*****
Accuracy	*****

The word “advanced” in the title places this book at the boundary between final year undergraduate and first year graduate student. In terms of students in the UK most of the material is more suited to graduates, though the author says that he has taught it successfully to undergraduates. The contents fall into two parts, with the first two-thirds devoted to advanced topics in quantum mechanics and the final third introducing quantum field theory. Although there are brief summaries of a number of key underlying principles, including Green functions, ladder operators and time-dependent perturbation theory, the starting level is already quite advanced. The material is presented in quite an accessible way, and whilst it is inevitably highly mathematical the author goes to great pains to explain the steps in the derivations and the physical consequences of intermediate approximations and final results. From that point of view, if this material were to be presented to undergraduates this would be a good textbook to use.

The first part of the book covers the interaction of electromagnetic radiation with matter (including, as a taster for the second part, the second quantisation of the electromagnetic field). Spontaneous and stimulated emission are covered, selection rules are derived for electric and magnetic dipole and electric quadrupole transitions, though further generalisation by using vector spherical harmonics are not included. A chapter on scattering theory covers the common approximations and named effects very clearly. There is a short chapter on symmetries and conservation laws, followed by a fairly comprehensive introduction to relativistic quantum physics covering the Klein-Gordon and Dirac equations as well as a treatment of the hydrogen atom with links to the non-relativistic limit. A brief chapter on “special topics” includes the EPR paradox, the Quantum Zeno effect and Bell’s theorem.

Part 2 comprises three chapters. The starting point is the second quantisation of a spin-1/2 field, and a revisiting of the spin-1 field which was treated in Part 1. The lengthiest chapter here covers covariant perturbation theory, with examples from electromagnetic and weak interactions. The essentials of summation over spin and integration over phase space are carefully described, and the use of Feynman diagrams is introduced. The book concludes with discussions of electron-positron scattering and electron-muon scattering within the framework of quantum electrodynamics.

Most chapters are rounded off with a few problems. In some cases these are short exercises of the “Prove Equation (x.y)” kind, but most are quite lengthy questions which will fully test the reader’s understanding of the material. The production is generally good, with few typographical errors.

I can recommend this as a good introduction to advanced quantum mechanics: it is rather less comprehensive, but considerably less intimidating, than other texts in the field.

Brilliant Study Skills: what you need to know...

Subject Area
Study Skills, Education

Description
A guide to esential study skills for a student's entire time at university

Author
Bill Kirton

ISBN
978-0-273-73437-6

Publisher/Supplier
Pearson Education
<www.pearsoned.co.uk>

Date/Edition
2010/1st edition

Level
Undergraduate

Price
£12.99

Summary Review	
range: * poor to ***** good	
Academic content	****
Usefulness to student	***
Usefulness to teacher	**
Meets objectives	***
Accuracy	****

This book is presented as an accessible, practical guide to the most important study skills students need throughout their university career. The book opens by discussing many issues facing the prospective student such as where to study, fees and accommodation. It continues with the type of learning found there that students might not be familiar with. It also aims to help students discover how they learn and which kind of student they are, and discusses key academic skills such as listening to lectures, teamwork, and learning how to read and write academically. The book also provides chapters on dissertation research and examination skills. Each chapter has many tips, brief definitions, sensible dos and don'ts and finishes with useful 'What next?' suggestions.

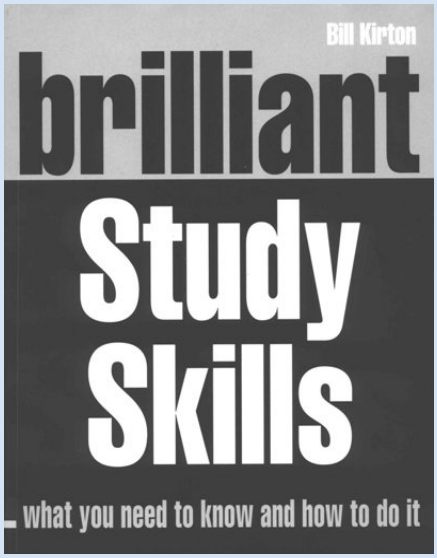
The layout is very clean with plenty of white space for students to write in, and a large attractive font. This may be a deliberate response to Stella Cottrell's *The Study Skills Handbook*, which has very busy pages. However, apart from the tip or definition boxes, the pages are quite plain with very few diagrams and no pictures. There is also no index, which would have been useful for a book which is supposed to be designed for a student's entire academic career. For all the ambition the book appears to have, the introduction states that the goal of the book is simply to make students more confident. However, it could just as well end up leaving students with more questions than it answers, as each chapter is only big enough to discuss complex areas briefly.

Despite its length, any student interested in developing their study skills would have to refer to other books for help. The book, rather like an encyclopaedia, tells rather than shows, even in straightforward areas. For example, when discussing reporting verbs, of which 12 are provided, it is mentioned that some of them are 'stronger' than others. However, it does not say which ones. Perhaps this is because the audience is assumed to be native speaker, but then why include these verbs at all? There is a chapter on notes, and note making formats, many of which it lists and describes in detail. However, it does not show any visual pictures of them. The book discusses herringbone maps, for example, but not having a picture of what these 'maps' look like would likely mean students would never use them. Students who have study skills needs require activities that help them develop these skills.

The 'What next?' sections at the end of each chapter provide some interesting ideas for developing study skills, such as drawing up a diary or planner with locations and times of tutorials and lectures. However, in my experience, people without study skills would not necessarily know how to create a work plan, or what a plan might look like, and this book provides no illustrations. Also, although the book is billed as a practical study skills book it has no exercises, unlike *The Study Skills Handbook*. It is heavily focused on reading and writing. There is little mention regarding presentations and the use of PowerPoint and writing note cards, or even e-learning, numbers and graphic data, and because there is no supplementary online material there is no opportunity for students to practise their note-taking skills listening to, for example, graded lectures.

Alistair McNair
Sheffield International College
The University of Sheffield
North Campus
Broad Lane
Sheffield S3 7HQ
March 2011

Brilliant Study Skills: what you need to know...



From the publisher...

Brilliant Study Skills: what you need to know and how to do it

By Bill Kirton

An accessible guide to the most important skills a student needs to succeed on any undergraduate or diploma course. This book will give the reader a sound understanding of how they can get the most out of their abilities and apply this to their studies. It will provide instantaneous answers to specific questions on all of the most important areas of academic skills.

978-0-273-73437-6 292pp 2010 £12.99

Despite there being chapters on academic writing and research, and important information on plagiarism and copyright, there are actually very few examples of academic writing. One activity in paraphrasing is given, and one of topic sentences, but more of this would have been welcome. There are also useful lists of words given that are used in presentations and linking sentences, but by no means exhaustive. The book is deliberately written in a conversational style, which for a native speaker or teacher makes it easy to read, but at the same time provides the wrong kind of language for academic writing, and means, again, that the book tells the reader what is expected but does not show much. The informal language would also make the book hard to understand for non-native speakers.

Although web-based resources are discussed briefly, there is little other reference to online resources, and no mention of useful websites, or even other books students can use to improve their study skills. Most students today spend much of their time online, either researching or writing essays, so not to provide other online sources is puzzling.

In conclusion, the book covers many areas relevant to a student's entire academic career, but none of them very fully. Students would have to read other books to find more complete information on referencing or taking notes, both areas being quite complex, yet no other references to further literature is given. It would be difficult to use as a classroom textbook as there are no practical activities provided, and the lack of colourful visuals would be off-putting to many students. The book would be useful for students who are interested in study skills already, and provides many useful ideas for those keen to develop themselves. It does a good job of telling students about what is expected at university, and would help new students get an idea of what university requires. It might also act as a reference guide, as it provides many useful quick definitions and tips, although it lacks an index. In the end, what the blurb on the back cover says is true: it is a guide, but not a very practical one. For students who need to practise how to study with examples and exercises, and for overseas students who need clear, simple language to explain complex ideas, this book would not be so helpful.

Chemistry for Non-Specialists

Subject area
Chemistry

Description
A collection of school laboratory experiemnts in chemistry

Author
Royal Society of Chemistry in conjunction with the Science Learning Centre Network

Publisher/Supplier
RSC Publishing
<www.rsc.org/Publishing/index.asp>

Date/Edition
2010/1st edition

ISBN
978-1-84973-112-6

Level
GCSE, AS-Level, GNVQ

Price
£25.99

David Harwood
Institute for Science Education
University of Plymouth
Portland Square
Plymouth PL4 8AA
February 2011

Summary Review

range: * poor to ***** good

Academic content	*****
Usefulness to student	***
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

This gem of a book contains eighty well organised laboratory activities, demonstrations and practical illustrations which will be of tremendous value to the non-specialist science teacher who has to teach the chemistry aspects of GCSE, GNVQ and AS level courses. It will also please the hard pressed chemistry teacher, PGCE or BEd student who has lessons to prepare and concepts to explain.

Some of the experiments are best demonstrated by the teacher but many can be carried out as classroom activities with varying degrees of guidance given to pupils. Each experiment is very well organised with precise instructions as to procedure, lists of requirements in terms of apparatus and chemicals, useful tips on constructing inexpensive in-house apparatus as well as summaries of the science behind each activity.

In addition there are excellent notes on lesson organisation, technical aspects, safety aspects, references and very good teaching notes which include conceptual issues as well as advice on scale and mode of operation. A good number of threshold concepts and areas of troublesome knowledge are addressed and a number of the activities are useful for helping to overcome common chemistry misconceptions.

This book is also an invaluable quick reference source for chemistry lecturers and indeed anyone who needs a demonstration they can work up quickly with recipes as reliable as those of the Blessed Delia of Norwich in another field!

One of the most useful aspects of this wonderful publication is the lesson organisation and conceptual notes which enable even an inexperienced science teacher to encounter solid and proven practical demonstrations and exercises that they can quickly work up themselves for use in class, or by their pupils. Critically, they can do this with confidence that experts have been there before them and there is good advice on scale and achieving visual impact.

A number of experiments are included which illustrate what can be done with perfect safety in a classroom environment, including for example the use of crude oil substitute for fractional distillation (real crude oil being a safety hazard). There is also good advice on handling hazardous materials such as the generation and use of chlorine gas (something I have known science department heads to veto in the past!)

This is a workbook, designed to accompany a course of the same name run by the RSC and Science Learning Centres with around 2000 teachers to date. It also comes with an excellent CD-ROM which contains electronic copies of all of the materials and may be held on a school network as a resource with multiple copies made as required. Armed with this and a copy of “classic chemistry demonstrations” there is a serious danger of chemistry lessons becoming much more interesting!

Chemistry for Sustainable Technologies: a foundation

Subject area
Chemistry, Sustainability

Description
Guide to the applications of chemistry to sustainable technologies

Author
Neil Winterton

Publisher/Supplier
RSC Publishing
<www.rsc.org/Publishing/index.asp>

Date/Edition
2011/1st edition

ISBN
978-1-84755-813-8

Level
Undergraduate, postgraduate

Price
£62.99

David Harwood
Institute for Science Education
University of Plymouth
Portland Square
Plymouth PL4 8AA
March 2011

Summary Review

range: * poor to ***** good

Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

Neil Winterton has written a very readable book on the applications and potential applications, of chemistry to sustainable technologies. I say readable because it is rare to encounter a “text”, if this is indeed what it is, that one can read cover-to-cover. This one you certainly can and it is a great achievement to be able to distil the issues so effectively without the sacrifice of all important depth.

The book sets its own scene in chapter one with a history of scientific development and its environmental impact, told in a balanced, scientific manner. The role of the expert in our modern media-driven world is discussed and the need for such a text as this is neatly summarised right there! Winterton then looks as the scientific method and how it came about; how we professional scientists follow our vocation, and the fundamental importance of science to our society and civilisation. He also considers carefully what we mean by sustainability and the importance of having an agreed definition.

Then follows an excellent summary of the chemistry of the environment before looking in subsequent chapters at some important environmental issues and how the science of chemistry can be brought to bear positively in our drive towards a more sustainable and civilised society. What is, and what is not, currently possible? Where is the research going and where is there potential for important advances? Chemical processing, chemicals from biomass, waste, pollution and the second law of thermodynamics as well as energy production are all considered in sufficient detail to inform the reader adequately and to stimulate further research, aided by a fine set of references for each chapter.

In the final chapter, Winterton considers the chemist as a citizen together with some ethical and political issues. He signs off with the “climategate” controversy.

As a chemist who teaches chemistry to non-chemistry undergraduates, mostly environmental scientists, these issues are familiar but important. To those whose main remit is mainstream chemistry teaching, academic research, processing, formulation, analytical, industrial or any other area of chemistry, this should equally be so. I would even go so far as to recommend this to any serious graduate or undergraduate scientist as a must read. Separating the fact from the fiction is a primary aim of many who are called upon to act as “experts” in a world where the story can so often dominate the science.

This book is a handy aid in helping scientists to ensure that the science remains in and becomes the real story as we strive to tackle some of the greatest challenges humankind has yet faced.

Chemistry of the Solar System

Subject area
Chemistry, Astronomy

Description
This text sets out the detailed chemical make up of the solar system with links to historical and comparative information throughout

Authors
Katharina Lodders and Bruce Fegley, Jr

Publisher/Supplier
RSC Publishing <www.rsc.org/Publishing/index.asp>

Date/Edition
2011/1st edition

ISBN
978-0-85404-128-2

Level
Anyone with a background in chemistry

Price
£29.95

Chris Finlay
School of Life Sciences
Boyd Orr Building
University of Glasgow
Glasgow G12 8QQ
April 2011

This book is described as a 'concise and factual account of the chemistry of the solar system', and is aimed at anyone with an interest in planetary science and a background in chemistry. After completing this book I feel that, at the very least, an A-level or equivalent in chemistry is required to begin to adequately tackle the subject matter.

Summary Review

range: * poor to ***** good

Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

This is obviously a massive and potentially very complicated subject to deal with in any book. The authors have nicely structured the text so that the reader can easily find any area of particular interest without having to work through the entire book. For example, my own personal interest in the gas giants is dealt with in a specific chapter with its own introduction and links to further reading. Where applicable, basic definitions, and historical references are used to ensure understanding of the following content. The historical information particularly, e.g. details on data gathered from the lunar missions, helps the reader work through the content, and understand its relevance.

Chapter 1 deals with the make up of the solar system with subsequent chapters breaking down the details into more specific sections, eg The Bodies in the Inner Solar System, Meteorites, and The Solar Nebula etc. There are constant comparisons and directions to other chapters which enhances the relevance of the information and data presented. These comparisons, particularly across the planets helps keep the information in focus across the multiple chapters and by the end of the book I felt that the detail expected from a book with this title was extensively covered. With the increase in popular interest in television programmes like Wonders of the Universe I can see a book titled **Chemistry of the Solar System** gaining in popularity with the general public, it is certainly one of the reasons I asked to review this text in the first place. I have approached this book with a background in A-level chemistry, with some small use of similar level chemistry in my working environment. I did find some of the detail challenging and some further reading/revision was required on my part to fully understand the details. I understand that someone with a more substantial background in chemistry would go through the substance of this book a lot quicker. However the content is presented in such a way that I actually wanted to find out more and understand the information on the page, not an easy task with detailed chemistry, and something the authors should be commended for. There are some very complicated diagrams used but the further reading suggestions and references from each chapter allowed me to understand and follow each section of interest. This probably pushes the book beyond the 'popular science' section in a book shop but the authors make it clear that this was not their intention for the book anyway.

As a summary I feel that this book is well structured, engaging and actively encourages the reader to expand on the content themselves. I believe that to fully work through the subject matter the reader would need a background in A-level/1st-year undergraduate level chemistry at the very least. Some competency in mathematics would also be an advantage. With the appropriate foreknowledge this book is a very interesting and informative read and I am certain that it would prove useful to planetary science/cosmos courses at undergraduate and postgraduate level.

Classical Mechanics: from Newton to Einstein: a modern introduction

Subject area
Physics

Description
An accessible guide to classical mechanics for first year undergraduates

Author
Martin W McCall

Publisher/Supplier
John Wiley and Sons
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2011/2nd edition

ISBN
978-0-470-71572-7

Level
Undergraduates

Price
£90.00

Summary Review	
range: * poor to ***** good	
Academic content	****
Usefulness to student	*****
Usefulness to teacher	***
Meets objectives	****
Accuracy	*****

For many years, Kibble and Berkshire's *Classical Mechanics* has been at the front of the grid as lecturers drew up reading lists to accompany their courses on this core element of the physics degree programme. Unlike Formula 1 cars, classical mechanics texts do not undergo year-by-year technical improvement so there are also artful problems and methods to be rediscovered in still more venerable and stately books by Routh, Pars, Lamb and others. Beautiful as these books are, it is likely that many students would find their content almost hieroglyphic and so there is certainly a place for a genial and unassuming contemporary guide like Martin McCall. Like Kibble and Berkshire, Martin McCall's **Classical Mechanics - From Newton to Einstein: a modern introduction** originates from undergraduate lectures at Imperial College. This is very much a course text, pitched at an introductory undergraduate level, but it also includes a couple of chapters on relativity and a few more advanced topics such as inertia tensors.

This is the second edition so those of you who adopted the first will be interested in what is new here. Fortunately this is summarised on the rear cover and includes enhanced chapter summaries, some new problems and deeper coverage of rigid body motion. If I could make one suggestion for the next edition, it would be to set a graphic designer to work on the figures which are often rather crude and unappealing. Equally it seems strange that the only photographs in the book show the author examining an early edition of Principia, a very low quality still of a (poor) cat being dropped (surely crying out for a time sequence - after all it comes from a video clip), and an unhelpful detail of the Science Museum's Foucault pendulum. Of all areas of the curriculum, surely this one lends itself to real-world illustration. At the very least, this might strengthen the author's (perhaps unnecessary) criticism of the use of 'theory' in the context of education and management practice. Physics should be drawn from experience and it is the success it has in describing this experience that motivates the construction of the type of theory that the author values. One other comment, and I'm amazed this escaped the editor over two editions, is that figure captions are often terse to the point of being useless - contrast this with the wonderful illustrations and captions in *Spacetime Physics* by Taylor and Wheeler, a book to which the author does express his dues, and which remains the best introduction to relativity for undergraduates.

How about the sub-title - a 'modern' introduction? Well I'm not sure about this - for a truly modern approach see the marvellous problem book by Guéry-Odelin and Lahaye reviewed elsewhere in this issue. This seems very much a standard introduction with standard exercises, but maybe that's almost inevitable if the author is constrained by tradition in the delivery of the course. I did enjoy section 2.12 on the times of fall of bodies under the inverse square law force, although I'm not sure the author is correct in suggesting this hasn't appeared in other textbooks - in astronomy, it is the basis of Kahn and Woltjer's famous timing argument based on the current positions and velocities of the Milky Way and Andromeda Galaxy. Nevertheless, if any student is encouraged to read Paradise Lost as a result (the physical fall from grace of the rebel angels takes nine days) then that has to be a triumph for the book.

James L Collett
Science & Technology Research Institute
School of Physics, Astronomy & Mathematics
University of Hertfordshire
Hertford AL10 9AB
April 2011

Classical Mechanics Illustrated by Modern Physics: 42 problems with solutions

Subject area
Physics

Description
A compilation of carefully worked and fascinating problems with a unique slant toward contemporary applications

Authors
David Guery-Odelin and Thierry Lahaye

Publisher/Supplier
Imperial College Press
<www.icpress.co.uk/index.html>

Date/Edition
2010/1st edition

ISBN
978-1-84816-480-2

Level
Undergraduate

Price
£59.00

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

How do you get a first impression about a physics programme? In the welter of aims, objectives, learning outcomes and embedded skills, it's comforting to see external assessors making a beeline for exam scripts and problem sets - just what is it that students can solve having done this course. I sat next to someone at a physics meeting once who said it was irrelevant for electrical engineers to know how to rewire a plug, after all they could simply look it up on the internet. Tellingly, when degrees are increasingly being touted as developing employability (what a horrible term), it is the employers who point out the idiocy of the cult of the problem-surfer. The high priests of this cult argue that problem sets are simply rote exercises; throwing a student a slippery fish or two can see them jumping through some pretty high hoops, but doesn't make them into wealth-generating innovators. And of course, there is some truth in this - but not every problem has to be open-ended and improvisational and not every jazz pianist would forgo the lessons of The Well-Tempered Clavier.

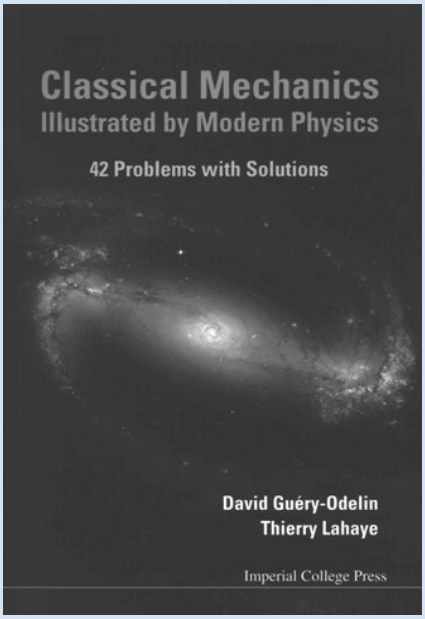
Classical Mechanics Illustrated by Modern Physics deserves mention in the same breath as Bach's masterpiece because there is a real care and skill displayed in the choice, presentation and development of the problems. In fact, rather fittingly - as this is the last volume of Reviews - if I could keep only one of the books I've reviewed over the years, it would be this one. So what makes it so special?

First, let's be clear that this is exclusively a problem book and not a stand-alone text on classical mechanics. However there are useful potted 'reminders' dotted through the text - e.g. Bernoulli's principle, envelopes of curves, forces in rotating frames, Mathieu's equation. To say there is a French style to the mathematics of the presentation is only to pay a compliment. The other most noticeable feature of the book is the use of problems from (real) contemporary physics: curved storage rings for neutral atoms; non-linear mixing of a trapped atom cloud; many body physics via the Calogero-Sutherland Model; ion traps; moving magnetic walls; Zeeman slowers ; Doppler cooling; and the relativistic oscillator, relevant to ionisation by high power lasers. These are areas well known to the authors from their research and they have used their expertise wisely.

One other beautiful feature of the book is that, where possible, simple experimental data (of the kind a student might obtain) accompanies the mathematical solution of the problem. So when a vertical fluid stream narrows as it flows under gravity, we have not only a plot of radius against height collected by experiment, but also a graphical determination of the initial speed of the stream deduced from this data. Similarly, when we are asked to consider the stability of a particle in a rotating saddle, we see a picture of Tobias Koch's saddle rig and his graph of the lifetime of the state as a function of the rotation frequency. All of this has two effects: you believe the problems have value because someone has invested time actually designing and doing an experiment; and second, you are encouraged to do similar experiments oneself and have some idea of the uncertainties that you might reasonably expect to find.

James L Collett
Science & Technology Research Institute
School of Physics, Astronomy & Mathematics
University of Hertfordshire
Hertford AL10 9AB
April 2011

Classical Mechanics Illustrated by Modern Physics: 42 problems with solutions



From the publisher...

Classical Mechanics Illustrated by Modern Physics: 42 problems with solutions

By David Guery-Odelin and Thierry Lahaye

This book provides an illustration of classical mechanics in the form of problems (at undergraduate level) inspired — for the most part — by contemporary research in physics, and resulting from the teaching and research experience of the authors. A noticeable feature of this book is that it emphasizes the experimental aspects of a large majority of problems. All problems are accompanied by detailed solutions: the calculations are clarified and their physical significance commented on in-depth.

978-1-84816-480-2 268pp 2010 £59.00

The book is attractively laid out and compact so that you might attempt all the problems well within a Hubble Time and carry the book inconspicuously onto a beach without looking like a faculty scientist from The Big Bang Theory. One drawback perhaps is that the problems do not obviously sit within a 'year' or 'level' of a UK physics programme. Do not let this put you off: you will find ideas that can be cherry-picked for particular courses and even small computational projects. Most importantly, this is one of only a handful of new books that can be recommended for promoting a sense of style in mathematical physics. If this is a slippery fish, it's a jolly tasty one!

Discover Entropy and the Second Law of Thermodynamics...

Subject area
Physics

Description
Introduction to the second law of thermodynamics without using mathematics

Authors
Arieh Ben-Naim

Publisher/Suppliers
World Scientific Publishing <www.worldscientific.com/index.html>

Date/Edition
2011/1st edition

ISBN
978-981-4299-76-3

Level
Undergraduate, general reader

Price
£27.00

Richard Henchman
Manchester Interdisciplinary Biocentre
The University of Manchester
131 Princess Street
Manchester M1 7DN
April 2011

Summary Review

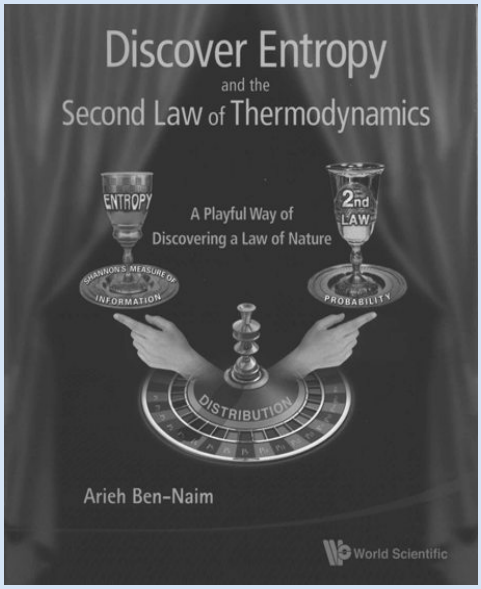
range: * poor to ***** good	
Academic content	*****
Usefulness to student	****
Usefulness to teacher	****
Meets objectives	***
Accuracy	*****

Two important quantities in science are entropy and energy. Everyone understands the concept of energy and numerous, commonplace examples of it abound. In this book Arieh Ben-Naim seeks to redress the lack of familiarity and understanding of the concept of entropy. He also explains how the second law of thermodynamics comes about. His intended audience is not only scientists of any discipline or level but especially interested non-scientists. For this reason, his way of explaining largely avoids the use of mathematics, he keeps it general and assumes no familiarity with chemistry or physics, he writes in a simple conversational style, and there are intriguing anecdotes and extensive figures, some quite elaborate and stylish.

Having essentially no mathematics beyond addition and multiplication is quite a feat, given the probabilistic nature of entropy. His main tool to do this is based around the random placement of marbles in a specified number of columns using computer simulation, subject to various constraints.

The book begins with a brief history of entropy which first arose in the context of steam engines as expounded by Carnot, Kelvin and Clausius. It continues with the atomistic, statistical formulation by Maxwell and Boltzmann and concludes with its generalisation and equivalence to the concept of information as made by Shannon. However, it omits the pivotal contribution of Gibbs to the probabilistic formulation of entropy. Ben-Naim argues that the term Shannon's measure of information, or SMI, is a more appropriate term in place of entropy and he makes use of SMI for most of the text. This he demonstrates with a quaint analogy of the naming of children at the end of this chapter. However, as is so often the case in science, the naming of a term usually goes to the originator rather than the one who characterises it most precisely. Chapter 2 provides a simple way to conceptualise entropy, or SMI, as the minimal number of questions needed to solve some puzzle. For example, one might determine what someone is thinking of as quickly as possible in the game of "20 questions" or, in the case of the marble-in-columns example, which marble some one is thinking of. He then points out the key idea that the distribution of marbles that requires the most minimal number of questions is quite special. In the next chapter he goes on to explain that this special distribution is the uniform distribution. This distribution has the most number of arrangements of marbles compared to any other. He demonstrates this by describing the progress of a computer simulation that randomly moves marbles from one column to another, making them converge to the uniform distribution. He further explains that this is the manifestation of the second law of thermodynamics, that all systems inevitably move towards this distribution. Chapters 4 and 5 generalise this approach for marbles-in-columns to the Bolzmann distribution and Maxwell-Boltzmann distribution. The Boltzmann distribution is brought about by tying each marble with rope to the edge of the left-most column of marbles and restricting the total amount of rope; this mimics the constraint of total energy in the case of an isolated collection of molecules. The Maxwell-Boltzmann distribution is demonstrated similarly using cloth in place of rope with the area of rope now being constrained;

Discover Entropy and the Second Law of Thermodynamics...



From the publisher...

Discover Entropy and the Second Law of Thermodynamics: a playful way of discovering a law of nature

By Arieh Ben-Naim

There is no other book of its kind (except "Entropy Demystified" by the same author) that offers the reader a unique opportunity to discover one of the most profound laws — sometimes viewed as a mysterious — while comfortably playing with familiar games. There are no pre-requisites expected from the readers; all that the reader is expected to do is to follow the experiments or imagine doing the experiments and reach the inevitable conclusions.

9978-981-4299-76-3 288pp 2010 £27.00

distribution can be found on the author's website <wwww.ariehbennaim.com>. Chapter 6 is a summary of the previous three chapters. The final chapter translates the example of marbles-in-columns to particles in a box. Ben-Naim considers how the entropy changes for identical or non-identical particles expanding and/or mixing. These are the more familiar examples given to chemistry and physics students in understanding entropy. The author is correct to point out that the entropy of mixing for two gases is equivalent to the entropy of expansion. However, he is somewhat harsh on Gibbs, the first to analyse this process, for only referring to it as the entropy of mixing, thereby influencing how this concept has been taught for generations after. Overall, this is a unique and original explanation of an important concept. It is an authoritative and accurate account of entropy with very few typographical errors. It should succeed somewhat in achieving its objective of explaining entropy to everyone. However, the at-times verbose style and numerous, incremental examples, generalising to a slightly more complex case, make this book quite difficult to read and requires quite a lot of patience and dedication.

Frequently I found myself skipping ahead to the next section. How a non-expert would fare is difficult to say. While minimising the use of mathematics increases the appeal to the non-expert, mathematics does have the advantage of conciseness. It is arguable that a chapter on combinatorics and statistics would be worth the reader's investment, to be used in later chapters. The main content relevant to chemistry and physics students is Chapter 7; the earlier chapters nonetheless do provide helpful ways to conceptualise entropy for both student and teacher alike.

Discrete Mathematics: proofs, structures and applications

Subject area
Mathematics

Description
An introductory text on discrete mathematics suitable for an undergraduate or a beginner

Authors
Rowan Ganier and John Taylor

Publisher/Supplier
CRC Press (Taylor & Francis Group)
<www.crcpress.com>

Date/Edition
2010/3rd edition

ISBN
978-1-4398-1280-8

Level
Undergraduate

Price
£39.99

Summary Review

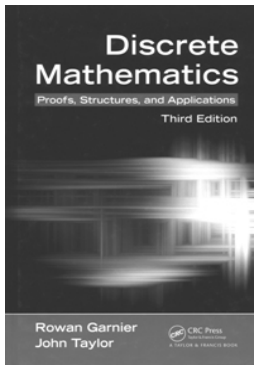
range: * poor to ***** good	
Academic content	****
Usefulness to student	*****
Usefulness to teacher	****
Meets objectives	****
Accuracy	*****

Discrete mathematics is an essential subject for computer scientists and mathematicians, and even physicists need a basic level of appreciation of logic and mathematical proof. This new book, written by two American authors Rowan Garnier and John Taylor and published by CRC press, attempts to present this difficult subject in a fresh and enlightening way. The thesis of the book is to lead the reader through the main ideas in a pedagogic manner, aiming to bring even a reluctant student to a good level of understanding. I would say the authors largely succeed. The discussions of the key ideas are well written and easy to follow, with a logical layout. The book is scattered with lighthearted pictures and analogies, which serve to retain the attention of the reader, and there is a well thought through progression from introductory topics to harder concepts. I don't think a book on this subject can ever be a complete joy to read, but this offering is better than most.

The book opens with several chapters on mathematical logic and the nature of proof. This early ideas, essential to the more advanced concepts later, are accessible, easy to read and written in such a way to not frighten off the less confident reader. Chapter 2, on mathematical proof, is especially well written. These ideas can often be presented in a dry and unenlightening way, which the authors avoid with excellent results. The book continues with sets, relations and function, before a series of chapters of matrix methods and algebraic structure. Finally, we close with number theory and graphs, relevant to students of data encryption. The extent of the coverage is enough for an undergraduate reader, although the more advanced student may find coverage of some of the topics insufficient.

A particularly nice feature is the incision of a comprehensive list of notation at the start of the book, clarifying all of the symbols and serving as a reference for later study. There is also a set of problems, which are designed to test the student's understanding and introduce him or her to some advanced ideas. Usefully, hints and solutions are included to selected problems.

Overall, this book presents an often-difficult topic with clarity and a sense of fun. Thoroughly recommended for any student of mathematics, computer science or the physical sciences at undergraduate level, but a postgraduate reader may want a little more.



Rob Appleby
The Cockcroft Institute and the University of Manchester
Oxford Road
Manchester M13 9PL
April 2011

Essential Practical NMR for Organic Chemistry

Subject area
Chemistry

Description
Use of NMR spectroscopy for determining the structure of small organic molecule

Authors
Stephen Richards and John Hollerton

Publisher/Suppliers
John Wiley and Sons
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2010/1st edition

ISBN
978-0-470-71092-0

Level
Undergraduate, postgraduate

Price
£45.00

Summary Review

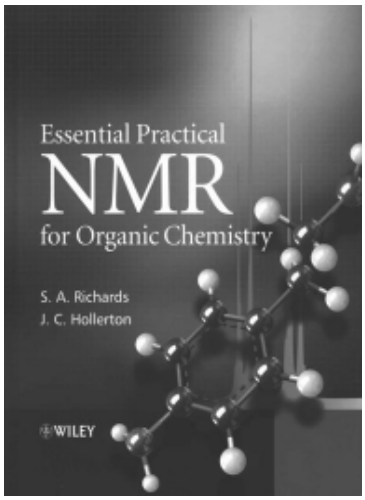
range: * poor to ***** good	
Academic content	****
Usefulness to student	***
Usefulness to teacher	****
Meets objectives	****
Accuracy	***

This book has a well-structured table of content. The table appears as though it is going to take you logically through the topic. An introduction with a spelling mistake, however, does not set the scene well for the 'storey' to come. I have to, early on, come clean and state my displeasure, but call me a "grumpy old Hector", at beginning sentences with "Because …". I know, I know, but in formal writing one can start a sentence with because as long as it's recognised as a dependent clause, that is not necessarily the case throughout the book.

As indicated previously the logical progression does happen and the authors lead us through excellent chapters on sample preparation with the pros and cons of solvent use and selection clearer than anything I have seen previously. The chapters on spectrum acquisition, processing and interpretation I can hear, in my head, coming from the mouth of a past colleague Chris Turner, my NMR guru of many years experience, with an explanation of great clarity but more valuable for being in print!

With a good grounding of the subject's practicalities in place the finessing of delving deeper into interesting effects and elucidation techniques works very well. Discussion of correlated spectroscopies is essential and pros and cons of these approaches are well covered. The later chapters handle the majority of other eventualities with coverage of hyphenated techniques, e.g. HPLC-NMR, a brief handling of solid state NMR, multi-dimensional techniques, nuclei of ^{1}H and ^{13}C and, to my mind finally, quantification. Further chapters on safety and software seem a little superfluous and don't bring much to the previous text, however, the real final chapter on problems could be valuable.

All in all any textbook that attempts to collect a wealth of practical knowledge of NMR approaches to solving structural problems is worth its weight in gold and should appear on bookshelves of anyone serious in using NMR to its full potential. I hereby commend this textbook to the reader's as an essential purchase.



Lee Banting
School of Pharmacy and Biomedical Sciences
University of Portsmouth
St. Michael's Building
White Swan Road
Portsmouth PO1 2DT
March 2011

Essentials of Online Course Design: a standards-based guide

Subject area
Education

Description
Informed by pedagogical theory, this book provides a practical approach to online course design and offers readers a step by step guided journey in making online courses a reality.

Authors
Marjorie Vai and Kristen Sosulski

Publisher/Supplier
Routledge (Taylor & Francis Group)
<http://www.routledge.com/education>

Date/Edition
2011/1st edition

ISBN
978-0-415-87300-0

Level
Practitioners, students

Price
£21.99

Summary Review	
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

The UK e-learning industry is continuously growing, and in addition to the established use of e-learning in HE, other contexts include health, governmental and corporate environments. This proliferation of e-learning and the requirement of many HE departments to have a minimum online course presence, suggests that some individuals - including those new to the area - may be required to initiate and to perhaps, design online courses. In these circumstances, an understanding of the learner centred constructivist approach to e-learning, and an awareness of technical infrastructures would be valid starting points in the journey towards online course design.

In such times, **Essentials of Online Course Design: A Standards-Based Guide**, is a very welcome addition to any e-educators library. The authors suggest - and these points would be advocated - that the book is aimed at practitioners involved in online learning and teaching at all levels. These include individuals who require to refresh their skills in online learning, students involved in educational technology programmes and for those individuals designing courses for the first time. The latter point can be demonstrated by the availability of e.g. open source Learning Management Systems (LMSs) whereby some, given the will to do so, can initiate online learning programmes.

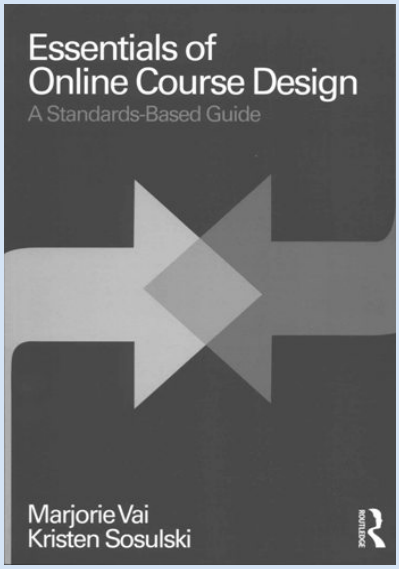
Key features of the book include a practical approach informed by theory, a companion website, and a checklist of online course standards (pp. 189-195). The authors support the approach that online teaching should be a rewarding and satisfying experience, which results in high quality educational engagement. The book is clearly and concisely written and provides readers with a chronicle of practical tips and guidelines from course inception, right through to course evaluation and teaching initiation. The principles of pedagogical support, technical tips, visual design and practical implementation guides, are thoughtfully intertwined, offering readers with a much needed holistic and engaging model to online course design.

Structurally, the book consists of 224 pages and is organised into an introduction, 10 chapters and two appendices. A general convention of the book includes (1) a standards-based checklist to help evaluate progress throughout each of the chapters as topics are covered, (2) all the standards listed at the end of each chapter in summary form, and finally (3) an accumulation of all the online standards in Appendix B. This convention helps reinforce to the reader the developmental process (and progress made) in creating such online courses.

The book can be roughly divided into six broad sections. The Introduction and Chapter 1 provides readers with an overview of the book and an outline of the key issues and trends in online course design. It could perhaps be asserted that in designing online courses, one may be influenced by multiple models of delivery and be informed by personal understandings of learning and teaching. However at the outset, the text lists some of the major underlying principles of online learning which forms the theoretical basis of the book. The authors also note the importance of acknowledging the needs and backgrounds of differing online learners (p 15) and offer an account of the differences of onsite and offsite teaching.

Nancy El-Farargy
NHS Education
Thistle House
91 Haymarket Street
Edinburgh EH12 5HE
April 2011

Essentials of Online Course Design: a standards-based guide



From the publisher...

Essentials of Online Course Design: a standards-based guide

By Marjorie Vai and Kristen Sosulski

Essentials of Online Course Design takes a fresh, thoughtfully designed, step-by-step approach to online course development. At its core is a set of standards that are based on best practices in the field of online learning and teaching. Pedagogical, organizational and visual design principles are presented and modeled throughout the book and users will quickly learn from the guide's hands-on approach. The course design process begins with the elements of a classroom syllabus which, after a series of guided steps, easily evolve into an online course outline.

978-0-415-97300-0 204pp 2011 £21.99

Elements of a LMS are then discussed in Chapter 2 and these include announcements, discussion forums, resources, course email and more advanced features such as blogs, wikis, workgroups and portfolios. The emphasis is placed more on asynchronous activities and resources (rather than synchronous ones). Chapters 3 and 4 outline the importance of writing styles and visual design, and emphasise the need for practitioners to adhere to these good practice frameworks.

Chapters 5 - 8 make up a large portion of the text which focuses on meeting the needs of learners in terms of engagement, accessibility, assessment and feedback. It is widely acknowledged that profitable learning is a constructive process, and lies on the premise that current knowledge is actively built upon previously gained knowledge - in a meaningful and relevant manner. In turn, such learners can become information literate, autonomous and self directed individuals. To some, e-learning may be an isolating experience, and the text demonstrates the collaborative opportunities that course designers can embed within their courses. Without the accusation of technical and digital determinism, an excellent overview of the digital culture is provided; such that course designers can choose tools to effectively initiate and maintain balanced communication with learners. The important elements of assessment and feedback are discussed with reference to learning outcomes, variety, timeliness, peer feedback, learner expectations and grading criteria. One key feature which is discussed earlier within this section of text is the advantages and limitations of different assessment formats (e.g. MCQs or 'fill in the blanks'). It is indeed known that different summative or formative assessment formats may actually be assessing the psychology of the learner (as opposed to the requirement of subject expertise).

Following on from this, Chapters 9 and 10 provide practitioners with guidelines in building online courses and in creating course structures. The various phases of course design in terms of sound pedagogical principles are discussed - these include practices aligned to learning outcomes and assessment activities, course descriptors, a rationale, and a consideration of social networking and collaboration issues. Whilst there is some explicit mention of intellectual frameworks elsewhere in the text (such as Bloom's taxonomy and Gardner), some of the guiding principles and theoretical models to learning (such as information processing and Kolb's learning cycle) are very well (implicitly) embedded. Thus the pedagogical theories in designing and cultivating the best environment for optimal learning to take place are seamlessly transformed into practical tips and guidelines for practitioner perusal.

Continued on page 20

Essentials of Online Course Design: a standards-based guide

Continued from page 19

Finally, Appendices A and B review the criticality of learning outcomes and summarises the standards checklists that have been discussed throughout the book.

Based on the constructivist school of thought, this book provides readers with an overview of effective online course design. The philosophical and theoretical bases of e-learning presented in the book, helps course designers to (1) select appropriate media, learning and assessment tasks, (2) design course components as per educational and institutional contexts, and (3) appreciate and apply the principles of pedagogical, organisational and visual design concepts. Overall, this is a clear and concise book that would be useful to students and practitioners alike.

Forensic Science: a very short introduction

Subject area
Forensic Science

Description
Introduction to forensic science primarily for the non-scientist

Author
Jim Fraser

Publisher/Supplier
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2010/1st edition

ISBN
978-0-19-955805-6

Level
General reader

Price
£7.99

Ian J Turner
Department of Biology and Forensic Science
University of Derby
Kedleston Road
Derby DE22 1GB
April 2011

At a recommended retail price of only £7.99 and in size format that could slip into you coat pocket **Forensic Science: A very short introduction** by Jim Fraser must be one of the smallest and cheapest 'scientific' forensic books on the market.

Summary Review

range: * poor to ***** good	
Academic content	***
Usefulness to student	****
Usefulness to teacher	***
Meets objectives	*****
Accuracy	*****

On initially picking up such a small book to read one might wonder 'what has been left out?' of the vast multi-disciplinary subject that is forensic science. Indeed whole areas of forensic science such forensic document analysis and computer forensics are completely omitted from this book. However the author is upfront about these emissions and aims in his short guide to convey the nature of forensic science without the reader needing to know the details of every area. The book is very successful in this aim and the author's personal style and elegant prose successfully illustrate and develop the central issues of forensic science 'identification and evidence evaluation, its main procedures and mechanisms, such as continuity of evidence and minimising contamination.'

This book and indeed the series of which it is part of, are written for the interested amateur rather than the academic market as a result the author is conveying the essence of the scientific examination of evidence such as DNA and drugs rather than detailed descriptions of the biological and chemical approaches behind them. The style is engaging, helped considerably by personal recollections from cases the author has been involved in and illustrative examples e.g. an explanation of a rape case in a mining town used to convey the principles of Bayesian evaluation of evidence. The author removes the legal terminology which varies from country to country e.g. items presented as evidence are exhibits in the UK and USA but productions in Scotland and replaces them with 'common sense terminology such as item (instead of production or exhibit) and report (instead of joint-report or statement)' this not only makes the book easier to read but makes it applicable to a wider audience.

The book includes chapters on investigating crime, crime scene management, laboratory examination, DNA, prints and marks, trace evidence, drugs and science and justice. Each chapter can be read standalone but the aim of the book is better achieved by reading the whole book. The book is full of useful diagrams and photographs and some especially useful tables that give an overview of aspects of forensics including the types of evidence routinely, occasionally, rarely and never found at various types of crimes.

In summary this book will not become a must read on undergraduate reading lists but it does not intend to. It offers an accessible and general introduction to the field of forensic science for those with little or no technical expertise. Personally I would recommend this as a good book for new students to read before their courses commence. It also with its low price makes an excellent prize at science taster and outreach events.

Foundations of Astrophysics: international edition

Subject area
Astronomy, Astrophysics

Description
An introductory course on Astrophysics for physics students

Authors
Barbara Ryden and Bradley M Peterson

Publisher/Supplier
Pearson Education
<www.pearsoned.co.uk>

Date/Edition
2011/1st edition

ISBN
978-0-321-74805-8

Level
Undergraduate

Price
£52.99

Summary Review	
range: * poor to ***** good	
Academic content	****
Usefulness to student	*****
Usefulness to teacher	****
Meets objectives	*****
Accuracy	*****

This book is an introduction to astrophysics. It is intended for students with knowledge and interest in general physics to show them applications of that physics within the context of astronomical examples and so to introduce them to the field of astrophysics.

As such it covers examples relating to geometry, angular motion, spectra, black-body radiation, optics, kinetic theory, electric and magnetic fields, thermodynamics, nuclear physics, sound, particle physics, relativity and of course gravity. Generally the student is expected to have met these topics before.

At each point time is taken to give example calculations to back up the descriptions given in the text.

The authors acknowledge that some particularly rich areas of astronomy such as stellar populations, globular clusters and the large-scale structure of the universe are only briefly touched upon as they did not lend themselves so much to being examples of important physical principles or of providing example calculations.

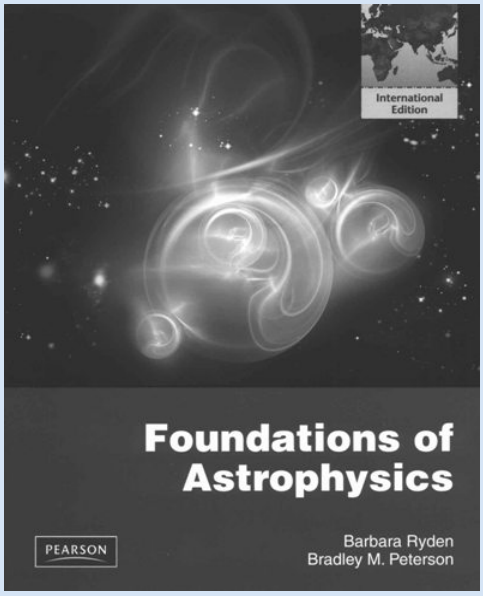
The book covers the topic area in a standard way. It starts with a brief history of astronomy that covers the coordinate system for the celestial sphere and Kepler's laws. It then looks at telescopes and the detection of electromagnetic radiation. The description of the structure of space itself starts off with the Earth-Moon system (tides, eclipses, but also looking at the Earth's interior, atmosphere and magnetosphere) before moving on to the Sun, other planets, and smaller bodies within the solar system. In the chapter on the solar system as a whole the detection and properties of exo-planets is covered. Next stars are covered, their atmospheres and interiors, and their formation and evolution. There is also a whole chapter covering interstellar dust and gas. Then galaxies are covered starting with our own before looking at galaxy classification to encompass the rest before moving on to active galaxies such as quasars. And so as the scale increases a chapter covers clusters and superclusters of galaxies, before finishing off with two chapters on cosmology and the history of the Universe.

The book is fully illustrated with an average of one diagram, table, graph or photo per two pages of text. The pictures are all well-chosen, offering additional information to what is covered in the text. There are 14 pages of colour diagrams and photos in the centre of the book.

There are also many footnotes, which are asides and interesting comments that one could imagine being delivered to students attending a lecturer on these subjects. And equally to maintain interest the book is willing to follow more unusual diversions, such as calculating the speed of impact if you were to fall off a Mercurian scarp, summarising the evolution of the Sun as a five act play, or explaining various misconceptions relating to space-based astronomy.

Jack McArdle
Lecturer in Physics
Worcester College of Technology
Deansway
Worcester WR1 2JF
April 2011

Foundations of Astrophysics: international edition



From the publisher...

Foundations of Astrophysics: international edition

By Barbara Ryden and Bradley M Peterson

Foundations of Astrophysics provides a contemporary and complete introduction to astrophysics for astronomy and physics majors. This text is briefer and more accessible than other texts in the market, and is the most up-to-date book available in this fast-changing field. With a logical presentation and conceptual and quantitative end-of-chapter problems, the material is easier-to-grasp for introductory astrophysics students.

978-0-321-74805-8 608pp 2011 £52.99

Every chapter has a selection of problems to enable the student to review the knowledge gained. No answers are given to the problems but in most cases realising the order of magnitude of the answers is an important item in any scientist's tool-kit and will make the students consider the validity of their answer as well as the validity of their method. Within the book students are encouraged not just to look at exact calculations but also to see how 'back of the envelope' quick calculations can provide useful information. In other cases the answers to the problems would be searchable, as the questions (and answers) are based on real data (eg the distance to the Large Magellanic Cloud). The authors describe how the problems have all been heavily field-tested by several classes of undergraduate students who provided feedback to clear up any clumsy or ambiguously worded problems.

Throughout the book key-words are highlighted in bold to enable quick scanning of the text.

There is an 8 page Appendix of Astronomical Data covering planetary and stellar data primarily.

The book is written by lecturers who enjoy the interaction with the students and so is written in that personal style that should appeal and maintain interest. An introductory course on astrophysics could easily and profitably be designed around this book.

Functional Molecules from Natural Sources

Subject area
Chemistry

Description
A book based on the proceedings of a conference that was concerned with the continuing importance of the use of naturally occurring compounds for pharmaceutical, nutraceutical and agrochemical use

Authors
Stephen K Wrigley, Robert Thomas, Colin T Bedford and Neville Nicholson (editors)

Publisher/Supplier
RSC Publishing
<www.rsc.org/Publishing/index.asp>

Date/Edition
2010/1st edition

ISBN
978-1-84755-259-4

Level
Academics, postgraduates

Price
£109.99

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	***
Usefulness to teacher	****
Meets objectives	****
Accuracy	*****

This book is based upon the proceedings of a conference, Functional Molecules from Natural Sources, organised by the Royal Society of Chemistry's Biotechnology Group and held at Magdalen College, Oxford, in July 2009. Most of the eighteen chapters are in the form of a transcript of an individual lecture given at the conference, while others are derived from a selection of the posters presented at it, and the final chapter provides a summary of those lectures for which a transcript was not available. In order to gain most benefit from the book, readers require some prior knowledge of medicinal or pharmaceutical chemistry and, consequently, its usefulness to many chemistry undergraduate students is likely to be limited. Moreover, at £109.99, it is priced well beyond that which most undergraduates would be willing to spend. As is to be expected from any book where individual chapters are written by different authors, the style of the writing varies considerably from chapter to chapter. In some of the best chapters the original 'transcript' appears to have been re-written by its author to make it a more readable chapter in the book. The book concentrates on the continuing importance of active compounds originally identified in and isolated from microbial, plant, and marine sources. The first chapter consists of a comprehensive survey of anticancer compounds that are currently undergoing clinical trials. This is followed by chapters that are case studies of the identification of functional compounds, their subsequent development and enhancement. While later chapters deal with the biosynthesis and genetics of active compounds. Altogether there is much to interest those working in drug discovery and development, or related fields. For undergraduate students, and their teachers, probably the two most useful chapters are "Discovery and Development of Antibiotics with Novel Modes of Action" (S B Singh), an interesting and elegantly written account of the discovery of platensimycin for development as a new antibiotic, and "High Capacity Countercurrent Chromatography for Fast Isolation of Natural Products" (I J Gerrard and D Fisher), a concise account of an important technique that is unlikely to be encountered in standard undergraduate chemistry textbooks.

The book contains few errors, and these are simply printing mistakes. However, in some of the cases where the skeletal formula of a compound is included in the text it is on a different page to that in which the compound is first introduced, thus necessitating superfluous page turning and sometimes making it more difficult to compare molecular structures, while in others the size in which the formula has been printed is so small (e.g. page 63, figure 11) as to make comparison of structures hard work. Other figures too, including some photographs of cultures from a microbial strain collection (page 85, figure 2) have been printed too small to serve any useful purpose. The use of colour in the three dimensional molecular diagrams, especially where this had clearly been intended (e.g. page 179, figure 22), would also have been helpful. Although such flaws are not uncommon in contemporary chemistry texts, it would have made the reading of this book a more comfortable experience if they had been rectified prior to publication. It is possible that increasing the number of pages to accommodate larger figures or enable their position in the text to be changed, and the use of colour for diagrams, were rejected on grounds of cost. But if that is the case, a more appropriate economy would have been to publish the book as a paperback rather than a hardback.

Julian Perfect
New York University in London
6 Bedford Square
London WC1B 3RA
April 2011

General Chemistry: principles and modern applications

Subject area
Chemistry

Description
A general chemistry text book designed for students taking other subjects but where chemistry is a required component of their course and for first year undergraduate chemists when combined with other resources

Authors
Ralph H Petrucci, F Geoffrey Herring, Jeffry D Madura and Carey Bissonnette

Publisher/Supplier
Pearson Education
<www.pearsoned.co.uk>

Date/Edition
2010/10th edition

ISBN
978-0-13-612149-7

Level
Undergraduate

Price
£53.00

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

General Chemistry is a text book designed for students whose higher education courses require an understanding and appreciation of general chemistry, whether this be a single module or a recurring theme throughout their course. It requires some background chemistry knowledge up to AS or A-level although the initial chapters would serve as an adequate starting point or reminder for those who have no chemistry background or those needing a refresher. The text book comes with access to a large quantity of online material in the MasteringChemistry resource. This provides access to the text in electronic form, organised as it is in the book. The text is interactive with the ability to highlight sections, bookmark passages and conduct full text searches. Key words are hyperlinked to a glossary with definitions. The reader provided is easy to use and has clear functions which do not inhibit the text in any way.

In addition to text, there are a number of other resources available to help students to fully understand the material presented. For each chapter there are practice quizzes where students answer multiple choice questions on topics from the chapter. The answers are then graded and shown to be correct or incorrect, with incorrect answers shown in a worked form. These quizzes can be sent to a participating academic who can use the results to guide their teaching. This strikes the reviewer as a very useful tool in helping students to help themselves and also as a form of feedback for teaching outside this book.

There are a series of glossary flash cards, which show a word on one side and then can be electronically “flipped” to show the definition of the word. Additional decks can be added from other chapters allowing students to construct personal collections of cards to test themselves and each other with.

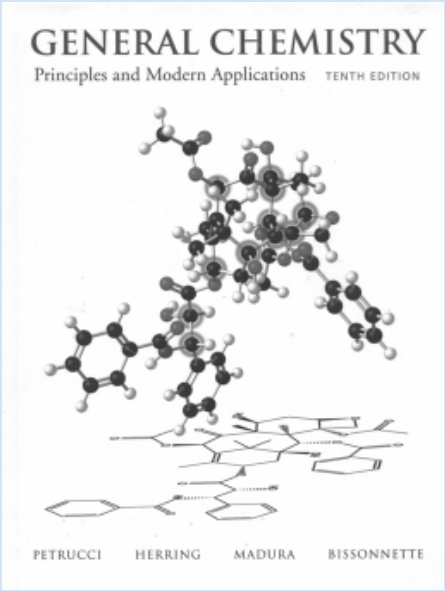
In addition to these fundamental resources for each chapter, there is a “Further your knowledge” section containing short essays on real applications of concepts covered within the chapter. It also provides a complete list of answers to questions from the chapter, which are also available in an appendix in the hard copy of the book. For lecturers and students there is a presentation in MS PowerPoint containing the salient points from the chapter and some of the diagrams and photos which can assist teachers to tie their teaching material in to the text book by using the same images. There is also a range of simple videos and animations organised in an easy to navigate way that show an alternative way of understanding some basic concepts. Some plug-ins may be required to display this material but these are readily available for most browsers. One very useful resource in this section is the “Maths Review Toolkit” which tackles common mathematical processes in a worked through chemistry context. This is particularly useful for physical chemistry content as often the mathematical components are those that students struggle with the most.

It has been found that the online interactive content is mostly functional using the Android smart phone platform as well as conventional internet browsers. The resources tested included the self-tests and downloadable Adobe Portable Document Format resources. The full text

Continued on page 26

Julia Percival
Chemical Sciences Division
University of Surrey
Guildford GU2 7XH
April 2011

General Chemistry: principles and modern applications



From the publisher...

General Chemistry: principles and modern applications

By Ralph H Petrucci, F Geoffrey Herring, Jeffry D Madura and Carey Bissonnette

General Chemistry: Principles and Modern Applications is recognized for its superior problems, lucid writing, precision of argument, and precise and detailed treatment of the subject. Popular and innovative features include Feature Problems, follow-up A and B Practice Exercises to accompany every in-chapter Example, Focus On application boxes, and new Keep in Mind marginal notes.

978-0-13-612149-7 1424pp 2010 £53.00

Continued from page 25

is not currently functioning on the reviewer's HTC phone however, it may function on other platforms, allowing access wherever a student has adequate internet signal, allowing fully flexible learning.

The text book itself is well illustrated in full colour with a large number of photographs and diagrams to illustrate the text. Key terms are highlighted in bold and covered in a glossary of definitions in an appendix. Important concepts, rules and equations are highlighted using coloured boxes. This makes the salient points easy to identify. Worked examples are well laid out and easy to follow, including visible units, making the processes easy to follow. The start and end of each mathematical process is also highlighted so that steps can be followed. Practice examples are also provided, one very similar to the worked example, and the second taking the calculation a step further.

The authors show an obvious appreciation of the need for students to understand concepts as well as follow calculation processes and include "Concept Assessment" boxes which introduce qualitative questions that interrogate students grasp of complex concepts. Answers to these are also included.

The content of the book is an excellent general range including basic chemistry in the first few chapters which is presented in a logical order taking the reader from the principles of the scientific approach to the structure of atoms, molecules and the fundamentals of chemical reactions. The reviewer concludes that while this book is aimed at higher level students, it even could be beneficial to AS and A-level students who are looking for more depth or an alternative method of explanation as the material is very well communicated.

The vast majority of the book is dedicated to physical and inorganic topics such as electrochemistry, bonding, periodicity, thermodynamics and kinetics. Organic topics are not introduced until chapters 26 and 27 of 28, however, this is likely to be sufficient to cover the basic principles, structures and reactions for the target audience.

For those students looking for a solid background in basic chemistry and those needing a general chemistry textbook for the start of a course then this book would be a good all-round choice. For those likely to take chemistry to a higher level or are looking towards a career in chemistry this book may not go into enough depth in some places but would be a valuable starting point to study unfamiliar topics. The reviewer feels that this book would also effectively bridge the gap between A-level and degree level chemistry and therefore would recommend the use of this book to undergraduate chemists looking for a general textbook for their first year of study.

Genome Duplication: concepts, mechanisms, evolution and disease

Subject area
Biology

Description
This text covers a range of topics revolving around the principles of genome duplication. This is linked to the three domains of life with further links to resulting genetic disorders and possible therapies.

Authors
Melvin L DePamphilis and Stephen D Bell

Publisher/Supplier
Garland Science (Taylor & Francis Group)
<www.garlandscience.com>

Date/Edition
2011/1st edition

ISBN
978-0-4154-4206-0

Level
Undergraduate

Price
£49.00

Summary Review	
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

The first line of the preface of this book, "This book is dedicated to the premise that nothing is more fundamental to Life that the ability to reproduce." sets up the subsequent chapters nicely for the reader. With directions throughout the text and the extensive glossary the content is accessible and interesting throughout. The book is aimed at undergraduate students and, in a very straightforward way, takes the reader through the basics of genetic replication, variations within these mechanisms and possible exceptions. Chapter 1 very clearly introduces the topic, highlighting the essential terminology and knowledge needed to completely follow the subject matter. Some prior knowledge is expected but these introductory sections are very well presented and the level of detail is such that anyone with an interest in this area should be able to at least grasp the theory behind the content. The links to further reading, mostly other textbooks, should then allow anyone to expand on the presented detail and ensure a detailed foundation in the topic. By the end of this initial chapter the reader is aware of the importance of, structures and roles of DNA within various organisms.

Chapter 2 then begins to link this information to the three domains of life. All subsequent chapters then refer across all three; bacteria, archaea and eukarya. Specific organisms from each domain are then focussed on throughout helping the reader follow the content through the multiple chapters and relate each part back to the basics of each organism. Subsequent chapters work through the various components and mechanisms involved in replication, synthesis, modification etc. The later chapters bring this all together with detail on the cell cycle, human disease and lastly, the evolution of these mechanisms.

The content is presented in a very straightforward manner and I particularly like the boxes presented throughout the text referring to experiments and data explaining how specific discoveries were made and their impact on the scientific knowledge of the day. With a personal interest in how these mechanisms/processes are related to disease I focussed with interest on chapter 14 (Human Disease). Understanding of the content of this chapter does require the knowledge from the previous chapters but the detail and diagrams are very useful and comprehensively cover the detail I would have expected. The chapter ends with information on how our level of current knowledge is being investigated for possible therapeutic uses. The final chapter, one of the shortest, closes the book by describing the evolutionary beginnings of these processes. Personally I feel this information may have been better placed throughout the previous chapters rather than as a stand alone chapter. Each chapter finishes with a summary of the chapter which I sometimes found presented a clearer explanation of a topic than the original text. This is followed by references to additional reading and the literature cited within the text.

As a summary I feel that this book is a great addition to the bank of available books on this content and I would be very happy to refer students to this resource. The build up of knowledge as you progress through the book and the clear links to expanding this knowledge would allow the book to be applicable for various year groups across a relevant degree programme. It is well structured, engaging and highlights the key points in a very straightforward and accessible way.

Chris Finlay
School of Life Sciences
Boyd Orr Building
University of Glasgow
Glasgow G12 8QQ
April 2011

High Temperature Superconductors

Subject area
Condensed Matter Physics

Description
Collection of review chapters

Authors
Raghu N Bhattacharya and
M Parans Paranthaman (editors)

Publisher/Supplier
Wiley-VCH (John Wiley and Sons)
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2010/1st edition

ISBN
978-3-527-40827-6

Level
Advanced undergraduate, research

Price
£70.00

Summary Review	
range: * poor to ***** good	
Academic content	*****
Usefulness to student	***
Usefulness to teacher	***
Meets objectives	*****
Accuracy	*****

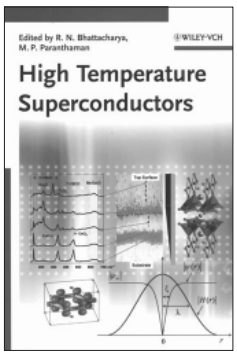
Since the discovery of high temperature superconductivity in Lanthanum Barium Copper Oxide in 1986 the field has continued to develop, with a steady stream of new materials sometimes bringing increased understanding and sometimes bringing surprises. The authors have brought together eight authoritative chapters from over 20 of the world experts in the field to provide a review of the current state of the art. There is a strong emphasis on the technological applications of high temperature superconductors.

This leaning towards applications is evident from the opening chapter on the theory of the materials. Although Cooper pairs are, of course, mentioned the bulk of the discussion is in the framework of the London equations and Ginzburg-Landau theory, with the aim of discussing the vortex lattice, pinning effects, and critical currents. There are useful diagrams of the crystal structures of typical High-T_c materials.

The remaining chapters cover methods for characterising materials and fabrication techniques, and discuss some of the newer materials. It should be noted that this volume does not attempt to be comprehensive: for example, the chapter on Raman spectroscopy does not discuss applications to the Lanthanum Cuprates or to the pnictides, though it refers to other reviews of these materials. The coverage of fabrication techniques for so-called second-generation High Temperature Superconducting wires, whilst being the shortest chapter in the book, brings the reader right up to date with the possibility of manufacturing wires in kilometre lengths. This is complemented by a chapter on flux pinning methods in Yttrium Barium Copper Oxides.

The classes of materials which have chapters to themselves are the Thallium Oxides, Mercury-based oxides, and Magnesium Diboride. The last material is particularly interesting for several reasons. After so many years of careful 'cookery' of nonstoichiometric compounds, here was a simple compound that was readily available from chemical suppliers with a critical temperature near 40K. It also turned out to be a much clearer example of a two-gap material than had been seen before.

This is, of course, not a text book. It can be recommended, though, as a source of material for lecturers who want to extend their treatment of superconductivity to show how the field is evolving technologically, and as an introduction to the recent literature for new researchers in the area.



Tony Harker
Department of Physics and Astronomy
University College London
Gower Street
London WC1E 6BT
April 2011

Inside Track to Academic Research, Writing & Referencing

Subject area
Study Skills

Description
General guide for students of all disciplines

Author
Mary Deane

Publisher/Supplier
Pearson Education
<www.pearsoned.co.uk>

Date/Edition
2010/1st edition

ISBN
978-1-4082-3698-7

Level
All

Price
£12.99

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	****
Usefulness to teacher	****
Meets objectives	****
Accuracy	****

This is an excellent little book. It is not aimed especially at physical scientists, but is a general book aimed at imparting information on literary skills relevant to students from all disciplines. There are just over 150 pages and eleven chapters divided among four sections covering academic integrity and the three elements of the title; research, writing and referencing. The first section on integrity deals principally with plagiarism and although most universities now have policies in place to make students aware of the issue, it needs to be covered in a book on this topic for completeness. Besides, Deane isn't just defining plagiarism, she is offering helpful advice on avoiding it through sections on such things as "scholarly practice" and "advancing knowledge". These are only small sections, barely a few paragraphs in length, within the first couple of chapters but they offer very useful advice on producing work of high academic quality, as evidenced by the correct, and appropriate, use of quotations, cited sources, and well-developed arguments. I particularly like the definition of scholarly practice, which "means producing quality work that is independently generated except where you acknowledge borrowed material or the contributions of others".

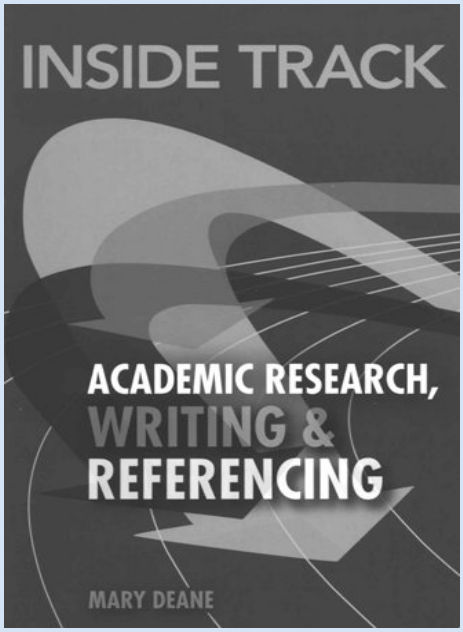
One of the features of the book is the absence of large blocks of unbroken text. There are numerous headings and sub-headings and sometimes only a single paragraph, or a paragraph with a few bullet points, within a section. This makes the book very easy to read and dip into, thereby enabling it to serve as a reference text as the reader can pick out very quickly the important information. To a seasoned academic the advice will mostly be familiar, but occasionally the book presents an interesting perspective. In the section on systematically searching for sources of information Deane asks the reader to consider whether the information in the source is confirmed elsewhere and whether the author is qualified to produce the source. This is something I had never really considered before. I require students to use peer-reviewed sources for which these questions are not really very important, but there is increasing pressure for science students to write generalist articles, perhaps of the kind that might appear in a newspaper or in a science magazine, wherein the credentials of the various authors cited or used in the work might well be important. Of course, in other disciplines where subjectivity is an integral part of the public discourse, these questions are probably crucial.

One of the things that I think Deane has done very well is to reinforce the ideas without becoming repetitive. It is impossible to read this book and not come away with the idea that incorrect use of sources constitutes bad academic practice. The theme is visited in all the four sections, but always in the context of a particular chapter. In the first section these ideas are mentioned in relation to academic, or scholarly, practice, in the second, in relation to keeping accurate records of one's reading, and in the third, in relation to integrating sources into the writing both by direct quotation and by paraphrasing. In the fourth and last section on referencing, the points are covered again. The weakness of the book, from the perspective of a scientist, is its generality. There is a whole chapter dedicated to the Harvard referencing system, which is rarely, if ever, used within scientific writing, but just a page devoted to referencing in the sciences. That said, there is enough in the remainder of the book to make it worthwhile reading and it's written in a style that I think makes it accessible.

Continued on page 30

David Sands
Department of Physical Sciences
University of Hull
Hull HU6 7RX
April 2011

Inside Track to Academic Research, Writing & Referencing



From the publisher...

Inside Track to Academic Research, Writing & Referencing

By Mary Deane

Inside Track to Academic Research, Writing & Referencing will provide you with practical guidance and tips on searching for literature and referencing your sources in a scholarly manner, helping you to avoid plagiarism and to produce successful academic writing assignments whatever your course of study. With the in-depth understanding of the practice of integrating and referencing academic sources and research into your writing that this book delivers, you will be better prepared to deal with - and succeed in - the full range of writing tasks that will be expected of you over the course of your academic studies and on into your chosen career.

978-1-4082-3698-7 184pp 2010 £12.99

Continued from page 29

I'll leave the last word to an acquaintance of mine who is studying for a PGCE and was struggling with an essay for which she needed the Harvard style of referencing. The book came to me too late to help her with that particular project but nonetheless I passed it across for her opinion. After all, it doesn't matter what I as an academic might think, if students don't find it useful there is little point in recommending it. I am pleased to say that she had nothing but good words to say about it, including the chapter on the Harvard system.

The book is written in a clear, easy to read and informative style that manages to avoid slipping into the sort of condescending that can be found in many books of this type. Well worth the price.

Inside Track to Critical Thinking & Analysis

Subject area
Study Skills

Description
Critical Thinking & Analysis will help you to develop and enhance the critical thinking skills that are a key element to successful academic writing

Author
Mary Deane and Erik Borg

Publisher/Supplier
Pearson Education
<www.pearsoned.co.uk>

Date/Edition
2010/1st edition

ISBN
978-1-4082-3697-0

Level
Undergraduate upwards

Price
£12.99

Part of the Inside Track series, which aims to provide students with practical ways to improve their academic skills, critical thinking and analysis focuses on the important, but often overlooked, subject of critical thinking.

Summary Review

range: * poor to ***** good

Academic content	***
Usefulness to student	*****
Usefulness to teacher	****
Meets objectives	****
Accuracy	****

Everyone thinks and analyses critically on a day-to-day basis without even realising it. Developing these skills and utilising them in an academic setting is something that tends to come with experience rather than through a conscious learning effort. This book aims to help students get to grips with what critical thinking is and advise how they can use it to get the best out of their academic work.

The book is easily digestible, set out in a simple red, black and grey colour scheme. It's split into four broad sections that consider how to use critical thinking when reading, planning, writing and reflecting at university, and in preparation for a chosen future career.

Despite the distinct section themes, much of the content is relevant across more than one topic. For example a discussion on locating and selecting sources for your academic assignment is found in the writing section, but could just as easily have sat within the reading or planning sections. The book's comprehensive index however means it's simple to find the topic you're specifically looking for.

It's unlikely that a student would read this book in full on its own, as like many study aids it's a fairly dry read if not being used in conjunction with practical work. Although it provides examples and case studies it won't be until a student actually begins to use the tips in their own work that they will start to benefit from the book.

And it's the practical tips that are the strength of the book. Advice, for example, on how to read efficiently using the SQ3R method and how to critically examine and relate a job description and person specification to your own skills and experience is all really useful stuff. Less useful is some of the accompanying history and theory of critical thinking. This may be of interest to some, with useful further references being provided at the end of each chapter, but is not of intrinsic importance to the main objectives of the book and can easily be skipped.

A mention must also be given to the use of contrived mnemonics. Love them or hate them, they're a feature of many a study guide and this one is no exception. The components of critical thinking are split out into the subtopics of Connections, Reflectivity, Independence, Time-management, Intellectual development, Context, Analysis and Long-term planning; CRITICAL for short. Whether this is useful or just annoying is for you to decide. A similar technique is used to help discuss the applications of Descartes' theories using sub-headings that spell out DESCARTES. Overall this is a decent guide that would be valuable to new students entering the academic world, who want to get a head start on how to get the most out of their assignments without relying on the trial and error learning experience that many students do. If you're a more advanced student, or even a professional already established in academia, it's a useful skills refresher that could well offer some new bits of advice that could benefit your work.

Nicola Frost
University of the West of England
School of Life Sciences
Frenchay Campus
Coldharbour Lane
University of the West of England
Bristol BS16 1QY
April 2011

Introduction to Biological Physics for the Health and Life Sciences

Subject area
Physics, Biomaterials Science, Biophysics, Chemistry, Bioengineering, Biomedical sciences

Description
Biological physics: overview, specialist and general text for stand-alone multidisciplinary topic (involves physics, chemistry, biology).

Authors
Karen Franklin, Paul Muir, Terry Scott, Lara Wilcocks and Paul Yates

Publisher/Supplier
John Wiley and Sons
<eu.wiley.com/WileyCDA/Section/index.html>

Date/Edition
2010/1st edition

ISBN
978-0-470-66592-3

Level
Undergraduate students; late-stage bachelor and master postgraduates needing top-up information

Price
£39.95

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

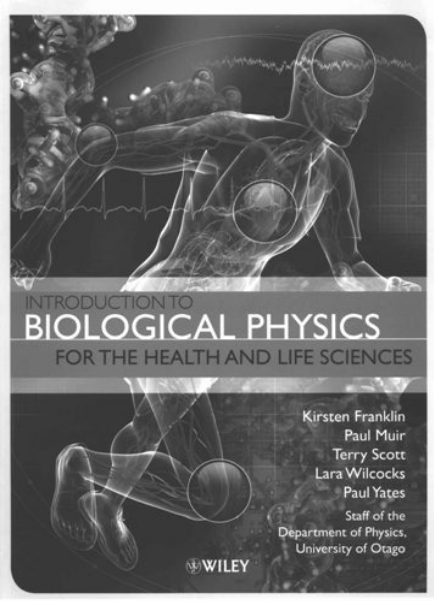
The overall form and presentation is generous, elegant and pragmatic. This comfortable read simultaneously manages to cope with impressive physics coverage across biological physics in a robust and steady manner that is done 'in a re-assuring' manner for 'maths nervous' natural scientists. The book comprises thirty nine (plus two for the Appendix) chapters, six essential sections and and 455 pages. Many a student will find the volume comfortable to heft around campus and to use as a more comprehensive referential guide during course. The book is particularly heavy reading within biology, depending on physics, engineering or maths skills-base for biology students (but with appropriate background the text is entirely comfortable). The text has a well-stated structure, thematisation and details relevant to some biophysics methodologies for the scrutiny of natural biomaterials (e.g. spectrometry; rheology, microscopy). Indeed there is a whole chapter on medical imaging (chapter 38).

The book combines pieces of physics, chemistry and engineering neatly under the 'compendium' that is biological physics [1] and surprisingly for a teaching text of this ilk and relatively speaking from a biologist's and medicine student's perspective. The utilitarian nature of the book from the lecturer ("removing the difficulties of a conceptual load") or advanced researcher's outlook is unmistakable. So although designed for undergraduates the book would be useful to researchers too. From a student's point of view, it is pleasant to see a textbook that is written from a physicist-within-biology standpoint (and from a real quintet of true physicists) in an area customarily frequented by 'unmixed' physicists [2-5] and their abstract-equals-norm presentational style. The authoring team do a truly superb job at contextualising the field and the reading is made ever more congenial and unambiguous by the talented use of ingenious technical diagrams, phenomenological schematics and cartoons.

The scientific impact of 'physics' within biology has been colossal in recent years, such as in recent biophysics research [3] and the mechanical properties of growing cells. This is woven into the book and therefore, means both the beginner degree student and superior-student readers will enjoy the text and see its value for their course. The sections dealing with methods for investigating solids, liquids, gases and biological forms of nanoparticle are bathed in sumptuous background on 'molecular organisation and the atom's structure'. The book also discusses equivalent technical advances in electro-physics (chapters 23 to 28) and the reach for innovation and production of novel (chapter 13, chapter part 32.10) materials [4-6]. There is a meaningful digression to the ear (p91), pressure and the human body (p121), the lung (p136), thermoregulation of the body (p220), the eye (chapter 31), myopia (p325), the CT scan (p403) that do not feature regularly in equivalently used (truly less universally indispensable) books in this area [1,2,5,7]. There are some spectacularly illuminating images , however the book quite rightly and in equitable fashion deals with the primary concerns of mechanics, bulk material properties, thermodynamics, electricity, optics and radiation, as befitting a proper physics textbook. The text doubles as supporting physics, engineering and (physical) chemistry courses at undergraduate and masters degree level and consequently it is an excellent investment for the university library for a reasonable and realistic price.

Dipak K Sarker
School of Pharmacy and Biomoleculer Sciences
University of Brighton
Lewes Road
Brighton BN2 4GJ
March 2010

Introduction to Biological Physics for the Health and Life Sciences



From the publisher...

Introduction to Biological Physics for the Health and Life Sciences

By Karen Franklin, Paul Muir, Terry Scott, Lara Wilcocks and Paul Yates

This book aims to demystify fundamental biophysics for students in the health and biosciences required to study physics and to understand the mechanistic behaviour of biosystems. The text is well supplemented by worked conceptual examples that will constitute the main source for the students, whilst combining conceptual examples and practice problems with more quantitative examples and recent technological advances.

978-0-470-66592-3 464pp 2010 £39.95

A number of 'physics' books exist on the university marketplace [1,2,5,6] and the content is in some obvious sense quite similar, however, this 'core text' is particularly suitable by virtue of covering materials and theories covered in 'a non-biological and non-medical or non-anatomical form' elsewhere. Consequently, one valid criticism of these books although first-rate is that they never seem to contain everything desired by the student of medicine or biology. If a student purchases a book it must therefore be of appropriately-weighted universal use on their course as is the precise case here for this book by Franklin et al. There is significant appeal in this book because all key formulae are boxed, highlighted and theoretical explanation and derivations are not excessive. The half-a-dozen sections are drawn together masterfully traversing the entire tranche of physics key topics [2,5].

The book moves cogently between subjects ranging from 'the ear' to 'the zeroth law of thermodynamics' and on to magnetic resonance imaging in a seamless transition. The book is interesting and with appropriate elements of hypothesising it provides a synopsis of the "particle and wave theory" (throughout the text) and the intrinsic properties of materials sourced from 'natural' or synthetic biological routes [7-9]. As with all truly well-written books the edition pays attention to themes considered imperative by contemporary authors [5, 6] (experts in the field, such as the authors themselves) and by 'physical science' students alike and this works ideally. Exemplary topic coverage is provided by helpful descriptions of a 'profusion' of theories that will help undergraduates with problematic concepts such as, Bernouilli's Equation and Torricelli's Theorem (p141-144), Kirchoff's Law (p273), Snell's Law (p296), Huygen's Principle (p336), the Bohr model of the atom (p353), nuclear decay theory (p365), activity and half life (p375), the Compton Effect (p388) and Faraday and Lenz's Laws (p411).

A textbook covering physics would be inadequate without alluding to particle physics (Heisenberg) principle of infinite precision failure in simultaneous measurements (p358) and its application to hard condensed matter and quantum dots used in cellular diagnostics [4,6,7]. There is then the obvious 'technology' of a Crookes tube or better thermo-ionic Coolidge tube by reference to bremsstrahlung (p378), which now feature in areas as diverse as device [6,7,9-11], material and medical imaging [1,7,9]. The book also navigates through the tricky conceptual themes of the 'phon' (p87, 96), stress-strain curves in biomaterials such as ligament systems (p108), the meaning of the pressure-volume phase diagramme (p186) and the meaning of blackbody emissivity (p210) or the Wien Displacement Law (p211, 215); relating colour to temperature. The book does not cover biological nanotechnology explicitly (and this

Continued on page 34

Introduction to Biological Physics for the Health and Life Sciences

Continued from page 33

could one failing) and use of this material science in much detail at all here. This clarifies a conceptual distinction between biological physics (physics in biological systems; whole organism) and biophysics (the physics of biological molecules at an 'atomic' or cellular level) but is suited ideally as a teaching aid in its description of anatomical bio-medical physics. These areas are significant branches of biomedical science that are now increasingly being energetically researched and targeted by students [8,11]. The section on surface tension and capillarity (chapter 13) is invaluable and essential to the fuller understanding of the importance of lung function, drug development (wetting and wettability of the skin), although little is really made of this. Presumably medics would find this information in pharmaceutics (medicinal chemistry and physics) books [9].

The splendid range of topics covered by Franklin, Muir, Scott, Wilcocks and Yates mean its use for physics or biology or biological physics courses is the norm and expected uptake at graduate level. The book covers areas of mechanics, structure and deformation properties, energetics, electricity, irradiation, magnetand supramolecular-assembled materials to name a few. The sections covering routinely used methodologies are described extensively and are generally found located throughout the text associated with the theory behind the concept or method and this is entirely logical. Examples include, geometric optics and microscopy (chapter 30), water vapour and psychrometry (chapter 20) and gamma-rays and detection ionising radiation (chapter 36). A very insightful thematic coverage is the one dealing with interference and diffraction and related interferometry and a range of routine used spectroscopy methods (chapter 32).

The fluid dynamics of viscous fluids (chapter 15) section is written painstakingly and presents clear details of a range of theories and notions in light of continual new discoveries [3-5]. Themes such as viscosity (p147) and turbulence (p149) and Bernouillian modelling are as relevant to biology and in pure theoretical physics and here are written with both elegance and energy. The section on heat transfer is dosed with liberal amounts of mechanistic description and thermodynamics (for example, p210) just in harmony with the detail needed by the undergraduate level reader. Functionalisation of interfaces and the lung and other valued topics are dealt with swiftly, contemporaneously and cogently (e.g. surfactants, chapters 13) in a way which is not too high-minded for the student.

On close scrutiny and inspection of the book text, maths and figures; there are no apparent errors. The accuracy of the content of this book is consummate and there most certainly can be considered no failings whatsoever in terms of providing worked examples for students. This provision is mandatory and particularly important when traversing two 'disparate' topics of physics and biology and the skill set of the students following these disciplines. This book should be very useful for students (now often seen as very useful for newcomers) at degree level 4 (undergrad year 1) to 7 (masters). The commentator feels some brief further discourse on a biophysics component might have been useful to the student to enhance or contextualise the 'technologies' and theoretical 'concepts' discussed in the volume. This is particularly the case since biopolymer use has such a profound impact in medicine and pharmacy, pervading virtually every type of therapeutic medium. The most likely use for this text is for those graduates embarking on 'physics science' or 'physical bioscience' study and undergraduate research projects [1,2,6,7,12]. There is also a wonderful section (p447-448) that provides the reader with a well considered bibliography for additional reading and this was a pleasure to encounter indicating the authors are seasoned 'teachers'. This is also indicated in the humour inserted into the text (cf Table 5.2 and Problems 5.8 and 33.3 (part e and f)). This textbook is recommended for primarily bachelor-level study and for final year degree specialisation or optional modules as a reference and shows physics is really fun.

References

1. Duncan, G. Physics in the Life Sciences (1990), Blackwell, Oxford, p1-324.
2. Jones, R.A.L. Soft Condensed Matter (2002), Oxford University Press, Oxford, p1-185.
3. Hersen, P. and Ladoux, B. Nature (2011), 470 340–341.
4. Lafferentz, L., Ample F., Yu, H., Hecht, S., Joachim, C. and Grill, L. Science (2008), 323 (5918) 1193-1197.
5. Rogalski, M.S. and Palmer, S.B. Advanced University Physics, Chapman Hall/CRC, Florida, p1-1006.
6. Vo-Dinh, T. (ed.) Nanotechnology in Biology and Medicine: Methods, Devices and Applications (2007), CRC Press, Boca Raton, Chapter 14:p1-26.
7. Melsenberg, G. and Simmons, W.H. Principles of Medicinal Biochemistry (2006), Mosby Elsevier, Philadelphia, p1-678.
8. Chang, R. Physical Chemistry for the Biosciences (2005), University Science Books, California, p1-677.
9. Mahato, R.I. Pharmaceutical Dosage Forms and Drug Delivery (2007), CRC Press, Boca Raton, p11-150.
10. Stryer, L. Biochemistry (1975), Freeman, San Francisco, p1-949.
11. Barat, D., Benazzi, G., Mowlem, M.C., Ruano, J.M. and Morgan, H. Optics Communications (2010), 283 1987-1992.
12. Cooper, A. Biophysical Chemistry (2004), The Royal Society of Chemistry, Cambridge, p1-184.

Introduction to Nuclear Science

Subject area
Nucear Science, Physics

Description
Introductory textbook on nuclear science

Author
Jeff C Bryan

Publisher/Supplier
CRC Press (Taylor & Francis Group)
<www.crcpress.com>

Date/Edition
2008/1st edition

ISBN
978-1420061642

Level
Undergraduate, postgraduate

Price
£58.99

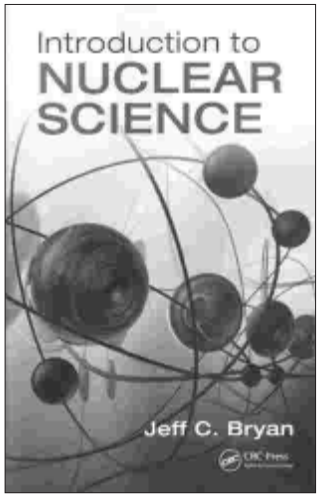
This is an excellent first guide to undergraduate and postgraduate students studying many aspects of the nuclear sciences, from the basics of radioactive decay to nuclear medicine and other applications of radioactivity. It is well written, combining good robust science with clarity and ease of reading.

Summary Review

range: * poor to ***** good

Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

The mathematical and theoretical underpinning of the subject are covered in more than sufficient depth, without detracting from readability. There is considerable coverage of the uses of radioactivity and radiation, presented in a scientific fashion, and not biased by political viewpoints. My only reservation is that the section on the disposal of radioactive waste could have been a chapter in its own right, given its importance to many countries at this moment in time.



This should be a very popular book with those teaching and learning in this important area of science, and will be of relevance to radiochemists, health physicists, RPO's, students of the nuclear fuel cycle and radiopharmacists.

Nick Evans
Department of Chemistry
Loughborough University
Ashby Road
Loughborough
Leicester LE11 3TU
April 2011

Introduction to Organic Chemistry: international student version

Subject area
Organic Chemistry

Description
Introdcutory undergraduate organic chemistry textbook

Author
William Brown and Thomas Poon

Publisher/Supplier
John Wiley and Sons
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2010/4th edition

ISBN
978-0-470-38467-1

Level
Undergraduate

Price
£49.99

Zia Khan
CA/151,9/A
Muhammad Hussain Road
Model Town A
Bahawalpur
Pakistan
April 2011

Summary Review

range: * poor to ***** good	
Academic content	****
Usefulness to student	****
Usefulness to teacher	***
Meets objectives	****
Accuracy	*****

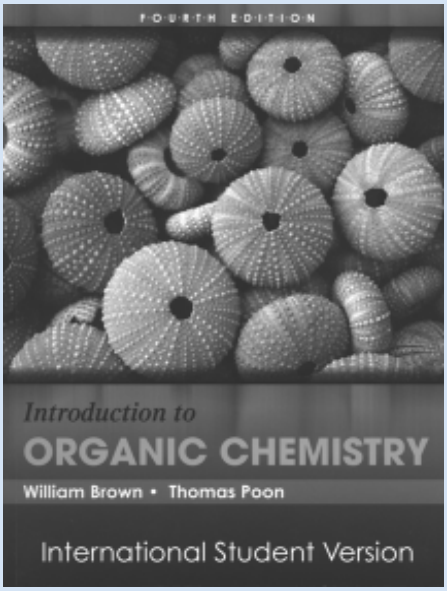
It couldn't be simpler! This is perhaps the best description of the 4th edition of **Introduction to Organic Chemistry**, a text book best serving the undergraduate students. That said, its utility ought not be overlooked also for instructors and higher degree students interested in keeping a reliable repository, contained in one volume, on the subject. The authors provide a comprehensive and comprehensible step-by-step guide to many a complex phenomena. A guide indeed it appears to be. Nothing is taken for granted. The undergraduate students, even the beginners in the subject, are helped in many alternative ways to understand and retain the information imparted on most of the topics considered important for a study of organic chemistry.

The general scheme of the book is simple and, almost, throughout uniform. The topics covered span over twenty-two chapters, supported by appendices, glossary and online help. Organic chemistry is shown to be a close relative of other sciences, particularly the biological and health sciences. Students are guided to be inquisitive, by the simplest, direct and monotonously dialectical scheme of inquiry. The methodical, though largely uninspiring, approach of the book helps unfold the limitless boundaries and dynamics of organic chemistry and its relationship with everyday life, including countless items, both natural and manmade, of industrial and domestic use.

As mentioned above, the method of inquiry adopted in this textbook is simple, direct and almost monotonous. The authors address a specific phenomenon, focus on it in near isolation and provide to-the-point, well rounded and abridged answer. Indeed, their method may justifiably be criticized as the key book approach to scientific learning, while the latter, by its very nature, warrants originality, spontaneity and internalisation. That said, such an approach usually provides undergraduate students appreciable help with many a topic that are often considered, according to the authors, difficult to understand. Moreover, the discussion of real life organic synthesis and important reactions, specifically those generally considered to be significant in the development of organic chemistry as a separate discipline of scientific discovery, add sufficient and demonstratively practical value to the book.

The first ten chapters describe the organic compounds. The electronic structure of atoms and molecules is reviewed in Chapter 1 by using the valence-shell electron-pair repulsion (VSEPR) model to help predict the shapes of molecules and polyatomic ions. This chapter also introduces the theory of resonance along with the use of curved arrows and electron pushing, followed by the description of the molecular orbital model of covalent bonding. Additionally, the students are introduced to functional groups, in particular hydroxyl, carbonyl, and carboxyl groups. The focus of Chapter 2 is the acid-base chemistry. The major themes discussed here are the quantitative determination of the position of equilibrium in an acid-base reaction, and the qualitative relationship between structure and acidity.

Introduction to Organic Chemistry: international student version



From the publisher...

Introduction to Organic Chemistry: international student version

By William Brown and Thomas Poon

Environmental engineers will find this engaging book bridges the gap between organic chemistry and how it relates to the real world. The new edition offers the richest assortment of examples along with Chemical Connections boxes to highlight the connection to everyday life. The worked examples present logical strategies and steps to help build their problem-solving skills. The examples are linked to end-of-chapter problems to reinforce the concepts. How To boxes explore common techniques and problems. In addition, questions are posed in several of the figure captions to make environmental engineers think about ways to apply the material.

978-0-470-38467-1 856pp 2010 £49.99

The next eight chapters are devoted to the discussion of the structures and typical reactions of the important classes of organic compounds. The structure, nomenclature and conformation of alkanes and cycloalkanes are given in Chapter 3, introducing and presenting the International Union of Pure and Applied Chemistry (IUPAC) system through the naming of alkanes and as a general system of nomenclature respectively.

The same topics are further extended and added to by the contents of Chapter 4, while the chemical energetics and reaction mechanisms are addressed in Chapter 5. The latter describes the reaction of alkenes, successively including electrophilic addition, oxidation and reduction. This is followed by the discussion on chirality, enantiomers and diastereoisomers, initiated and elaborated, with the help of molecular models, in Chapter 6. The major focus of Chapter 7 is nucleophilic substitution and elimination, discussed after introducing haloalkanes. The structure and characteristic reactions of alcohols are the subject matter of Chapter 8, concluding with a discussion of the acidity of thiols and their oxidation to disulfides.

Chapters 9 and 10 begin by introducing the structure and nomenclature of benzene and amines respectively. The other contents of these chapters are the standard details of a degree level text book on organic chemistry: aromatic heterocyclic compounds; electrophilic aromatic substitution; structure and acidity of phenols; basicity of amines; and the reaction of primary aromatic amines with nitrous acid.

The instrumental methods of analysis for structure determination are explained in Chapters 11 and 12, infrared (IR) spectroscopy and nuclear magnetic resonance (NMR) spectroscopy respectively. The authors begin by explaining the fundamentals of electromagnetic radiation and move on to infrared spectroscopy, explained with the help of basic correlation tables and interpretation of infrared spectra for characteristic functional groups. This is followed by a discussion on the absorption of radio-frequency radiation in Chapter 12, providing a lesson in NMR spectroscopy technique. The difficulty level of the chapter ranges from the magnetic properties of nuclei to the interpretation of NMR spectra, with a brief reference inbetween to 13C-NMR spectroscopy. The identification of NMR with magnetic resonance imaging (MRI) technique helps students appreciate its significance in modern health care, representing one of the landmark developments in diagnostic technologies.

Continued on page 38

Introduction to Organic Chemistry: international student version

Continued from page 37

The chemical properties of compounds containing the carbonyl group (C=O) is the focus of next four chapters, beginning with the chemistry of aldehydes and ketones in Chapter 13, and successively describing the chemistry of carboxylic acid and chemistry of carboxylic acid derivatives in Chapters 14 and 15. The discussion is capped in Chapter 16 with the introduction of the concept of an enolate anion and its intervention in Aldol, Claisen and Dieckmann reactions to form new cabon-carbon bonds.

The organic chemistry of polymers, discussed in Chapter 16, exposes the scientific reality of some familiar cognitive objects of the universe created by the humankind. Indeed, this chapter helps understand highly important phenomena demonstratively related to most commonly manipulated elements in nature for manufacturing the artifacts representing successively multiplying and widely prevalent exhibits of human industry and ingenuity. Students are provided incremental understanding ranging from description of the architecture of polymers to the chain-growth polymerisation.

The last topic addressed in this book is on the elements responsible for sustenance of the species in biodiversity including Homo S. Sapiens. The authors appear to have grossly overlooked the significance of the topic in terms of its essentiality and contemporary controversies having implications for a healthy life. The chemistry of carbohydrates is discussed in Chapter 18, and, with the exception of the picture of palatable dainties on opening page, the discussion remains almost divorced from life, knitted into the labyrinth of chemical bonds depicting soulless formulas. This is followed by the description of amino acids and proteins in Chapter 19. The next strand of the topic, nucleic acid, helps generate quite some interest both by its very nature and because of the latest scientific discoveries decoding the marvels of nature conveyed in the genetic code. Chapter 21 and 22, the tail end, provide useful information on lipids and metabolism, opening with the tale of the polar bear who festively eats and almost ritually fasts in Winter and Summer respectively.

All in all this book is compatible with many a standard textbooks discussing standard topics of organic chemistry for beginners in the subject. However, the approach adopted by authors widely differs in terms of the challenge expected of a degree level book, translated into originality, spontaneity, connectivity and rhythmic flow of the body text. Many of the features claimed new in this edition are diminutive rather than additive to the academic and scholarly value of a standard textbook. The major source of apprehension is the exam solicitation, the whole paraphernalia including key questions, quizzes etc., at the end of each chapter which may drive those not mindful of their responsibilities as teachers to either use it letter by letter and/or reproduce a disgraceful and unscholarly mimicry of the same. The authors' presumption of students using the help for self-evaluation bears little evidence to actual practice. Moreover, many of such kind of formulations, summary answers to key questions, for example, usually promote rote learning rather than scholarly articulation expected with internalization of scientific phenomena. Finally, there were no times more apt than the present times to be mindful of Dickens' opening words in his Tale of Two Cities; labeling the era as both best and worst of the times. The case in point is the formidable challenge to keep apart the ruthlessly rent seeking market hegemony from the sacred scholarly tradition of human society. All the more so when it is about the quest for understanding the mysteries of nature which essentially warrants a systems analysis, closed as well as open for recognising synergy and combating entropy.

Introductory Chemistry: international edition

Subject area
Chemistry

Description
General introductory Chemistry text for non-specialist Foundation students or first year undergraduates

Authors
Steve Russo and Mike Silver

Publisher/Supplier
Pearson Education
<www.pearsoned.co.uk>

Date/Edition
2010/4th edition

ISBN
978-0-321-72224-9

Level
Access/Foundation

Price
£64.99

Summary Review	
range: * poor to ***** good	
Academic content	***
Usefulness to student	***
Usefulness to teacher	**
Meets objectives	***
Accuracy	***

This book is appropriate for foundation or first year undergraduates who do not need to specialise in chemistry, but need a grounding in the basic principles of the subject. Topics covered include atomic structure, chemical bonding and reactions, and equilibria including acids and bases. Some subjects are not covered in much depth - there is little on electrochemical cells or rates, and the section on energy changes only accounts for nine of the 864 pages for example. There is a reasonably good section about unit analysis and significant figures at the beginning. Students aiming for further study in other physical sciences or engineering may be grateful for the weight saved by the decision to make the chapters on organic chemistry and polymers available as “eChapters” only - although I could not work out how to access these from the inspection copy.

The presentation is attractive and comfortable to study, using a low key colour scheme, with small, clearly drawn diagrams in a limited colour range and full page colour photos as chapter headings. There are also a number of cartoon style line drawings. It is printed on rather flimsy paper. The general approach is explanatory and although the mole concept is covered with plenty of example calculations, the level of mathematics in other topics is kept quite low. Students taking a chemistry course as part of study in engineering would benefit from a more rigorous approach. The writing style is conversational, discussing concepts in useful detail - the well-illustrated section on London forces explains this theory very clearly. This manner would suit weaker students who are native English speakers, but international students who struggle to read longer texts might prefer a more concise style.

The American origins of the book are very obvious, and it is surprising that in this international edition, more effort has not been made to reduce the references to inches and baseball - when reading about calorimetry, I can guess at what a “Twinkie” bar is, but it is still irritating.

Each section includes “Workpatches” within the text to test understanding; and practice problems, including some with worked answers. At the end of each chapter, there is an extensive collection of further short questions, for which selected answers are provided at the back of the book. I would have liked to see some more extended questions, combining different concepts - but there are few alternative text books which include this either.

There is an extensive, well written glossary at the end.

Overall, this is a useful book for a Foundation student who responds to a descriptive, rather than mathematical approach. However, at an RRP of £64.99, it is unlikely to be favoured over the many similar but cheaper books on the market.

Carolyn Gibbs
Sheffield International College
The University of Sheffield North Campus
Broad Lane
Sheffield S3 7HQ
April 2011

Introductory Statistics: international students edition

Subject area
Statistics, Mathematics

Description
Introductory textbook on statistics

Author
Prem S Mann

Publisher/Supplier
John Wiley and Sons
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2010/7th edition

ISBN
978-0-470-50583-0

Level
Undergraduate

Price
£49.99

A good understanding of statistics is an essential skill for every scientist and engineer, anyone involved in any quantitative analysis of information and a grasp of the basics is often useful for anyone interpreting some of the statistics-based claims made in the media. This book aims to teach statistics in an easy to read way to a reader with little prior exposure to the subject.

Summary Review

range: * poor to ***** good	
Academic content	****
Usefulness to student	*****
Usefulness to teacher	***
Meets objectives	****
Accuracy	*****

The book is laid out in an extremely engaging style. The text is large and easy to read, and the pages seem to be uncluttered and free of distraction. Worthy of particular note are the vast array of examples and worked problems, which deepen the student's knowledge of key points. These range from conventional numerical examples, to case studies and to fictitious statistics problem pages and examples of statistical analysis in the media. This breadth of illustration of the subject matter is useful, often enlightening and frequently address myths or misuses of statistical analysis.

The book starts from the absolute basics, with material on the fundamental kinds of statistics and methods of organising and graphing data. The book continues with chapters on probability, discrete and continuous distributions, all of which are clear and easy to follow. With the target audience being younger students of statistics, some readers may find the pace a little slow at times and in some places derivations of key results are omitted. However these are minor complaints given the target audience. Later chapters are on estimation and hypothesis testing, followed by topics such as regression analysis and goodness-of-fit tests.

Overall the material maintains its accessibility and all topics are illustrated by the impressive case studies. The breadth of material is a little too narrow for this to be a useful text for anything beyond an introductory course, but the statistical novice will find the clear explanations very useful.

The book includes many problems, and is supplemented by a web site containing solutions to some of the problems, self-tests and additional material. There are also many useful appendices on topics such as sampling techniques and statistical tables.

Overall, this book is very good for a new or nervous student of statistics, with an engaging style and clearly made key points. The case studies and examples are excellent, imaginative and serve to reinforce the core material. A more advanced student will find the pace a little slow, and this book is not ideal for anyone wanting a statistical desk reference book, but for everyone else this is an excellent introductory text.

Rob Appleby
The Cockcroft Institute and the University of Manchester
Oxford Road
Manchester M13 9PL
April 2011

Laboratory Manual for Principles of General Chemistry

Subject area
Chemistry

Description
This book covers a two semester lab program which presents each experiment with concise objectives, a comprehensive list of techniques, and step-by-step procedures

Author
Jo Allan Beran

Publisher/Supplier
John Wiley and Sons
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2010/9th edition

ISBN
978-0-470-64789-9

Level
Year 13 – foundation/first year degree level undergraduate, students, teachers (A-level/HE level)

Price
£99.50

Katy J McKenzie
Department of Chemistry
University of Leicester
University Road
Leicester LE1 7RH
April 2011

J A Beran has taken his popular laboratory manual into its ninth edition. With 448 pages, 3 chapters covering lab safety, recording and reporting data and lab techniques, 12 chapters of experiments, and 7 appendices, this book is a comprehensive guide for students and teachers alike as to what should be covered in a general chemistry introductory lab programme.

Summary Review

range: * poor to ***** good

Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

A major strength of the book is its accessibility and ease of navigation. The manual has five major sections. The first section on lab safety and guidelines gives a detailed written overview of personal protective equipment which should be worn in a lab, what to do in case of accident and general rules which should be adhered to in a lab setting. Unfortunately some of the photographs in this section detract from the conveyed messages as they show students in laboratory situations with their safety glasses on their head (page 3) and not wearing safety glasses (page 5).

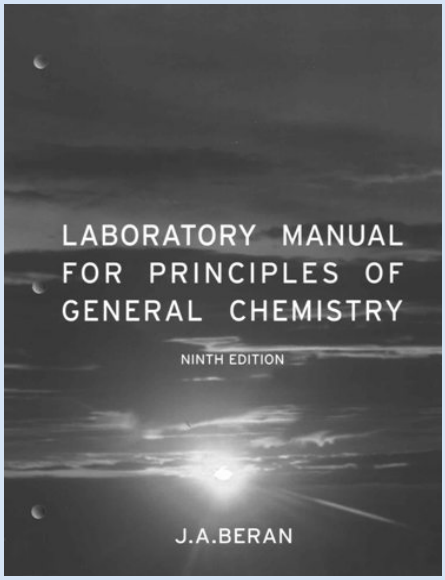
The second section concerns recording and reporting data. In the section on accessing supplementary data, the author lists suggested websites which include Wikipedia. Though my own students use this website often, we do not advocate this and are constantly encouraging students to use peer reviewed sources of information. However this section has many good aspects including useful tips on keeping a laboratory notebook and the equipment checklist is a useful feature for those students who may not have come across particular pieces of apparatus before.

The third section on laboratory techniques demonstrates seventeen basic techniques and the procedures for safe handling of chemicals and apparatus. The techniques covered would certainly be of use for A-level students, and some of these are used in the early stages of a UK chemistry degree programme eg titration. It is a shame however that the author tends to concentrate on very basic methods of heating and separation, and techniques such as refluxing and distillation are not included.

The fourth section contains thirty-nine experiments and four ‘dry labs’ which have been subdivided into 12 basic chemical principles. Each experiment is further divided into six sections which include objectives, techniques used, introduction/theory behind experiment, procedure, pre-lab questions, and report sheet. Each experiment is designed to take approximately three hours of laboratory time and it is clear that topics have been carefully selected so that students are able to relate to them and would find them interesting eg vitamin C analysis of tablets compared to fresh fruit and vegitables. The wide range of experiments detailed allows one to select those which are most appropriate for their own programme, and they are an instructor’s dream in that all resources are included. Despite the mismatch between the content of a typical first year UK vs US degree programme, everyone will find at least a few experiments which are useful. From my own point of view, I will definitely be trialling the experiment on Galvanic Cells and the Nernst Equation on our first year undergraduate students!

Continued on page 42

Laboratory Manual for Principles of General Chemistry



From the publisher...

Laboratory Manual for Principals of General Chemistry

By Jo Allan Beran

This new edition of the Beran lab manual emphasises chemical principles as well as techniques. The manual helps students understand the timing and situations for the various techniques. The Beran lab manual has long been a market leading lab manual for general chemistry. Each experiment is presented with concise objectives, a comprehensive list of techniques, and detailed lab intros and step-by-step procedures.

978-0-470-64789-9 464pp 2010 £99.50

Continued from page 41

The final section of the book contains several useful appendices which include how to treat/graph data including basic error analysis, and tables of data on conversion factors, familiar chemical names and their IUPAC alternatives, solubility of salts, and concentration of acids/bases.

In summary I felt this book was well set out with excellent diagrams to illustrate points of technique, and a good range of experiments are covered. The book has three holes punched on the left hand side and is designed to fit in a ring binder. Each page of the book is perforated to allow students to rip out pre-lab and report sheets; however the paper which the book is printed on is very thin and may tear easily. In comparison to other books[1-2] relating to practical chemistry that we recommend to our students I felt that the book was a little on the expensive side, however it is an appropriate price for practitioners who may wish to reproduce resources such as the pre-lab question sheets. One of the main strengths of the book is the wide variety of topics relating from A-level to first year degree level that will hopefully encourage some readers to try out some of these approaches in their own teaching.

References

1. Dean, J.R. et. al., *Practical Skills in Chemistry,* Pearson Education; 2nd edition (2011).
2. Zubrick, J.W., *The Organic Chem Lab Survival Manual: A Student's Guide to Techniques*, Wiley; 8th edition (2010).

Matter and Interactions

Subject area
Physics

Description
Introductory calculus-based physics textbook

Authors
Ruth Chabay and Bruce A Sherwood

Publisher/Supplier
John Wiley and Sons
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2010/3rd edition

ISBN
978-0-470-50347-8

Level
Undergraduate

Price
£59.99

Summary Review	
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

What do we expect first-year college students to learn from an introductory physics course? I do not believe that any teacher will enjoy the scene in the cartoon in that a student, a future professional-to-be, is apparently satisfied saying that "Hi, I learned a lot of physics by attending Mr. Equation's physics course since I remembered lots of equations to calculate all sorts of forces, energies etc" but at same time he is actually very poor, when confronted with real world phenomenon, in explaining or modeling using the equations he got from the course.

College teachers are by no means slow in recognizing this issue of gap between the information transmission and actual capability of understanding. Prof. Eric Mazur of Harvard University found that it is frequently very hard to correct incorrect concepts rooted in a student's mind. He developed a peer learning method to create a kind of class atmosphere that helps a student form correct understanding of a concept.

Richard Feynman authored one of most wonderful college physics textbooks which were based on his Caltech lectures. Personally, I was pretty much a Mr. Equation before touching the three volume red books as a engineering student; after reading the books at a speed of one chapter per day in my second year as a master student, I was completely reformed - I wrote down that, on a page of the borrowed copy when reading some parts like experimental confirmation of existence of resonant states of particles, "I want to be an experimental physicist!" The books of Feynman can quickly captivate a professor-to-be in the world of the beauty and power of physics. One of my friends, my PhD roommate and a college physics professor at SNU, complained (to my surprise) that he would not recommend Feynman's books to their students because he found it was difficult to use it as a textbook (in terms of assignment and pace of lecturing).

After several years career as a university professor, now I fully understand the challenges and difficulties of effective learning (for both students and teachers) and lecturing (for teachers). Now I am glad that **Matter and Interactions** (3rd Edition) by Ruth Chabay and Bruce Sherwood may fulfill the need for teachers and students when they have read or plan to read the work of Feynman.

Matter and Interactions is modern in several aspects. First, it is based firmly on the understanding that a college physics course should be used to engage readers with rich experience of simplifying by modeling, based on a handful of physical laws, the complex real-world phenomenon. Lots of self-test questions and problems are used to help readers gain deeper understandings. Second, a unifying conceptual line of "interaction", used throughout both parts of mechanics and electric and magnetic, is an exciting and powerful invention for an introductory textbook. Third, this book is fully color-illustrated having many 3D schemes like ball-spring model of solids and the field around a moving electron.

Yang Gan
School of Chemical Engineering & Technology
Harbin Institute of Technology
Harbin
Heilongjiang 150001
P. R. China
April 2011

Michael Faraday: a very short introduction

Subject area
Science, Physics

Description
A biography of the scientist Michael Faraday

Author
Frank A J L James

Publisher/Supplier
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2010/1st edition

ISBN
978-0-19-957431-5

Level
General

Price
£7.99

Summary Review	
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	n/a
Meets objectives	*****
Accuracy	*****

As a physicist with a strong interest in the history of my subject and the stories of its founding fathers I had been looking for a good biography of Michael Faraday for a while. I thus eagerly took the chance to review this book – the 253rd in the Oxford University Press Very Short Introduction series – and was not disappointed. As the title suggests this is not meant to be an absolute and comprehensive biography, but Frank James manages to distil the most important and interesting facts and accomplishments of Faraday's life without the book seeming cluttered or disorganised. It is obvious that the author has a genuine love and deep knowledge of the subject matter and the history he describes.

This is a thorough book. As well as providing facts and succinct corresponding analysis of Faraday's life, James also continues the story of the great man until the present day. The reader is left in no doubt as to the contribution Faraday made to society. This was not only well recognised throughout his life, but we have rightly continued to honour Faraday since he died. Leading scientists of the late 19th century celebrated the centenary of his birth, subsequent centenaries of individual discoveries have since been celebrated, a picture of Faraday lecturing adorned the £20 note for some years and he was one of the Margaret Thatcher's heroes. The author is also to be commended for including information on some of Faraday's less well-known experiments, which make fascinating reading. His studies on the nature of the Earth's magnetic field, while ultimately ill fated, were undertaken with the same enthusiasm and determination as some of his more successful ventures. Finally, James is to be commended for highlighting the extent of Faraday's collaborative work at the Royal Institution and on the Christmas lectures, rightly debunking the notion of Faraday slaving away as a lone maverick in a basement laboratory.

Though the book is necessarily concise, the one thing I felt it was most lacking was some analysis on why Michael Faraday was so good at what he did. There was little speculation on exactly what set him apart as such a brilliant experimentalist with such a sound understanding of the scientific method. There is also the question of why Faraday, unlike so many other big names in the field, remained so apparently ignorant of the mathematics that fundamentally explained the experiments he worked on. Did he simply choose not to study the subject or did he try and fail? James makes it clear that Faraday made a conscious decision to become a scientist and he certainly had access to the relevant books, and associated with the leading mathematicians of the time so it certainly was not for want of inspiration.

In summary this short biography makes for interesting reading, provides a good history and allows the reader to develop a proper and informed appreciation of a great scientist.

Vijay Tymms
Department of Physics
Imperial College London
South Kensington Campus
London SW7 2AZ
April 2011

Microscale Organic Laboratory...

Subject area
Organic Chemistry

Description
A practical guide to microscale organic chemistry experiments

Authors
Dana W Mayo, Ronald M Pike and David C Forbes

Publisher/Supplier
John Wiley and Sons
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2011/5th edition

ISBN
978-0-471-21502-8

Level
Undergraduate and above

Price
£143.00

Summary Review	
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

Chemistry is largely an experimental science. By illustrating to students 'why and how' things happen constitutes the most important step towards the making of a successful chemistry teacher. The 'cause and effect' relationship in basic sciences, in most instances, could be made abundantly clear to students by carefully planning and executing laboratory-scale experiments. Thus, it is always desirable to try to pass on to students the conceptual aspects of matter and its changes rather than by asking them to brood over textbook matters. However, sometimes it is difficult to 'translate' mathematical equations directly into the underlying physical concepts. For example, the principle of the origin of spin quantum numbers of nuclei from the *vectorial combination of spins of individual nuclides* might be a difficult concept for students to grasp; however, nuclear magnetic resonance spectrum given by a nucleus is a compelling and an unequivocal piece of evidence that the particular nucleus is has a net non-zero value for its spin quantum number. In other words, demonstrating to students that 'spectroscopy is quantum mechanics in action' would definitely enable them to appreciate the quantum mechanical concepts governing the molecular, atomic and sub-atomic world. This is exactly where the sheer beauty of chemistry, as a predominantly experimental science, presents itself to the students.

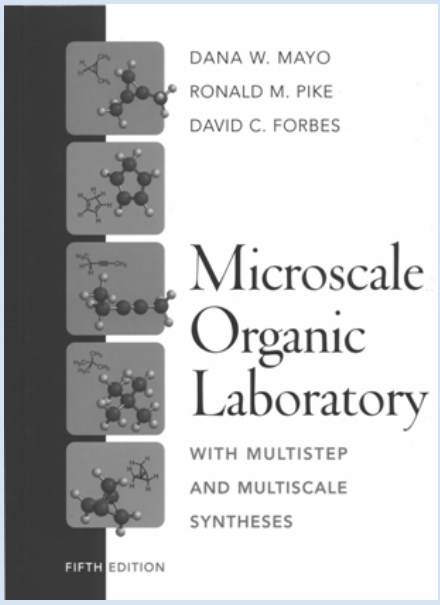
To effectively teach the principles of organic chemistry, especially at the under-graduate level, most certainly require the students to perform some basic and small-scale laboratory experiments. This would involve, for instance, separation and purification of organic compounds, functional group identification/conversions, through to spectroscopic identification of the starting material(s) as well as the products/derivatives. Therefore, there has been always a range of organic chemistry practical manuals, and tailor-made standard textbooks covering this subject matter, for students who are majoring in chemistry disciplines. The well-known authors in the area, in recent years, have also endeavored to incorporate elements of microscale techniques as well as advanced topics in spectroscopic identification of organic compounds. Some of these books, owing to sheer depth and relevance, have emerged as essential guides to synthetic organic chemistry, and beyond the graduate level and as a useful aid to research students as well [1]. The book entitled, **Microscale Organic Chemistry with Multistep and Multi scale Synthesis**, 5th Edition, by Dana W Mayo et al. is another addition in this area.

This book is conveniently divided into nine chapters, which are then followed by an appropriate section on glossary and a very comprehensive index. The introductory chapter is followed by sections on safety, microscale equipment/techniques, determination of physical properties, microscale laboratory techniques, detailed individual experiments, and finally sections on spectroscopic and qualitative identification of organic compounds. Other salient features of the book include provisions to allow for enquiry-based experimentation, the use of microwave heating as a tool in synthetic organic chemistry, and a rich collection of end-of-chapter exercises. The authors have very carefully poised the chronological disposition of the text material so that the different components follow smoothly and also complement each other so as to make it a good story.

Continued on page 46

Paul Joseph
School of the Built Environment
University of Ulster
Newtownabbey BT37 0TA
Northern Ireland
April 2011

Microscale Organic Laboratory...



From the publisher...

Microscale Organic Laboratory: with Multistep and Multiscale Syntheses

By Dana W Mayo, Ronald M Pike and David C Forbes

This is a laboratory text for the mainstream organic chemistry course taught at both two and four year schools, featuring both microscale experiments and options for scaling up appropriate experiments for use in the macroscale lab. It provides complete coverage of organic laboratory experiments and techniques with a strong emphasis on modern laboratory instrumentation, a sharp focus on safety in the lab, excellent pre- and post-lab exercises, and multi-step experiments. Notable enhancements to this new edition include inquiry-driven experimentation, validation of the purification process, and the implementation of greener processes (including microwave use) to perform traditional experimentation.

978-0-471-21502-8 704pp 2010 £143.00

Continued from page 45

The first five chapters give a good introduction to the overriding theme of the book itself. This in effect directs the reader to the in-depth discussions and the relevant laboratory techniques such as measurement of physical properties, common separation and purification procedures, and detailed experimental procedures covering all the major classes of reactions, including some classical and well-known *named* reactions. The chapter on spectroscopy is very well presented, and is an in-depth treatise that covers UV-visible, infrared, nuclear magnetic resonance spectroscopic techniques and mass spectrometry. It would have been very useful to provide few examples of identification of organic functional groups/compounds where the complementarily among the various techniques were illustrated, especially, through some relevant case studies. The final chapter on qualitative identification of organic compounds gives very classical, but quite intriguing, techniques for qualitative analyses of organic compounds, and includes sections on preparing derivatives for the purpose of confirming the identity of compounds.

Overall, the book covers relevant subject areas that are of interest to synthetic organic chemists, and other aspirants from slightly different, but from related subject areas. Having said this, one would assume a pre-university or A-level knowledge of the basic principles of organic chemistry, before embarking on the experimental procedures given in the book. Whilst the specific materials given in the book are well tried and tested, and the accompanying procedures are proven to be of low/medium level risk, an adequate level of supervision for the students in the laboratory is expected be in place.

The book also serves as a ready reference material for those aspiring for, and engaged in, teaching and research in the general field synthetic organic chemistry, especially, on a micro-scale. Since the book also covers an up-to-date literature in the subject area, including some web-based resources, it will serve as a specific reading material for post-graduate students who are intending to take up doctoral programmes in this subject area. The web-based resources specifically include an *Instructors Manual* and a *Wiley Custom Select* provision. It would be relevant to note here that the subject matter and its style, given in the book, have stood the test of time, and has also evolved and matured through five editions.

References

1. Harwood, L. M., Moody, C. J. and Percy, J. M. Experimental Organic Chemistry: Standard and Microscale, 2nd Edn., (1999), Blackwell Science, Oxford (ISBN: 978-0-6320-4819-9)

Microwave Heating as a Tool for Sustainable Chemistry

Subject area
Organic synthesis, Drug design, Process chemistry

Description
An all round guide to microwave assisted chemistry covering research areas from organic synthesis to ceramics and proteolysis with many literature examples provided

Author
Nicholas E Leadbeater

Publisher/Supplier
CRC Press (Taylor & Francis Group)
<www.crcpress.com>

Date/Edition
2010/1st edition

ISBN
978-1-4398-1269-3

Level
Postgraduate, academic

Cost
£95.00

Luke C Henderson
School of life and Environmental Sciences
Faculty of Science and Teachnology
Deakin University
Waurn Ponds Campus
Geelong
Victoria
Australia 3217
March 2011

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	****
Usefulness to teacher	****
Meets objectives	*****
Accuracy	*****

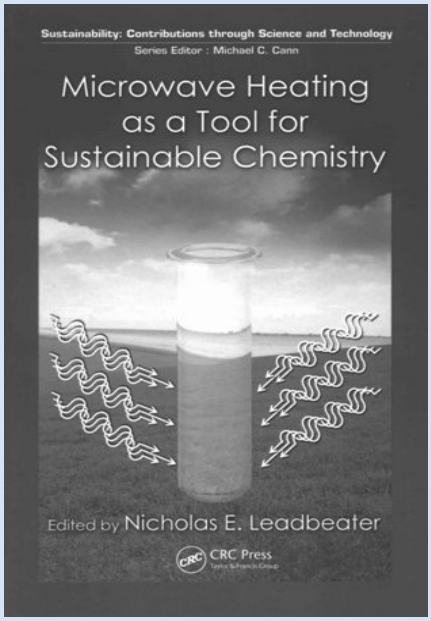
Final year undergraduate through to academic
The advent of microwave facilitated reaction has come to the fore of research based chemistry in the past decade. Though reported in 1986 as a curio, microwave reactors have now found their way into most organic research labs and are proving to be a powerful means of optimising conditions and preliminary investigations into novel chemical transformations. This book deals largely with the application of microwave assisted synthesis to various aspects of chemical research including organic synthesis, drug design, polymer chemistry, process chemistry, peptide synthesis, inorganic chemistry and the emerging application of this technology in the biosciences. Also highlighted is the integration of microwave based reactions for teaching purposes which must give results in a time restricted setting. The high yields, fast reaction time and minimal by-products which are synonymous with reactions carried out under microwave irradiation make use of this technology in undergraduate laboratories an excellent option.

Chapter 1 introduces the concept of microwave assisted heating to a reaction vessel and does an excellent job of making abstract concepts simple and digestible to the average reader. This chapter also addresses the illusive 'Microwave Effect' - the commonly associated magic that microwave heating imparts to a reaction giving higher yields and cleaner products. To quote directly from the book "heating is heating" and perceived microwave effects are more likely the result of uniform and efficient heating profiles. The introduction to these concepts of microwave heating is followed by a description of several commercially available microwave reactors and their capabilities and would serve as a good starting point for researchers who are interested in acquiring new equipment.

Chapters 2 and 3 elaborate on aspects of microwave assisted chemistry applied to organic synthesis and polymer chemistry, respectively. In chapter 2 particular emphasis is placed on transition metal catalysed reactions (typically Pd, Ru and Cu) with respect to Suzuki, Sonogashira, Ullman, Metathesis and 'Click' chemistry transformations. This is complemented nicely by the identification of purely organic medicated cascade and domino transformations such as cycloadditions, Michael additions and organocatalytic mediated transformations - including helpful tips on how to increase the microwave absorbance of low absorbing solvents such as hexane and toluene. Chapter 3 deals largely with applying polymer based chemistry to a wide range of solvents under microwave irradiations such as: ionic liquids, water, supercritical CO_2 and reactions in the absence of solvent as means to access 'greener' chemistry transformations.

Continued on page 48

Microwave Heating as a Tool for Sustainable Chemistry



From the publisher...

Microwave Heating as a Tool for Sustainable Chemistry

By Nicholas E Leadbeater

Shorter reaction times, higher product yields, and enhanced selectivity are some of the advantages microwave heating has over conventional methods, causing its use to transition from a curiosity to mainstream, both in industrial and academic settings. Microwave Heating as a Tool for Sustainable Chemistry showcases the application of microwave heating in a number of areas of preparative chemistry as well as in the biosciences.

9978-1-4398-1269-3 290pp 2010 £95.00

Continued from page 47

Chapter 4 covers drug discovery and draws very heavily from the previous section of organic chemistry transformations (Chapter 2) as these fields are closely linked. The main benefit of microwave irradiation when applied to drug discovery is the high throughput nature of the technique and this chapter initially deals with multi-component reactions which generate complex organic compounds in one-pot while benefiting from the fast reaction times of microwave assisted synthesis. Later combinatorial like strategies, utilising solid supports, are discussed to further demonstrate how a large amount of chemical space can be investigated in a time and cost efficient manner. The end of this chapter takes a step back from explicit chemical transformation examples and gives a broader view of drug discovery concentrating on sections such as - Hit-to-Lead optimisation, Knowledge Based Design, Biostere Replacement including several others while giving specific examples of microwave assisted synthesis' role in these processes.

Closely related to the development of pharmaceuticals is their production on a large scale, as such an efficient microwave assisted synthesis on a lab scale (0.1 - 1 g) poses an interesting challenge when scaling up to commercial quantity requirements. Chapter 5 identifies the practical issues with scaling up microwave assisted synthesis to commercial levels and offers several approaches to how processes have and are scaled up including the use of open vessel reactors, continuous flow and parallel syntheses. Again, as with the introduction, a variety of commercially available instruments are examined with specific examples and instrument capabilities. Overall this chapter brings to the fore concepts and important issues many lab scale researchers do not consider when trying to develop novel pharmaceuticals for mass production.

Microwave Heating as a Tool for Sustainable Chemistry

The implementation of microwave chemistry into undergraduate laboratory practical classes is examined in chapter 6 with many excellent example reactions which are suitable for implementation due to high yields, rapid synthesis and relevance to undergraduate chemistry courses. It could be argued that training undergraduate students in the use of microwave reactor technology will complement the more traditional techniques in chemical synthesis. Additionally experience and competency using a commonly employed instrument at an undergraduate level may provide and edge to a student seeking employment in chemical industry.

Chapters 7 and 8 examine microwave technology applied to inorganic/organometallic chemistry and materials chemistry. Compared to organic synthesis and its applications previously discussed the use of microwave technology in these three areas is relatively scarce. The majority of examples contained within chapter 7 (inorganic and organometallic synthesis) utilise domestic microwaves to carry out their transformations which are predominantly ligand-exchange based. The use of microwave heating to produce inorganic materials such as zeolites, adsorbents, ceramics, battery materials (e.g. LiFePO4) and their application to processes such as chemical vapour deposition (CVD) is discussed in chapter 8 and covers research from 2006-2009 providing excellent examples. Never-the-less this area is much more narrow and specialised than previous chapters within the contents.

The final chapter (9) introduces the use of microwave heating in the synthesis of peptides, an area which is receiving a lot of attention recently as a means to quickly access small peptides in good purity. This chapter covers the basics and commonly employed techniques for successful coupling. The development of microwave based solid phase peptide synthesis has shown increased rates of reaction and higher yields due to microwaves disrupting aggregation on the solid support surface. This chapter highlights the synthesis of cyclic peptides, glycopeptides and shows an explicit example of a manganese labelled peptide for use as a potential treatment for breast cancer. The latter section of this chapter involves the use of microwave heating to reduce time in protein degradation by hydrolysis for identification purposes.

Overall this book covers many areas which utilise microwave heating technology to enhance one or many aspects of chemical transformations. The text is best suited to postgraduate students and academics with an interest in synthetic methodology and serves as an excellent starting point to flesh out ideas potentially applicable to microwave irradiation. Well worth a read and an excellent addition to any professional library.

Molecular Driving Forces...

Subject area
Chemistry, Biology, Nanoscience, Physics

Description
Introduction to statistical thermodynamics

Authors
Ken A Dill and Sarina Bromberg

Publisher/Supplier
Garland Science (Taylor & Francis Group)
<www.garlandscience.com>

Date/Edition
2010/2nd edition

ISBN
978-08153-4430-8

Level
Advanced undergraduate/ graduate

Price
£49.00

David Sands
Department of Physical Sciences
University of Hull
Hull HU6 7RX
April 2011

Summary Review

range: * poor to ***** good	
Academic content	****
Usefulness to student	****
Usefulness to teacher	****
Meets objectives	****
Accuracy	****

First impressions count, and at first sight this is an impressive book. It very obviously represents a huge investment of time and intellectual effort. There are over 700 pages divided among 34 chapters covering a huge range of materials, from basic concepts in probability, basic physics, such as the concept of temperature and electrostatics, to more complex ideas, such as thermodynamics and phase transitions, and then the applications of some of these ideas to such areas as chemical equilibria, intermolecular interactions, catalysis, polymer solutions, polymer elasticity and ligand binding. The range of topics covered is remarkable.

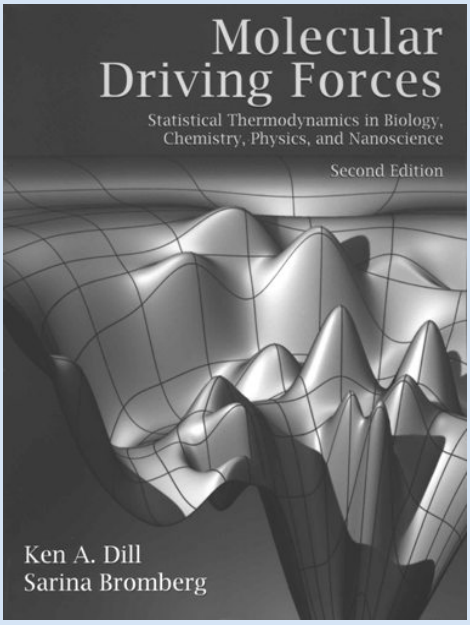
The authors are not physicists but respectively a professor of biology and a biophysicist by training who now, according to the inside cover, “writes, edits, and illustrates scientific textbooks”. That explains the glossy feel to the book, the extensive use of snappy and informative titles and subheadings, the copious use of line drawings, and the shaded blocks of text that break up the page. This is a visual, as well as intellectual, treat.

So, who would benefit from reading this book? The subtitle, *Statistical Thermodynamics in Biology, Chemistry, Physics, and Nanoscience* essentially says it all, but surprisingly the book is not aimed at physics undergraduates. The closest thing in the authors’ target list of graduate and advanced undergraduate students is a student of biophysics. The rest comprises physical chemists, biochemists, bioengineers, polymer and materials scientists, pharmaceutical chemists, chemical engineers, and environmental scientists. Though straight physics doesn’t warrant a mention in this list I do think nonetheless that this is a book that will appeal to many physicists. There is increasing emphasis on the applications of physics in other disciplines and the topics covered here are the sort of things that might well be taught in interesting final year courses. The difficulty lies with the level of the chapters on basic physics rather than with the chapters on the applications of the physics.

As befits a book aimed at non-physicists, it is self-contained and all the necessary basic physics required for the more complicated applications is covered in separate chapters. These are fairly basic and more appropriate to the second, or even first, year of a physics course than to the final year. Then again, it wouldn’t do students any harm to remind themselves of those basics. There is, however, one note of caution. This is not a conventional book on statistical thermodynamics, as the authors stress in the preface. The approach advocated by Gibbs based on ensembles is eschewed in favour of the maximum entropy approach of people like Edwin T Jaynes. The book therefore contains none of the usual material that makes up a statistical mechanics text; the different ensembles, especially the canonical ensemble, the partition function, free energies and fluctuations.

Jaynes was interested in the information theoretical approach to statistical mechanics and the maximum entropy method is essentially about maximising the probability distribution. Within the context of this book, which is concerned with the applications of concepts in statistical

Molecular Driving Forces...



From the publisher...

Molecular Driving Forces: Statistical Thermodynamics in Biology, Chemistry, Physics, and Nanoscience

By Ken A Dill and Sarine Bromberg

Molecular Driving Forces, Second Edition is an introductory statistical thermodynamics text that describes the principles and forces that drive chemical and biological processes. It demonstrates how the complex behaviors of molecules can result from a few simple physical processes, and how simple models provide surprisingly accurate insights into the workings of the molecular world.

978-08153-4430-8 720pp 2010 £49.00

physics to advanced problems in chemistry and biology, it is entirely appropriate to prefer the idea of distributions over particles over the method of ensembles. Boltzmann 1, Gibbs 0. Of course, free energies and fluctuations, the last two in the list above, are both directly relevant to the topics covered in this book, but they are dealt with in a different way. The free energy is introduced in the context of the extremum principle, that is, as a quantity for which the minimum value predicts equilibrium conditions. Fluctuations are treated in the context of fluctuation-dissipation theorems, which seem to have become very important in molecular physics in recent years.

Occasionally the maximum probability approach leads to ideas that cause me as a physicist to raise an eyebrow. Two examples illustrate the point. One page 34 two different perspectives on pressure are described, the mechanical model and maximum multiplicity. The mechanical model is acknowledged as “particles banging against the container walls”, but dismissed because “few problems can be solved by the mechanical approach”. Rather, the maximum multiplicity approach is preferred. This is quite understandable in the context of statistical physics, but pressure is not “the tendency to spread out”. Pressure is force per unit area, and the action of pressure over any volume change involves changes in energy, or work done. These are mechanical effects rather than consequences of maximum multiplicity. In the second example, diffusion is described on p309 as an “effective force” given by the gradient of the chemical potential. Diffusion arises from random processes, but it is only later on p335 that such ideas are introduced to describe Fickian diffusion. Physics education research has shown that conceptual misunderstandings, once entrenched, can be very difficult to remedy, so I find it disappointing that the authors have not made more effort to distinguish between the physical and mathematical models.

No text book is without its flaws and these are but small sections in an otherwise very impressive work. The authors have obviously given a great deal of thought about the content and the layout, and the end result is a book that will be useful to a wide readership. One of the features I haven’t yet mentioned in detail, but cannot possibly exclude, is the use of snappy, but informative chapter headings and sub-headings; “Extremum principles predict equilibria” (chapter 2), or “physical and chemical states evolve toward equilibrium” (chapter 17, subheading) are just two examples. One look at the contents and you can see instantly what you are going to get in the book. First impressions again. Fortunately, those impressions survive more detailed reading and I recommend this book to anyone with an interest in the applications of statistical physics.

Molecular Quantum Mechanics

Subject area
Quantum Mechanics

Description
Textbook on molecular quantun mechanics

Authors
Peter Atkins and Ronald Friedman

Publisher/Supplier
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2010/5th edition

ISBN
978-0-19-954142-3

Level
Undergrauate

Price
£39.99

Summary Review	
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

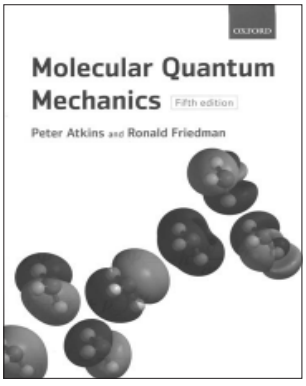
Your reviewer has on his bookshelf a well-thumbed earlier edition of this book. The publication now of a fifth edition is alone testimony of the author's clarity of approach.

Side-by-side on the desk, the editions are compared. In line with a general trend in modern textbooks, fewer assumptions are made about the mathematical background of the reader: introductions to complex numbers, differential equations, linear algebra, and fourier transforms appear throughout the text. These sections are rather brief: methods to obtain analytic solutions of linear first order differential equations are presented, but only power series solutions to second order differential equations are discussed. The background material on complex numbers suffers from ambiguity due to its short length: the principal argument of a complex number $z = x + iy$ is given as $\arg(z) = \arctan(y/x)$, with no reference to the quadrants of the Argand diagram. And figure MB1.3 in this section is messy.

In the new edition effort is made to allow more familiarity with the salient equations. This is achieved in two ways. First, there are brief illustrations of the use of an equation as it is introduced: often this will be to illustrate the typical range in magnitude of a property. Second, and more innovative, are the numerous online spreadsheets which allow functions to be graphed with different parameters.

The chapter on electronic structure calculations has been rewritten (and is now labelled "Computational Chemistry"). Notable here is the thorough treatment of the H_2 molecule in the context of density functional theory to facilitate a greater understanding of the calculations used in commercial and academic software. Example electronic structure calculations are provided on the book's website. The end-of-chapter questions throughout the book have been grouped into (mostly numerical) "exercises", and (more difficult) "problems".

One topic of which your reviewer could find no mention is Landau-Zener theory, which is used in applications as diverse as rates of electron transfer in the context of Marcus theory, to the ionisation dynamics of molecular Rydberg states. Overall, though, this book is a solid and broad introduction to quantum theory at the graduate or advanced undergraduate level.



Michael Pounds
Division of Chemical Sciences
University of Surrey
Guildford GU2 7XH
April 2011

Neutrino

Subject area
Science

Description
A telling of the story of the quest to detect the neutrino from the 1930's to the present day

Author
Frank Close

Publisher/Supplier
Oxford University Press
<ukcatalogue.oup.com>

DateEdition
2010/1st edition

ISBN
978-0-19-957459-9

Level
General reader

Price
£9.99

Summary Review	
range: * poor to ***** good	
Academic content	***
Usefulness to student	***
Usefulness to teacher	***
Meets objectives	*****
Accuracy	*****

When I have a book to review I read the first few pages and then I start to skip and dip. And the rest of the book is covered by increased skipping and dipping until I feel I have fully understood it. With **Neutrino** I began at the start and I did not put the book down again until I reached the end.

The book is made up of short stories. The stories are populated by fully realised characters. The idea for the book started when Frank Close wrote the obituary of Ray Davis. Right from the start his interest is in the scientists as much as the science.

He begins with the early history of radioactivity. A history of unexpected discoveries leading to prospective theories indicating further experiments. Much as the story of the neutrino turns out to be. By the end of the 20's there were two problems: the stability of the atomic nucleus and the energy distribution in beta decays. In 1930 Pauli proposed a solution to both by postulating a new particle, the neutron. The neutron was discovered but it only solved nuclear stability. A separate particle was needed to solve beta decay and its name became neutrino ('little neutron' in Italian).

But calculations on this new particle in 1934 concluded that the neutrino passed through matter 'like a bullet through a bank of fog' and that 'there is no practical possible way of observing [it]'. Pauli jokingly wagered a case of champagne against anyone ever detecting the neutrino.

Close says 'my original idea had been Ray Davis's singular quest…I had not anticipated the central character would turn out to be Bruno Pontecorvo.' Pontecorvo was an Italian physicist who fled fascist Italy in 1936, became a British citizen in 1948, but then defected to Soviet Russia in 1950. Close says, 'during the course of the story, Pontecorvo will always be there, behind the scenes, often a central actor. He never got the Nobel prize, but nine others did, doing work based on his ideas.'

While still in the West, Pontecorvo wrote a paper proposing neutrino detection. He proposed a detection method using huge vats of chlorine. The neutrinos would convert chlorine atoms into argon atoms, and these argon atoms could be detected and counted.

Ray Davis came across the paper and so 'the course of the rest of Davis's life was set'.

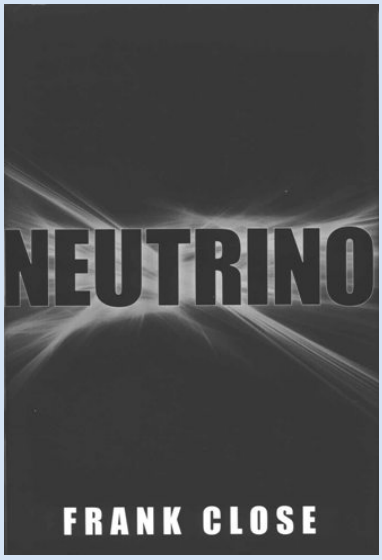
Davis set up a 4000 litre tank of chlorine by the Brookhaven test reactor and began the search. He found no neutrinos. So in 1955 he built a larger detector by the Savannah River reactor in South Carolina. But again he detected nothing.

Meanwhile Cowans and Reines had built a different type of detector (looking for positron and neutron production as a result of neutrino interactions) at a nuclear reactor in Washington State. They got a signal in their detector. But when the reactor was turned off they still got a signal! So they moved 12 metres underground so as to be shielded from cosmic rays. And on 14 June 1956 they were able to announce to the world that 'the neutrino has been detected'. They won Pauli's case of champagne.

Continued on page 54

Jack McArdle
Worcester College of Technology
Deansway
Worcester WR1 2JF
April 2011

Neutrino



From the publisher...

Neutrino

By Frank Close

Neutrinos are perhaps the most enigmatic particles in the universe. Formed in certain radioactive decays, they pass through most matter with ease. These tiny, ghostly particles are formed in millions in the Sun and pass through us constantly. For a long time they were thought to be massless, and passing as they do like ghosts they were not regarded as significant. Now we know they have a very small mass, and there are strong indications that they are very important indeed. It is speculated that a heavy form of neutrino, that is both matter and antimatter, may have shaped the balance of matter and antimatter in the early universe.

978-0-19-957459-9 192pp 2010 £9.99

Continued from page 53

By 1958 Davis had switched to trying to detect neutrinos originating from the Sun. He realised he needed a bigger detector and he needed it buried deeper in the ground. Theoretical predictions made by John Bahcall said that neutrinos should be detected at the rate of 7.5 SNU. With Davis's new experiment he was only getting at the most 3 SNU.

Gallium detectors are able to detect the more numerous lower energy neutrinos. By the 1990's two gallium detectors were built: one in Italy; and one in the Caucasus. When their data was assembled the number they detected was 80 SNU. Again less than Bahcall's calculated number of 130 SNU. Bahcall felt he was known as 'the guy who wrongly calculated the flux of neutrinos from the Sun'.

In the 80's other detectors had joined in the hunt for the neutrino. Kamiokande in Japan and the IMB experiment below Lake Erie. These expensive behemoths had been built to look for proton decay. They were re-tooled and as such became 'neutrino telescopes' which could not only detect neutrino interactions but could tell the direction and energy. They could also distinguish between electron and muon neutrinos.

The Standard Model predicted that when a cosmic ray pion decays there should be 2 muon-neutrinos per electron-neutrino. But IMB and Kamiokande measured the ratio as 1 to 1. It was this anomaly that drove the upgrade of Kamiokande into SuperK. SuperK showed that the neutrinos travelling through the Earth had a smaller ratio than those coming from overhead. The muon-neutrinos were disappearing the further they travelled. This led in 1998 to a revival of the idea of neutrino oscillations: an idea that had been proposed 30 years earlier by Pontecorvo and Gribov.

And by 2003 measurements from SNO in Canada and SuperK confirmed that electron neutrinos only form a third of the total solar neutrino flux. So Davis and Bahcall ('the guy who wrongly calculated') had been correct all along.

This is a book is written for a lay audience. And as such I review it as a history of science text rather than a text-book on neutrinos. But it would provide a good framework to the science for students and the source of appealing anecdotes for any lecturer. Close provides many more details and insights than I can mention here. The book has been thoroughly researched, with details from original papers, letters and reviews. Close is interested in showing how some ideas can be off target (in the 70's some proposed that the Sun had stopped working) while others can be prophetic (Pontecorvo: "It would be nice if this ends with something unexpected from the point of view of [neutrinos]".)

New Approaches to Problem-Based Learning...

Subject area
Education

Description
This book provides insight on how a Problem Based Learning (PBL) approach to teaching can be developed and implemented effectively.

Authors
Terry Barrett and Sarah Moore (editors)

Publisher/Supplier
Routledge (Taylor & Francis Group)
<http://www.routledge.com/education>

Date/Edition
2011/1st edition

ISBN
978-0-415-87149-5

Level
Academic

Price
£30.99

Dylan P Williams
Department of Chemistry
University of Leicester
University Road
Leicester LE1 7RH
March 2011

Summary Review

range: * poor to ***** good

Academic content	*****
Usefulness to student	n/a
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

This book brings together the experiences of a number of academics who have used a problem-based learning (PBL) approach to undergraduate and postgraduate teaching across a range of disciplines. The scope of the book makes it an excellent resource for both teachers with little or no experience of PBL and for experienced PBL practitioners. The book takes the reader from descriptions of what PBL is to explanations of how (and why) it is used with plenty of discussion about the range of approaches to PBL used by different practitioners.

As the use of PBL in some disciplines (such as the physical sciences) has only gained popularity in recent years, the need for this type of book is clear. As science educators there is clearly a lot we can learn from teachers with more experience of this style of teaching than us (medicine and social science educators for example). Additionally, given the variety of ways that PBL is used at different institutions, it is essential that these varying approaches are evaluated and shared with the wider academic community in order for us to learn what goes into an effective PBL problem or case study, this book provides a platform for some practitioners to share their experiences. Although the book focuses mainly on examples from disciplines outside of the physical sciences area, the PBL design, implementation and development processes discussed in this book are of relevance to any practitioner using PBL.

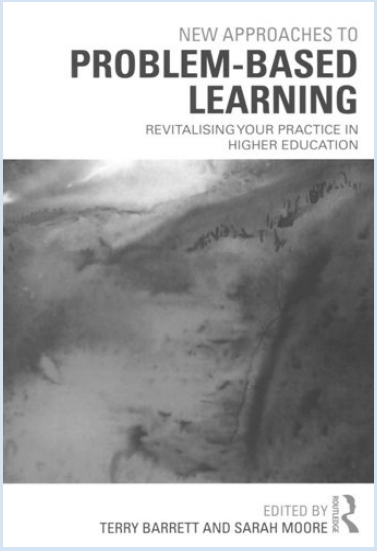
The structure of the book makes it easy for the reader to access the content most relevant to their needs. The book is divided into three parts, part one starts with an explanation of what PBL is and what it offers to both teachers and students. Part one goes on to confront the challenges of designing good PBL problems, this theme is developed in part two where a number of strategies for maximising the impact that the PBL approach has on problem-solvers are presented. Part three provides insight on how sustainable approaches to PBL may be developed and embedded in new and existing courses.

The opening chapter provides a very useful starting point for those new to PBL. The description of PBL as a six-dimensional approach to higher education guides the reader through the key aspects of the PBL approach from a guide to the problem design process and what form the PBL tutorial takes to PBL curriculum development and the philosophy of the approach. All of the themes introduced in the opening chapter are picked up in greater detail later in the book.

The remaining chapters of part one focus on different approaches to developing PBL problems, the perspectives of various stakeholders on PBL initiatives and a discussion of how PBL initiatives can be evaluated. Practitioners new to PBL will find the second chapter particularly useful as it highlights the different kinds of trigger that can be used in PBL problems and provides useful guidance on how to develop problems. Chapter 3 presents an interesting discussion of what goes into the design of authentic PBL problems for multidisciplinary groups, including a very interesting discussion of the uses of problem design days for bringing together multidisciplinary stakeholders in the problem design process.

Continued on page 56

New Approaches to Problem-Based Learning...



From the publisher...

New Approaches to Problem-Based Learning: revitalising your practice in higher education

By Terry Barrett and Sarah Moore (editors)

Problem-based learning (PBL) is a pedagogical approach that has the capacity to create vibrant and active learning environments in higher education. However, both experienced PBL practitioners and those new to PBL often find themselves looking for guidance on how to engage and energise a PBL curriculum. New Approaches to Problem-based Learning: Revitalising your Practice in Higher Education provides that guidance from a range of different, complementary perspectives.

978-0-415-87149-5 298pp 2010 £30.99

Continued from page 55

The second part of the book will be of great interest to both new and experienced practitioners of PBL. This part of the book provides examples of how to get the most out of the PBL approach in the classroom (or laboratory). Part two starts with a discussion of the significance of the concept of “dialogic knowing” and how to encourage the co-construction of knowledge within groups. This part of the book includes chapters on using PBL to develop information literacy of students and applying concepts of design thinking to PBL which I found particularly interesting. The use of real examples to highlight the relationship between good practice and educational theory is excellent.

The final part of the book takes a look at some of the highly significant issues related to embedding a PBL component in an existing or new course. This part of the book includes a chapter discussing the challenges that instructors new to PBL face, I found this chapter to be an honest review of the work that must be done to introduce, embed and maintain a PBL curriculum that will help guide academics planning to introduce PBL to their courses.

In summary I felt this book provided a range of very interesting insights on the development and implementation of PBL in a range of HE courses. One of the main strengths of the book is the number of examples that will hopefully encourage some readers to try out some of these approaches in their own teaching and to be innovative in their implementation of PBL.

Observational Exercises in Astronomy

Subject area
Astronomy

Description
A lab manual of astronomy exercises using a range of planetarium software

Authors
Lauren Jones

Publisher/Supplier
Pearson Education
<www.pearsoned.co.uk>

Date/Edition
2010/1st edition

ISBN
978-0-321-63812-0

Level
Non-science undergraduates

Price
£23.99

Summary Review	
range: * poor to ***** good	
Academic content	***
Usefulness to student	*****
Usefulness to teacher	****
Meets objectives	*****
Accuracy	****

This book is a "lab manual containing a series of astronomy exercises that integrates technology from planetarium software".

I found it disappointing to see that the particular student cohort targeted for this book is not explicitly mentioned on the back cover or on the publisher's web site. It is only in the Introduction that it is made clear that the book is intended as a series of exercises for the so-called Astronomy 101 students (non-science majors who are not likely to choose astronomy or physics for a major). As far as I was concerned, it became clear I would not use this book for my students, as we do not have a lab component in our equivalent Astronomy 101 course. With respect to our astronomy students, the level of the problems presented in this book is generally too low to be comparable to what is expected from them. The book might still constitute interesting reading for some of them (probably among the weak students). However for the same price it is likely there will be more useful and more complete resources to purchase.

The style of the book makes it quite easy to read, and students would not need too many prerequisites to do the exercises. These exercises are intended to be tackled in order, but there is some degree of flexibility to re-arrange the sequence as needed.

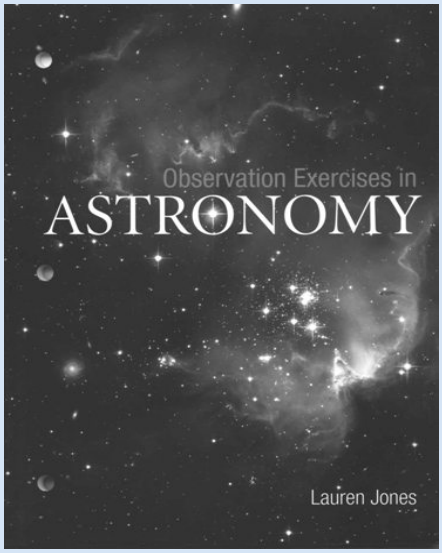
There are 15 exercises that follow a typical sequence for that kind of introductory astronomy: Earth-Moon system, solar system, distance measurements, physics of stars, galaxies, and the expanding Universe. Each exercise has a short background introduction, then questions are posed, and much space is left then for the student to write the answers to the questions. Progressively through the book, the student is invited to write short essays tending towards what could be regarded as a scientific lab report. The exercises are followed by five appendices, four of them dealing with instructions to run planetarium softwares for each relevant exercise, and the last one presenting some geometric principles applied to the calculation of the astronomical unit.

Overall I found that the themes discussed in the problems were interesting as they usually reflect well the process of scientific discovery and inference of properties of remote objects. The questions are quite detailed and break the problems in small steps. However in several instances I found that the problem was broken down to a point that it would become too easy to do, and that the level was too low and not challenging enough to engage the students. For instance there is a problem on galaxy classification between their different types according to their observed shapes. The student is asked to suggest categories to classify galaxies, but it becomes clear once the background material and the lab script have been read what these categories should be (spiral, elliptical, irregular, etc). It will be very tempting for students to just use what is given in the script and not think about it by themselves.

Nicolas Labrosse
School of Physics and Astronomy
University of Glasgow
University Avenue
Glasgow G12 8QQ
March 2011

Continued on page 58

Observational Exercises in Astronomy



From the publisher...

Observational Exercises in Astronomy

By Lauren Jones

Observation Exercises in Astronomy is a lab manual containing a series of astronomy exercises that integrates technology from planetarium software such as SkyGazer, StarryNight Pro, Stellarium, WorldWide Telescope, and GoogleSky. Each exercise is designed to engage you in a different aspect of the scientific process.

978-0-321-63812-0 208pp 2010 £23.99

Continued from page 57

In the 'typo' category it is sad to see that Wien's law has become 'Wein's law' in the section on stellar spectroscopy. I was also perturbed by the fact that sunspots, prominences and flares were associated to 'magnetic anomalies' or 'anomalous magnetic features' on the Sun. It is not because the properties of the magnetic field in these regions are still puzzling solar physicists that they should be considered as anomalies!

It is a small detail, but since this book aims to educate future citizens and make them 'scientifically literate', why qualifying something as anomalous just because it is not understood?

Organic Chemistry

Subject area
Organic Chemistry

Description
General organic chemistry textbook for undergraduates

Author
David Klein

Publisher/Supplier
John Wiley and Sons
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2011/1st edition

ISBN
978-0-471-75614-9

Level
Undergraduate

Price
£49.99

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

Organic Chemistry by David Klein is a new book on the market and it is an excellent alternative to the other well established general organic chemistry textbooks that have been around for many years. The book combines very clear explanations with useful worked examples and problems in a way that will encourage the student to develop the skills required to succeed in the study of organic chemistry. The content covered is very similar to that found in other organic chemistry textbooks books but here it is more readable and better explained than I have seen before. It would be suitable for any chemistry student right through their years at university except perhaps at honours level where more detailed specialist topics might be covered.

The book begins with very understandable explanations of fundamental topics such as bonding, structures, acids and bases and reaction mechanisms, meaning that it is an ideal starting point for new undergraduates. Once this underpinning theory is established the normal material expected of a general organic chemistry textbook is covered. The important topics in stereochemistry, reaction chemistry and spectroscopy are all nicely explained and the book finishes with chapters on carbohydrates, peptides, selected natural products and polymers. Each chapter has illustrations of practical applications of the topics and there are many worked examples to allow the reader to apply the subject matter to solving problems.

The book looks terrific and more importantly it is easy and enjoyable to read. Excellent use is made of colour to make diagrams useful to the reader. The diagrams are also well labelled and annotated.

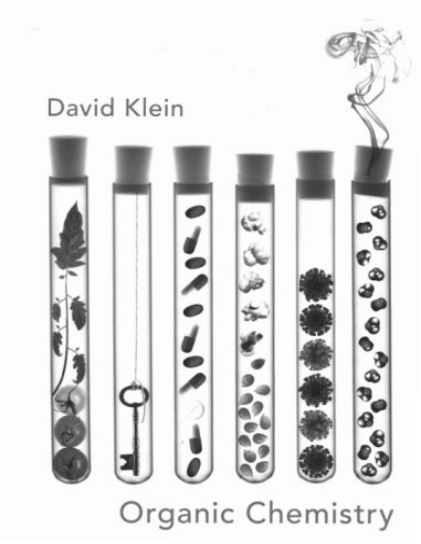
The skills based approach to organic chemistry favoured by the author is most clearly seen in the “Skills Builder” sections in each chapter. Here the reader is invited to “Revise” a skill (for example, drawing resonance structures) “Practice” the skill with a series of problems and then “Apply” the skill to some harder problems. Each chapter also has “Practice” problems, “Integrated” problems (which can refer to material elsewhere in the book) and “Challenge” problems. At the end of each chapter there are useful summaries of new concepts, vocabulary and reactions. If the book was being worked through by a student I think this approach would work very well.

The way topics are explained constantly encourages the reader to apply what they have previously read. Excellent use is made of thermodynamics, kinetics and molecular orbital theory to rationalise explanations avoiding the pitfall of asking the student memorise a seemingly random collection of reactions. The explanations given in the book feel complete and should satisfy the curious reader.

Ciaran Ewins
School of Science
University of the West of Scotland
Paisley PA1 2BE
April 2011

Continued on page 60

Organic Chemistry



From the publisher...

Organic Chemistry

By David Klein

To address the disconnect in organic chemistry instruction, David Klein has developed a textbook that utilizes a skills-based approach to instruction. The textbook includes all of the concepts typically covered in an organic chemistry textbook, but special emphasis is placed on skills development to support these concepts. This emphasis upon skills development will provide students with a greater opportunity to develop proficiency in the key skills necessary to succeed in organic chemistry.

978-0-471-75614-9 1360pp 2011 £49.99

Continued from page 59

There is a large amount of other printed and electronic material available for lecturers and students to encourage the adoption of this book. The electronic material is extra to the textbook so it is not required in order to use the book properly.

If you were considering trying to increase the amount of "student centred learning" in your course or if you were a student looking for extra study material then this book is an excellent option. It engages the reader as it is an interesting read; it explains topics clearly and presents lots of good examples to work through.

The author hopes that students who use this book will learn to "think like organic chemists" and "become proficient at approaching new situations methodically based on a repertoire of skills"; I think that this book will give the committed student every chance of reaching these goals.

Organic Chemist's Desk Reference

Subject area
Organic Chemistry

Description
A reference book that incorporates the most current data and information in organic chemistry

Author
Caroline Cooper (editor)

Publisher/Supplier
John Wiley and Sons
<eu.wiley.com/WileyCDA/Section/index.html>

Date/Edition
2010/2nd edition

ISBN
978-1-4398-1164-1

Level
Undergraduate and post-graduate

Price
£48.99

Summary Review	
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

The **Organic Chemist's Desk Reference**, under the editorship of Caroline Cooper, is a resource that academics and researchers in organic chemistry will find extremely useful in their line of work, be it in class or laboratory. It is specifically intended as a reference material at a glance and, as mentioned by the editors, is indeed a useful subsidiary to the *Dictionary of Organic Compounds*. The book is a compilation of an array of scientific information ranging from abstracting services and chemical hazards to spectroscopy and nomenclature.

As a reader whose first language is not English, I find the material extremely readable and easy to understand without any compromise at all on the validity and accuracy of the data or information presented therein. As such, students of chemistry and researchers will find the book invaluable, and it should also appeal to a wider readership in academia. The texts are presented in brief but clear formats with appropriate examples given to illustrate specific points of the text. A fair number of the data and information are tabulated in clear and uncluttered style which enhances the readability of the material.

The book's treatment of nomenclature of organic compounds is commendable and I am convinced that readers will find the guidelines therein adequate and helpful. The conventions followed in nomenclature are detailed enough to be of a good reference material for researchers and is very well illustrated that students of organic chemistry will find it unintimidating at all. The coverage on nomenclature extends to include those of various ring systems and individual classes of compounds in carbohydrates, lignans, and nucleotides to name a few.

I find the inclusion of a chapter on acronyms and miscellaneous organic chemistry terms to be a wise choice, given the range of terms that are in use in contemporary literature.

Stereochemistry and chemical hazards are adequately covered and should be a bonus for chemistry students and researchers alike. The coverage on abstracting services and literature databases which can be accessed in print and electronic format should also be helpful.
The graphics on the soft cover are well-chosen and appropriate for the targeted readers.

I find **Organic Chemist's Desk Reference** *(2nd edition)* to be well written, and very appropriate as a guiding reference. I am recommending to our local university library to acquire a few copies of this outstanding reference book. A copy will definitely be made available at our main organic chemistry laboratory here at the University.

Tevita Voro
Faculty of Science and Technology
University of the South Pacific
Laucala Campus
Suva
Fiji
April 2011

Physical Chemistry for the Life Sciences

Subject area
Biology, Biochemistry, Medicine, Environmental Science

Description

Authors
Peter Atkins and Julio de Paula

Publisher/Supplier
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2011/2nd edition

ISBN
978-0-19-956428-6

Level
Undergraduate

Price
£35.00

In line with other texts by Atkins and De Paula, this book is a must for any lecturer and student in life sciences willing to go deeper into the fundamentals of chemistry. The authors adapt the working method of physical chemistry to the needs of life sciences to produce a brilliant text without losing rigour, quantitativeness and accuracy.

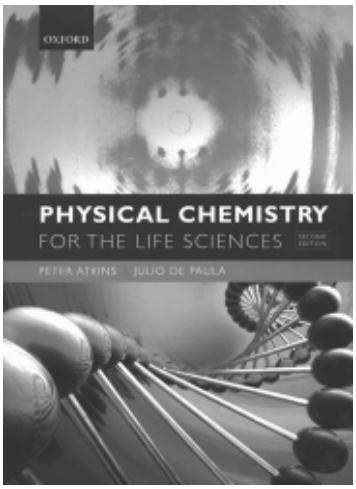
Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

The book revises the foundations of different topics of physical chemistry that are essential to understand the world around us. Thus, the book is roughly divided into four parts: the first one, dedicated to thermodynamics, accounts for the equilibrium processes governing a large part of the processes we observe; the second, to do with kinetics, deals with the foundations of chemical change, i.e. the way chemical bonds rearrange during chemical reactions; a third part, dedicated to the foundations of quantum mechanics, introduces how events take place at the atomic and molecular scale; and a fourth last part deals with spectroscopy, showing how we can observe and identify molecules, specially those of biochemical relevance.

The book includes a variety of resources designed to guide students to navigate through the contents without getting into complications. Thus, for example the “Mathematical tookits” will be of great help, same as the “Checklists of key concepts” and “Checklists of key equations”. A good number of pertinent biological examples are given, very useful to put the content in context. Also, there are worked examples, discussion questions, exercises and projects, as well as laboratory dedicated sections, all of them highlighting different applications of the topics treated in each chapter. The artwork is attractive, including an atlas of structures at the end of the text, into a “Resource Section” including different sets of data used here and there in the book.

In summary, this book points, again, to a large success among students and lecturers.



Moisés Canle López
Dept. of Physical Chemistry & Chemical Engineering
Faculty of Sciences
University of A Coruña
Rúa da Fraga
10. E-15008 A Coruña
Spain
April 2011

Scientific Protocols for Forensic Examination of Clothing

Subject area
Forensic Science

Description
Professional text aimed primarily at forensic practitioners, but will also be of use in undergraduate and postgraduate courses in forensic science

Authors
Jane Moira Taupin and Chesterene Cwiklik

Publisher/Supplier
CRC Press (Taylor & Francis Group)
<www.crcpress.com>

Date/Edition
2010/1st edition

ISBN
978-1420068214

Level
Undergraduate and above

Price
£82.00

Simon W Lewis
Department of Chemistry
Curtin University
GPO Box U1987
Perth
Western Australia 6845
Australia
May 2011

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

Clothing is commonly encountered during forensic investigations and can be extremely important, either in its own right or as a vector for other forms of transfer evidence. While clothing examination may be covered as chapter in larger forensic work, this is the first specialised text focussing solely on this subject. The authors are very experienced forensic scientists with many years work in this field, and so are in a good position to write authoritatively on the subject.

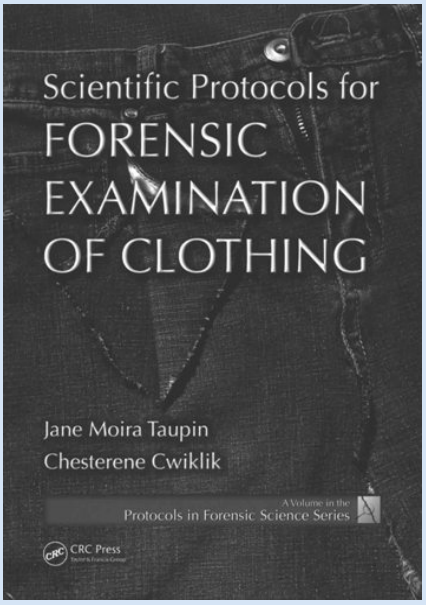
The book is divided into 9 chapters. Chapter 1 is very short and provides an overview of clothing examination, its' importance in forensic investigations and a description of the approach taken in the book. This is described by the authors as a "nonprescriptive holistic approach", which the importance of the context of the evidence being stressed. Chapters 2 and 3 focus on preliminary matters: collection and preservation of clothing as items of evidence, reference and control samples, documentation and recovery of evidence from clothing. Chapter 3 also includes an overview of clothing construction and textiles with associated definitions and terminology.

Chapters 4 to 8 are the real meat of the text where a detailed discussion of the types and sources of evidence found on or as part of clothing takes place. This evidence types include stains and deposits (Chapter 4), pattern evidence (Chapter 5), damage (Chapter 6), human biological evidence (Chapter 7) and traces and debris (Chapter 6 - a long chapter, almost double the length of any of the other chapters). Each chapter is illustrated with numerous colour photographs which are of great assistance in understanding the points made in the text. A major strength of the text is the lavish use of case examples, from both the authors and colleagues in the clothing examination field. This makes the text particularly useful for teaching and training purposes. There is some overlap between chapters, however this is unavoidable in a text such as this. Each chapter has an extensive list of references, with the most recent dating to 2009.

The text concludes with Chapter 9 which deals with significance of the results of the forensic examination of clothing. This chapter is very short and appears to be somewhat of an afterthought. Unlike the other chapters it is not illustrated with case examples, which is a pity, as these would have helped in understanding the issues in presenting results of clothing examinations in court. There is an interesting, albeit brief, discussion of what has been called "observer effects", with the authors coming down very firmly on the side of the examiner having access to background information. They however state that "a comprehensive discussion of bias and controls for bias are beyond the scope of this book". It is a shame that the reader is not pointed towards where such a discussion can be found.

Continued on page 64

Scientific Protocols for Forensic Examination of Clothing



From the publisher...

Scientific Protocols for Forensic Examination of Clothing

By Jane Moira Taupin and Chesterene Cwiklik

The first of its kind, Scientific Protocols for Forensic Examination of Clothing discusses the forensic examination of clothing in criminal cases. It examines the ramifications of DNA profiling and its effect on the screening approach to clothing examination. Coverage includes protocols and procedures, preliminary assessment, examination, testing and sampling, quality assurance and control, and the significance of results.

978-1420068214 251pp 2010 £82.00

Continued from page 63

This book is aimed very clearly at the forensic practitioner with lists of terminology in several of the chapters, a check list for note taking (Appendix 1), and advice on how to develop a reference collection (Appendix 3). A basic understanding of forensic science, in particular trace evidence, along with microscopy knowledge and skills are assumed. There is no doubt the book can be used a reference text to dip into as needed for information on specific subjects. The authors make it clear this was the intent in their introduction, and from the discussions I have had from forensic professionals to whom I showed the book, the text is certainly very useful for this purpose. However I also feel it would be a very useful reference text for the latter stages of undergraduate forensic degrees, as well as for post-graduate studies involving trace evidence. It would also be of use to researchers in the field to place their investigations in context.

Highly recommended.

Statistics and Chemometrics for Analytical Chemistry

Subject area
Analytical Chemistry

Description
Introduction to the main statistical methods used in analytical chemistry.

Author
James N Miller and Jane C Miller

Publisher/Supplier
Pearson Education
<www.pearsoned.co.uk>

Date/Edition
2010/6th edition

ISBN
978-0-273-730-42-2

Level
Undergraduate, Postgraduate

Price
£38.99

Summary Review

range: * poor to ***** good

Academic content	****
Usefulness to student	****
Usefulness to teacher	***
Meets objectives	****
Accuracy	****

Miller and Miller have written a very welcome book with the 6th edition of **Statistics and Chemometrics for Analytical Chemistry**. In an excellent introduction they take the opportunity to go back to basics and very usefully formalise what should be "common sense" to every analytical chemist. As such, the introduction should give the more experienced reader a nice refresher of the need to keep basic principles in mind, which will certainly help with teaching this material to novices in the field. Some issues may seem obvious, but, as they are so essential to get right merit being mentioned in a suitable context. Not that this book concentrates solely on simple, basic material: it quite comprehensively covers the main concepts in statistics as applicable to analytical chemistry and introduces more recently "in vogue" subjects such as Bayesian statistics and chemometrics. The list of further reading at the end of each chapter will aid those interested in more specific applications.

Context is something provided throughout in a very useful manner. Well-chosen examples make sometimes rather dry concepts come alive and, moreover, are used very nicely to guide the reader through the relevant mathematical steps. Hence they not only serve to show the relevance of topics, but also aid in developing a very practical understanding of their application. Practicality is kept in mind throughout, even if sometimes the mathematics can get rather involved. Whilst the choice of symbols is perhaps not always optimal for immediate understanding, if always based on common conventions, the reader is guided step-by-step through a relevant application after each important new concept is introduced. Similarly, the exercises at the end of each chapter are based on (referenced) papers from the peer-reviewed analytical literature.

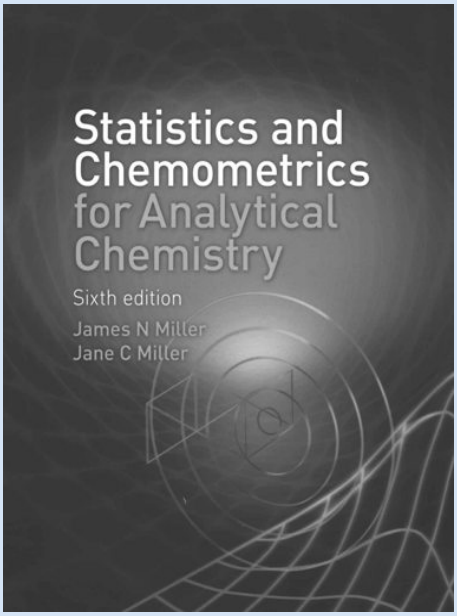
Design of experiments is referred to throughout, to minimise the in evitable measurement errors as well as to avoid unnecessarily high numbers of analyses. What adds to the value of this text for the reader looking for a targeted solution, is a decision tree at the start of the appendix section, aiding rapid identification of the optimal method of analysis. Whilst links to the text could be a bit better, it will no doubt be very useful when referring back to this book in the future.

As is expected, useful electronic resources are provided, including Microsoft PowerPoint slides of all diagrams and an instructor manual. Perhaps this is slightly churlish, but I was a bit disappointed that even though Excel and Minitab are mentioned frequently and used for many examples, no electronic files of the example data are supplied to facilitate analysing them. No doubt the authors have such files, including the actual analysis, readily available and hopefully the publisher can make these available on-line. This would also minimise confusion that at points arises due to slightly different terminologies used, most instances of which are covered in the text.

Frank J M Rutten
School of Pharmacy and EPSAM
Keele University
Keele ST5 5BG
April 2011

Continued on page 66

Statistics and Chemometrics for Analytical Chemistry



From the publisher...

Statistics and Chemometrics for Analytical Chemistry

By James N MIller and Jane C Miller

This popular textbook gives a clear account of the principles of the main statistical methods used in modern analytical laboratories. Such methods underpin high quality analyses in areas such as the safety of food, water and medicines, environmental monitoring, and chemical manufacturing. The treatment throughout emphasises the underlying statistical ideas, and no detailed knowledge of mathematics is required. There are numerous worked examples, including the use of Microsoft Excel and Minitab, and a large number of student exercises, many of them based on examples from the analytical literature.

978-0-273-730-42-2 296pp 2010 £38.99

Continued from page 65

This text has been very carefully edited and only the odd error has escaped the clearly rigorous editing process. Eq.3.1.1 displays the variance s^2, rather than the standard deviation s. This is readily recognised as the correct formula was applied in the worked example directly below.

Included in this edition is a very welcome introduction to the ever more important field of chemometrics. As my PhD student told me (thanks for your input Rebecca!): “I wish I had this when I started with chemometrics.” The back-to-basics approach firmly establishes the main principles and terminology, when most specialised texts tend to move on to complex mathematics and specialised terminology rather quickly. Matrix calculations may be underpinning chemometrics, but as the authors show, the main concepts can be explained and appreciated without too much mathematics. For the more advanced concepts the coverage is necessarily rather limited and other than occasional users will need to consult more specialised texts, such as those recommended by the authors. Kenneth Beebe’s *Chemometrics: A Practical Guide* is arguably a notable omission from their list.

In terms of the targeted student audience, sections can be a valuable additional resource for general chemistry students. Students on a specific analytical course are more likely to benefit from reading the entire book and postgraduate students as well as those working in the analytical field will find it a very valuable resource of basic information and pointers to further reading.

As will always be the case with a text like this, choices about what to include and indeed exclude have had to be made. Whilst it has many merits and I would certainly recommend this book, I personally missed some details. Bayesian statistics gets an intriguing introduction, and whilst mention is made of a number of recent applications, there are no specific references to those for the interested reader. This is indeed a rather puzzling omission in all chapters. Clearly the authors know many exciting examples and could have included references allowing the reader to investigate these. I strongly urge the publisher to make this information available as an electronic resource. Inclusion of Excel and Minitab examples is excellent, but could be a bit more extensive, e.g. I expect the random function will more often be used than a random table consulted. The Internet resources suggested are rather limited. A quick search on *chemometrics* and *tutorial* gives just under 62,000 hits and a brief exploration of a few of these does reveal some very promising resources. Articles focussed on specific subjects within chemometrics by Tony Davies in Spectroscopy Europe are freely accessible on the

Statistics and Chemometrics for Analytical Chemistry

web and give interesting and highly practical insights in the field. A very minor point: when discussing sampling issues using pharmacy as an example the authors could refer to the Good Manufacturing Practice (GMP) guidelines.

Concluding on a certainly warranted high note, I have found much of interest and use in this book and will no doubt be referring back to it both for teaching (UG and PG) and research purposes. Any (minor) shortcomings can hopefully be addressed by the publisher in the form of additional electronic resources and should not detract from an excellent and very useful text.

Study and Communication Skills for the Chemical Sciences

Subject area
Science, Study Skills, Education

Description
Guide to developing study and communication skills for all third level students - not just those in chemical sciences

Authors
Tina Overton, Stuart Johnson and Jon Scott

Publisher/Supplier
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2010/1st edition

ISBN
978-0-19-953968-0

Level
Undergraduate

Price
£19.99

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

We greet them every autumn, those new undergraduates who think that they can do anything because they have done enough to achieve a place on a course that they have chosen. More and more, these include mature students with experiential learning but not necessarily 'our' way of expressing it, as well as the fresh-faced school leavers. That's when the hard work begins: just because they have passed this hurdle does not mean that they are equipped for the demands of third level, for independent study without the discipline of the homework journal or the guided time management and supervision of managers or parents and guardians.

This book should be mandatory reading for students in any scientific discipline, not just chemical, and indeed has many chapters of relevance to all undergraduates. It has chapters which are of use for all stages of the undergraduate programme and aims to prepare the student for life beyond their studies as well.

Tina Overton needs no introduction for anyone involved in chemical education and her co-authors are well experienced in the fields of personal student development and biological studies. This reviewer wonders why the authors have perhaps limited their audience by including the word 'chemical' in the title, as the text is so useful and pertinent and could help a much wider student population.

The book has seventeen chapters, each broken down into a number of sections, all ending with a summary and some including references, sources, or further reading. One might question the order in which the chapters are presented as the sequence doesn't always seem to fit, but this is a book for the entire undergraduate programme and as such can be picked up and read as a reference and help throughout the years of study to degree level.

It begins by contextualising the skills required for undergraduate success and differentiating between those and the study skills required for success in the second level system. There is not anything there that we have not told our 'freshers' year in year out, but what we may sometimes forget is that they are caught up in the excitment of this new experience and are bombarded with so many activities and ideas in the early weeks that they may not quite catch them all. Asking them to look at this book will not tax them: the chapters are short but the advice is invaluable.

Three chapters talk about how to make the most of lectures, tutorials and group work, and practical work. This includes brief mention of the approaches necessary for the ever more popular problem-based learning, which can be a total culture shock for new undergraduates.

Marie Walsh
Department of Applied Science
Limerick Institute of Technology
Moylish
Limerick
Ireland
April 2011

Study and Communication Skills for the Chemical Sciences

From the publisher...

Study and Communication Skills for the Chemical Sciences

By Tina Overton, Stuart Johnson and Jon Scott

Written in a practical, motivational style, with plenty of examples and advice to help the reader master the skills being explored, the book explains how to get the most out of lectures, tutorials, and group work; how to get the most out of the vast array of information that is available in books, in journals, and on the web; how to communicate your work and ideas effectively to others; and how to revise for and complete exams to give yourself the best chance of success.

978-0-19-953968-0 272pp 2010 £19.99

Six chapters deal with different areas around writing: working with different information sources; choosing the right writing style; writing essays, assignments, practical and project reports; writing for the non-scientific audience and avoiding plagiarism. While citation and referencing are dealt with in the first of these chapters, plagiarism comes last. Again the book is not designed to be read in sequence but perhaps the plagairism could have come closer to the advice on referencing. Other methods of communication, using presentations and posters, are also addressed. Throughout the book the style is clear, succinct and anyone involved in encouraging students to develop these varied skills will find themselves nodding in agreement as they read.

The systems we work in are still greatly driven towards examination as assessment and the text addresses the vital areas of revision, exam preparation and technique and using feedback.

The authors have guided the students through various skills that they will have to develop throughout their coursework but it doesn't all end with the degree! The final section of the book looks at career planning, from writing the CV to personal development planning.

Some courses include introductory modules on study and/or writing and presentation skills, others don't. Some lecturers give explicit guidance, and again others don't! If your course does include the personal development modules then this could be the recommended text you have been searching for. If your course doesn't have personal development modules then this is the recommended text you will want your students to access. Lecturers setting assignments, collecting practical and project reports, etc, will find it gives them hints for setting clear guidelines for students to follow.

The authors are to be congratulated for distilling their experiences into such a useful handbook. Every library should have several copies!

Study Skills for International Students

Subject Area
Study Skills, Education

Description
Written for all international students studying at universities in the UK, it sells itself as a "...quick reference guide helping you navigate your way through social and academic life"

Authors
Kathleen McMillan and Jonathan Weyers

Publisher/Suppliers
Pearson Education
<www.pearsoned.co.uk>

Date/Edition
2011/1st edition

ISBN
978-0273734949

Level
Undergraduate

Price
£17.99

Claire Henstock
Sheffield International College
The University of Sheffield
North Campus
Broad Lane
Sheffield S3 7HQ
March 2011

Study Skills for International Students is one of a series of books in 'The Smarter Student Series'. It claims to help international students "studying in the UK for the first time" by offering "practical support and guidance" in all fields of university life, but could be separated into two main areas; those of academic and life skills.

Summary Review

range: * poor to ***** good	
Academic content	***
Usefulness to student	***
Usefulness to teacher	**
Meets objectives	***
Accuracy	***

The preface states that the book is aimed at both undergraduates and postgraduates, students who may and may not be proficient in English, along with those who may or may not know about studying in Europe. It is aimed at all international students studying in the UK, therefore, with a variety of needs, which probably accounts for its 57 chapters, divided into 6 'toolkits' or sections. The first chapter explains how to use the book, giving some indication of its complexity, and highlighting that each chapter can be taken as a separate unit, picked up and referred to whenever needed. Each chapter offers practical tips and a language section that offers a short glossary of terms to help less fluent readers. There are cross-references to other chapters and a short appendix offering a few resources for students to copy and use, including a blank revision timetable and budget for student expenditure. Of the six main sections, topics include "Managing yourself in the UK", with chapters on banking, social life, and time management, and "Improving your Academic Writing".

The book addresses target readers explaining what and how 'you' can learn from it, and is therefore more of a self-help guide to students than a book to be used in the classroom. As such, it is rather dense and potentially too complex for less proficient speakers of English, despite the vocabulary sections. Some statements the book makes, such as "Originality is valued (in the UK learning environment) and, to a certain extent, eccentricity is tolerated" (p11) are questionable. Other claims are arguably too obvious to be included, e.g. "British school classrooms are less formal than those in many other countries, but more formal than in others" (p11), and may deter students who have a poorer grasp of English, or those who simply do not enjoy reading.

Students would need to employ skimming and scanning techniques to pick out sections of the book that are useful to them, and there is the danger that they would lose interest due to the sheer volume of information that is packed in. Moreover, as a self-help book, there are few activities for students to try, despite the practical tips at the end of each chapter, which only the most active students will attempt.

For students about to embark on post-graduate study, and with a high level of English, the "Choosing a dissertation or project topic" section may be of value, with an easy-to-read table that explains components of a dissertation particularly well. For undergraduate students, the chapter focusing on laboratory sessions offers basic tips, and practical information, which students who have never entered a lab in the UK before may find useful.

For Personal Tutors at a higher education institution, sections of this book could be used to aid tutorials. Motivated students may find it of use, but in trying to offer everything to every international student, this book, at times, loses impact.

Sustainability Education: perspective and practice across higher education

Subject area
Sustainability, Education

Description
Covering a wide range of disciplinary areas, the book presents highly researched contributions towards generating a more sustainable future

Authors
Paula Jones, David Selby and Stephen Sterling (editors)

Publisher/Supplier
Earthscan

Date/Edition
2010/1st edition

ISBN
978-1-84407-878-3

Level
Academics, students, policy makers and senior managers

Price
£29.99

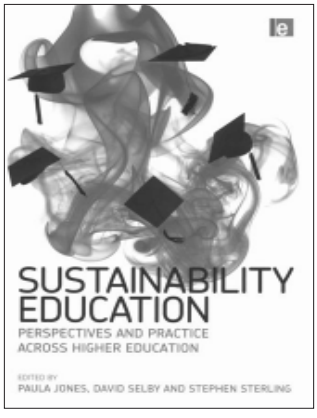
Summary Review	
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

Through an extensive review of curricula and pedagogical methodologies, **Sustainability Education: Perspectives and Practice Across Higher Education** seeks to address the ways in which universities can contribute to the sustainability agenda. Whilst the challenges of transforming learning and teaching practices are acknowledged, the book aims to demonstrate the "disciplinary potential and benefits accruing from infusing sustainability concepts, issues and case studies into learning and teaching, in terms of the quality of student motivation and learning, teacher satisfaction and opportunities for innovative and active learning". In short, the ethos is directed towards embedding learning, transformation and critical inquiry amongst real life issues that will be extended throughout professional and continuing development.

So how and to what extent does the book do this? The book is highly researched and consists of contributions from a wide range of disciplinary areas: general higher education, business studies, geography and environmental sciences, nursing, law, the arts and humanities, engineering, language education and teacher training.

The first four chapters set the sustainability education scene and seeks to explore the interdisciplinary approaches in addressing some of the challenges noted in the area. Whilst some policy makers may already be convinced of its importance, this book provides a thorough overview of some of the pedagogical methodologies by which practitioners can transform their learning and teaching practices. Much of this is denoted within the subsequent chapters, in which the work of 24 subject specific authors explore the disciplinary areas in detail – here practical insights and ideas into embedding sustainability into curricula and pedagogical development are discussed.

To summarise, this book has a clear academic justification and is aptly outlined with examples of creative and relevant ideas that could easily be adapted and implemented in many fields – particularly for those subject areas that were intentionally omitted. Readers can easily navigate to their field of interest and the book would be a highly recommended resource for many, including the student market, academics, practitioners, policy makers and senior managers.



Nancy El-Farargy
NHS Education
Thistle House
91 Haymarket Street
Edinburgh EH12 5HE
April 2011

The Laws of Thermodynamics: a very short introduction

Subject area
Thermodynamics, Physics

Description
Shport introduction to thermodynamics for the general reader

Author
Peter Atkins

Publisher/Supplier
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2010/1st edition

ISBN
978-0-19-957219-9

Level
General reader

Price
£7.99

A good understanding of thermodynamics is vital for any student in the physical sciences. If we agree with C P Snow, not knowing the Second Law of Thermodynamics is akin to having never read a play by Shakespeare. Peter Atkins reminds of this, in this addition to the OUP's Very Short Introduction series.

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	***
Usefulness to teacher	***
Meets objectives	**
Accuracy	*****

The book deals with each of the four laws chapter by chapter, with an extra chapter on Free Energy slipped sensibly between the second and third laws. Atkins starts with the zeroth law and explains the unusual numbering system. The main section discusses the concepts of thermal equilibrium and temperature. This leads naturally to the relationship between heat and temperature, which Atkins describes well, and shows how it relates to the Boltzmann distribution.

The later chapters develop these points and introduce more, such as the relationship between entropy and spontaneous changes; requiring the entropy to increase of the universe rather than the system. A good example of the author's understanding and ability to communicate is in the chapter on the second law. Carnot's work on steam engines is introduced and it is stated that the heat sink is as important as any other part of a heat engine, so the cooling towers of a power station are just as important as the turbine. An insight that often gets overlooked by chemistry students worried about exams.

This book is, as expected, factually without fault. One criticism I have is that some processes being described, I feel, too deeply, i.e. the idea of three bodies being in thermal equilibrium. This prevents him exploring some of the more unusual insights in more depth, as the format of the book is a short introduction. I would have been especially keen to see the section on temperatures below absolute zero expanded. How these might be achieved is explained well, then the laser is used as an actual example of a system that functions at these temperatures, but why is not clarified. I found myself going of to read the section on lasers in the author's textbook to understand the example.

For the interested non-scientist (the target audience) the editing of the book has let it down, with technical language distracting from a good story. An example is that systems are often described as adiabatic not isolated. The art work has the feel of being taken from a text book and some do little to improve the readers understanding of the text.

For lecturers and students this book is worth reading, the lack of problems and worked examples, allowing a more relaxed approach. For the general reader, who C P Snow hoped would understand the basic scientific laws that govern the Universe, this book is too technical in its language and without enough real life context to appeal. This is a shame as there is much thought and effort gone into this book.

Lee Reilly
Biology, Forensics and Sport
University of Derby
Kedleston Road
Derby DE22 1GB
April 2011

The Light Fantastic...

Subject Area
Physics, Optics

Description
A self contained, modern and thorough presentation of optical physics, covering both classical and quantum optics and containing an interesting mix of applications.

Author
Ian R Kenyon

Publisher/Supplier
Oxford University Press
<ukcatalogue.oup.com>

Date
2008/1st edition

ISBN
978-0-19-856646-5

Level
Undergraduate, postgraduate

Price
£33.99

Summary Review	
range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

At least since the invention of the microscope and telescope, optics has been a central topic in the physical sciences. This ambitious text succeeds in displaying the continued importance of the subject and has several features that make it a distinct and useful addition to the cannon of optics books. There is the broad and balanced coverage of the three main branches of optics, geometrical (ray) optics has four chapters, physical (wave) optics seven chapters and quantum (photon) seven chapters. Another strong feature is the emphasis on optics in the laboratory and in technology, with extensive coverage of instrumentation, devices and applications. This makes the book particularly attractive to experimental physicists. To indicate the range of topics, there are sections on gravitational wave detectors, fibre optic gyroscopes, and the laser cooling and trapping of atoms. Considerable effort has gone into making the text self contained. A chapter on electromagnetic theory preludes the topics of polarisation, scattering and dispersion. Two chapters on the quantum nature of light and matter and on the quantum mechanics of atoms provide sufficient background for the discussion of lasers, detectors, optical fibres, light-atom interactions and the quantisation of the electromagnetic field. The broad scope of the text, and the inclusion of background material has resulted in a weighty tome, at over 600 pages. A book of this size however does deserve a more comprehensive index than is currently provided.

A feature that particularly appealed to the reviewer was the large number of high quality line diagrams embedded in the text (some 450 produced by the author). These are strategically placed and have helped save many additional pages of description. Less useful were some of the figures imported from other sources. For example figure 3.33 detailing the refractive indices and dispersion indices of a selection of 'Shott' glasses is barely legible. The author has a good writing style and provides clear and succinct accounts of each topic. The mathematical level is within the compass of a final year physics (or engineering) undergraduate and derivations are complete and easy to follow. The number of worked examples in the text is fairly low, but they are well selected. There are a modest, but sufficient number of exercises, together with model solutions to make the text a useful teaching text. No single course could however encompass all the material in the book. The subtitle of the book is '*A Modern Introduction to Classical and Quantum Optics*'. I think the author has succeeded in providing a modern perspective without sacrificing essential material. It is worth selecting examples of the breadth of the material presented.

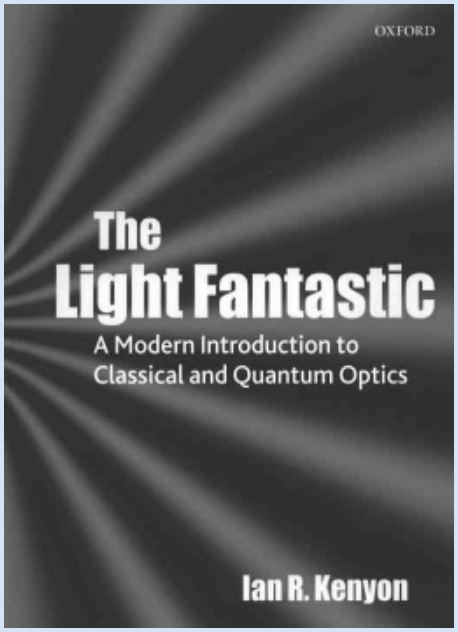
A quantity of practical importance, called the *etendue*, and which expresses the overall light gathering power of an optical system, is discussed in several contexts which include, the matching of entrance and exit pupils in optical instruments (section 4.2.2), the throughput performance of a grating spectrometer (section 6.9.2), its relation electromagnetic modes and the spread of laser beams (section 14.3) and in relation to the uncertainty principle (section 21.10.1). However, not all these aspects could be found via the index.

Interferometry (chapter 5) provides a nice account of Fabry-Perot spectrometry. In the early part of this chapter, monochromatic waves are

Continued on page 74

Alan McCall
School Physics, Astronomy & Mathematics
University of Hertfordshire
Hatfield AL10 9AB
November 2010

The Light Fantastic...



From the publisher...

The Light Fantastic - a modern introduction to classical and quantum optics

By Ian R Kenyon

This book presents a thorough and self-contained introduction to modern optics, covering in full the three components ray optics, wave optics, and quantum optics. The text covers all that would be needed over a comprehensive course in optics at the advanced undergraduate or beginning graduate level. Digital cameras, LCD screens, aircraft laser gyroscopes, and the optical fibre-based internet illustrate the penetration of optics in twenty-first century life: these and many more modern applications are presented from first principles.

978-0-19-856646-5 656pp 2008 £35.00

Continued from page 73

introduced. Here the author pauses to explain the alternative choices of the exponential notation expi(ùt-kx) and expi(kx- ùt), saying where these are likely to be encountered and why different topics make different choices. I have rarely seen this in print. Astronomical telescopes receive close attention in chapter 8, probably reflecting the author's close association with the active astronomical department at Birmingham. This chapter provides many further examples of interferometry in action. There are also some nice and diverse examples of diffraction in chapter 6. Included are include lunar occultation, microprocessor lithography and the properties of Gaussian laser beams.

Chapters 12 and 13 introduce sufficient background quantum theory for the subsequent chapters on lasers, detectors, optical fibres and light atom interactions. Interesting items sandwiched into this standard material are discussions of 'which path' interferometer experiments and the measurement of photon momentum and spin. A printer's error in my copy meant that sections 12.4 to 12.8 were missing. In addition, a second 'ghost' chapter 12 repeated some of chapter 11. I hope that the publishers quickly issue a corrected reprint. The coverage of lasers is comprehensive. Most types of laser are covered and the important topics of Q switching and mode locking, the generation of ultra-short pulses and non-linear effects are covered. Photo-detectors and optical fibres, topics of great technological importance are each allocated a chapter. A brief discussion of photonic crystal fibres (micro-structured fibres and their use to generate a broad continuum of spatially coherent light, a *supercontinuum* source brought the fibre optics chapter to an interesting end.

The final chapters on light-atom interactions and quantisation of the electromagnetic field provide an introduction to quantum optical theory. These subjects are usually reserved for more specialist texts, but they are so important that it is good to see them represented in what otherwise would have been a more standard looking optics textbook. The discussions are clear and the descriptions of the beautiful experimental work on the quantum nature of light will leave the reader wanting to discover more.

Any undergraduates who have completed second level courses in optics, electromagnetism and mathematics will find this text accessible. It has been well researched as is evident from the acknowledgments and it will certainly expand the reader's awareness of the applicability of modern optics. Graduate students involved with optical measurements across a range of physics disciplines will find this book a very useful resource.

The Theory of Open Quantum Systems

Subject area
Physics

Description
The physical concepts and mathematical techniques used to investigate the dynamics of open quantum systems.

Authors
Heinz-Peter Breuer and Francesco Petruccione

Publisher/Supplier
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2007/1st edition

ISBN
978-0-19-921390-0

Level
Post graduate and research

Price
£43.95

Zia Khan
CA/151,9/A
Muhammad Hussain Road
Model Town A
Bahawalpur
Pakistan
April 2011

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

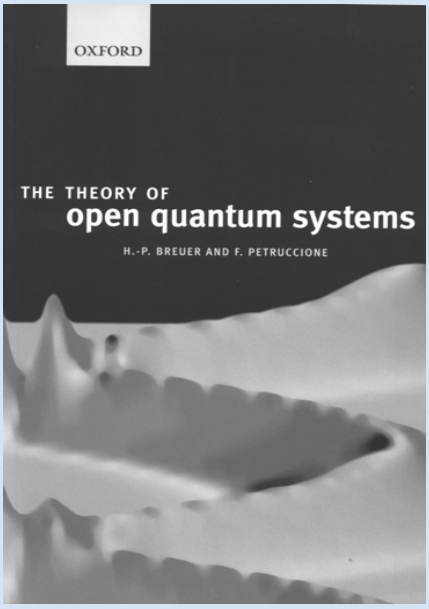
Compared to the rather simplified study of closed systems, the study of open systems universally underscores highly dynamic complexities relating to both manmade mechanisms and the objects in nature. This is all the more true when the study of open systems addresses as complex a phenomenon as quantum mechanics and its application. **The Theory of Open Quantum Systems**, by Breuer and Peteruccione, appears to have successfully covered many miles in operationally defining the advanced and latest concepts of this relatively young (starting life in 1900 with Planck's theory of black body radiation) scientific discipline. Notwithstanding the challenging contents of book, in terms of selection as well as description of phenomena, the authors claim that their target consumers are undergraduate and graduate students, having a basic understanding of quantum mechanics and elementary knowledge of probability theory.

The body text organisation of the book divides the topics into five parts of widely varying lengths, while all but Part III contain 2 chapters each. Part I successively addresses the classical probability and quantum probability in two chapters with concentration on the phenomena important for a better understanding of the subsequent topics in the books. The classical probability is therefore explained with a matter of fact focus on probability space, random variables and stochastic processes, while the Markov processes, precise deterministic processes and Levy processes are interpreted with commensurate detail. The emphasis of Chapter 2 is on the standard formulation of quantum mechanics. To fully characterize the statistical properties of a quantum mechanical ensemble, a density matrix is introduced. The concept of composite quantum system, quantum entropies and theory and description of quantum measurement provide both students and researchers useful information on theoretical and analytical perspectives which are necessarily required for the study of open systems.

Part II of the book begins with a survey of various types of master equations for analysing the density matrix theory. The emphasis of Chapter 3 are the laws describing the dynamics of open quantum systems, derived from the unitary dynamics of the total system. The Markovian dynamics of open systems are discussed in tangible detail. Hence the explanation of Markovian density matrix equations with a number of derivations furnishing useful tools for investigation of phenomena like irreversibility, entropy production, and relaxation to equilibrium. This chapter also includes a discussion on quantum optical and the quantum Brownian motion master equation, which helps the understanding of the standard application of the dynamics of open systems with a number of examples and discussion on the basic properties of corresponding master equations. Additionally, the laser equations and the phenomenon of super radiance are explained while considering dynamics of many-particle system and the mean-field level. The authors discuss a number of examples including quantum Boltzmann equation, the time-dependent Hartree equation, and the non-linear Schrodinger equation. The environment-induced, dynamical destruction of quantum coherence is the subject of the second chapter of Part II under the heading of decoherence. The mathematical derivations are augmented by graphical illustration which helps better explain

Continued on page 76

The Theory of Open Quantum Systems



From the publisher...

The Theory of Open Quantum Systems

By Heinz-Peter Breuer and Francesco Petruccione

This book treats the central physical concepts and mathematical techniques used to investigate the dynamics of open quantum systems. To provide a self-contained presentation the text begins with a survey of classical probability theory and with an introduction into the foundations of quantum mechanics with particular emphasis on its statistical interpretation. The fundamentals of density matrix theory, quantum Markov processes and dynamical semigroups are developed. The most important master equations used in quantum optics and in the theory of quantum Brownian motion are applied to the study of many examples.

978-0-19-921390-0 340pp 2007 £43.95

Continued from page 75

interrelated and complicated phenomena such as the dynamical selection of a preferred basis, the decoherence time, and the emergence of coherent subspaces. This is followed by the discussion of various fundamental physical decoherence mechanism, with the interplay between decoherence and dissipation by investigating the damped harmonic oscillator in the quantum optical limit. The experiment on the decoherence of electromagnetic field states, performed by Haroche and coworkers, is considered as an application of the theoretical analysis provided in this chapter. Part II ends with the discussion on the role of environment-induced decoherence in the quantum theory of measurement, leading to a detailed description of the dynamical model for a quantum measurement.

The next two parts of this title successively exhibit a disproportionate scheme of arrangement in terms of the length of body text. Unlike other parts of the book, Part III is not only noticeably longest, it is also divided into four chapters. The discussion of Stochastic processes in Hilbert space, the part heading, begins with addressing the probability distribution on Hilbert space in Chapter 5. Fundamental focus of the authors is a new kind of quantum statistical ensemble, described with the help of mathematical framework of functional integration in Hilbert space. The chapter further helps understand the probability distributions on the space of density matrices. This is followed by the discussion on stochastic dynamics in Hilbert space, the subject matter of Chapter 6, focusing on the dynamics of open quantum systems from a new perspective. The authors provide a detailed account of the relation between dynamical semi groups and piecewise deterministic processes in Hilbert space. The discussion is supported with advanced and elaborate mathematical formulations, such as microscopic derivation of various stochastic processes, explaining application of the related theoretical perspectives. Moreover, a number of simple examples for stochastic processes in Hilbert space and their derivations in the framework of continuous measurement theory help users better understand highly abstract phenomena. The next chapter briefly reflects on the difficulty of numerical integration by deterministic algorithms and proceeds to suggest and explain an alternative, the so-called Monte Carlo or stochastic simulation methods for numerical analysis of stochastic processes. Simulation techniques for the two stochastic processes, piecewise deterministic process and diffusion process, in Hilbert space are described and illustrated with the help of advance mathematical derivations and specific examples respectively. A detailed comparison of the numerical performance of the stochastic wave function method and of the integration of the corresponding density matrix

The Theory of Open Quantum Systems

equation is also provided in this chapter. The last chapter of Part III, Chapter 8, includes a brief survey of the quantization of the electromagnetic field while its emphasis lies on the derivation of the quantum operations and the corresponding stochastic processes for various detection schemes. The stochastic dynamics are formulated in terms of a stochastic equation of motion for the reduced density matrix of the source. Incomplete measurements are also described, showing a stochastic density matrix equation which does not preserve the purity of quantum states. This chapter also provides a detailed discussion of some important physical problems, specifically those involving the interplay of coherent quantum evolution and dissipative processes. The investigation of the emergence of dark states in the interaction of atoms with coherent laser fields is augmented with the derivation of corresponding piecewise deterministic process for the quantized motion of the atoms.

Part IV of the book is minimally apportioned in the distributional scheme of the body text of this title, as it is devoted only 58 of 606 pages, inclusive of references provided at the end of each chapter. The authors introduce here what they call some powerful techniques which allow a systematic description of the non-Markovian features of the dynamics of open systems. Chapter 9 discusses two variants of projection operator techniques. One is the Nakajima-Zwanzig technique; an integro-differential equation involving a retarded time integration over the history of the reduced systems, and the other is the time-convolutionless technique; providing a first-order differential equation which is local in time. The rules for the perturbation expansion of the convolutionless generator are also developed and the most important general results derived in this chapter lead to the specific physical applications discussed in Chapter 10. The authors treat the damped Jaynes-Cummings model and the spontaneous decay into a photonic band gap as the specific examples for applying the time-convolutionless projection operator technique. Vivid illustrations and elaborate derivations are used to describe quantized Brownian motion, showing an important role played for certain parameters by non-Markovian effects. The specific examples for this application include damped harmonic oscillator and the spin-boson model.

Relativistic quantum process are discussed in Part V of the book, Chapters 11 and 12. Measurement and state reduction in relativistic quantum are studied in Chapter 11, by considering the state of a quantum system as a functional on the set of spacelike hypersurfaces in Minkowski space. The measurements of non-local observables and the verification of non-local entangled quantum states are discussed in detail, providing the proof of the Popescu and Vaidman theorem along with the discussion of its physical application. Furthermore, this chapter also discusses the preparation of states, the notion of exchange measurements, and the instantaneous transfer of a coherent quantum state.

Lastly, Chapter 12 combines certain methods, including functional methods from field theory, with the super-operator technique to derive an exact, relativistic representation for the reduced density matrix of the matter degrees of freedom. Hence the functional super-operator technique illustrated by means of a specific application. The possibility of the destruction of coherence of the superposition of many-particle states is also analyzed in this chapter.

Finally, with 2,889 equations and 117 illustrations this books provides great help in understanding the theoretical phenomena related to open quantum system. However, the difficulty is that most of the mathematical formulations involve derivations which may appear much too complicated even to accomplished scholars on the subject. Therefore, including the title in the recommended, let alone the required, reading list of undergraduate and graduate students would be an unrealistic expectation and unfairy taxing. Having said that, the book undoubtedly is an invaluable addition in the literature on quantum theory. It is well researched and contains a rich repository of chapter end references. The title should be placed in the reference category, as it is equally useful for research projects of higher degree level students and professional researchers in the field.

Thermal Physics of the Atmosphere

Subject area
Physics

Description
A concise introduction at roughly Masters level to the role of thermodynamics in atmospheric physics

Authors
Maarten H P Ambaum

Publisher/Supplier
Wiley-Blackwell (John Wiley and Sons)
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2010/1st edition

ISBN
978-0-470-74515-1

Level
Postgraduate; advanced undergraduate

Price
£45.00

Summary Review

range: * poor to ***** good	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

Thermodynamics can seem a very abstract subject to many students and there may well be some virtue in introducing it by concentrating on its application to a single real system. When that system is as exquisitely fragile, rich in physics and wrapped in controversy as the Earth's atmosphere, the argument becomes even more compelling. Although Maarten Ambaum's **Thermal Physics of the Atmosphere** is based on a Masters Course at the University of Reading, I would suggest those teaching thermodynamics at Bachelor's level might also find a lot to interest them.

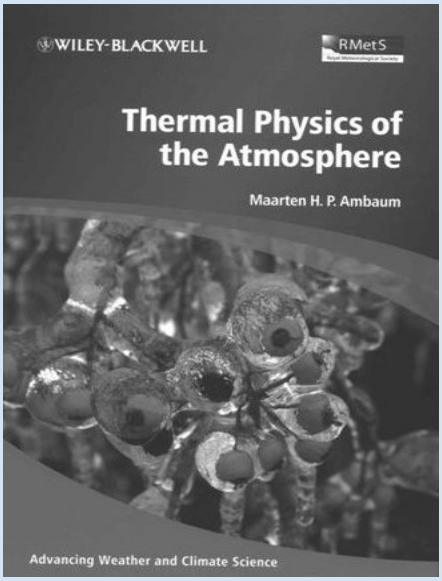
First impressions are good: a beautiful photograph taken by Reading undergraduate Matthew Lewis graces the front cover - berries encased in dimpled ice shrouds after a freezing rain event in Oklahoma. The author acknowledges that this is not a stand-alone text and the usual suspects, e.g. Adkin's *Equilibrium Thermodynamics* and (out of equilibrium) Kondepudi & Prigogine's *Modern Thermodynamics*, may well be required to fill out the details. However there is a measured introduction to the basic definitions and ideas, requiring a degree of trust (if you'll forgive the pun) on an unknowing reader's part that the formalism will subsequently be useful in the context of atmospheric physics. In these introductory pages, a bright student may worry that no real wall is as smooth as that shown in Figure 1.4 in introducing the microscopic basis of gas pressure.

At the same time this student will see, in a revealing plot a couple of pages earlier, that although isothermal atmosphere models are useful ways to introduce concepts such as the scale height, they have natural limitations when describing the Earth's atmosphere. I have to confess to a weakness for graphical methods of solution or nomograms, partly because of their beauty but also because you learn so much more about the effects of changing parameters. This book promotes these tools - particularly the tephigrams widely used in atmospheric science - and Appendix C describing these was one of my favourite parts of the book. But not the favourite - that must be reserved for Chapter 7 on cloud drops which is a small hymn to the Clausius-Clapeyron equation and its developments. First, we see how the saturated vapour pressure above a surface curved by surface tension is modified from its value above a plane surface - the Kelvin effect. But spontaneous droplet formation would then require a relative humidity in excess of 400% and this does not happen in the Earth's atmosphere.

So we must move on and see how dissolved particles can reduce the saturation pressure; then combine both effects to find how the saturation ratio depends on radius at a given temperature - a very nice mathematical exercise for an undergraduate problem set. Of course, some droplets will be charged and a charged droplet seeking to lower its electrostatic energy will want to grow: put another way, make a charged drop too small (the Rayleigh radius) and it will explode under the mutual repulsion of its charges. In a coda to the chapter, we need to figure out if the removal of vapour by the growing droplet leads to a drop in the local vapour pressure (and so a slowing of the growth). The question is whether the diffusive flux maintains a steady supply of saturated vapour and how this flux is affected by the release of latent heat from the growing drop. I hope I've

James L Collett
School of Physics, Astronomy & Mathematics
University of Hertfordshire
Hatfield AL10 9AB
April 2011

Thermal Physics of the Atmosphere



From the publisher...

Thermal Physics of the Atmosphere

By Maarten H P Ambaum

Thermal Physics of the Atmosphere offers a concise and thorough introduction on how basic thermodynamics naturally leads on to advanced topics in atmospheric physics.

The book starts by covering the basics of thermodynamics and its applications in atmospheric science. The later chapters describe major applications, specific to more specialized areas of atmospheric physics, including vertical structure and stability, cloud formation, and radiative processes. The book concludes with a discussion of non-equilibrium thermodynamics as applied to the atmosphere.

978-0-470-74515-1 256pp 2010 £45.00

said enough to make it clear that a lot of useful core physics can be taught in a context and geometry permitting reasonably simple calculations.

The other applications chapters focus on mixtures and solutions, thermal radiation, convective stability, radiative-convective equilibrium, and non-equilibrium processes. Each chapter has a useful problem set with many interesting applications: the virtual temperature, with respect to methane, of Titan's thick atmosphere; adiabatic compression and Concorde's cabin air ventilation; pressure heating in ballistics; the operation of a Wilson Cloud Chamber; and something I'd never seen before, an estimate of rainfall rates based on entropy production - fascinating!

One small thought for a future edition: the book has no colour and as a result many of the diagrams and contour maps are quite difficult to entangle. However, this is a minor criticism of a very useful and carefully constructed book.

Understanding Physics

Subject area
Physics

Description
A textbook on basic university physics for those starting a physics degree but much of the material could also be valuable to students of engineering.

Authors
Michael Mansfield and Colm O'Sullivan

Publisher/Supplier
John Wiley and Sons
<eu.wiley.com/WileyCDA/Selection/index.html>

Date/Edition
2011/2nd edition

ISBN
978-0-470-74638-7

Level
Undergraduate

Price
£99.00

Summary Review	
range: * poor to ***** good	
Academic content	****
Usefulness to student	****
Usefulness to teacher	****
Meets objectives	***
Accuracy	***

Understanding Physics is a comprehensive 675-page textbook covering the essentials of university physics. As such it has many competitors: so what makes this book special? It is easy and clear to read but not verbose, in a large format with an uncluttered appearance. It is self-contained, introducing each topic from first principles. It does not demand a prior knowledge of vectors or of calculus, but instead introduces these mathematical methods when the need for them arises.

Today, university courses do not only require textbooks: it is becoming common for publishers to provide, in addition, supplementary online resources for learners and teachers. And indeed, this book's preface promises a website (wiley.com/go/mansfield) with "links to suitable interactive resources in the form of animations, simulations, tutorials, etc. and other multimedia materials". The website contains PowerPoint files reproducing many of the illustrations from the book. The PowerPoint files will certainly be convenient for lecturers whose teaching follows this book, but at the time of this review nothing else had yet appeared, let alone any interactive material which might compete with Pearson's market-leading *Mastering Physics* resources. That is a pity, because authors and publishers are now presented with exceptional opportunities in a world of tablets, slates, e-readers and other handheld devices.

Mansfield and O'Sullivan claim to integrate "classical" and "modern" physics, introducing the latter earlier than other textbooks. To some extent they have achieved that: for example, relativity and quantum physics are covered prior to any electromagnetism or optics. But still, some of the stuff that students find most exciting – particle physics and astrophysics - is dealt with only very briefly in the final chapter, although the book's cover illustration is from the CERN LHC ATLAS detector. Although this is intended principally as a first-year textbook, a more adequate treatment could surely have been included. Quark confinement is illustrated by a confusing diagram showing "colour field lines" between a red quark and a blue antiquark. Interactions are illustrated by four "quark flow" diagrams of which three are wrong or misleading. And Mansfield and O'Sullivan follow most comparable textbooks in giving cosmology just a handful of pages at the end of the book. Elsewhere in the book, too, the balance could have been improved: for example, lasers today surely merit more than a one-page description of a gas laser which does not even tell us what the gas is.

Still, on balance **Understanding Physics** is an attractive and refreshing textbook and, coming from University College Cork, it is welcome in a field generally dominated by US-based authors and publishers.

Martin Counihan
School of Physics and Astronomy
University of Southampton
Southampton SO17 1BJ
March 2011

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UK Physical Sciences Centre
Department of Chemistry
University of Hull
Hull HU6 7RX
Phone: 01482 465418/465453 Fax: 01482 465418
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