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Physical Sciences Educational Reviews

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Reviewed in this issue:

3 software packages

40 books

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Physical Sciences Educational Reviews

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Items for review and offers to contribute to the review process are welcomed. Please contact the Centre.

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Editorial

This is a bumper issue with 43 reviews. As well as subject based resources there are some that cover generic issues (eg e-learning, assessment) and this issue includes reports from several academics based overseas.

Roger Gladwin
Editor

In this issue...

Book reviews...

Software reviews...

500 Tips for Open and Online Learning

Subject area
General.

Description
This book provides advice for those involved with open learning and those considering its use.

Authors
Phil Race.

Publishers/Suppliers
RoutledgeFalmer
(http://www.tandf.co.uk/books).

Date/Edition
2005.

ISBN
0-415-34277-5.

Level
Teachers.

Price
£18.99 (pbk).

Anita Pincas
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International Development [LEID]
Institute of Education
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London
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March 2005

Summary Review

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

Professor Race has a distinguished history of writing highly intelligent books about teaching and learning, written in fluent style with practitioners in mind. All his work is solid commonsense, and that is high praise. He does not confuse the reader with convoluted theories that have little foundation in experience. But this does not mean he has not based his work on theory; on the contrary, a glance at his website at http://www.phil-race.net/Downloads.htm where one can download, for instance, the very challenging *A Teaching Taxonomy* shows clearly that he has a strong theoretical understanding of what teaching involves.

His books give the impression of being superficial. Titles like:
How to Win As a Final Year Student, Essays, Exams, and Employment, (2000), Paperback
The Lecturer's Toolkit, A Practical Guide to Learning, Teaching and Assessment (2001), Paperback
Lecturing, A Practical Guide, (2002), Paperback (with Sally Brown)
Producing Teaching Materials, A Handbook for Teachers and Trainers, (1993), Paperback (with Henry Ellington)
are too popular for 'sniffy' research-oriented academics.

It has always been the academic world's mistake to think that being practical lacks the high value of theory. For some time, the term *professional* has replaced *practical* in the vocabulary. For the RAE, practical books or papers for *professional journals* rate fewer 'brownie points' than the purely research ones. Yet, on the other hand, there are many education practitioners with a deep distrust of theory or *theoreticians*. One of the reasons, clearly, is that there are frequent shifts of learning theory, so that practising teachers can be forgiven for feeling the ground moving dangerously beneath their feet. Neither is right. The practitioner has valuable knowledge based on empirical observation, but may not be very good at articulating this in coherent abstract frameworks. The theorist may be excellent at logical thinking and experimental processes, but too little concerned with human variables. Both need to discipline themselves to take account of each others' perspectives.

Here, Professor Race and his books come into their own. At first these 500 tips present the problem of how to read such a book. Can one read through nearly 200 pages of tips, each not much longer than 6 lines? Every section has an overview, but the tips remain tips. Is this, then, merely a book for browsing, or for finding a check-list of items to remember when, perhaps, adapting materials, or designing new ones, or when looking for good ways of supporting learners or using new technology? Yes. But it is also more than that. Chosen at random, consider Section 41: 'Helping learners to help each other'. The section offers 11 tips, ranging from 'Help open learners to appreciate the benefits they can derive from other learners', through 'Show learners the value to them of teaching other people', and 'Explore the possibility of setting open learners collaborative tasks' to 'Don't, however, try to force learners into collaborative learning'. Yet the terms *constructivism*, or *learning styles* or *individualised instruction* do not appear once.

You may not want this book, but Professor Race knows what he is talking about and what his readers need.

500 Tips on Assessment

Subject area
General.

Description
A handily sized slim volume on issues around assessment in university education.

Authors
Phil Race, Sally Brown and Brenda Smith.

Publishers/Suppliers
RoutledgeFalmer (http://www.tandf.co.uk/books).

Date/Edition
2005/2nd edition.

ISBN
0-415-34279-1.

Level
Teachers.

Price
£18.99.

David Harwood
Institute for Science Education
University of Plymouth
Drake Circus
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PL4 8AA
March 2005

Summary Review

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

This is an absolute gem of a book full of succinct and good advice based upon a wealth of personal experience by three well known and widely respected authors. Assessment is a topical subject in Higher Education, especially post SENDA. Assessment strategies have recently been reviewed extensively on the majority of courses offered throughout the university sector. Quality audits, subject reviews and so on, reveal a rather conservative approach to assessment in many areas as well as some very innovative and exciting approaches in others. This is a timely publication therefore, which most academics will find both useful and thought provoking.

The book begins by exploring values we might associate with best practice in assessment and why (and indeed what) we are assessing. Both summative and formative assessments are considered, although there is no formal consideration of student engagement with the latter, understandably perhaps! Questions such as does the assessment encourage deep, surface or strategic learning and the importance of using diagnostic assessment early on in a course are considered as is the relationship between assessment and learning outcome (LO). I was delighted to discover, for example, that the authors do not advocate the assessment of every published learning outcome in each year of the course and there is good advice on integration of LOs with assessment as well as involving students in the process.

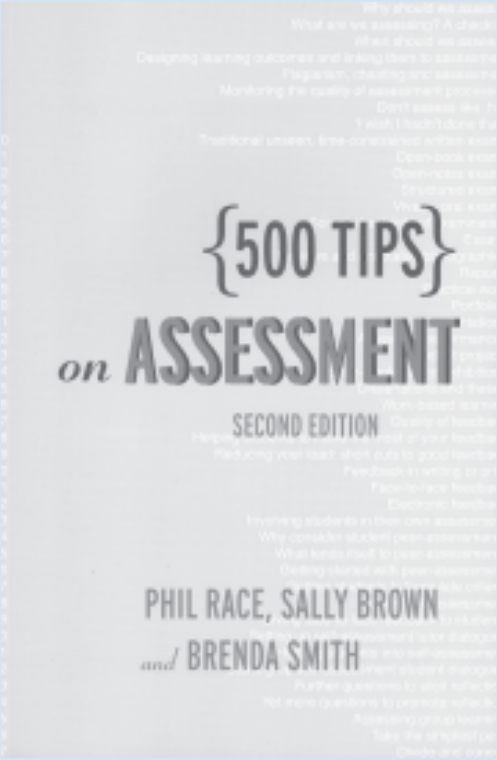
As part of our research in the Institute for Science Education at Plymouth, we have been looking at, and trying out, various forms of more inclusive assessment. As a result, we have learned a great deal about various approaches to the problem of inclusiveness in assessment, preservation of rigour and alternative forms of assessment. I was delighted therefore, to discover many of our approaches suggested herein, as well as some that we hadn't thought of.

This book is couched in non-subject-specific terms for the most part but it is relatively easy to see how the various strategies might be applied to one's own subject and how one might tackle the perceived problem of acceptance of non-traditional assessment styles by professional bodies (an argument, I might add, frequently put forward by academics but seldom supported by the professional bodies themselves, interestingly).

There are excellent sections on examinations, in their various forms (27 pages), with thoughtful advantages and disadvantages given in each case. The authors also reflect on what these particular formats really assess, as well as the limitations. There is also a short, but particularly good, section on monitoring the quality of assessment and reflecting on what it is that our assessment strategies are really telling us about our students. This completes the first third of the book.

Continued on page 4

500 Tips on Assessment



From the publisher...

500 Tips on Assessment

By Phil Race, Sally Brown and Brenda Smith

500 Tips on Assessment is an invaluable dip-in aid for hard-pressed lecturers and teachers in further and higher education. It should be read, enjoyed and seriously considered by all those concerned about the quality and appropriateness of their assessment methods.
In this completely updated edition of 500 Tips on Assessment, the authors look at the questions and the problems that teachers face and provide them with practical guidance. Their advice is down-to-earth, jargon free and digestible, covering such key issues as:
* Putting assessment into context
* Different examination formats
* Different assessment formats
* Feedback and assessment
* Assessing group learning.

0-415-34279-1 184pp 2005 £18.99

Continued from page 3

The middle third looks at 11 types of assessment, other than examinations, commonly used in universities: essays, reviews and annotated bibliographies, reports, practical work, portfolios, presentations, assessing performances, student projects, poster displays and exhibitions, dissertations and theses, and work-based learning. There is a lot to cover here and one might wish for more on practical work, for example but colleagues in Drama might easily say the same about assessing performance. Each short section is a good starting point and covers the basics but some specific references for further reading at the end of each, would enhance the text and increase its value.

In the final third we encounter feedback and assessment, involving students in their own assessment, and finally, in eight short pages, the difficult issues around group assessment are tackled. The feedback section is particularly useful and all of us will find mentioned sins we have committed, as well as excellent ideas for improving our performance in this respect, as well as reducing our workload - practical suggestions of this kind are welcome indeed!

This book is full of excellent advice that is not difficult to put into practice. It is both a first class reference book for designing or developing assessment as well as an invaluable check list: my review copy is well-thumbed already. The authors are to be congratulated and I would recommend any serious academic to have a look at it.

Advanced Practical Organic Chemistry

Subject area
Organic Chemistry.

Description
Written for postgraduate organic chemists, this book covers several important laboratory techniques that will especially help synthetic chemists.

Authors
J Leonard, B Lygo, G Procter.

Publishers/Suppliers
Nelson Thornes Ltd – CRC Press (http://www.crcpress.com).

Date/Edition
2001.

ISBN
0-7487-4071-6.

Level
Undergraduate, research.

Price
£23.19.

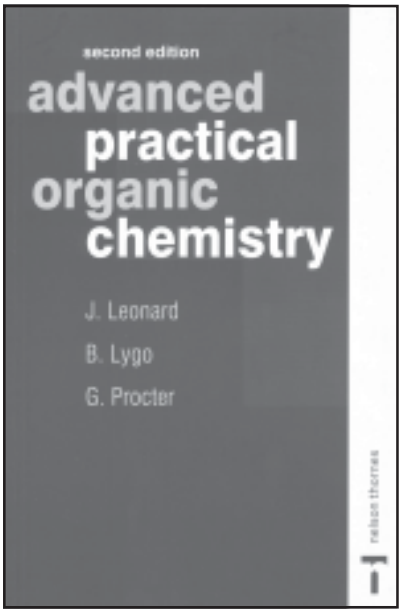
Valdir Florêncio da Veiga Junior
Rua Carlos Alberto Braune
151 / 3 / 301
Braunes - nova Friburgo
RJ - Brazil
28611 - 000
March 2005

Summary Review

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

In the second edition of "Advanced Practical Organic Chemistry", Leonard, Lygo and Procter bring an improved and even more functional and practical guide to postgraduate students in organic chemistry, with re-drawn figures and a revised text. The clean style of this book leads the reader around the laboratory, advising cautions and warning of dangerous proceedings, the best way to perform experiments and how to write up the laboratory notebook.

Several tips and pieces of advice are given especially in the use of the chromatographic methods and laboratory equipment, turning this book into an almost obligatory reading for students that are taking their first steps in the organic chemistry laboratory.



Vacuum pumps, equipment and glassware, gases measurement and handling and an initial chapter explaining how to document the laboratory experiments are some of the most useful parts of this book to organic chemistry students.

Reading this book is like having a thoughtful and smart tutor guiding all your steps in the laboratory.

Although it is a very valuable practical book, several chapters will be particularly useful mainly to the organic synthesis chemist. It is not only the speciality of the authors but the great emphasis of the book too.

How to prepare the most common reagents, drying and purifying solvents, carrying out small and large scale chemistry reactions and extracting and purifying its products are some of the sections of this book totally dedicated to organic synthesis.

To the general organic chemistry students the absence of references in almost all the chapters, the lack of an overview of structure elucidation methods and about how to prepare samples to perform spectroscopic analyses, will sometimes give more questions than answers.

Overall the booklet is an excellent choice that could be further updated and reviewed, becoming an outstanding guide to postgraduate organic chemistry students.

An Introduction to Computer Simulation

Subject area
General Physics.

Description
Introduction to the methods of computer simulation in physics and engineering, illustrated with a wide range of examples.

Authors
M M Woolfson and G J Pert.

Publishers/Suppliers
Oxford University Press (http://www.oup.co.uk).

Date/Edition
1999.

ISBN
0-19-850425-X (Pbk).

Level
Undergraduate, research.

Price
£33.99.

Tony Harker
Department of Physics and Astronomy
University College London
Gower Street
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April 2005

Summary Review

range: * poor to ***** good

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

Writing a book on computer simulation is rather like walking a tightrope: the balance is crucial. On the one side are the scientists and engineers, who want numerical methods that work; on the other are the numerical analysts, who want to be equipped to derive methods and analyse their accuracy and stability. Michael Woolfson and Geoffrey Pert have succeeded well in this introduction to computer simulation. There is enough analysis to show the principles by which numerical schemes are derived, but the variety of examples is rich enough to satisfy the reader who is interested in the applications.

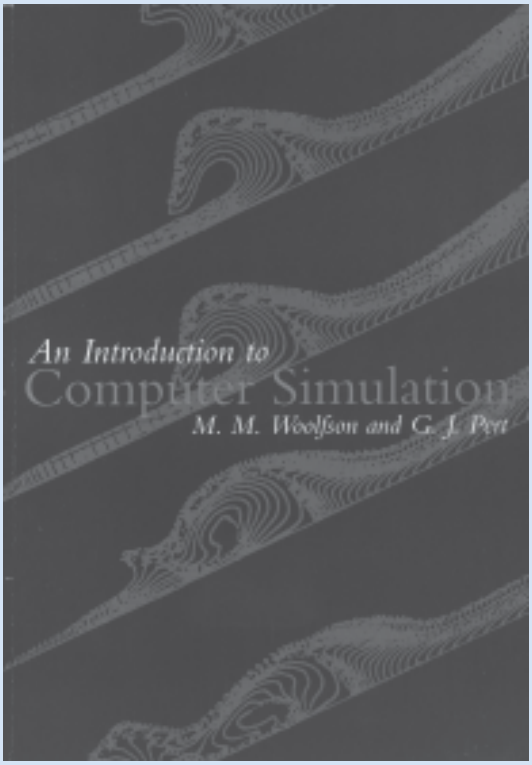
Naturally much of the book is concerned with methods for solving differential equations in continuous media, and the longest chapter explains and illustrates classical finite difference techniques for the diffusion equation (steady state and time-varying), Laplace's equation and Poisson's equation. Examples clearly show the effects of the choice of the discretisation on the accuracy and stability of the calculations. Finite element techniques are also described, and as the problem of a heated plate is treated by both finite difference and finite element methods the reader gains clear insight into these two approaches.

Other important methods of simulation which are described include particle methods, the Monte Carlo method, and Fourier techniques. The range of examples is carefully selected, including an electron microscope lens, stellar clusters, the equation of state of a liquid, and a nuclear reactor. There is a long chapter on fluid dynamics, which includes methods for treating free-surface problems. Once again, there are comparisons between techniques, with the equation of state of a liquid being computed using both molecular dynamics and Monte Carlo methods.

One particularly strong feature of the book is the way in which numerical algorithms are analysed in a physical way. For example, when describing the simulation of a stellar cluster the authors explain why the scheme being used (the leapfrog algorithm) is expected to conserve momentum, but also show not only that it does not conserve energy but that the energy increases randomly as a result of truncation errors. As they point out, this may well be acceptable for many purposes, but it is important to appreciate the existence of the problem. In this case there is a reference to a more accurate numerical scheme.

It must be stressed that the scope of this volume is wide, and it is clearly titled *An Introduction*. Nevertheless, it would have been useful to see rather more references to advanced techniques and software libraries. In the chapter on finite element analysis it would have been useful to have a mention, at least, of isoparametric elements with their ability to conform to curved boundaries. The notion of an equilibration period for molecular dynamics simulations is described rather briefly. But these are small criticisms of a book that generally achieves its aims very well.

An Introduction to Computer Simulation



From the publisher...

Introduction to Computer Simulation

By M. M. Woolfson and G. J. Pert

Computer simulation is increasingly used in physics and engineering to predict the probable outcome of experiments and to aid in their interpretation. The methods of simulation are based on a range of numerical techniques for treating ordinary and partial differential equations. Since much of physics can be broken down into a relatively small set of fundamental equations, there is a set of very general methods which can be widely applied. This text aims to give an introduction to those methods suitable for readers at an undergraduate level and those meeting the subject for the first time at postgraduate level. The methods are illustrated with simple programs and problems. The book covers a range of material not available in a simple form in a single text elsewhere.

0-19-850425-X 328pp 1999 £33.99

Readers are prompted throughout the book and in chapter-end problems to experiment with the methods described. FORTRAN code is available from the Oxford University Press web site, so the reviewer tested a few of them. They are clear, well commented, and would be easy to modify. The code is essentially FORTRAN77, and some features (such as having multiple DO loops ending on the same statement) caused errors when the codes were complied and executed with a FORTRAN95 compiler. In one code, describing a radiative heat flow problem, an array was declared with its index starting at 1, but its 0th entry was written to. These problems were readily addressed, and the programs reproduced the results in the book.

This is an excellent introduction to the techniques and the wide applications of computer simulation methods in science. It is well suited to an undergraduate course: indeed, the reviewer intends to spend part of the summer converting some of the examples to another programming language to use in his own course.

Aromatic Chemistry

Subject area
Organic Chemistry.

Description
Specialised textbook for organic chemistry.

Authors
J D Hepworth, D R Waring and M J Waring.

Publishers/Suppliers
Royal Society of Chemistry (http://www.rsc.org).

Date/Edition
2002/1st Edition.

ISBN
0-85404-662-3.

Level
Undergraduate.

Price
£14.95.

Simon Jones
Department of Chemistry
Dainton Building
University of Sheffield
Brook Hill
Sheffield
S3 7HF
April 2005

Summary Review

range: * poor to ***** good

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

Aromatic chemistry forms one of the fundamental parts of organic chemistry that is taught from an early level reaching back to high school and used and applied extensively in modern academic and industrial environments. It is therefore a subject with an immense subject depth that covers many diverse topics and concepts making it an extremely useful vehicle for teaching at University level. The addition of "Aromatic Chemistry" to the Royal Society of Chemistry's Tutorial Text series is therefore a potentially very useful and exciting resource.

The Tutorial Text series appear in no uncertain terms to rival the Oxford Chemistry Primers as bite-size student texts aimed at encompassing a complete lecture course in one volume. Each book is reasonably sized and lightweight containing important notes and concepts in the margin alongside the text. The tutorial texts do have two points of merit above the Primers though. The first is the limited use of colour to highlight specific elements and the second the inclusion of answers to the end of chapter questions, making them truly supportive materials for the student. "Aromatic Chemistry" does not disappoint in this respect, but it is the content that appears to set it above its rival.

The first forty pages or so of this book are devoted to the general principles of aromatic chemistry. It explains in detail the requirements for a molecule to be aromatic, the general processes for introduction of the common functional groups into an aromatic nucleus and the effects that substituents have on the regiochemistry of a second substitution reaction. The latter point is explained exceedingly well by considering the stabilisation of all of the intermediates formed in the reaction. This is a much more logical way to approach this topic than looking at which atoms have more or less electron density as some texts do. Reference is also made to the Hammett equation here. The book then changes direction by considering each substitution in turn (eg alkyl aromatics, nitro aromatics). The individual chapters are extremely well laid out, with clear aims at the beginning, followed by the synthesis of the compounds in question, then their reactions. The chapter concludes with a summary and study problems. This approach is somewhat different to that in many textbooks however it appears to work extremely well. It packages the chemistry effectively and progressively and makes it very easy to use this book as a reference text as well as a textbook. The last three chapters of the book then deal with the concepts of organometallics, oxidation and reduction, and polycyclic aromatic compounds. These last chapters are more advanced than one would probably find in an undergraduate course, at least at elementary level and would more than likely be covered at third year level. This is especially true of the organometallic chapter, and although elements of this are pivotal to modern aromatic chemistry, they are far too advanced to be covered early on in a degree programme. In this respect then I feel that the book as a whole tries to cover more material than one would expect to be covered in a single lecture course. However, it covers sufficient material for all of the aromatic chemistry that would be taught at undergraduate level.

In summary this is an excellent book that is well worth recommending to undergraduate students studying in this area. The only drawback is the cost. At £14.95, this book may be too expensive for most students who may consider other cheaper alternatives.

Assessing Students' Written Work

Subject area
General.

Description
A small book, almost a pocket guide, covering all the major issues of assessment of written work in Higher Education.

Authors
Catherine Haines.

Publishers/Suppliers
RoutledgeFalmer
(http://www.tandf.co.uk/books).

Date/Edition
2004.

ISBN
0-415-30721-X.

Level
Teachers.

Price
£15.99 (pbk).

Gren Ireson
Matthew Arnold Building
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LE11 3TU
April 2005

This book starts with the sentence, 'assessment is one of the most powerful tools in teaching yet it is rarely measured in effort, time and effectiveness, and is usually done alone and against the clock.' I am sure that all readers of this journal have, at some time, experienced this to be true.

Summary Review

range: * poor to ***** good

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

What this book does, in part one, is to provide an overview of the issue covering the role of the assessor, why do we assess, what is assessment, time management and assessment issues due to language and culture. All of this is achieved in about fifty pages of an A5 book. A great deal of practical advice is given along with questions to make the reader question their current or future practice. The scope is excellent, if brief, with everything from the 'standard essay' via portfolios and computer aided assessment to virtual learning environments getting some coverage. Each section ends with further reading and demonstrates a good level of understanding of the current issues in Higher Education.

In part two the book looks in more detail at assessment within subject disciplines and whilst the scope of the book does not allow room for a great deal of material which is specifically physical science, contributions from both chemistry and physics are present and readers of this journal will no doubt glean much from the engineering contributions. In part two a chapter is devoted to 'assessing problem classes and problem-based learning' which, amongst other issues, looks to the variation in mathematical ability amongst engineering students via the Shaw and Shaw[1] data from Warwick University. Again readers will no doubt be able to transfer these ideas to their work in the physical sciences.

The references at the end of the book complement the further reading and allow the reader to develop their own understanding of particular issues. In essence this book should be read by all new lecturers and graduate teaching assistants and it ought to be read by all experienced lecturers if only to confirm they are doing the best for their students without putting excessive demands on themselves or the students.

As a 'University Assessor' I have the privilege to observe and advise new lecturers and this is certainly a book I will be recommending, largely for its readability. It is this readability which makes the book ideal for when time is short, it will not replace other texts aimed at learning in teaching higher education but it is more accessible and does not have a mass similar to that of a house brick!

I do, however, have one small gripe with the book, one which I am surprised to find given the content. The great number of tips and questions are presented in 'grey boxes' where an inevitable reduction of contrast appears. If we, as practitioners, avoid this to help dyslexic students, should we not do the same for our colleagues?

Not withstanding the minor gripe this text makes an excellent and timely read and can only better inform practice to the benefit of the student body.

Reference

1. C T Shaw and V F Shaw, *Attitudes of first-year engineering students to mathematics - A case study*, International Journal of Mathematical Education in Science and Technology **28**, 289-302 (1997).

Atomic Physics

Subject area
Atomic Physics.

Description
Undergraduate text on Atomic Physics with some additional interesting topics.

Authors
Christopher Foot.

Publishers/Suppliers
Oxford University Press (http://www.oup.co.uk).

Date/Edition
2005.

ISBN
0-19-850696-1.

Level
Undergraduate.

Price
£22.95.

John Leaver
11 Ridley Road
Lowerhouse
Bollington
Macclesfield
Cheshire
SK10 5HL
May 2005

"Atomic Physics" is an up-to-date text covering, in a fairly comprehensive way, the textbook requirements for an undergraduate course in Atomic Physics. It also goes beyond this by offering chapters on some more specialised topics. Some of the introductory material would, of course, also be useful to physical chemists.

Summary Review

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

The written style is clear and accessible. The textbook is divided into thirteen chapters together with assorted appendices. Throughout the book there are many numbered footnotes (or rather sidenotes, as this is how they are positioned) and some will no doubt find this distracting as it is difficult to resist the temptation to read all of them! In many cases they are merely definitions or offer extended explanations of possibly unfamiliar terms, or sometimes some supplementary information or a literature reference. They vary in length from just a few words to several sentences. They certainly make a significant contribution to the word count of the book. I generally found these sidenotes to be useful and interesting and consider them to be a positive feature, despite any consequent interruption to the flow of the main text. However, I can remember many years ago when I read J G Frazer's "The Golden Bough", (all ten or so volumes of it!), finding the footnotes as entertaining as the main text, so this is a personal like - I am pointing it out as I know some people prefer all such material to be hidden away at the back of a book.

Chapter one is entitled 'Early Atomic Physics' and deals with some expected familiar topics such as the hydrogen spectrum, Bohr's theory, atomic number, radioactive decay, the Zeeman effect and so on. The chapter concludes (as do the other chapters) with some exercises. Subsequent chapters continue with what might be considered core material to an undergraduate atomic physics course and then in later chapters some more specialised and in some cases very interesting topics are explored. Chapter two deals with the hydrogen atom, chapter three with helium, chapter four with the alkalis, chapter five with LS-coupling, six with hyperfine structure, seven with interaction of atoms with radiation, eight with Doppler-free laser spectroscopy, nine with laser cooling and trapping, ten with magnetic trapping etc, eleven with atomic interferometry, twelve with ion traps and thirteen with quantum computing.

The standard of production is generally very good with clear text and diagrams which are attractive, well designed and relevant. A good collection of references is provided including both bibliographic details of relevant textbooks and references to original research papers. These are as up-to-date as could be expected for a recently published book. The index is sufficiently comprehensive to allow for topics to be located effectively.

The author has provided the address of his website to allow for access to supplementary information and corrections. The most useful item related to the book currently available on the website is a PDF file containing answers to the exercises.

"Atomic Physics" can be thoroughly recommended for its suitability as a standard undergraduate text but with the bonus of some interesting specialised content that might otherwise not be encountered by the typical student.

Band Theory and Electronic Properties of Solids

Subject area
Condensed Matter Physics.

Description
This book highlights the theory (and experiment) relating to some of the modern *hot topics* in solid-state physics.

Authors
John Singleton.

Publishers/Suppliers
Oxford University Press (http://www.oup.co.uk).

Date/Edition
2001.

ISBN
0-19-850644-9.

Level
Undergraduate, research.

Price
£22.95.

Jonathan Goss
School of Natural Science
University of Newcastle upon Tyne
Newcastle upon Tyne
NE1 7RU
February 2005

Summary Review

range: * poor to ***** good

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

The stated aim of John Singleton's relatively short, 'synoptic' text, which exists as part of a linked series, is to complement the traditional text-books such as "Introduction to Solid State Physics" by Charles Kittel and "Solid State Physics" by Ashcroft & Mermin. In particular, "Band Theory and Electronic Properties of Solids" highlights the theory (and experiment) relating to some of the modern *hot topics* in solid-state physics which are absent from the older text-books. The book is well structured, with the first half of the book dedicated to the introduction of the underlying concepts and methods pertaining to band-structure, and the second half exploring the implications in some interesting special cases such as the de Haas-van Alphen effect, magnetoresistance in two-dimensional systems and the quantum Hall effect.

There is an excellent mix of theoretical derivations and experimental data, leading the reader to reflect on the implications of the sometimes abstract mathematical expressions in terms of physical, geometric and in particular measurable terms. A reasonable quantity of reference to experimental issues are covered, with those applying to the measurement of resistivity and the Hall effect, which feature heavily in the book, covered in an appendix.

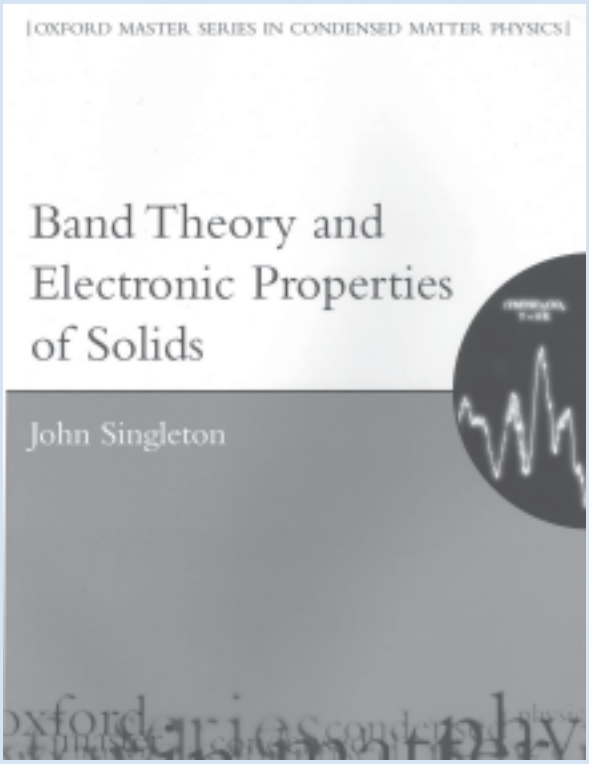
The mathematics is certainly not excessive for the material covered, but might well prove too demanding for candidates who are weak in this area: although I find that the emphasis throughout the book is on the physical concepts and principles rather than complex esoteric derivations, a reasonable mathematical knowledge is necessary to appreciate the material in the book. Some of the more lengthy and/or complex mathematical derivations, which might otherwise distract the reader, are deferred to an excellent collection of appendices, where one can find the definitions for crystal structures, derivations of density of states and distribution functions, a discussion of the concepts underpinning phonons and the Bohr model of the hydrogen atom. The reader with a thirst for mathematical rigour and the gory details is not left completely unsatisfied.

At the end of each chapter there is a set of exercises. Indeed, there are many references to the exercises and their results during the reading of the material. I find this approach rather useful and it is clear how such material could readily fit into a course based on the book. Indeed, the fact that the book was born out of a university undergraduate lecture course of the same name is unsurprising.

The use of (albeit monochrome) illustrations is superb throughout, making the book rather pleasing to the eye. Furthermore, the author leads the interested student to detailed references throughout the text, with comprehensive 'Further reading' lists showing where one might expand upon the overviews given in this book, listed on a subject-by-subject basis. Indeed, the author makes the point that this encourages students to develop the habit of exploring a range of written sources, a skill to be honed particularly for those who intend to perform any research.

Continued on page 12

Band Theory and Electronic Properties of Solids



From the publisher...

Band Theory and Electronic Properties of Solids

By John Singleton, Department of Physics, University of Oxford

Band theory is evident all around us and yet is one of the most stringent tests of quantum mechanics. This textbook, one of the first in the new Oxford Master Series in Physics, attempts to reveal in a quantitative and fairly rigorous fashion how band theory leads to the everyday properties of materials. The book is suitable for final-year undergraduate and first-year graduate students in physics and materials science.

0-19-850644-9 238pp 2001 £22.95

Continued from page 11

I found the book to be written in a style that is both light-hearted (there are even some jokes) and intellectually accessible, with, at least in my view, the advantage over other course text-books in this genre that John Singleton has tackled less material than one finds in traditional 'comprehensive' texts on the subject, choosing instead to focus on a relatively small range of particularly interesting topics.

I detected only a very few small technical errors in the book, which do not materially affect the reading, and I was irritated by the style adopted for the mathematical expressions where the size of the brackets did not match their contents. However, these are very small matters and I have no compunction in recommending this book as a text either to supplement or indeed to form the basis of a specialised solid state physics course, probably in the latter parts of a physics-based degree programme. The cost of the paperback at the time of writing this review is well below that of many other books in the field, further recommending its use as a text-book to accompany a lecture course.

Chemistry: an Industry-Based Introduction

Subject area
General chemistry.

Description
This text explores the direct relevance to industry of some aspects of chemistry.

Authors
John Kenkel, Paul B Kelter and David S Hage.

Publishers/Suppliers
CRC Press
(http://www.crcpress.com).

Date/Edition
2000.

ISBN
1-56670-303-4.

Level
A-level, access, undergraduate.

Price
£53.99.

Joan Halfpenny
Division of Chemistry
School of Biomedical and Natural Sciences
Nottingham Trent University
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NG11 8NS
March 2005

The authors of this text have made a very praiseworthy effort to 'break new ground' and engage the student's interest by exploring the direct relevance to industry of each aspect of the chemistry discussed.

Summary Review

range: * poor to ***** good

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

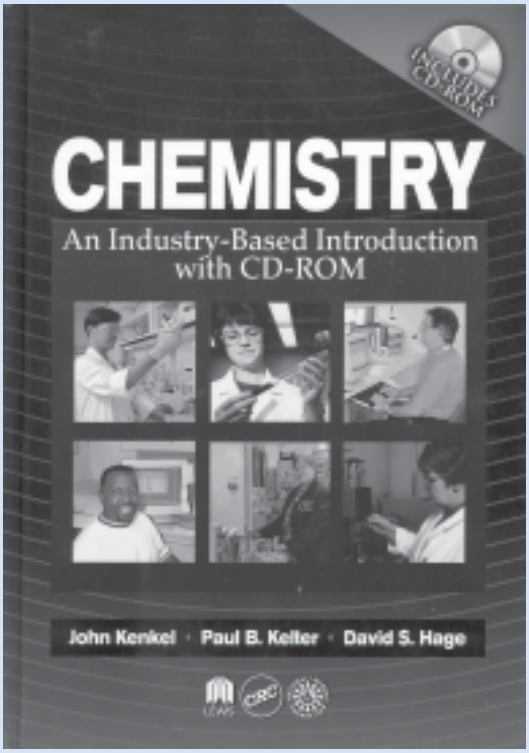
In common with most American textbooks at this level, topics in inorganic, organic, and physical chemistry, along with some radiochemistry, are all covered; and while the majority of topics are introduced from scratch, some of the case studies require considerable depth of understanding, meaning that the text is suitable to some extent for use by both UK A-level and first year undergraduate degree students. It is unfortunate that due to the requirements of the US market, coverage of systematic inorganic chemistry (especially transition metal chemistry) is very limited and there is only one chapter on organic chemistry, which will prevent the book being generally recommended as a 'standard' UK first year undergraduate text; those undergraduates who do discover it are likely to find it a refreshing change from their other recommended books.

Each chapter has a start box entitled 'why study this topic?', bringing out relevant 'real world' applications and suggesting 'homework' activities, some of which (encyclopaedia/book/website investigations of the topic, group discussions) are rather more realistic than others, which suggest that each student should locate a chemistry professional in various types of local industry and get them to provide relevant data or discuss a specific topic in the context of their company. One can imagine local industry rapidly getting tired of this! There are very clear worked examples throughout and the text is broken up every few pages by the special topic boxes, which direct the student to industrial applications of the theory and suggest suitable 'homework' activities (again, some more realistic than others). Some of these boxes introduce the career details of industrial chemists and demonstrate to the student the variety of applications and work areas spanned by the subject. Diagrams in the text are rather sparse as the majority of these are on the associated CDROM, but sufficient are present that students for some reason unable to access the CDROM would not be unduly disadvantaged in their work. Understanding is reinforced by a comprehensive series of self-study questions at the end of each chapter, supported by the very full 'answers' section at the end of the book. Each chapter ending also has a 'class discussion and reports' section, suggesting possible group activities including industrial visits, literature research, and report writing on relevant industrial topics or problems. This will be of interest to, and a source of ideas for, staff wishing to promote group learning among their students.

The real glory of this book is in the associated CDROM, which extends the black-and-white main text through colour diagrams (some interactive), movie clips, worked examples, self-assessment questions and more: the problems, mostly involving case studies in which a range of information has to be synthesised by the student to find a solution to a 'real life' industrial problem, are excellent.

Continued on page 14

Chemistry: an Industry-Based Introduction



From the publisher...

Chemistry: An Industry-Based Introduction with CD-ROM

By John Kenkel, Southeast Community College, Lincoln, Nebraska, USA; Paul B Kelter, General Chemistry, Univ. of Illinois, Urbana, IL, USA; David S Hage, University of Nebraska, Lincoln, USA

Covers all the basics in a readable style
Presents all requisite laws, formulae, and theory
Contains equations, structures, line spectra, and figures
Provides an excellent, on-the-job reference
Includes a CD-ROM that contains industry-based problems to solve
Addresses advanced topics such as energy in chemical processes, oxidation-reduction, nuclear energy and power, and biochemistry
Solutions manual available with qualifying course adoption.

1-56670-303-4 544pp 2000 £53.99

Continued from page 13

The material on the CDROM is organised on a chapter-by-chapter basis with clear topic mapping and a separate database of definitions including many diagrams. I was initially a little disappointed with the mainly text-based 'review' pages on material from the early chapters, featuring links from keywords in the text to the definitions database, but once I discovered the related self-assessment questions and the problems, I was hooked. The self-assessment questions test the student's knowledge in a number of ways, providing help in the case of wrong answers and justification for correct answers. A good feature, helping to avoid student frustration, is the program's ability to accept alternative correct or nearly correct answers, eg in some examples both the formula and the name of an element were accepted, and in a numerical problem .03, 0.03 and .033 were all accepted as correct for an answer of 0.03333... recurring. A less good feature is the reliance on American spelling, causing a particular problem wherever the correct answer (e.g. in nomenclature questions) is 'aluminum'.

The problems on the CDROM (one or two per chapter) by and large pose realistic industrial situations, eg a costing of preparing in-house, rather than buying in, acetylsalicylic acid for a particular application. The student must explore these using both supplied and recalled data, and apply logic to obtain a satisfactory solution. In some cases there is also an opportunity for the student, acting as a 'consultant', to learn other skills by preparing a short report on their conclusions in a form that would be acceptable to an 'employer'.

In summary, this book and the associated CDROM attempt to involve the student with the realities of industrial chemistry from the start of the learning experience. It will no doubt have a ready sale in the American market. In the UK the content and level fall between A-level and first year undergraduate degree standard, which, combined with the relatively high price, is likely to mean that it is not recommended for purchase to students at either level. However, many students would undoubtedly benefit from working through some of the self assessment exercises and problems on the CDROM, and should be enthused by the clear industrial relevance of the topics discussed.

Chemistry: an industry-based laboratory manual

Subject area
General Chemistry.

Description
Softback, ring-bound laboratory manual.

Authors
John V Kenkel.

Publishers/Suppliers
Lewis Publishers – CRC Press (http://www.crcpress.com).

Date/Edition
2000/1st edition.

ISBN
1-56670-346-8.

Level
Undergraduate.

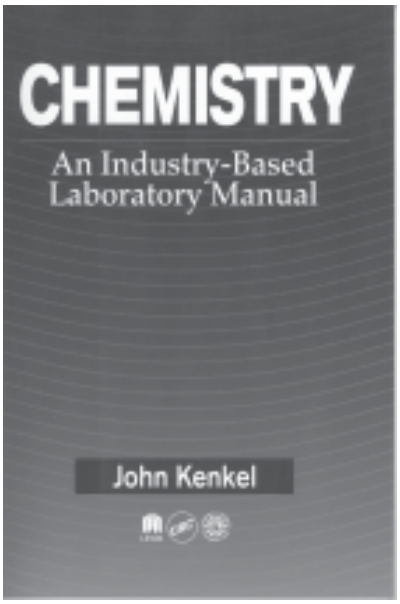
Price
£23.99.

This book claims that it is 'at last, a laboratory manual that brings the chemists' workplace to the student'. It aims to remove general chemistry practical exercises from the theoretical to real-world industrial chemistry lab scenarios, and should be an ideal foundation for making the undergraduate chemistry practical programme more relevant.

Summary Review

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

The manual covers laboratory safety, record keeping, control charts, certified reference materials and includes 25 practical activities.



Would I use it as a course text? No: much as I appreciate the work the author has done in putting this illustrative text and practical coursework together, I'm afraid it involves too much of the fictitious laboratory which is the setting for the exercises. The CEO of the fictitious company in which the simulations take place is Ms C Hemistry, and among the 'people' she communicates memos to and from are Otto Speck, Reed P Ayche and Ethyl E Glykle! To cover a full laboratory programme around these characters would start to try one's patience. Having said that, the whole premise is a good one and there are some excellent ideas for making activities more interesting, and as the manual claims - more like 'real world'.

Like all good laboratory courses there is an emphasis on safety from the start, with a safety manual modelled on a real workplace manual. There is also emphasis on the necessity for good recordkeeping, report-writing and communication of results.

The practical activities are well explained, and the appendix includes a list of necessary supplies for each activity. The author refers to these as innovative 'discovery' challenges and there are certainly good ideas for ways to liven up standard general chemistry experiments or convert them to suit Problem-based Learning modules.

Overall, I would recommend this as a reference text and a source of ideas for instructors, but (outside the US, where the manual originated) I cannot envisage it being adopted as a course text. I do envy the energy and imagination that John Kenkel shows in this text!

Marie Walsh
Limerick Institute of Technology
Moylish
Limerick
ROI
April 2005

Chemistry: Matter and its Changes

Subject area
General Chemistry.

Description
Introductory chemistry textbook.

Authors
James Brady and Fred Senese.

Publishers/Suppliers
John Wiley and Sons Ltd
(http://www.wiley.co.uk).

Date/Edition
2004.

ISBN
0-471-44891-5.

Level
A-level, access, undergraduate.

Price
£39.95.

Elizabeth Barron
Science Dept
Midmills
Inverness College
Crown Ave
Inverness
IV2 3NF
March 2005

Summary Review

range: * poor to ***** good

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

This textbook is one of the best I have encountered at introductory level. As stated in the preface, students of chemistry tend to fall into one of two camps. Either they have no problem grasping the required problem solving techniques, or they struggle despite trying hard. This has left tutors either struggling to find a 'one size fits all' textbook that is suitable for all students in the class, or flicking from one text to another confusing all involved. This textbook should be an end to that!

With links to a website and blackboard/webCT sites this is more the basis of a learning scheme than just a textbook. The Brady/Senese website has a huge amount of information, media, quizzes and test banks. There is also the option of the premium site, which allows the tutor to create their own teaching environment including managing online homework and tracking student's homework.

Each chapter begins with an outline of what will be covered and a short section that places the chapter in context, a useful technique for 'pointing out' what the students should be looking for. There are many worked examples too, clearly marked from the rest of the text by a green frame hence making it easy for students to check their progress or refer back to tasks already completed.

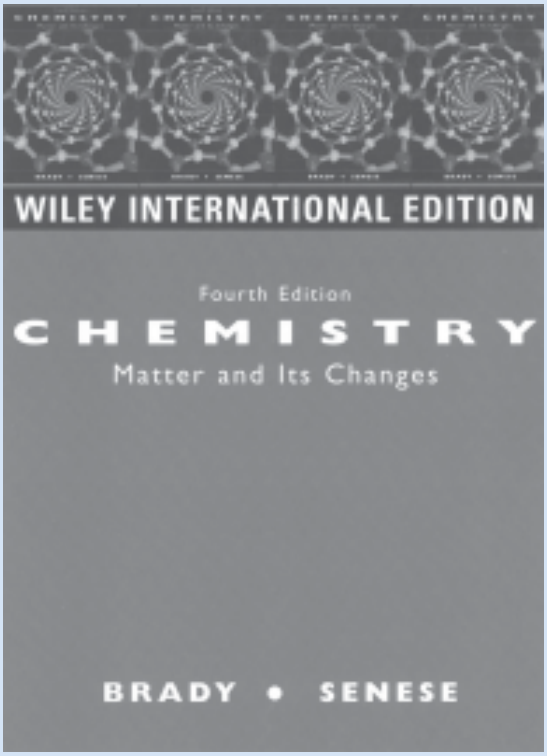
At the end of each chapter there is a summary of what has been covered so far, with key words picked out in bold text. There is also a 'thinking it through' section which refers students that require extra help to the website and introduces the following sets of problems. There are two levels of these; the first requires the student to think through what they have learnt so far. The second level contains more challenging questions for those students who already have a good grasp of the concepts involved. These are then followed with a series of review questions, which would be useful when it comes to revision.

Problem solving techniques are described as tools throughout. When complex problems are introduced, students are encouraged to refer back to the simple tools that they have trained in previously.

The textbook starts with a chapter on atoms and elements, which also covers the periodic table. This is followed by compounds and chemical reactions, then a chapter on moles and measurement. Despite being a potentially quite dry topic, the illustrations and photographs, for example of laboratory equipment commonly used to make these measurements, really help to break up the text and make measurements more 'palatable'.

The textbook then goes on to look at reduction/oxidation reactions, breaking and making bonds, the quantum mechanical atom and then general concepts of bonding and structure. The orbital diagrams are particularly effective, as there are lots of them! It can be hard for students to form a clear picture of these at first but this textbook should certainly help. The book then goes on to look at the properties of gases, liquids, solids and solutions in an equally graphic way.

Chemistry: Matter and its Changes



From the publisher...

Chemistry: The Study of Matter and Its Changes

By James E. Brady, Fred Senese

The student-friendly style of the book makes the content accessible without sacrificing either breadth or depth of coverage. The text's informal writing style, emphasis on problem solving, and state-of-the-art media package make this book an ideal fit at schools with large class sizes and a wide range of student abilities and backgrounds. The authors' goal was to create a complete package (text + media + supplements) which would challenge the better-prepared students and provide support to the lesser prepared students, giving ALL students a chance to succeed.

0-471-44891-5 1256pp 2004 £39.95

Then follows a chapter on kinetics, equilibrium and acids and bases. At this point I lent the textbook to a student that was struggling with acid/base calculations. They now feel they have a much better understanding of the topic and liked the way the book explained both the theory and worked through the problems.

There are also sections on thermodynamics, electrochemistry, nuclear reactions, metallurgy and non-metals and metalloids. There is also a final chapter on organic compounds and biochemicals including a section on DNA and genetic fingerprinting.

Although I cannot comment on the A-level syllabus, this textbook certainly contains all of the Higher and Advanced higher syllabus and would be worth recommending as a foundation text to all students who plan to go on to study chemistry at University.

Throughout the book there are references to why chemistry is so important. Reinforcing throughout why chemistry is an important subject to study, useful when students are struggling with acid base titration calculations! There are also ‘Chemistry in Practice’ sections, which demonstrate the practical applications of chemistry.

Each chapter is well illustrated with clear and intuitive diagrams that are simple without compromising on accuracy. They aren’t just colourful for the sake of it though, unlike many textbooks in this field, here different types of atoms are assigned a particular colour throughout. In particular, their ‘macro to micro’ diagrams really help students visualise what is occurring at the molecular level. Highly recommended!

Chemistry of the f-Block Elements

Subject area
Inorganic Chemistry.

Description
Outline of the chemistry of the Lanthanides and Actinides.

Authors
Helen Aspinall.

Publishers/Suppliers
Gordon and Breach - CRC Press (http://www.crcpress.com).

Date/Edition
2001.

ISBN
9-0569-9333-X.

Level
Undergraduate.

Price
£34.39.

John Leaver
11 Ridley Road
Lowerhouse
Bollington
Macclesfield
Cheshire
SK10 5HL
May 2005

Summary Review

range: * poor to ***** good

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

"Chemistry of the f-Block Elements" is the fifth book in a series of Advanced Chemistry Texts which concentrate on particular specialised topics in chemistry but at a level suitable for inclusion in an undergraduate course. The intention is to explore the topic in more detail than is possible in a general chemistry textbook but without going to the level of detail and complexity that would be found in an advanced research monograph.

This book therefore covers the Lanthanides and Actinides and I must say that I really enjoyed this opportunity to re-acquaint myself with these elements! The book is very clearly written in a very readable style and the content is readily intelligible to anyone with a reasonable background in general and inorganic chemistry such as might be developed some way into an undergraduate course. This book would be suitable as a late second year or third/final year text depending on the individual course being followed.

The book is divided into five chapters.

Chapter one contains introductory material and covers the history (the first pure sample of Thulium was obtained after 11000 re-crystallisations apparently!), sources, applications and properties of the elements together with material on binary compounds - oxides and halides.

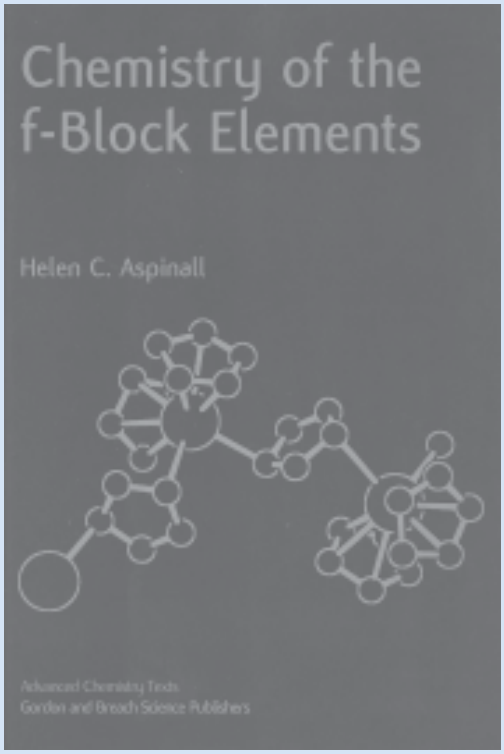
Chapter two explores some spectroscopic themes; electronic absorption, luminescence (including a concise but interesting outline of lanthanide luminescence in lighting and neodymium lasers), nuclear magnetic resonance (including the familiar lanthanide shift reagents and a section on the use of Gadolinium complexes in magnetic resonance imaging for medical diagnosis) and finally Electron Paramagnetic Resonance.

Chapter three looks at co-ordination chemistry of the lanthanides and actinides. It provides a concise but well balanced outline of a huge topic, covering an interesting selection of ligands and concluding with a brief outline of solvent extraction processes relevant to these elements.

Chapter four covers the organometallic chemistry with a good section on cyclopentadienyl complexes and interesting sections on the reactions of organolanthanides and organoactinides.

Chapter five explores the catalytic use of lanthanide complexes (including the triflate salts) and also their use as organic synthetic reagents (for example organocerium reagents, oxidising and reducing reagents).

Chemistry of the f-Block Elements



From the publisher...

Chemistry of the f-Block Elements

By Helen C Aspinall University of Liverpool, Liverpool, UK

Chemistry of the f-Block Elements provides a systematic introduction to the chemistry of the lanthanide and actinide elements. The book illustrates the main features of f-block chemistry and the important applications of the elements and their compounds. Details and references from current research are included. Aimed at advanced undergraduate students learning about this area of inorganic chemistry, this book provides a detailed introduction to the topic.

9-0569-9333-X 176pp 2001 £34.39

This is a beautifully produced book with well thought out content at the right level for its intended audience. It is very readable (considering it is an Advanced Chemistry Text!), the printing is very clear and the size makes it ideal as a bedside book! The tables, reaction schemes, structures and diagrams are all clearly produced. Each chapter has a good selection of reference material appended which is generally up to date; Chapter one also lists a selection of relevant textbooks ranging from relatively concise to detailed reviews. The book concludes with a concise but useful index. No significant errors were encountered except for the occasional typographical one - e.g. 'sructures' instead of 'structures' on p117.

This book can be thoroughly recommended as both a 'good read' and also as meeting very well the authors aim of producing a text covering lanthanide and actinide chemistry at a level and depth suitable for inclusion on an undergraduate course.

Employability Resource Pack

Subject area
General.

Description
Resources designed to help students of the physical sciences develop skills for employment.

Authors
Paul Chin, Della Grice, Tina Overton.

Publishers/Suppliers
LTSN Physical Sciences - now Higher Education Academy Physical Sciences Centre (http://www.physsci.heacademy.ac.uk).

Date/Edition
2004.

ISBN
1-903815-11-8.

Level
Undergraduate.

Price
Free to UKFE/UKHE.

Elizabeth Barron
Science Dept
Midmills
Inverness College
Crown Ave
Inverness
IV2 3NF
March 2005

Summary Review

range: * poor to ***** good

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

This is a very well thought out and presented resource pack, designed to help students of the physical sciences choose a career path and prepare themselves for employment. The pack consists of a series of activities, which are of the right length and flexible enough to be fitted into an existing degree program. Although it is designed specifically for the physical sciences, it could be easily modified in order to be suitable for all the sciences. There are also clearly separate tutor and student guides so minimal tutor preparation is required.

Activity 1 is a useful exercise to help both the students and their advisor assess what stage they are at in the career planning process. The advice is clear and helpful with practical and feasible suggestions for selecting a career or improving your CV.

Activity 2 is a card sorting exercise. There is both a card version and an online version so students can complete this exercise in groups or individually. This exercise is designed to help students prioritise action points.

Then follows another multiple-choice quiz that aims to help students think about the wide variety of scientific careers open to them. Most areas are covered here, including a realistic description of what is involved in further study as well as a list of possible careers that do not specify a degree discipline.

The next activity is a skills audit that encourages students to compare the abilities they have with some of the key skills required by employers. In the first activity they are required to rate their ability in group work, then go on to look at a specific problem which they solved in order to identify key skills that they have already utilised.

Activity 5 helps the students to create effective presentations. This is a useful skill to possess since many interviews now require students to deliver a ten-minute presentation on a scientific topic. Several slides are used to demonstrate some of the problems that can arise.

Activity 6 requires the students to prepare and deliver a one-minute presentation on a topic of their choice. They are only given ten minutes to prepare which is wise given how long students often waste preparing presentations. Also, since it is only one minute long it is a useful, if extreme, exercise in keeping to time.

Activity 7 is a similar exercise but is aimed at improving student's communication rather than presentation skills. It's a longer talk, where students take an article from a scientific journal and create a ten-minute presentation. Here the students assess each other identifying both a positive aspect of the talk and an area that may require improvement. There are also a couple of sheets of advice provided for both activity 6 and 7 which manage to convey most of the important points to consider, without inducing a state of panic!

Employability Resource Pack

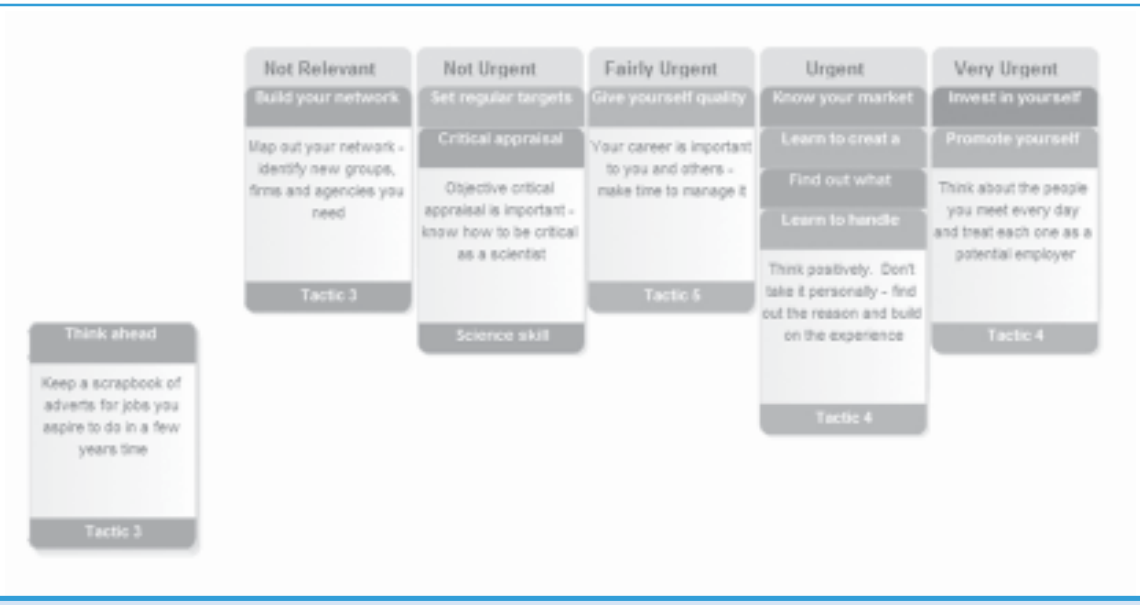


Figure 1: Example of the card-sort exercise in action

In activity 8 the students have to prepare a press release, a useful exercise that gives them a taste of what they are likely to encounter in the work place. They are given information on a topic they are unfamiliar with and in ten minutes they have to prepare a short statement from the point of view of the protagonist.

Activity 9 is a CV evaluation where the students are given two poorly designed CVs and are asked to identify the mistakes. The errors are very obvious; however this may be designed to help the students remember them. The following exercise requires the students to prepare their own CV and to this end provides a couple of pages of advice. Example CVs and covering letters would have been useful here, although of course that runs the risk of the activity generating a series of identically formatted documents.

Activities 11 and 12 are designed to help students prepare for interviews. The first helps students prepare for interviews by demonstrating the kind of company research they will need to do before attending the interview. The second activity requires the students to watch four clips of 5 - 7 minute interviews all with good and bad points. A guided, non-assessed discussion then follows.

The next activity provides students with valuable practice of applying for job vacancies. In the first they are assigned a particular job description and they must tailor their CV and covering letter to suit. Sample interview sheets are supplied, along with help sheets and sample questions.

Its not just employability that's covered by this pack, there is also guidance on possible dilemmas that the students might face while they are employed. In activity 14 students are asked to consider ethical dilemmas that they might face when in the workplace. This is completed via role play in scenarios such as: reporting offensive colleagues and supervisors taking credit for discoveries that were not their own. These are well-presented and feasible scenarios that should really inspire debates.

Activity 15 introduces the variety of institutions that may help progress their careers, specifically, the Institute of Physics, the Royal Society of Chemistry and the Royal Astronomical Society. These are valuable sources of support and advice for students, which are often overlooked in publications of this sort.

Activity 16 requires students to re-evaluate their skills after the series of activities. They are required to look back over the work they have produced and the results of their discussions and role-play exercises. The student then produces a report that could easily be transferred into a Personal Development Plan.

The final activity is then a trip to and a tour of the Careers Service of their University. Although students can access this facility at any point in their course, they often leave it to the last minute, hence failing to fully exploit this valuable resource. This part of the course is not assessed but has the potential to be the most valuable activity of all.

By activity 2, I thought we should implement this material into our existing degree program. By the end, I was convinced. Highly recommended to all.

e-tivities: the key to online learning

Subject area
Electronic learning.

Description
A guidebook for would-be creators of electronic learning resources.

Authors
Gilly Salmon.

Publishers/Suppliers
RoutledgeFalmer
(http://www.tandf.co.uk/books).

Date/Edition
2002.

ISBN
0-7494-3686-7.

Level
Teachers.

Price
£22.99.

Summary Review

range: * poor to ***** good

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

The notion of the online university has come in for a bit of stick recently, but, despite the set-backs, enthusiasts for the electronic seminar room and networked distance learning programs can still be found. This vanguard frequently includes teachers who teach teaching, and Gilly Salmon in her guidebook “E-tivities: the key to online learning” primarily draws on examples of training others. This is not unreasonable given that previous disastrous experiments in ‘e-ducation’ have the roots of their failure in their proponents’ lack of recognition of the fundamental differences between classroom interaction and the asynchronous and anonymous interaction of the internet. E-tivities is a follow-up to Salmon’s previous book “e-Moderating: the key to teaching and learning online”.

As Gilly Salmon rightly points out most of us who teach in a modern university or elsewhere have been strongly influenced by the ways in which we were taught ourselves. The existence of a new teaching technology is not in itself an insurmountable barrier to change - most of us, after all, have both made and observed the journey from chalk and talk through the overhead projector to the joys (sic) of PowerPoint without difficulty - but unless we experience the new possibilities of electronic learning for ourselves how can we learn to employ it in our own teaching? This book, therefore, sets out to provide a no-nonsense, straight from the horse’s mouth, guide to how to run distance learning courses using electronic tools. These are worthy aims. Unfortunately, despite containing some very good advice, I don’t think that this book succeeds.

E-tivities is a collective toolkit of suggestions and advice for educators wanting to deliver ‘tutorial style’ personalized teaching whilst bowing to the increasing demands of cost-efficiency and lower staff-student ratios. The thesis is that network methods can be used to genuinely enhance the learning experience of students and educators alike provided that practitioners properly understand both the possibilities and limitations of the medium; since so many of us were educated in a traditional classroom this is by no means obvious and what we need is some insight into the practicalities. Gilly Salmon draws from her experience in delivering electronically moderated courseware within the Open University Business School to come up with a 5 stage model for structuring a successful online course. She covers, at each stage, the technical skills that course leader, the e-moderator, and students will need to acquire.

The book is divided into two parts.

The focus of the first part, written in a direct style, free of technobabble and pedagogical jargon, is on the social interaction and activities that can be employed by educators in higher education and corporate training alike. This is the most useful part of the book and is genuinely thought provoking in places. Some experience of specific commercial online conferencing tools is occasionally implicitly assumed but the techniques talked about are generic.

Benjamin Whitaker
School of Chemistry
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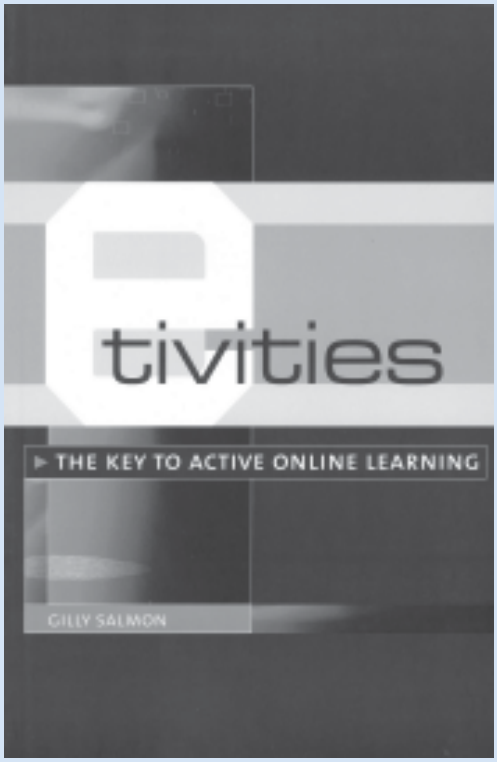
Leeds
LS2 9JT
March 2005

e-tivities: the key to online learning



From the publisher...

e-tivities: the key to online learning

By Gilly Salmon

This book addresses readers in both higher education and corporate training who are seeking to develop interactive and online programmes that truly engage learners. In education and training, the focus of those teaching with online technology is now on the actual content of programmes. Written by Gilly Salmon, an e-learning expert, this book shows the central role of activities in online learning and the importance of engaging learners. The book shows how to: develop low-cost and worthwhile e-activities; create fuller participation in online learning; and retain and satisfy learners. Based on Gilly Salmon's own research and worldwide experience working with students and in commercial training, this book is intended for professionals involved in online learning.

0-7494-3686-7 238pp 2002 £22.99

The second part of the book essentially consists of a set of checklists for the would be e-moderator to think about at each stage of planning and running a distance learning course. There is some useful information here too, particularly concerning the planning of time commitment on the part of the e-moderator. There is considerable focus throughout on the 'social skills' involved in internet learning and teaching; the 'netiquette' of asynchronous communication; techniques for motivation and bringing-in the 'lurkers'; suggestions for controlling the student/teacher interaction including moderating potential outbreaks of 'flaming'; cost effective techniques for summarising and leading students on to the next stage of their learning journey. The advice given seems sound and its efficacy is liberally illustrated with verbatim student feedback, but as a handbook for the would be 'e-ducator' this collection of anecdotes falls rather short of the mark. The contextual examples are rather narrowly drawn - essentially the social sciences - and, for me as someone who is interested in the possibility of applying electronic learning methods as, say, a replacement for tutorial support in the Physical Sciences I was left with rather more questions than answers.

Fundamentals of classical and statistical thermodynamics

Subject area
Physical Chemistry, Physics.

Description
This book presents the fundamentals of classical and statistical thermodynamics through concepts which are supported by examples and applications.

Authors
Bimalendu N Roy.

Publishers/Suppliers
John Wiley and Sons Ltd (http://www.wiley.co.uk).

Date/Edition
2002.

ISBN
0-470-84316-0.

Level
Undergraduate.

Price
£42.50.

Summary Review

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

The subject matter covered by this book features to some extent on all chemistry undergraduate courses as well as many in related subjects. However, there is much more here than would typically be covered. The book moves away from the fashionable approach of smaller texts; this one amounts to 743 pages but this is mitigated by the inclusion of a large number of worked examples, end of chapter problems complete with worked answers as well as a sizeable appendix covering the mathematical topics necessary for study. These features make the book valuable as a student resource since there is much to encourage independent study and learning. However, the range of depth of topics means that careful guidance will be necessary from tutors as to precisely which parts of the book are relevant to particular schemes of study.

The book follows a fairly typical and logical progression from the basics of classical thermodynamics - systems, work, heat, energy etc - through entropy and Gibbs free energy through to the fundamental concepts of statistical thermodynamics. The final parts of the book deal with Fermi-Dirac and Bose-Einstein gases and so go beyond the requirements of most chemistry undergraduate programmes although they might be suitable for more specialist options in some MChem or MPhys courses.

In general, the writing style is clear and accessible although there were some areas where explanations were pitched at too high a level and more detail would have helped to clarify points. I felt that the use of more diagrams would also have benefited many students. The page layout is quite ‘dense’ and with the inevitable degree of mathematical symbolism involved might be off-putting to less confident students. Although the worked examples serve to illustrate how the concepts can be used, I did find the presentation rather ‘dry’ and somewhat abstract; there is a lack of real-world contexts which students could use to engage with the material.

It is not possible to comment on a book of this type without considering the mathematical aspects. A reasonable level of competence - and perhaps more importantly confidence - in algebra and basic calculus is necessary to use this book with any expectation of success. The required level should not tax physics students too much; sadly the same is not true of many chemistry students. I felt that the basic level of the mathematical treatment was about right, albeit that some of the topics in the book require somewhat greater sophistication.

In summary, I’m not sure that this would be on the recommended list of primary texts for undergraduate chemistry courses but it will serve as a valuable source of further information, particularly as far as the examples and problems are concerned.

Gareth Price
Department of Chemistry
University of Bath
Claverton Down
Bath
BA2 7AY
April 2005

Fundamentals of Crystallography

Subject area
General Science.

Description
This book is a research-level monograph in crystallography, which is an interdisciplinary area between chemistry, physics, earth sciences, biology, mathematics and materials science.

Authors
Carmelo Giacovazzo, Hugo L Monaco, Gilberto Artioli, Davide Viterbo, Giovanni Ferraris, Gastone Gilli, Giuseppe Zanotti, and Michele Catti.

Publishers/Suppliers
Oxford University Press (http://www.oup.co.uk) and International Union of Crystallography.

Date/Edition
2002/2nd Edition.

ISBN
0-19-850958-8.

Level
Undergraduate, research.

Price
£44.50.

Kieran F Lim (林百君)
School of Biological and Chemical Sciences
Deakin University
Geelong VIC 3217
Australia
April 2005

Summary Review

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

This is a comprehensive monograph dealing with both the theory and practise of crystallography. The content includes: the theory of X-ray, electron and neutron scattering; applications to the structures of minerals, ionic and molecular solids and proteins; various X-ray sources, including synchrotrons, and detectors; materials used for X-ray filters; the crystallography of imperfect crystals, such as twins and crystals with defects; crystallisation methods; and crystal properties.

The book consists of ten chapters by eight authors. Unlike, and better than, most edited books, each chapter has appropriate cross-references to other chapters (by different authors), giving the book unity. The many diagrams are easy to read. The monochrome photographs have good use of contrast, brightness and shade. Some of the monochrome diagrams are replicated in colour. A minor complaint is that I could not find a mention of the location (eight unnumbered pages between pages 682 and 683) of the colour plates.

Chapters 1-4 and 6, 'Symmetry in crystals', 'Crystallographic computing', 'The diffraction of x-rays by crystals', 'Beyond ideal crystals' and 'Solution and refinement of crystal structures' relies on knowledge of 2- and 3-dimensional geometry, vectors and matrices, symmetry and group theory, Fourier transforms, convolution/deconvolution and tensors. The level of mathematical ability required to fully comprehend this book is equivalent to or in excess of that required for advanced physical chemistry textbooks. A trap for unwary readers is the use of unusual notation $\boldsymbol{a} \wedge \boldsymbol{b}$ for the vector cross product, instead of the normal $\boldsymbol{a} \times \boldsymbol{b}$ notation. Although the book is intended for undergraduates, graduates and professionals, these chapters may be too difficult for most undergraduate students.

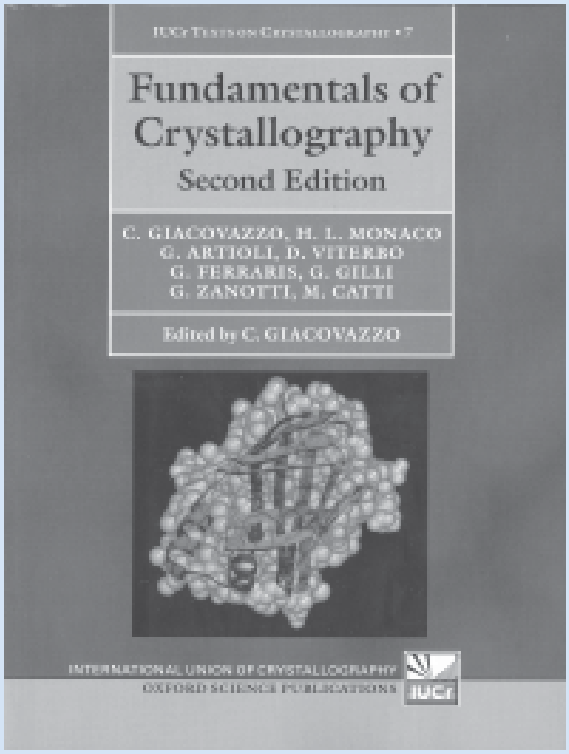
The remaining Chapters 5 and 7-10, 'Experimental methods in x-ray and neutron crystallography', 'Mineral and inorganic crystal chemistry', 'Molecules and molecular crystals', 'Protein crystallography' and 'Physical properties of crystals: Phenomenology and modelling' are more descriptive and can be easily used for middle-level and senior undergraduates. These Chapters also contain discussion of molecular structure, properties, reactivity and modelling.

The accompanying CDROM, "An interactive Book on General Crystallography (ABC)", can be used as a stand-alone computer-aided learning resource for first- or second-year undergraduates, ie it is pitched for a more-novice readership than the book. The book and CDROM can be viewed independently as they do not appear to be cross-referenced or otherwise integrated. Note that the CDROM does not work properly on some Macintosh computers. The CDROM does not have any revision questions or problem sets.

Graduates and researchers will find the monograph to be a very useful reference book. The ideas are well-presented and well-indexed. Each chapter has an extensive list of references to the primary literature. Graduates and researchers should be the target readership, especially as there are no worked examples, exercises or problem sets.

Continued on page 26

Fundamentals of Crystallography



From the publisher...

Fundamentals of Crystallography

By C. Giacovazzo, H.L. Monaco, G. Artioli, D. Viterbo, G. Ferraris, G. Gilli, G. Zanotti, and M. Catti

This book offers a comprehensive account of the wide range of crystallography in many branches of science. The fundamentals, the most frequently used procedures and experimental techniques are all described in a detailed way. A number of appendices are devoted to more specialist aspects. The book is an updated and fully revised new edition with emphasis on the wide range of topical applications and current areas of research. Ample illustrations help clarify the subject matter. To provide a better understanding of the basics of crystallography, a compact disk has been added to this new edition, offering the facilities of modern graphics to simulate experiments, show complex images, and provide a number of exercises.

0-19-850958-8 844pp 2002 £44.50

Continued from page 25

I found only two small typographical errors in the content of over 800 pages: the formula for naferisite (page 574) and the orientation of the molecule depicted in Figure 9 (d).

In summary, “Fundamentals of Crystallography” is well written and is an excellent and comprehensive reference for practising crystallographers and graduates.

Fundamentals of Molecular Symmetry

Subject area
Chemical Physics.

Description
This book by Bunker and Jensen is part of the IoP Series in Chemical Physics. It sets out to be an advanced treatise on molecular symmetry and its application to spectroscopy and bonding. In particular it aims to demonstrate which of complete nuclear permutation inversion groups (CNPI), molecular symmetry groups (MS) and point groups are best suited to different problems.

Authors
Philip R Bunker, Per Jensen.

Publishers/Suppliers
Institute of Physics (http://bookmarkphysics.iop.org).

Date/Edition
2004.

ISBN
0-7503-0941-5.

Level
Undergraduate, research.

Price
£29.99.

Nigel A Young
Department of Chemistry
The University of Hull
Hull
HU6 7RX
May 2005

Summary Review

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

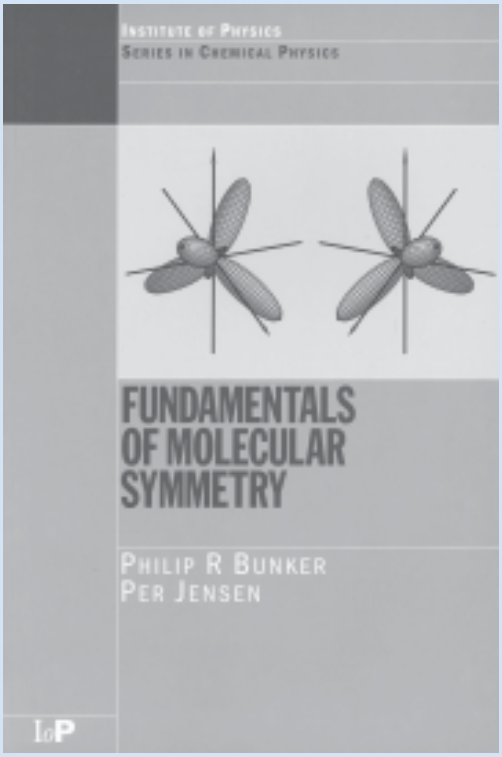
This book by Bunker and Jensen is part of the IoP Series in Chemical Physics. It is also a broader, lower level book than their research level "Molecular Symmetry and Spectroscopy"[1]. It is aimed at a senior undergraduate/postgraduate student/research worker readership. In the context of a chemistry course, this would really only be an advanced 3rd or 4th year undergraduate or a postgraduate specialist course, and even then its mathematical content and approach might challenge a significant fraction of UK students. In a physics context, this should prove less of a problem.

The title could be read to mean either introductory or basic fundamentals, and it is certainly the latter which is meant in this case. This is not a book for 2nd year undergraduates to use to work out the IR activity of metal carbonyls, or the construction of simple MO diagrams. There is also a more subtle play on words in the title, as the phrase molecular symmetry can be used both in a general sense, and as the authors show at some length, in a more formal, accurate and specific description making use of the complete nuclear permutation inversion (CNPI) approach. In essence the whole book is devoted to the theme of using the most appropriate symmetry techniques in order to understand bonding and to extract as much information as possible from experimental spectra. This ranges from the relatively simple and straight-forward point group approach, through to CNPI.

The book is divided into four sections. The first deals with spectroscopy and the quantum states of molecules, and is meant as an introduction to the parts that follow in order to make the book self-contained. This is at a fairly high level, and could easily frighten the mathematically less adept students. To answer this in part, there is a brief section on matrix algebra, but I am not convinced it is in the most appropriate place. The second part is the real meat of the book and deals with symmetry and symmetry groups. This starts from what should be the familiar ground of geometrical symmetry of molecules and their point groups. This rapidly moves into the concepts of nuclear permutations and the inversion operation E*, by pointing out the deficiencies of the point group approach for molecules that can tunnel, excited electronic states with different structures to their ground states, and cases where rotations and reflections are just not appropriate. The case of rigid molecules in isolated electronic states (i.e. no tunnelling observed) is dealt with first using the CNPI method. The authors go on to show that by deleting unfeasible operations from the CNPI group of the rigid molecule, a sub-group is obtained, which is called the molecular symmetry (MS) group, and that for rigid non-linear molecules this is isomorphic to the more conventional point group. The workings of this are demonstrated in some detail for H_2O, $(H_3)^+$ and C_2H_4. The third part deals with applications of symmetry and includes sections on: nuclear spin and statistical weights; symmetry of the electronic wavefunctions; symmetry of rotation-vibration wavefunctions; symmetry selection rules for optical transitions and symmetry groups of non-rigid molecules. The final section, part four, deals with other symmetries and symmetry violation.

Continued on page 28

Fundamentals of Molecular Symmetry



From the publisher...

Fundamentals of Molecular Symmetry

By P R Bunker, National Research Council, Canada; P Jensen, University of Wuppertal, Germany

Molecular symmetry is an easily applied tool for understanding and predicting many of the properties of molecules. Traditionally, students are taught molecular symmetry using point groups derived from the equilibrium geometry of the molecule. However, the true basis for molecular symmetry is not geometrical symmetry, and this book shows how to set up symmetry groups for molecules using more fundamental ideas. It is no more difficult than doing it using molecular geometry, and one obtains Molecular Symmetry (MS) groups. Point group symmetry is derived by approximation from MS group symmetry. The book is suitable for both undergraduates and research students in molecular science.

0-7503-0941-5 358pp 2004 £29.99

Continued from page 27

The book is very detailed, with all the important ideas and concepts thoroughly discussed and demonstrated. There are also a large number of problems at the end of the chapters, some of which have worked answers in the back of the book. I did find in places that it did not seem to flow very well, moving very quickly from one area onto another unrelated area without pause for breath. Also in a number of places the reader is referred back and forward to diagrams/ideas outlined in previous sections.

As a teaching text, I would not find it very easy to use, but as a resource for an advanced course in symmetry and spectroscopy/bonding there is a lot of very useful material in it. To avoid confusing the students, they would need to be clearly guided as to the relevant sections, if the whole CNPI approach was not to be used. As a resource for a starting out research students and other workers in electronic structure and bonding and high resolution spectroscopy it would serve as a very useful introduction to the more advanced aspects of symmetry. It would be a welcome presence on the research lab bookshelves, and would hopefully show signs of much use.

Reference

1. P Bunker and P Jensen, *Molecular Symmetry and Spectroscopy*, 2nd Ed, NRC Research Press (1998).

High Performance Liquid Chromatography

Subject area
Analytical Chemistry.

Description
This book aims to present the fundamental theory and practice of HPLC.

Authors
W J Lough & I W Wainer (eds).

Publishers/Suppliers
Blackie Academic & Professional – CRC Press (http://www.crcpress.com).

Date/Edition
1995.

ISBN
0-7514-0076-9.

Level
Undergraduate, research.

Price
£31.99.

Geoff Potter
formerly of
Faculty of Applied Sciences
University of the West of England
Coldharbour Lane
Bristol
BS16 1QY
April 2005

Summary Review

range: * poor to ***** good

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

This text aims to present the fundamental theory and practice of HPLC to advanced undergraduates and immediate postgraduates. It assumes that readers will have a good grounding in analytical chemistry and that they will be expecting to apply the technique to at least one of the newer sciences. Twelve chapters present a logical range of topics by authors from the UK and North America; the editors contributing three of the chapters.

Theoretical aspects are covered in one chapter on 'Efficiency, Retention, Selectivity and Resolution' and another on 'Method Development and Quantitation'. Practical matters are covered in several chapters including ones on 'Materials' and on 'Instrumentation'. Applications are addressed in 'Polymer Analysis', 'Biomedical and Forensic Analysis', 'Environmental Analysis', and 'Food, Organic and Pharmaceutical Applications' although, it has to be said, these are somewhat shorter than the theory and instrumental chapters. The text succeeds well in its stated aims; the level at which the topics are presented is neither unnecessarily elementary nor bafflingly obscure.

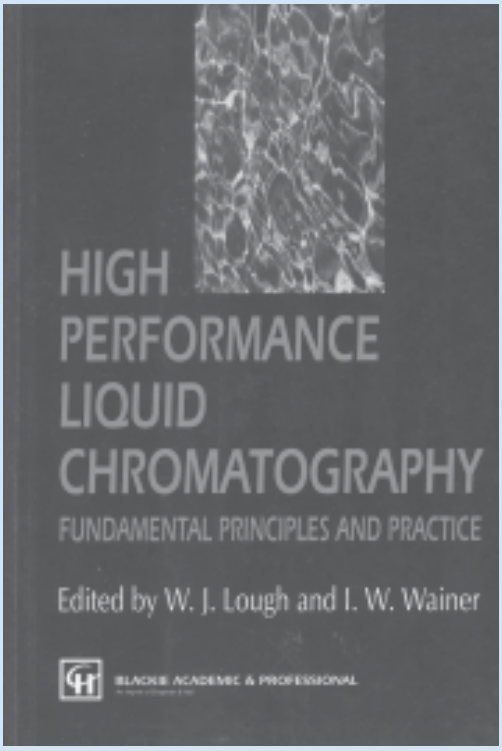
I was impressed by the inclusion of almost all of the facets of HPLC that I expected but I missed any reference to guard columns and to peptide separations. Generally, the amount of detail is sufficient for a good grounding in the topics to be achieved but in some sections it is perhaps a bit lacking. I have a few other reservations but none of them is particularly serious. Most chapters, but not all, have a bibliography but references to original papers are confined to only a few chapters. The applications chapters are particularly short of such references. However, further references can be found in the legend to figures and tables. The small print for these legends and a shortage of discussion in the main text made some of the figures laborious to interpret. There is quite a variation in the use of diagrams; some are almost too detailed but others have no labelling and are of doubtful value. I noticed a few minor typographical errors.

Inevitably, in a multi-author work, there is some duplication of material but this is only noticeable if the book is viewed as a whole. If the chapters are read individually it enables them to be more coherent and avoids laborious cross-referencing. The chapters on theory contain a fair number of equations but, I suspect, many chromatographers and students will try a system first and only use the equations when they need an explanation for a particular result.

I note that the text was first published in 1995. This means that the most recent references are dated 1993; in fact the majority are from the 1970s and 1980s and I doubt that many readers will want to look them up these days. However, the book is by no means out of date and all the material is relevant and appropriate. Of course, some of it is couched in terms of an 'emerging technique' but readers should readily understand that, in many cases, what are described as possible developments have now become accepted methods.

Continued on page 30

High Performance Liquid Chromatography



From the publisher...

HPLC:
Fundamental Principles & Practice

By W J Lough, University of Sunderland, UK and I W Wainer, National Institute on Aging (NIH), Baltimore, Maryland, USA

Written in a manner suitable for undergraduate students studying analytical chemistry and learning about chromatographic analytical techniques applied to pharmaceutical analysis, biochemistry and related disciplines, High-performance Liquid Chromatography: Fundamental Principles and Practice introduces the fundamentals of HPLC. Loosely structured in three parts, the text begins with a thorough introduction of the subject and then progresses through the essential knowledge of the instrumentation needed for HPLC. The final part covers the applications of HPLC in real-world situations. Developed by a team of international experts from a wide cross-section of disciplines, the text is relevant to a wide range of courses.

0-7514-0076-9 288pp 1995 £31.99

Continued from page 29

Since the book was written HPLC has become a mainstream technique rather than one that needs to establish its credentials. The lack of references more recent than 1993 is perhaps more serious in the applications chapters but the reader could easily compensate for this with some searching of journal indices and manufacturers' catalogues. It is to be hoped that a revised edition of the text will soon appear so that it can confirm tentative developments and can include the most recent column chemistries and applications.

The overall impression is that the text is a straightforward, thoroughgoing introduction of a satisfactory length. It is readable, very uniform in style and is eminently useful for the intended readership. The cost is in line with other texts of similar specialisation and size. It can serve well as an introduction to most aspects of the technique. It is equally suitable for personal use and for library shelves.

Inorganic Chemistry in Aqueous Solution

Subject area
Inorganic chemistry.

Description
A softback tutorial chemistry text aimed at undergraduate students which reviews the aqueous chemistry of the elements.

Authors
Jack Barrett.

Publishers/Suppliers
The Royal Society of Chemistry (http://www.rsc.org).

Date/Edition
2004.

ISBN
0-85404-471-X.

Level
Undergraduate.

Price
£14.95.

Claire Lenehan
School of Chemistry, Physics and Earth Sciences
Flinders University
Adelaide
South Australia
April 2005

Summary Review

range: * poor to ***** good

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

The knowledge of the fundamental principles which underpins our understanding of all facets of chemistry is essential for practising chemists. Inorganic chemistry is a vast discipline and accordingly aqueous inorganic chemistry is a complex and interesting subject involving many aspects of chemistry including atomic theory, ionic equilibria, oxidation, reduction, electrochemistry and thermodynamics. Jack Barrett's book "Inorganic chemistry in aqueous solution" presents a detailed discussion of the nature of ions in solution, and neatly ties together the fundamental thermodynamic and chemical concepts essential to explain their behaviour. "Inorganic Chemistry in Aqueous Solution" is a tutorial text of 184 pages intended for undergraduate audiences and concentrates on fundamental chemistry of the elements in aqueous solution.

From the outset, this book concentrates heavily on the thermodynamic aspects of aqueous inorganic chemistry, explaining many of the properties of inorganic ions in terms of enthalpy, entropy and Gibbs energy. The text is well written and structured, although sometimes a little heavy going, and is more suited to the more advanced student (2nd or 3rd year) or practitioner as many of the underlying thermodynamic concepts are assumed knowledge.

Considering the limited number of pages, the author has packed a lot of punch into the text including; the properties of water, acid/base chemistry, the hydration of ions in aqueous solution, thermodynamics and electrode potentials, solubility and stability of ions in aqueous solution and an in-depth discussion of the periodicity of inorganic aqueous chemistry. The chemistry of the s, p, d & f block elements is discussed in terms of their variation in oxidation states and hydration. This is followed by a summary of the general trends in the aqueous redox chemistry occurring within each group. A considerable amount of supporting data (including standard reduction potentials, Gibbs energies and enthalpies of hydration) is presented in a tabulated, easy to read, format.

The structure of the chapters is in a logical and ordered fashion and the layout of the text is very easy to follow. I particularly liked the use of side margins containing short statements and/or data to clarify and extend on important points raised in the text. The use of two colours in the text and diagrams (red and black) is a fantastic visual aid in highlighting important concepts and worked examples. The worked examples positioned throughout the text are well chosen, and illustrate the various concepts with solutions that not only give the answer but more importantly the reasoning and rationale used to reach the answer. However, as the intended use is as a teaching tool, I was a little disappointed by the limited number of problems presented for the students. As a result of its detailed, yet simple to read, format I would highly recommend the text as an excellent reference for those practising in aqueous inorganic chemistry or for those interested in geology/hydrology.

Interpreting Organic Spectra

Subject area
Organic Chemistry.

Description
Problem based book on the interpretation of organic spectroscopic data.

Authors
David Whittaker.

Publishers/Suppliers
The Royal Society of Chemistry (http://www.rsc.org).

Date/Edition
2000.

ISBN
0-85404-601-1.

Level
A-level, access, undergraduate.

Price
£27.95.

John Leaver
11 Ridley Road
Lowerhouse
Bollington
Macclesfield
Cheshire
SK10 5HL
May 2005

Summary Review

range: * poor to ***** good

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

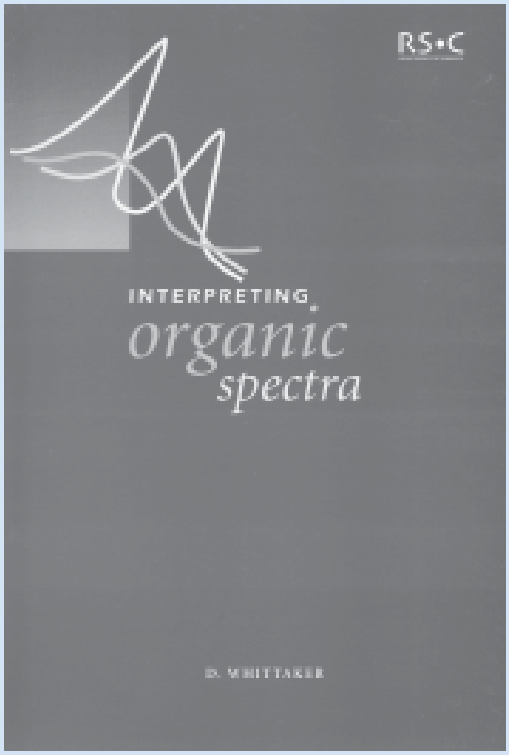
"Interpreting Organic Spectra" derives originally from an introductory course in spectroscopy delivered by the author, David Whittaker. He describes in his preface the limitations of this approach and quite rightly identifies that although the theoretical background to spectroscopy may be covered in a series of lectures the actual interpretation of spectroscopic data is much more successfully delivered by a workshop approach. Workshops of this sort depend on the availability of sufficient, suitable spectroscopic data for students to interpret and this book attempts to provide a resource of such material.

The spectroscopic techniques covered are Infrared, Mass, Ultraviolet, 13C Nuclear Magnetic Resonance and 1H Nuclear Magnetic Resonance.

Each of the spectroscopic techniques is introduced in its own chapter with a concise outline of the background theory, comments on sample preparation, information on the sorts of spectroscopic data which might be encountered, examples of interpreting provided spectra and useful tables of data such as IR absorption frequencies of common functional groups and NMR chemical shifts. These tables are not comprehensive, but there are many other sources of such data and this is a teaching and learning resource rather than a research text. These introductory chapters are very well thought out, with just enough information to be useful reminders of the theory which would have been covered in lectures and, in more detail, in theoretical spectroscopy teaching textbooks of which there are many good examples. It would have been useful if the current text had included a brief bibliographical section mentioning some of the textbooks to which students might like to refer to discover more about the theoretical background to each topic.

Each of the introductory chapters then has a section providing problems in structural interpretation based just on that particular spectroscopic technique covered in the chapter. There are also chapters based on using more than one technique to further elucidate a structure. So we have problems concerning the combined use of IR and 13C-NMR, MS and 13C-NMR and then a problem solving chapter involving the use of IR, MS, UV and 13C-NMR. 1H-NMR is then introduced with associated problems on interpreting 1H-NMR spectra. There is then a chapter on combining IR, MS, UV, 13C-NMR and 1H-NMR which encourages the learner to be careful when deciding on the significance of information from different sources and not making assignments that are mutually inconsistent. Then follows a chapter called 'Difficult Problems in Interpreting Spectra' these involve either the presence of several functional groups or species where the spectroscopic information seems rather meagre because of symmetry within the molecule.

Interpreting Organic Spectra



From the publisher...

Interpreting Organic Spectra

By D Whittaker, University of Liverpool, UK

Interpreting Organic Spectra covers the basic principles of spectroscopy in as non-mathematical a way as possible. It assumes no previous knowledge of spectroscopy and avoids excessive theory, approaching the topic as an exercise in pattern recognition. Hence the main focus of the book is in the provision of a variety of spectra for the student to interpret. Students are able to pace their progress by gaining confidence on the simpler spectra, and applying techniques learned to tackle more complex examples.

As an introduction to the subject, it is ideal for A-level students as well as chemistry undergraduates and will prove to be a very useful reference tool for teachers and lecturers.

0-85404-601-1 262pp 2000 £27.95

Overall this book provides a useful selection of spectroscopic problems for interpretation and lends itself very well to the author's aim of providing such information for an introductory course on the analysis of organic spectroscopic data. The book is well produced in a ring bound format allowing for the pages of spectra to lay flat and stay open. The spectra are produced with sufficient clarity to allow for the essential information to be extracted when solving the problems. Answers are provided in a final chapter, these are just the names of the compounds with no additional hints for those who become stuck, however in most cases working backwards from the structure should provide the learner with enough information to see where they were going wrong! The book concludes with a concise index, mostly covering the terminology found in the brief theoretical introductory chapters. This book can certainly be recommended as a useful source of spectra for interpretation for an introductory course on spectroscopy. Much of the content is accessible to A-level chemistry students and the book will also be useful as an introduction for undergraduates on chemistry related courses.

Introduction to liquid crystals

Subject area
General science.

Description
The text gives an historical account of the discovery of liquid crystals and continues with a description of how different phases are generated and how different molecular architectures affect liquid crystalline properties. The rest of the book is concerned with understanding and explaining the properties of the various types of liquid crystals, and in the final part of the book, the technology of LCDs is discussed and illustrated.

Authors
Peter J Collings and Michael Hird.

Publishers/Suppliers
Taylor & Francis – CRC Press (http://www.crcpress.com).

Date/Edition
1997/1st Edition.

ISBN
0-7484-0483-X.

Level
Undergraduate.

Price
£21.59.

Keith Wilkinson
Science Department
International School of Lusaka
PO Box 50121 Ridgeway
Lusaka
Zambia
May 2005

This introductory text is the first in the Liquid Crystals Book series edited by Gray, Goodby and Fukuda. Given the continuing growth of the field since it was first written in 1997, this work still stands as a comprehensive introduction reflecting the interdisciplinary nature of study of liquid crystal science and its applications.

Summary Review

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

Liquid crystals represent not only a new phase of matter, but also a new light in which to view biomolecules, many of which have liquid crystalline properties. The textures and colours of butterfly wings offer one example, and on supermarket shelves the addition of liquid crystalline compounds give the opalescence now familiar in hair conditioners. Liquid crystals are more usually associated with the use of nematic phase liquid crystals in the production of cheap, compact, energy efficient LCD watches/ calculators in the late 70s, moving to commercially viable colour laptop displays in the late 80s. With the massive funding from large computer manufacturers, research efforts to reduce the response time of liquid crystals to electric field changes, as well as improved brightness and contrast has led to LCD displays that are replacing traditional CRT technology.

The liquid crystal field is truly multidisciplinary; spanning mathematics, electronics, physics and the chemical fields. Consequently, any introductory text should not presuppose particular expertise. The authors claim that the material presented requires only introductory level physics and chemistry. This claim is well supported, and makes this an ideal introduction to liquid crystals for scientists of all disciplines. Undergraduate level mathematics is presupposed as much of the vector tensor analysis uses matrix operations, and partial differential calculus. Always, however, the science and maths is presented in the practical context of liquid crystals.

This field, as with others, has evolved a rich terminology of its own, and this is introduced gradually through the book. Yet given the number of terms, a glossary would have been helpful for those needing to scan the text selectively, and for those new to this field.

The book opens, as has become a ritual custom in this field, with a presentation of kinetic models that explain the different liquid crystal phases. Related introductory aspects of molecular shape and intermolecular attraction are discussed. An engaging historical introduction opens with Friedrich Reinitzer's observation in 1888 that a cholesterol analogue appeared to have two melting points with an intermediate phase between the two, and culminates with the explosion of interest through the latter part of the 20th century with the first technical applications.

Introduction to liquid crystals

The mesophases, each with characteristic birefringent textures when viewed between crossed polaroids under a light microscope, are discussed and supported by a section containing six colour plates of typical mesophase textures in the middle of the book. Given that for most readers the real fascination with liquid crystals lies in observing the colourfully textured phases the number of plates is a bit on the sparse side. This excellent text could be better supported by a multimedia CDROM including a number of simulations, an on-line glossary, as well as a structure-property database for ease of reference.

The mathematical treatment is comprehensive using tensor notation and vectors to support models of degrees of order. The mathematical models are extended in the subsequent chapters as different types of liquid crystal and different mesophases are considered.

Similar to the structure-property relationships that have given medicinal chemistry an exciting predictive edge in drug development, this text illustrates how structure-property relationships have been inferred with liquid crystals. Thus the concept of liquid crystals by design has been of particular importance with the drive for enhanced properties in LCD displays, the main technological application for liquid crystal research.

Hydrogen-bonded liquid crystal dimers are discussed, as well as first hand descriptions of pioneering work carried out at Hull University such as the contribution by Gray of the alkylcyanobyphenyls, the first commercially viable nematic liquid crystals to be used in display devices. These are, of course, the same compounds still in use for watches and calculators. This leads naturally to a structure-property relationship discussion using these cyanobyphenyl based mesogens as examples of the effect on the phase transition temperatures of varying the terminal moieties on the aromatic core.

A similarly detailed discussion based around discotic and polymeric liquid crystals follows in subsequent chapters, together with an exploration of the stereochemical aspects of chiral moieties, and the dependence of properties on molecular asymmetry.

A chapter is given to lyotropic liquid crystal behaviour commencing with studies of myelin nerve sheath materials mixed with water giving birefringent textures. Such effects as detergent action and micelle formation are discussed with the introduction of phase diagrams.

For those interested in the biological significance of liquid crystals, there are a range of examples explored from viruses to phospholipid bilayer cell membranes emphasising the importance of lyotropic liquid crystal behaviour in living systems. For an educator seeking examples to demonstrate the context and importance, there are plenty to use here. The black and white line drawings used throughout the book to illustrate the models proposed are especially clear.

A chapter detailing the common chemical synthesis pathways follows featuring detailed coverage of the common synthetic routes for calamitic, chiral, discotic and polymeric mesogens.

As is the case in any practical field, phase identification is a practical art learned by experience and guidance, and a textual treatment will have the same limitations as learning to ride a bicycle by reading a book! Yet the section on phase identification covers important empirical aspects and introduces the use of differential scanning calorimetry (DSC), noting the expected ranges of energy change that are empirically associated with particular phase transitions. An annotated example of a DSC graphical output would have been helpful for those new to DSC. This would have made this section invaluable given the importance of this technique in verifying phases coupled with observations of birefringent textures under the light microscope.

This work remains an excellent introduction to those new to the field. The reader is fully immersed in the vocabulary, structures, data and kinetic models, and will rapidly build up an understanding of the models in current use. The text, whilst introductory, is well populated with data that support the models and ideas presented. A multimedia CDROM or supporting website would expand the range of media and presentation particularly in assisting in training those new to the field in the visual aspects of phase identification.

Introduction to Modern Inorganic Chemistry

Subject area
Inorganic Chemistry.

Description
This textbook serves as an introduction to all the basic concepts of modern inorganic chemistry, including some selected topics in the areas of biological, medicinal and environmental inorganic chemistry.

Authors
K M Mackay, R A Mackay, W Henderson.

Publishers/Suppliers
Nelson Thornes – CRC Press (http://www.crcpress.com).

Date/Edition
2002/6th Edition.

ISBN
0-7487-6420-8.

Level
Undergraduate.

Price
£22.39.

Brian Murphy
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College of Science
UAE University
PO Box 17551
Al-Ain
UAE
May 2005

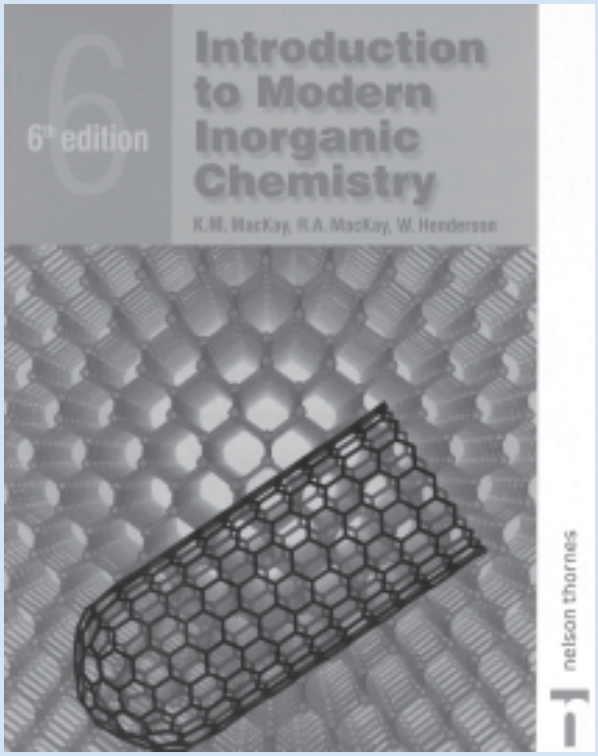
Summary Review

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

"Introduction to Modern Inorganic Chemistry" is the sixth edition of this well-established textbook, which was first published in 1968. The text itself consists of twenty chapters, covering all the basic concepts of a typical undergraduate university inorganic chemistry course. The overall structure of this edition is similar to previous editions with the earlier chapters covering core concepts in inorganic chemistry such as electronic structure, physical properties, molecular orbital theory, VSEPR, solid-state and solution chemistry, as well as an excellent chapter on experimental methods, covering topics such as methods of separation and diffraction, spectroscopic methods (including NMR, electronic spectra, vibrational spectra, ESR, Mössbauer, mass spectrometry), SEM, STM and PES. The second section of the book covers systematic descriptive inorganic chemistry, with the final third focusing on more specialized topics such as cluster compounds, silicates, aluminosilicates and related materials, polychalcogenide compounds, fullerenes and nanotubes, dendrimeric molecules and aspects of biological, medicinal and environmental inorganic chemistry. With this wide coverage of topics, the text would certainly form the back-bone of an introductory level course in inorganic chemistry at university level. This edition has been strengthened in the more specialised areas of inorganic chemistry, and topics such as the use of supercritical fluids as solvents, large metal clusters and the application of mass spectrometry in inorganic chemistry have all been added in this edition. As the authors point out in the preface, inorganic chemistry as a subject continues to fascinate, and the authors have nicely integrated the fundamentals of the subject with the latest developments in the field.

Overall the chemistry is very solid in this book, and can easily be supplemented in the areas where the authors do not go into a comprehensive in-depth treatment. This may appeal to students and to some lecturers, which allows flexibility in teaching the material and in the lecture delivery. It is difficult to state exactly what cohort of students this book would suit best. The text would certainly be appropriate for an introductory course in inorganic chemistry for a student pursuing a BSc General Degree, or perhaps for a student in year 2 taking a BSc Honours course. However, this may necessitate the purchase of a more advanced text on inorganic chemistry in subsequent years, which may be a consideration. The book does cover some topics in a refreshing manner. For example, I particularly liked the way the authors treat VSEPR Theory, bypassing the determination of Lewis structures initially, and deducing structures based on a sigma-bonding framework approach. In addition, their treatment of the electron counting procedure of p electrons is nice, an approach not often seen in inorganic chemistry textbooks. The book also contains various margin notes, leading to a more modern and readable style. For example, in the case of the SO_2 molecule, the authors refer to a recent article in the literature which has concluded that the bonding is best described by means of two S=O double bonds.

Introduction to Modern Inorganic Chemistry



From the publisher...

Introduction to Modern Inorganic Chemistry

By Ken Mackay, Professor Emeritus
Ann Mackay, Professor Emeritus
Bill Henderson
University of Waikato, Hamilton, New Zealand

Introduction to Modern Inorganic Chemistry begins by explaining the electronic structure and properties of atoms, then describes the principles of bonding in diatomic and polyatomic covalent molecules, the solid state, and solution chemistry. Further on in the book, the general properties of the periodic table are studied along with specific elements and groups such as hydrogen, the 's' elements, the lanthanides, the actinides, the transition metals, and the "p" block. Simple and advanced examples are mixed throughout to increase the depth of students' understanding.

0-7487-6420-8 624pp 2002 £22.39

Overall the style of the book has improved from previous editions. I found the layout reasonably satisfactory. However, the most disappointing aspect of the production is the lack of colour. For many years, most inorganic chemistry books have not carried colour graphics, which is a real pity as the subject lends itself so readily to colour, especially in the area of the three-dimensional representation of molecules, complexes and lattices and in the representation of orbitals and MO diagrams. Recently however, the latest editions of inorganic textbooks have addressed this short-coming. The publishers missed a golden opportunity in this respect! In addition, most modern textbooks have an excellent bank of supplementary material accompanying the main text, such as a solution manual, transparencies, linked website, Blackboard cartridge etc. This text does not refer to any of these features, and hence if it is to become a real contender in the choice of text for introductory inorganic chemistry, then all these materials must be developed in subsequent editions. Students and lecturers these days expect this level of support from a publisher. Unfortunately, this development has not taken place to the same extent in inorganic chemistry books, if one compares the corresponding situation with publications in general chemistry, organic chemistry and analytical chemistry.

Finally, the book could be improved on in some areas, where I felt the treatment of some topics was just too general. Point group symmetry is relegated to an appendix in the book. The book would be considerably strengthened if symmetry and group theory was introduced early on. Other topics which are only partially covered include the magnetic properties of transition metal compounds, isomerism of transition metal complexes and electronic spectra. All of these subjects get a mention, but the authors I feel could easily have approached these areas with a more in-depth treatment.

In summary, I definitely would recommend that this book be stocked in a university library. The book may suit a very general inorganic chemistry course, but expansion in some areas will definitely be necessary.

Introduction to Solid State Physics

Subject area
Solid state physics.

Description
This book is aimed at introducing undergraduate physics students to the basic concepts and phenomena needed to understand the physics of the solid state. The book is an updated version (8th edition) of this well established text. Of particular note is the new section on nanostructures.

Authors
Charles Kittel.

Publishers/Suppliers
John Wiley and Sons Ltd (http://www.wiley.co.uk).

Date/Edition
8th Edition.

ISBN
0-471-68057-5.

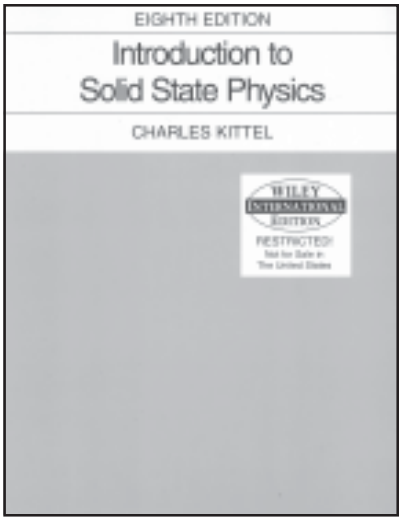
Level
Undergraduate.

Price
£37.95.

Summary Review

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

This is the latest edition of the book that first appeared in 1953. For those familiar with previous editions, there is much in this book that has remained unchanged in the last twenty to thirty years. The early chapters concerning the basic properties of crystals, phonons, the behaviour of electrons in metals, magnetism etc remain clear and at a level suitable for current undergraduates studying solid state physics in the 3rd or 4th year of their degree course. However, with each new edition of this book, the author has endeavoured to incorporate the latest progress in the field and this edition is no exception. For example, there is a completely new chapter entitled 'Nanostructures' that covers the theoretical and experimental aspects of Scanning Tunnelling Microscopes, Atomic Force Microscopes and other methods for imaging on this scale. In addition to these imaging aspects of nanostructures the ramifications concerning the electronic structure and properties of these nanoscale objects is also presented. The basic idea for the creation and the properties of quantum dot systems is then presented in a clear and precise fashion.



One point that is immediately clear from this edition is the lack of bibliographical information. The author reasons that much of the additional information concerning the topics covered in the book may be obtained easily from the internet using Google. My feeling is that such reliance on the internet is still a little premature. I would agree that up to date information on the latest techniques and devices is easily obtained in this way. However, finding suitable and reliable theoretical descriptions for undergraduate courses still remains problematic. Why rely exclusively on the internet when authoritative bibliographic references have been long established?

There are many other books now available that cover similar material but this book remains, with the recent additions, a classic undergraduate text.

Adrian Barnes
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May 2005

Mass Spectrometry: A foundation course

Subject area
Physical Chemistry.

Description
This book comprises 10 Chapters, and 11 Appendices. The first 2 chapters deal with an introduction to mass spectrometry and the mass spectrum, and precede two substantial chapters which describe instrumental aspects of mass spectrometry. Organic mass spectrometry and ion chemistry chapters introduce aspects of interpretation of fragmentation processes, the effects of different chemical classes on types of fragmentation obtained, and ion-molecule reactions. The final 4 chapters address specific approaches and roles of mass spectrometry in a range of applications areas. The book commences with a guide to the student (or instructor) to provide a structured approach to using the text for various teaching courses.

Authors
Kevin Downard.

Publishers/Suppliers
The Royal Society of Chemistry (http://www.rsc.org).

Date/Edition
2004.

ISBN
0-85404-609-7.

Level
Undergraduate, research.

Price
£39.95.

Philip Marriott
School of Applied Sciences
RMIT University
Australia
April 2005

Summary Review

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

Students of instrumental analysis need a good MS textbook. One that introduces the essence of the technique, provides sufficient background to place theory into context, delivers an understanding of the role, scope and capabilities of various MS methods, and then illustrates how modern MS is employed by capturing the range of essential applications that make MS a fundamental tool for today's chemical, biological and environmental analyst.

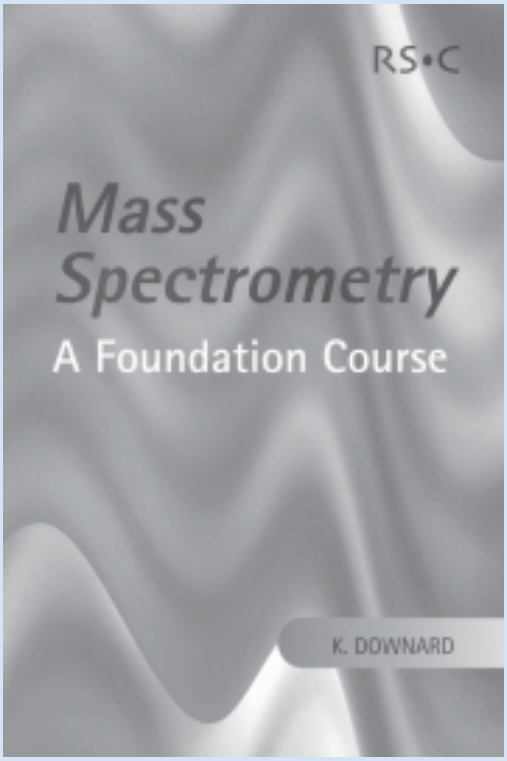
This book by Kevin Downard has made a valiant effort to distil the broad literature and practice of MS into a compact format that will serve to educate the student or newcomer to the field. He acknowledges that this is not an encyclopaedic tome, nor does it treat cutting edge theories or offer a broad treatise. There will be time ahead for the reader of this book to delve or graduate into the more detailed or specialised MS texts or primary literature. But for now, get the value and concepts of MS across without overwhelming the student, who may not yet specialise in MS but who requires, by dint of coursework or demand for a summary overview, basic understanding of the topic. For them, a single text volume that is clear, uncluttered, concise and systematic is exactly what is needed - and it is apparent that this is achieved in this text.

The author has chosen to also offer a guide for the student (or course instructor) to the topics he recommends as covering the needs of various area of MS study, from undergraduate to postgraduate, in a variety of disciplines. This also serves to further guide and steer the reader through sufficient information that will address their needs, without unnecessary peripheral information. Thus sufficient discussion of the instrumentation of MS (and tandem MS) is included, as is how the mass spectrum is generated and some information on interpretation of the mass spectra of various compound classes (termed organic mass spectrometry). However there are not copious examples of each of these. Of course, the instructor may choose to embellish the material with case studies where MS is applied to particular problem solving exercises in the relevant discipline - and I would certainly suggest that this text does not cover this too widely across all the discipline areas mentioned. So there will still be a requirement for the user of this text to gather additional information from without the pages of this text. The success of this book should be based on what it does include and the manner in which it presents the topic, rather than what it does not.

Four chapters deal with specific applications areas of mass spectrometry, covering biological, medical, environmental and surface sciences, and accelerator mass spectrometry. Each of these presents small cameo sections on different relevant aspects of mass spectrometry in the general area. Here, there is probably more of a chance that an individual's preferences will not be dealt with in the detail that they may expect, or require. For instance, the attention given to pesticides analysis, or drug/toxicological analysis might be seen by some to be under-represented, as against the attention devoted to mass spectrometry in space. There is clearly much more current use of MS in the former areas, than in the latter, and so the weight given to analytical mass spectrometry might seem to be not in keeping with practice in the wider mass spectrometry community.

Continued on page 40

Mass Spectrometry: A foundation course



From the publisher...

Mass Spectrometry
A Foundation Course

By K Downard, University of Sydney, Australia

Mass Spectrometry: A Foundation Course is a text-book covering the field of mass spectrometry across the chemical, physical, biological, medical and environmental sciences. Sufficient depth is provided for the reader to appreciate the reasons behind and basis for particular experiments. It is uniquely and logically organised to enable the book to form the basis for a university course in mass spectrometry at the undergraduate or postgraduate level. This is achieved by combining specific core sections coupled to optional areas of study tailored to students of the chemical, physical, biological, medical and environmental sciences. Recommended course structures are provided in the front of the book.

0-85404-609-7 210pp 2004 £39.95

Continued from page 39

However as a text that attempts to be broad-based, and to serve as a foundation of the general science, instances where it fails to address certain topics above and beyond other equally significant applications topics cannot be helped

This book should find ready adoption in courses which focus on teaching of MS, and it appears to be one of the better teaching texts in MS. Being purposely designed to meet the objectives of the author as a teacher (and researcher) in mass spectrometry, it appears to this reader that it has achieved this goal.

Mathematics Teaching Practice: A Guide for University and College Lecturers

Subject area
Physical Chemistry.

Description
Teaching guide for lecturers of mathematics.

Authors
John H Mason.

Publishers/Suppliers
Horwood Publishing Ltd (http://www.horwood.net/publish).

Date/Edition
2002.

ISBN
1-898563-79-9.

Level
Teachers.

Price
£30.00.

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Keele University
Keele
Staffordshire
ST5 5BG
May 2005

Summary Review

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

Many lecturers in physical chemistry will be familiar with the need to teach basic mathematical skills to students, whether as part of a formal course or as an aside during chemistry classes. This book is aimed at those who will be teaching mathematics at a range of levels, with the readership including those employed in university departments, teacher training colleges, colleges of further and higher education, sixth form colleges and secondary schools. However, my own feeling was that the material is aimed directly at tertiary education, reflecting the author's own background.

In a brief Chapter 0, the labelling of which reflects that this book belongs to the discipline of mathematics, the author states that the book is directed to lecturers including those who are teaching students who have been told they need mathematics for their own discipline. He does not however elaborate on whether such lecturers are assumed to be in mathematics or other departments; the former seems to be assumed.

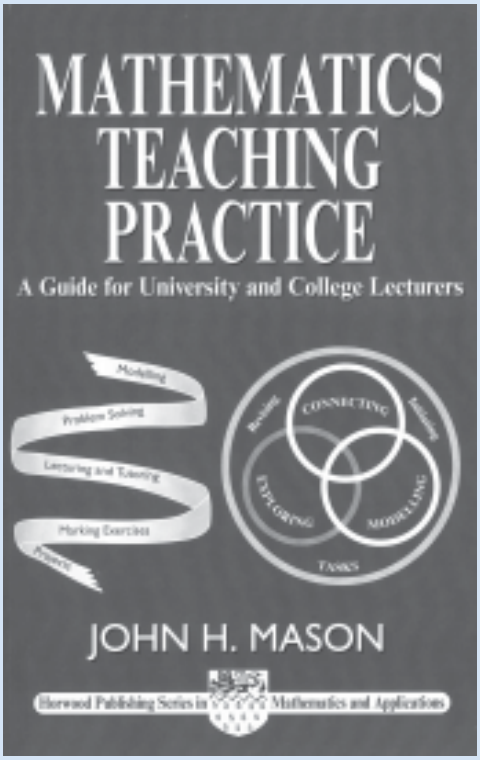
One feature which runs throughout the book is the inclusion of highlighted tactics. The author identifies these as a series of specific acts within lecturing, and describes these as short-term goals rather than long-term aims. The scope of these tactics varies considerably. Examples include 'Instead of always stating a generality and then offering one or more worked examples, try starting with the particular examples and then inviting students to express what they see as common between them' and 'When introducing a new term to students, take a brief moment to indicate its origins, or the sense in which the ordinary usage is being made more precise'.

Another feature which considerably enhances the usefulness of such tactics is that they are indexed by topic and chapter at the end of the book. A glance down the list for Chapter 2, 'Lecturing' reveals such topics as 'Emphasising One Thing Per Session' and 'Varying Notation'. Much of the material in this chapter on 'Lecturing' is based on a discussion of screens. The author groups these as physical, mental and multiple screens, and stresses the advantages of using more than one type of physical screen to convey information during a lecture.

Other topics covered in separate chapters include tutoring, constructing tasks and marking and commenting. Each of these contains material which will be of use to those who are teaching mathematics to chemists. A section on 'Advising Students How to Study' includes tactics on advising students how to study a mathematics text, advising students how to make the most of a worked example, and advising students how to recognise a problem type. In the 'Constructing Tasks' chapter, one tactic emphasises the importance of encouraging students to self check their work by doing this during the presentation of a worked example. A very useful tactic for those who are overburdened with marking and commenting appears in the chapter on this topic. This is to select what to mark in great detail and what to mark more generally. The author stresses that as long as the students do not know in advance which questions will be carefully scrutinised, they are likely to try hard at all of them.

Continued on page 42

Mathematics Teaching Practice: A Guide for University and College Lecturers



From the publisher...

Mathematics Teaching Practice: Guide for University and College Lecturers

By John H Mason, Faculty of Mathematics and Computing, The Open University, Milton Keynes

Clarifying the distinction between mathematical research and mathematics education, this book offers hundreds of suggestions for making small and medium sized changes for lectures, tutorials, task design or problem solving. Here is guidance and inspiration for effective mathematics teaching in a modern technological environment, directed to teachers who are unhappy with results or experience, or those now in teacher training or new to the profession.

1-898563-79-9 200pp 2002 £30.00

Continued from page 41

The remaining chapters are devoted to 'Making Use of History' and 'Issues and Concerns in Teaching Mathematics'. I felt that these would be of less use to chemists; the former suggested using portraits of famous mathematicians, and while the equivalent process is of value in physical chemistry exploring the history of the relevant mathematics is probably straying too far from the essential material.

There is a useful bibliography at the end of the book, containing references up to around 2001. These are grouped into a general section, 'Historical Sources and Resources', 'Teaching of Specific Mathematical Topics', 'Classroom Techniques', 'Research into Teaching Mathematics at Tertiary Level' and 'Perspectives on Mathematics'. The list of printed resources is followed by a list of websites.

I found that this book gave a very useful and practical perspective on the teaching of mathematics in higher education. I would certainly recommend it to any lecturer who has been given responsibility for the Mathematics for Chemistry course for the first time, but there is also much of interest for those who will need to cover mathematical topics and techniques during their teaching of physical chemistry.

Mechanisms in Organic Reactions

Subject area
Organic Chemistry.

Description
This book aims to inform students about both the drawing of mechanisms and how they can be experimentally verified.

Authors
Richard Jackson.

Publishers/Suppliers
Royal Society of Chemistry (http://www.rsc.org).

Date/Edition
2004.

ISBN
0-85404-642-9.

Level
Undergraduate.

Price
£14.95.

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

The text "Mechanisms in Organic Reactions" by Richard Jackson aims to inform students about both the drawing of mechanisms and how they can be experimentally verified.

The style of the book is to be commended with a sensible use of a single colour to add emphasis where required. A marked contrast to some of the 'rainbow' coloured texts that emerged a while ago. A clear chapter style, including introductions and aims, makes for a very user friendly product. Solved problems and end of chapter study problems (with detailed solutions) are all relevant and helpful.

Chapter one introduces the reader to a mechanism and the basics of breaking and making bonds. Chapter two outlines the use of experimental evidence, such as rates and order, in deciphering mechanistic information. Chapter three covers transition states along with steric and electronic effects. Chapters 4 and 5 describe nucleophiles-reactions under basic conditions and electrophiles-reactions under acidic conditions respectively. Chapter 6 outlines radicals with a description of ESR as a technique for identifying them. The last chapter deals with frontier orbitals and pericyclic reactions.

Certainly when attempting to cover both theoretical and practical aspects in 7 chapters (~200 pages) a comprehensive description of every topic cannot be provided but the level of detail is ample and a list of recommended further reading follows each and every chapter.

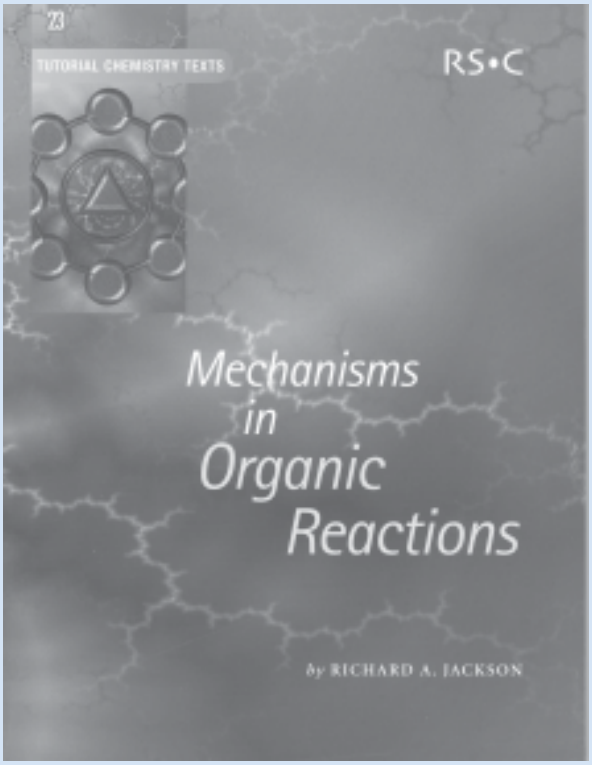
Only one major error was noted by this reviewer; in reaction 2.41 on page 40, the nitro group has vanished from the product! Aside from this mistake the text is clear and error free.

A particular grievance was the use of a resonance arrow in the representation of hyperconjugation (Figure 3.3 page 51). The two 'resonance' structures clearly do not have the same sigma bonding network and thus should not be considered resonance structures. I am also aware of the confusion undergraduates have understanding formal charge (an atom with a negative charge owns one electron more than its valence) and using the double headed mechanistic arrow to form a new covalent bond (movement of two electrons). Although it has become accepted to draw mechanistic arrows starting from the negative charge, the inclusion of electron pairs on the charged atom, and the drawing of the mechanistic arrow from a lone pair (as in McMurry[1]), is of great use to instructors and is something textbooks aimed at an undergraduate market could easily include.

Fred Pfeffer
School of Biological and Chemical Sciences
Deakin University
Waurn Ponds
Geelong 3217
AUSTRALIA
April 2005

Continued on page 44

Mechanisms in Organic Reactions



From the publisher...

Mechanisms in Organic Reactions

By R A Jackson, University of Sussex, UK

Mechanisms in Organic Reactions helps students to make sensible proposals for the mechanisms of particular organic reactions and then how to distinguish between different possible mechanisms. Techniques for this include product studies kinetics and the identification of intermediates. Three chapters on intermediates discuss likely points of attack on molecules by anions radicals and cations and the important role of acid- and base-catalysed reactions and radical chain reactions. The prediction of reaction rates and the effects of structural changes on reaction rate are also covered. It concludes with a discussion of molecular reactions both thermal and photochemical - reactions which provide deep and beautiful insights into the reasons why some reactions go and others do not and why the majority of real-life reactions involve multi-step processes.

0-85404-642-9 192pp 2004 £14.95

Continued from page 43

For just drawing mechanisms other texts, such as that by Grossman[2] or Sykes[3], are available but overall "Mechanisms in Organic Reactions" is a fine, affordable, addition to the current range of available texts as it includes some experimental science and as such its scope is broader than the simple arrow pushing approach.

In summary I think the text meets its objectives and is very well presented. I believe this book would suit a student who has a little practical experience and some basic understanding of either organic or physical chemistry.

References

1. J McMurry, *Organic Chemistry*, 6th ed, Brooks Cole, Belmont CA (2004).
2. R Grossman, *The Art of Writing Reasonable Reaction Mechanisms*, 2nd ed, Springer Verlag, New York NY (2003).
3. P Sykes, *Guidebook to Mechanisms in Organic Chemistry*, 6th ed, Longman, New York NY (1996).

Molecular Modeling: Basic Principles and Applications

Subject area
Pharmaceutical Chemistry.

Description
A textbook for beginners as well as an invaluable reference for all those dealing with molecular modelling in their daily work.

Authors
H-D Holtje, W Sippl, D Rognal, G Folkers.

Publishers/Suppliers
Wiley-VCH (http://www.wiley-vch.de/publish/en).

Date/Edition
2003/2nd edition.

ISBN
3-527-30589-0.

Level
Undergraduate, research.

Price
€52.90.

P M Rodger
Department of Chemistry
University of Warwick
Coventry
CV4 7AL
March 2005

Summary Review

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

In picking up a book entitled "Molecular Modeling: Basic Principles and Applications", one might anticipate learning something of the very broad range of applications in which molecular modelling is now used - areas such as framework materials, oxides and ceramics, liquid crystals, polymers, biological membranes, proteins and DNA. In fact, the authors have defined their scope much more narrowly than the title might suggest, and this book is focussed entirely on pharmaceutical chemistry. It covers areas such as molecular docking, computational screening for active drugs, protein homology modelling and protein ligand interactions in considerable depth, and seeks to give a brief overview of some quantum, classical and statistical methods that underpin these applications

This book is a second edition, and is intended to update the methods and applications that were presented in the first edition. Molecular modelling is, indeed, a very rapidly developing field, driven by massive improvements in both hardware and modelling methods over the last 15 years. The scale of problem that can be tackled with molecular modelling increased so dramatically during the seven years between the first and second editions that there was certainly a pressing need to update the material presented in the first edition. Unfortunately, the book completely fails to do this. There has been only a token attempt to update the references. For example, in chapter 4 (which was neither the best nor the worst from this perspective) I counted just 17 out of more than 200 references that were published after the date of the first edition, and there are repeated references to publications 'during the last decade' where the publication date turns out to be in the 1980s. In consequence, the discussion of methods is often sadly out of date. The treatment of electronic structure methods is limited to a discussion of (small) basis sets and semi-empirical methods. There is not even a mention of the density-functional methods that are now so common-place in all forms of modelling. Likewise the treatment of classical methods (molecular dynamics and Monte Carlo) is primitive at best. There are repeated references to the difficulty in including solvent effects, and the book positively advocates the use of a distance-dependent dielectric to mimic solvent despite the fact that this was considered dubious even when the first edition was produced. There is absolutely no mention of the particle-mesh methods that were developed during the early-mid 1990s and have allowed explicit treatment of solvent to become routine when simulating biomolecules. The book even fails to give any idea of the scale of computation that is now possible. Indeed, in one worryingly obsolete reference, the book completely ignores more than a decade of unbelievably rapid increase in computer power and speed by citing the amount of time it took to perform a calculation on a microvax as proof that certain calculations are too time-consuming to consider.

In summary, this is a second edition that is still waiting to be written. The advice and methods are now so out of date that readers would be much better advised to look at almost any of the other molecular modelling books that are now being produced.

Molecular Physics and Elements of Quantum Theory

Subject area
Molecular physics, quantum theory, spectroscopy, physical chemistry.

Description
This textbook introduces the molecular and quantum chemistry needed to understand the physical properties of molecules and their chemical bonds.

Authors
H Haken and H C Wolf.

Publishers/Suppliers
Springer (http://www.springeronline.com).

Date/Edition
2004/2nd edition (tr. from German).

ISBN
3-540-40792-8.

Level
Undergraduate, research.

Price
£46.00.

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Manchester
M60 1QD
April 2005

Summary Review

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

Just by chance, I was invited to review two weighty tomes on seemingly similar topics. It was just a matter of luck as to which one I started with, but it turns out that the two texts are quite different.

Haken and Wolf have chosen a good title, for the text aims to bridge the gap between physics and (physical) chemistry. So we don't meet the postulates of quantum mechanics, nor do we find any mention of the Aspect experiments (or Schrödinger's cat for that matter). What we do find is a treasure trove of interplay between experiment and basic theory. Even the molecular structure section is passable (for physicists at least). This text is a translation from the German of the second edition of "Molekülphysik und Quantenchemie", which builds on "The Physics of Atoms and Quanta"[1] by the same authors (where Schrödinger's cat is to be found, along with the Einstein-Podolsky-Rosen paradox, Bell's inequality, quantum entanglement and much more).

The authors claim that '[This]... book is intended to fulfil a dual purpose: on the one hand to give an introduction to the well-established fundamentals of the field of molecular physics, and on the other, to lead the reader to the newest developments in research'. Let's see. The website http://www.springeronline.com/3-540-40792-8 gives an abbreviated 'Table of Contents', if you want to know. Rather than repeat it word for word, I'll give a running commentary.

Personally I would have thought that any reader of this text would know what a molecule is. That would have saved 23 pages (Chapters 1 and 2). 'Molecules in external fields' (Chapter 3) is good sound classical stuff, but 30 pages on (essentially) dihydrogen (4) seems over the top for 2005, especially as Chapter 7 (The Multi-Electron Problem) isn't at all bad. Chapters 5 and 6 are to do with point group symmetry and the Hückel π-electron model. Again, good sound if rather dated material. Molecular scientists should certainly recognise the symbol C_{2v} and know the phrase *similarity transformation*, and they will by this stage if they have mastered the material. In my opinion, the great strength of the text is the next 300 pages, which treat the theory and application of various branches of spectroscopy. There is nothing particularly new about the treatment, but it is sound and coherent. Chapter 8 (Overview) is followed in traditional order by rotational (9) and vibrational (10) spectroscopies. Chapter 11 starts naturally enough with Born-Oppenheimer and leads into the quantum treatment of vibrational and rotational energy levels. We then move to Raman spectroscopy and electronic states. There is a good discussion (16) of the quantum treatment of the interaction of radiation with matter, followed by spin resonance. There is a limited bibliography of supplementary and specialist literature. The final three Chapters are meant to be current hot topics that should stimulate discussion amongst senior students; 'Macromolecules' (20), 'Experiments with and on Single Molecules' (21) and an 'Introduction to Molecular Electronics' (22). These come complete with an adequate set of literature references.

The book's website contains extensive answers to the many problems.

Reference

1. H Haken and H C Wolf, *The Physics of Atoms and Quanta. Introduction to Experiments and Theory.* Springer, (2000). (Translated from the German by W D Brewer).

More Practical Problem Solving in HPLC

Subject area
Analytical Chemistry.

Description
A unique approach to solving HPLC problems.

Authors
Stavros Kromidas (with Friedrich Mandel, Jürgen Maier-Rosenkranz, Hans-Joachim Kuss).

Publishers/Suppliers
Wiley VCH (http://www.wiley-vch.de/publish/en).

Date/Edition
2004/1st edition.

ISBN
3-527-31113-0.

Level
HPLC user.

Price
£39.95.

Christoph Nimptsch
Department of Pharmaceutical Chemistry
Auf der Morgenstelle 8
University of Tuebingen
72076 Tuebingen
March 2005

Summary Review

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

"More Practical Problem Solving in HPLC" by Stavros Kromidas is the successor of the book "Practical Problem Solving in HPLC" by the same author. It is not linked to the first book and thus it is not necessary to have read the predecessor. Stavros Kromidas has written a number of articles and books on HPLC, validation and quality in analytical sciences. The book is written by Stavros Kromidas with contributions by Friedrich Mandel, Jürgen Maier-Rosenkranz and Hans-Joachim Kuss.

As the author states in the preface the book is meant to be an easy-to-read companion for HPLC users, providing tips and suggestions in a compact form. The book is not a textbook, for the author has chosen a different approach. It is more a collection of everyday problems and answers, as well as hints to HPLC in general.

The book is basically divided into two parts and an appendix.
The general section comprises the first part of the book (tips 01-73). Among the topics discussed are the choice of stationary phases, buffers and pH, optimization techniques and peak homogeneity, trouble-shooting and miscellaneous tips.
The second part (tips 74-91) deals with questions of a specific topic, ie LC-MS coupling, Micro- and Nano-LC and examples of quantification calculated with Excel.
The appendix contains a bibliography, an index and some additional information, like empirical formulae, information resources on the internet and two essays on analytical chemistry today and trends in HPLC.

The book is very clearly written, clearly arranged, clearly laid out and concise. Quite unusual for a scientific book, the first pages contain a crossword, an HPLC-quiz and an HPLC-tale. In the middle of the book (p. 138) the reader is asked to complete the sentences and find the matching pairs, to verify if everything so far has been understood.

The author keeps this humorous style throughout the book. Often, it is quite funny to read ('after all HPLC is full of mysteries', p. 131). He directly addresses the reader and also incorporates him in the problem solving process, which makes the book very enjoyable to read.

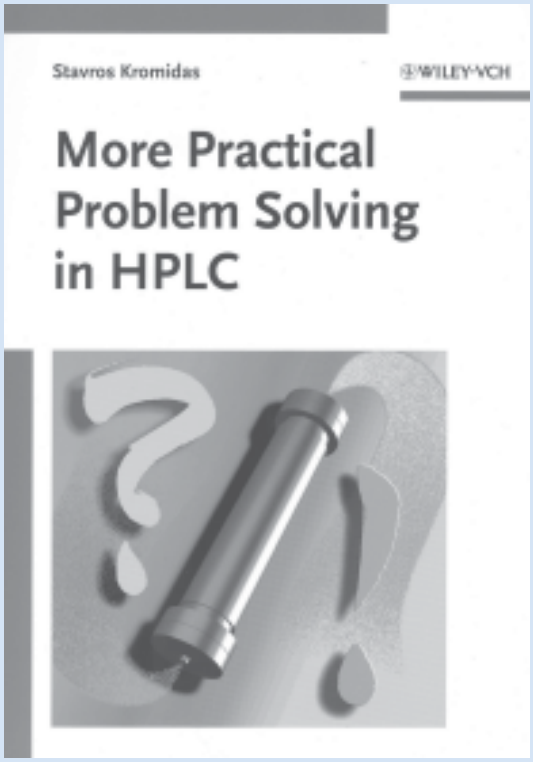
Every tip is covered with not more than 4 pages per problem. Most tips start with the introduction of a problem/question, which is followed by the solution/answer. Finally, a conclusion, which includes answers for the everyday routine, completes the tips. The tips are quite short, but full of vital information.

What is to mention positively, is the great number of authentic HPLC chromatograms. Their quality is diverse, ranging from very nice (most of them) to grainy (p. 157).

Unfortunately, there are some errors in the book. Sadly, the nice crossword and the solution in the appendix don't match, which is quite irritating. On page 114, there is a picture of typical tailing peaks, which looks as if it has been printed lopsided. The top of the peak is overhanging the bottom, which looks confusing. This also happens on page 112.

Continued on page 48

More Practical Problem Solving in HPLC



From the publisher...

More Practical Problem Solving in HPLC

By Stavros Kromidas

A unique approach to solving HPLC problems. Everyone who bought "Problem Solving in HPLC" by Stavros Kromidas will equally benefit from nearly 100 new practical examples for optimization, trouble-shooting, and instrument performance given in this sequel.
In each case the problem, the solution and the conclusions are presented over a maximum of 4 pages, and in addition the book contains manufacturers' addresses, references, data tables and checklists.

3-527-31113-0 294pp 2004 €55.00

Continued from page 47

So, who can benefit from the book? This book is not meant as an introduction to HPLC and thus requires basic knowledge and experience with HPLC. In my opinion it is not suitable for students at all. But for the everyday HPLC user, who wants to avoid pitfalls and gain insights in the method development and the HPLC separation process, the book holds valuable and applicable information, which make it a useful reference book for analytical questions/problems and their answers/solutions. This book is the second part of a trilogy and in the last chapter the author announces that the third book is on its way.

As most specialized books, this book is not inexpensive, but at €55/£39.95 it is reasonably priced.

Optical Properties of Solids

Subject area
General physics and materials science.

Description
Introductory treatment of the optical properties of solids for final year undergraduate students in physics and material science.

Authors
Mark Fox.

Publishers/Suppliers
Oxford University Press (http://www.oup.co.uk).

Date/Edition
2001 (2004 reprint).

ISBN
0-19-850612-0.

Level
Undergraduate.

Price
£24.99 (pbk).

Raymond Bailey
P & A Chemistry
University of Strathclyde
Cathedral Street
Glasgow
G1 1XL
April 2005

Summary Review

range: * poor to ***** good

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

This text claims to be an introductory treatment of the optical properties of solids for final year undergraduate and first year postgraduate students in physics and material science. The content is based on a course given by the author to final year students at Oxford University and is aimed primarily at supplementing the standard texts in this field as well as introducing recent material not covered by standard texts. I can agree that the author has achieved his aims in producing an innovative and valuable text suitable for this purpose.

The subject matter in this field has expanded tremendously in recent years, but the fundamentals remain unchanged. The book begins with the linear aspects of light propagation, namely transmission, reflection and absorption of light governed by the dielectric function of the solid. Luminescence and light scattering are also treated for a wide range of materials including crystalline insulators and semiconductors, glasses, metals, and molecular materials. Aspects such as Beer's law are treated in detail with some practical examples of dielectric functions in the first chapter.

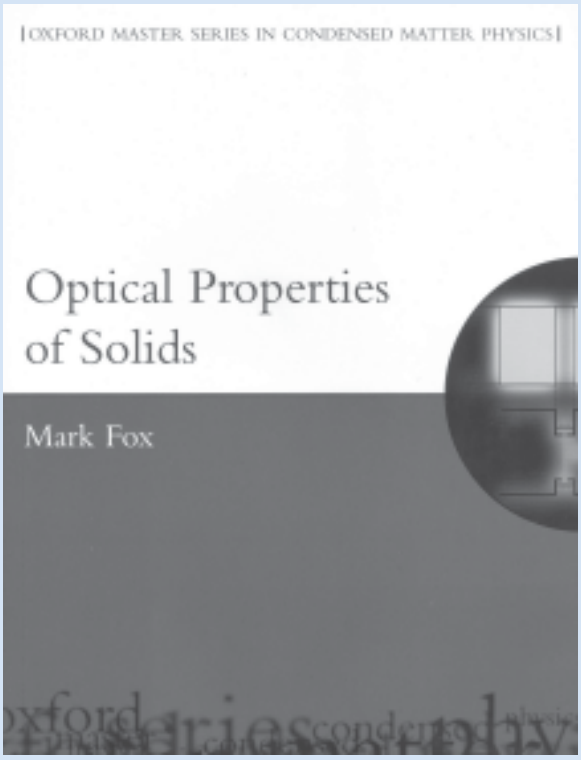
Simple models can usefully describe the behaviour of the dielectric function in different types of materials. For example, in metals, the Drude model is discussed in detail and used to derive the existence of plasmons. The dielectric function in semiconductors and in tightly bound insulators is largely controlled by the electronic band structure the behaviour of which is treated adequately in this text. The band gap, whether direct or indirect, controls many features of the dielectric function. The author provides many good examples of this relationship, showing in some cases graphs of actual dielectric functions of solid materials of modern technological interest such as organic semiconductors and semiconductor quantum wells.

An introduction to non-linear optical materials, useful for frequency conversion and optical modulation, for example, is provided in chapter 11. Technologically important vibronic solid-state lasers such as Ti-sapphire and gallium arsenide are introduced and discussed separately in chapter 9. The treatment of both these topics is very clear and adequate for this level of text. An appendix is provided in which the principal electromagnetic equations used throughout the book are collected together. This includes electromagnetism in dielectrics, quantum theory of absorption and emission, band theory and semiconductor diodes.

I found the book very readable, with clear explanations supported by mathematics. It is clearly laid out with numerous illustrative figures. A notable feature of the book is the many exercises (with solutions) located at the end of each chapter. While straightforward, these exercises offer the reader an excellent way to test their understanding of the material. Also included is a bibliography containing a list of general texts and a chapter-by-chapter list of key references for supplementary reading. This would be particularly useful for postgraduate students wishing a take the subject further. The copy I received was a corrected version, reprinted in 2004. There were consequently very few errors.

Continued on page 50

Optical Properties of Solids



From the publisher...

Optical Properties of Solids

By Anthony Mark Fox

The innovative text gives an introductory treatment of the optical properties of solids. The fundamental principles of absorption, reflection, luminescence and light scattering are discussed for a wide range of materials, including crystalline insulators and semiconductors, glasses, metals, and molecular materials. Classical and quantum models are used as appropriate, and the phenomena are well illustrated using recent experimental data. A particular feature is the inclusion of many new topics that have come to the fore in recent years and have not previously been covered in other solid state texts at this level. Examples include semiconductor quantum wells, organic semiconductors, vibronic solid state lasers and nonlinear optics.

0-19-850612-0 318pp 2001 £24.99

Continued from page 49

Overall, I believe this book achieved its objectives providing a compact, readable, introductory text at final year undergraduate or first year postgraduate level. Notably, the book supplements the standard texts, and introduces interesting topical material not usually covered by standard books in this area. Although the book was primarily aimed at physics and materials science students, I believe it would also be a useful addition to the library of physical chemistry students whose courses at present cover many of these topics. At today's prices, this book offers excellent value especially in the paperback edition.

Organic Chemistry at a Glance

Subject area
Organic Chemistry.

Description
An introductory summary to organic chemistry.

Authors
Laurence M Harwood, John E McKendrick, Roger C Whitehead.

Publishers/Suppliers
Blackwell Publishing (http://www.blackwellpublishing.com).

Date/Edition
2004.

ISBN
0-8654-2782-8.

Level
Undergraduate.

Price
£13.99.

This book attempts to 'address the needs of a wide range of students requiring an introduction to the basics of organic chemistry'.

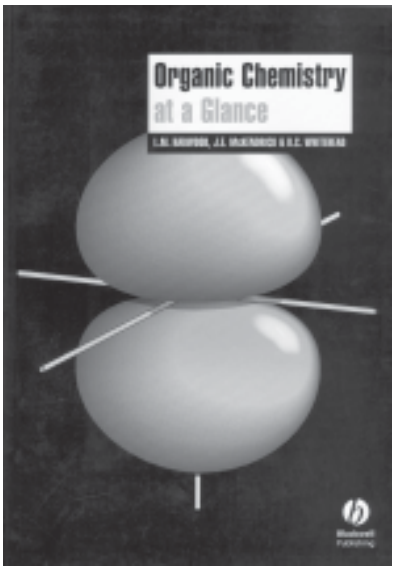
It comprises six chapters:
Atomic structure
Bonding and molecular structure
Configurational and conformational analysis
Structure - activity
Reaction types
Compound classes.

Summary Review

range: * poor to ***** good

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

The fact that these are covered in less than one hundred pages will alert to the fact that this is a summary text. To that end it might be useful for revision purposes, or for directing the new student to the important points in the much larger usual organic text book. Indeed the authors refer to the 'growing pressure to learn efficiently and unambiguously within increasing time constraints' and they have produced a useful aide memoire or refresher text.



The information is presented in a two-page format: the text is on the right and the example illustrations/diagrams/molecular structures on the left hand page. The text and diagrams are largely black and white, with just some red highlighting and that lends a clarity to the ideas in the book. It may not be as attractive to some students as some of the more colourful equivalents available, and it certainly would find it hard to compete with similar materials available in 3-D colourful CDROM formats.

This book is what the authors intended - a useful support text, but students pursuing organic chemistry beyond first year would require a standard text with more depth.

Marie Walsh
Limerick Institute of Technology
Moylish Park
Limerick
ROI
April 2005

Organotransition Metal Chemistry

Subject area
Organic Chemistry.

Description
This book aims to introduce undergraduates to the utility of organotransition metal chemistry.

Authors
Anthony F Hill.

Publishers/Suppliers
Royal Society of Chemistry (http://www.rsc.org).

Date/Edition
2002.

ISBN
0-85404-622-4.

Level
Undergraduate.

Price
£14.95.

David Ruddick
School of Health Sciences
University of Ulster
Newtownabbey
BT37 0QB
May 2005

Summary Review

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

The book covers the subject in about 180 pages consisting of seven chapters printed in a single added colour (orange): Introduction, Scope and Bonding; Co-ligands in Organotransition Metal Chemistry; Carbon Monoxide; σ-Organyls; Metal-Carbon Multiple Bonding; π-Coordination of C-C Multiple Bonds; η^n-C_nR_n Carbocyclic Polyene Ligands. Each chapter starts with a few broad 'Aims' and is split up into numerous useful 'Sections' and 'Subsections'. Each time a new technical term appears in the text it is presented in colour, but there is no glossary of these terms and rarely any explanation of them. There is a one-page list of 'Abbreviations' in addition to the 'Subject Index'.

Each chapter contains a wealth of detail, with many 'Tables' of numerical data, 'Figures' containing general and specific molecular structures, general and specific reaction schemes, molecular orbital diagrams and references to catalytic cycles where appropriate. Despite this rich content there are very few errors (although the acac- ligand is consistently mis-named), and there are helpful cross-references between chapters.

Chapter 1 gives an overview of d-block organometallics and sets them in the context of (assumed known) main group chemistry such as that of boron. There is an introduction to M-C bonding and the 18-electron rule.

Chapter 2 surveys co-ligands such as PR_3 and then discusses the hydride ligand and its reactivity in some detail. The effect of H transfers on the formal oxidation state of the metal is illustrated, and the term Oxidative Addition is introduced, but it is not pointed out that coordinated H is regarded formally as H^- even when it has been added as a proton.

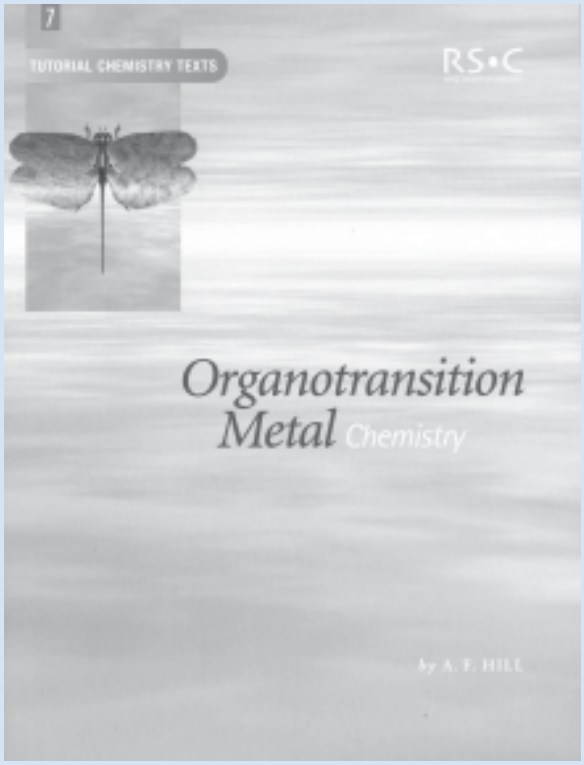
Chapter 3 covers the synthesis and reactivity of binary metal carbonyls. The effect of coordination on the properties of CO is stressed, including its ability to migrate and insert. This is a useful lead-in to the reactivity of coordinated alkenes.

Chapter 4 surveys σ-organyls such as alkyls, aryls, vinyls and alkynyls. Their synthesis and reactivity towards electrophiles and nucleophiles (including H^+ and H^-) is illustrated, and the main modes of decomposition such as β-elimination and α-abstraction are discussed.

Chapter 5 looks at M=C and M≡C bonds, and shows that Fischer carbenes/carbynes and Schrock alkylidenes/alkylidynes are just opposite ends of a continuum of bonding which depends on the nature of the metal. The numerous examples of synthesis and reactivity lead to a discussion of catalytic reactions such as metathesis and coupling of unsaturated molecules.

Chapter 6 covers coordinated alkenes, alkynes, etc. Their reactivity towards nucleophiles and electrophiles, and H transfer to/from the metal leads into several examples of commercial catalytic cycles such as reactions for hydroformylation, enantioselective hydrogenation, oligomerisation and other rearrangements and couplings.

Organotransition Metal Chemistry



From the publisher...

Organotransition Metal Chemistry

By A F Hill, Australian National University Canberra

This book aims to introduce undergraduates to the utility of organotransition metal chemistry: a discipline of importance to scientists and technologists in a variety of industry sectors. The main focus will be on the reactivity of organometallic compounds of the transition metals supported by discussion of structure and bonding and their implications. The aim on completion of the course is that a student will be equipped to recognize the key classes of organometallic compound their methods of characterization, possible synthetic routes and anticipated reactivity.

0-85404-622-4 186pp 2002 £14.95

Chapter 7 surveys coordinated carbocyclic polyenes, starting with ferrocene but covering sandwich and non-sandwich complexes of C_nH_n for n = 3 to 8. The changes in reactivity of the carbocycles on coordination are explained by reference to interactions between ligand frontier orbitals and the metal orbitals. The concept of 'Aromaticity' is invoked to explain the planar nature of the coordinated rings, which can then be lost if the electronic requirements of the metal are altered. Many normally difficult organic reactions such as couplings, rearrangements and substitutions are shown to be achievable by prior coordination to the metal.

The book is one of the RSC Tutorial Chemistry Texts series which is stated to 'embody an independent learning philosophy and include worked examples'. There is no evidence of this in the printed text. However, the 'Preface' refers to 'Examples, Problems and Answers' on the RSC website for the series, but none of the given url links work, despite the 'Preface' being shown on the website. A complaint to their Help service elicited an acknowledgement but no further information at the time of writing.

The text assumes a great deal of background knowledge, eg formal oxidation numbers, named organic reactions, symmetry elements and orbital symmetry, IR and 13C NMR spectroscopy, frontier orbitals and MO theory of bonding. It is therefore aimed at third (or possibly second) year undergraduates. Even the former may find it daunting, because of the high density of information. Lecturers and researchers should, however, find it very stimulating and full of useful insights.

Polymer Physics

Subject area
Polymer science.

Description
A general discussion of most aspects of the physics of polymer systems including single chains, blends and solutions and networks.

Authors
Michael Rubenstein and Ralph Colby.

Publishers/Suppliers
Oxford University Press (http://www.oup.co.uk).

Date/Edition
2003.

ISBN
0-19-852059-X.

Level
Undergraduate, research.

Price
£55.00.

Gareth Price
Department of Chemistry
University of Bath
Claverton Down
Bath
BA2 7AY
April 2005

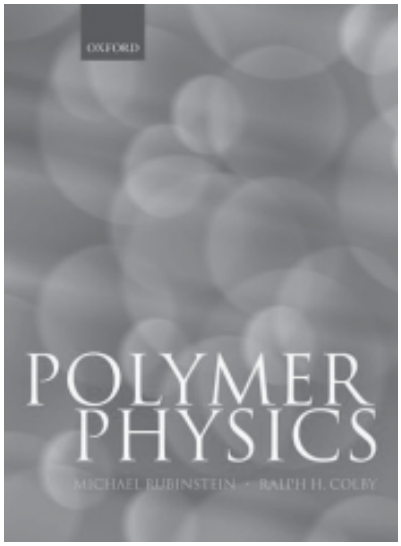
Summary Review

range: * poor to ***** good

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

Polymer science is a truly interdisciplinary area of study. It is rare that a student of polymer physics can get by without knowing some synthetic chemistry or that a student of polymer synthesis does not need some understanding of how polymer systems behave. This book is an excellent introduction for the latter category as well as laying firm foundations for students and researchers who need in-depth knowledge of polymer physics.

The authors are active researchers in large US universities but both have spent a significant part of their careers working in industry. Their book is aimed at 'upper level undergraduates and first year graduate students'. Putting this into a UK context, I would say it is suitable for students in the later stages of Bachelors, MChem or MPhys degrees as well as those studying for MSc or PhD. It is clearly written with good, clear illustrations and should be easy to follow for most students. Particularly useful is that each chapter has a selection of problems; however, it is not clear whether the answers are available and, if not, this might limit the usefulness to students in terms of independent study. Each chapter also has a bibliography to guide the reader to other sources of information.



After an introductory chapter summarising many of the basic principles of polymer science, the book is divided into four main sections. The first deals with the properties of single chains under a variety of conditions. The next section deals with the thermodynamics of blends and solutions. Again this is well written and reasonably comprehensive but perhaps a little more discussion of phase separation in eg block copolymers would have brought things right up to date. The remaining sections deal with networks and the dynamics of polymer systems. In all cases, the emphasis is on understanding the principles involved rather than being mathematically rigorous. The book assumes a good working knowledge of calculus and algebra and while the mathematical demands might challenge some chemistry students, physicists should have few problems.

The organisation of the book is sensible and leads the reader through in a logical order although it is possible to use chapters in isolation since there is good cross referencing. The choice of topics is sensible; of course 'polymer physics' is such a broad area that it would not be possible to treat every potential area within a reasonably sized book. For example, there is no discussion of the physics of electroactive or photoactive systems. The topics that are treated are covered very well and this book will be a valuable addition to individuals and research groups working in polymer science as well as to university and industrial libraries.

Quantum Physics

Subject area
Quantum Physics.

Description
This text covers quantum physics and balances mathematical discussions with physical discussions.

Authors
Stephen Gasiorowicz.

Publishers/Suppliers
John Wiley and Sons Ltd (http://www.wiley.co.uk).

Date/Edition
2003/3rd edition.

ISBN
0-471-42945-7.

Level
Undergraduate, research.

Price
£35.95.

Alan Hinchliffe
School of Chemistry
The University of Manchester
Sackville Street
Manchester
M60 1QD
April 2005

Summary Review

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

Over the years, I have taught the topic of quantum mechanics (and its applications) to three quite different student audiences. First of all the chemists; here it is wise never to use the word 'quantum' because they translate it into 'scary', to emphasize molecular structure theory and give all equations and derivations in the most qualitative way possible, if at all. Next the mathematicians; here it is wise to begin the discussion with your own set of postulates and to give all derivations in the most elegant manner. Links with experiment are of no great consequence, indeed they are to be avoided, but heaven help you if you can't demonstrate the eigenvalues of a simple harmonic oscillator using operator methods on the back of a very small postcard. Finally we have the middle ground, occupied by physicists. Here, theory and experiment intertwine, and the math has to be done properly.

Naturally, there are books that cross the frontiers; for example, the Open University SM355 "Quantum Mechanics" course caters largely for mathematicians and physicists, and our set book is French and Taylor[1].

Had the present volume not had a title, I would have been able to place it accurately in my 'middle ground' simply from the cover illustration (which shows Rayleigh counting). That sums it up, and Stephen Gasiorowicz's Third Edition is just as sound and rigorous as the First Edition was all those years ago. Obviously we have moved along in thirty years, but the basics are still basic and still have to be understood. Like every other professional before you, you will have to grit your teeth and master the material. It isn't easy.

I won't list the complete 'Table of Contents'; if you are interested, you can get them from the Wiley website under http://www.wiley.com/college/gasiorowicz

Instead, I'll just give a running commentary.

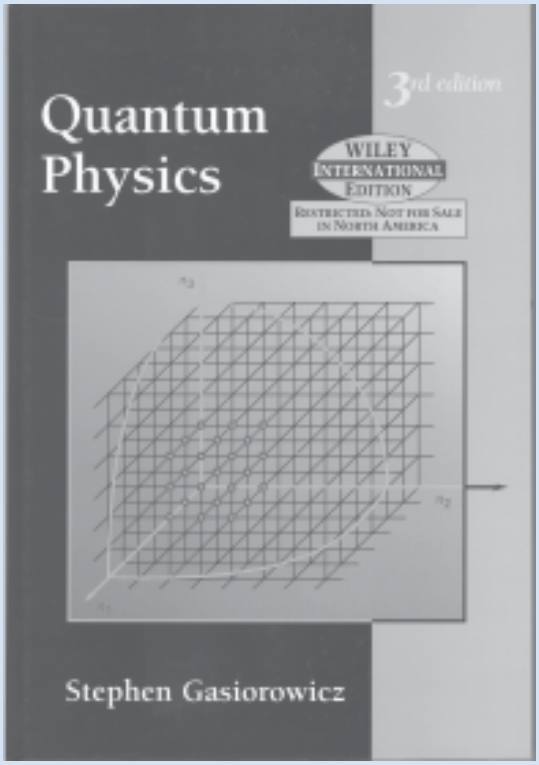
Chapters 1 through 4 (of 20) cover the usual elementary material (black bodies, one dimensional potentials etc). Vector spaces and operators make their debut in Chapter 5, bras and kets in Chapter 6, angular momentum in Chapter 7 and the Coulomb model of one-electron atoms in Chapter 8.

There's a nice discussion of matrix mechanics in Chapter 9, and spin is treated in Chapter 10. Sadly, the word 'spinor' is conspicuous by its absence. Time-independent perturbation theory (Chapter 11) and the 'Real' (relativistic) hydrogen atom follow. It is good to see experimental techniques discussed in some detail. It's hard to fault the treatment of many particles (Chapter 13), but Chapter 14 (About Atoms and Molecules) is pretty thin and very 1930s. The most complicated molecule treated is the hydrogen molecule ion; to be fair, the website gives a bit more detail, but the Chapter is in need of a serious rewrite.

I can't fault time dependent perturbation theory (15). All the material so far (apart from Chapter 14) should be compulsory for all physicists, as I'm sure it is (unless you are registered as an MPhys 'Physics with Forensic, Media and Football Management Studies' student).

Continued on page 56

Quantum Physics



From the publisher...

Quantum Physics

By Stephen Gasiorowicz

Since the publication of the first edition over 35 years ago, Quantum Physics has been one of the standard quantum mechanics texts for undergraduate physics majors. Its hallmarks are clear, concise exposition and a balance of theory and applications. In the 3rd Edition, the author has made numerous changes - based on feedback from teachers and students - to enhance the book's strengths. One of the author's important goals has been to offer teachers and students a textbook that is manageable in one semester. However, recognizing that some teachers like to go into more depth on certain topics, he has developed a web site where more detailed presentations can be found.

0-471-42945-7 336pp 2003 £35.95

Continued from page 55

Now it gets interesting; Chapter 16 treats the interaction of charged particles with electromagnetic fields, Chapter 17 treats radiative decays. Lots of nice, well-informed interaction with experiment. Finally, there are three Chapters (Radiation; Collision Theory and Entanglement (20)) that should stimulate senior students. In fact Chapter 20 is quite different from the others in that it has many recent literature references. It was nice to see mention of the Aspect experiments, and whilst I also tantalize my students with Schrödinger's cat, I wonder if the topic should not have appeared earlier in the text.

There is a useful list of books in 'Various Topics in Modern Physics', together with the author's personal comments, and there are a good number of problems and examples (problems with solutions) scattered through the text. Some are pretty simple, some are challenging.

It is the fashion for textbooks to have an associated website; the author has used his website

To include long derivations
To include material previously given as Appendices
To give solutions to the problems.

You log on to the website as a 'student' or an 'instructor'. Instructors have to register with John Wiley to get access to the problem solutions. Seems a reasonable enough procedure but I am still waiting for my access code.

Book Reviewers are expected to pick a nit or two, and here are mine (apart from the disastrous Chapter 14 and associated website material).

P 329 Quoted physical constants are hopelessly past their sell-by date.
P 152 I really don't believe that solution of the determinantal equation is the best way to find matrix eigenvalues and eigenvectors.

It is the fashion to precede Chapters with a list of learning outcomes. Apart from a global statement on vii, we get no real guidance as to what students will be able to do after they have mastered the material.

Overall, I liked this book. Good solid material, no punches pulled, and pretty much up-to-date (apart from Chapter 14).

Reference

1. A P French, E F Taylor, *An Introduction to Quantum Physics*, Nelson Thornes, £30.75.

Reaction Mechanisms at a Glance

Subject area
Organic Chemistry.

Description
Self-help workbook for writing organic reaction mechanisms.

Authors
Mark G Maloney.

Publishers/Suppliers
Blackwell Publishing (http://www.blackwellpublishing.com).

Date/Edition
1999/1st edition.

ISBN
0-632-05002-0.

Level
Undergraduate.

Price
£14.99.

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Department of Chemistry
Dainton Building
University of Sheffield
Brook Hill
Sheffield
S3 7HF
April 2005

Summary Review

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

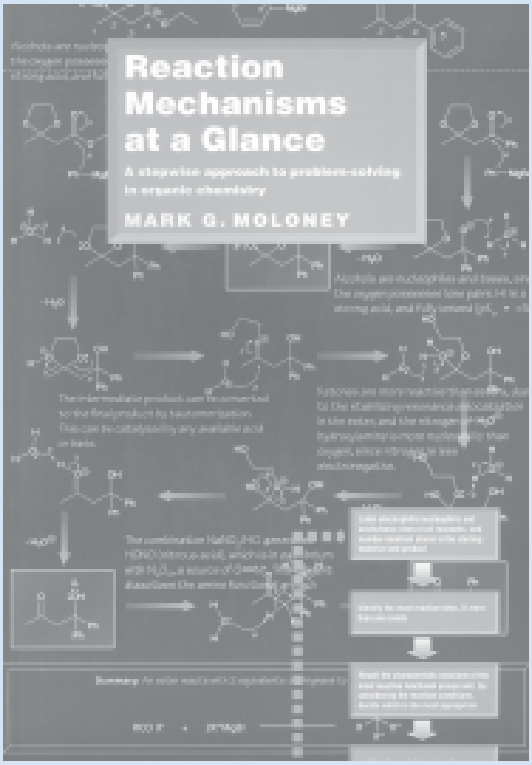
Physical sciences are often perceived by students as being hard subjects, a contributing factor often being the large quantities of data and information that need to be learnt, often in unrelated subject areas. Within chemistry the one discipline that circumvents some of these needs is in organic chemistry. Here, the art of drawing reaction mechanisms, where given a set of fundamental principles it is more often than not possible to predict product outcomes rather accurately, removing the need to learn vast quantities of material. However the stumbling block with many students is trying to remove the mind-set of 'I need to learn yet another mechanism' and replace this with 'All I need to do is learn one set of principles'. In this book, Mark Maloney aims to provide a self-help approach to the reaction mechanism skills.

The book is well prepared and set out in a large A4 portrait format. Reaction mechanisms are sub-classified into appropriate chapters that helps keep ideas and concepts associated with these areas of organic chemistry focussed. Additionally, at the end of the book there is a comprehensive index.

Each chapter starts with a short summary of the key learning outcomes for that chapter, containing short key-words and phrases that should help the student source textbooks on these topics. The chapter then starts with each worked problem covering a double page spread. In the top left, the reader can see the problem, followed by a dotted line. The simple and very effective idea here is that if you are confident enough to try the example on your own, you just need to cover up the page beneath with the help and hints. The remainder of the left hand page always contains a chart showing the cycle of events that occur when we try to write a reaction mechanism and a series of notes that correlate with these. While this approach is extremely useful and effective, the constant repetition of the cycle means that lots of other notes and discussion points could not be added, simply due to a lack of space. For example, pages 12 and 13 describe an elimination reaction, but there is also the possibility of a substitution reaction taking place. It would be a useful thought to put into a readers mind, 'Can substitution compete and does it?' Although such discussion points may be considered as advanced material, given the approach adopted here it would serve to stretch the ability of good students even further. One suggestion (perhaps for a second edition?) would be to have the cycle printed as a fold out leaf on the front cover. The reader could then fold this into each page as necessary and that would free up the rest of the page for more information. The right hand page first gives a hint by showing the polarisations and connectivity of the reaction partners and reagents. This is a superb idea, since this preliminary step is fundamental to all of the subsequent steps and getting this correct is the student's first hurdle to overcome. The reminder of the page then shows the mechanism in detail, followed by a summary of the transformation at the bottom of the page. All of these are laid out clearly and as far as I could ascertain without error. Another great idea is that at the foot of each page are references to end of chapter problems that relate to the ideas covered in this example. This is a great help for the students as they can build upon the ideas and principles of the example that they have just covered.

Continued on page 58

Reaction Mechanisms at a Glance



From the publisher...

Reaction Mechanisms At a Glance
A Stepwise Approach to
Problem-Solving in Organic Chemistry

By Mark Moloney, University of Oxford

Students at all levels find considerable difficulty in applying their knowledge of organic chemistry to the solution of problems, often relying on memory alone. This book takes a unique approach to show that a general problem-solving strategy is applicable to many of the common reactions. Using a novel 'at-a-glance' layout, the left-hand page provides a stepwise procedure for working through the reaction mechanisms, with helpful hints about the underlying chemistry, and the facing page contains a fully worked-through answer.

0-632-05002-0 128pp 1999 £14.99

Continued from page 57

I would say that some of the end of chapter questions are significantly harder than others and it may have been better to grade them in some way as 'normal' and 'advanced'.

Overall the book provides an excellent approach that would help many students who wish to strengthen their skills in drawing reactions mechanisms. I would hesitate to say that this book would be of benefit to many first year undergraduates since many of the basic principles (eg spotting bond polarisations) are not covered in sufficient depth, but it would certainly be of use to many students of second year and above.

Rethinking University Teaching

Subject area
General.

Description
This book is described as a conversational framework for the effective use of learning technologies.

Authors
Diana Laurillard.

Publishers/Suppliers
RoutledgeFalmer
(http://www.tandf.co.uk/books).

Date/Edition
2001/2nd Edition.

ISBN
0-415-25679-8.

Level
Teachers.

Price
£22.99 (pbk).

Summary Review

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

Before reviewing the second edition of this book, I thought I had better take a look at the first, originally published in 1993, which was according to one reviewer 'probably the most cited book of the decade in its area'. The intervening decade has seen rapid and dramatic changes in the underlying learning technology and its pervasion through HE. Was this second edition going to be an upgrading and expansion, building on the core of the first edition, or had things changed to such an extent that a back-to-the-drawing-board rethink was required?

It is clearly the former of these. The cornerstone concept of both the first and this revised second edition, is that of the Conversational Framework; a perspective that envisages learning process as an iterative dialogue between student and teacher. Though many of the examples have changed (out of necessity, to reflect technological advances), the fundamental ideas persist. It is a book whose scope far exceeds the subject confines of the physical sciences, though those within this subject community will find many pertinent and relevant examples within.

The book is organised into three parts. The first describes student learning as mediated by the teacher, as distinct from learning in an everyday context. After delving into aspects of how individual students learn, the question of how this is reflected in a teaching strategy is discussed and the main features of the conversational framework presented: it should be discursive, adaptive, interactive and reflective.

The second part of the book comprises 5 chapters that categorise the various types of technological educational media, and maps each one of these onto the components of the learning process as defined by the Conversational Framework. Such a mapping will certainly be very valuable to those looking to answer the question of 'what medium can best support the teaching/learning aims in a particular context'. The actual technologies themselves are comprehensive; there are more than 20 of them, categorised into groups of narrative, adaptive, interactive, communicative and productive. They cover the whole spectrum: from the obvious weaknesses of traditional lectures as a teaching method to large heterogeneous classes ('forget the eight hundred years of university tradition that legitimises them') to others such as collaborative microworlds and educational games.

The final part of the book returns to the practical aspects of how to make it work for courses (integrating and delivering the appropriate technologies) and for organisations (how universities need to adapt to enable academics to utilise the technologies to best effect). It has been suggested that the vice-Principal of every university should be sent a copy of this book and urged to make time to read it. This is particularly true of the last chapter, which suggests a view of what such an institution-wide infrastructure might look like.

Simon Bates
School of Physics
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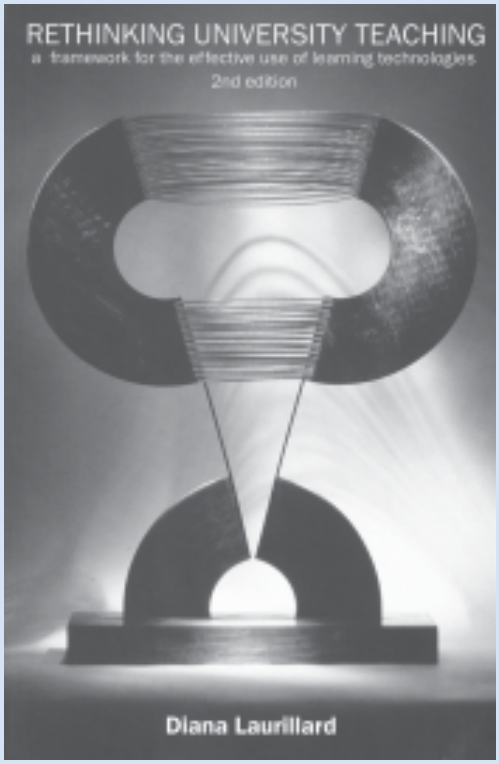
Edinburgh
EH9 3JZ
April 2005

Continued on page 60

Rethinking University Teaching



From the publisher...

Rethinking University Teaching
A Conversational Framework for the Effective Use of Learning Technologies
By Diana Laurillard

Teachers in higher education have had to become more professional in their approach to teaching, matching their professionalism in research. The first edition of this book prepares teachers to do and undergo quality audits and appraisals, and to achieve their personal aims of improving their teaching and their students' learning. The strength of this book is that it provides a sound theoretical basis for designing and using learning technologies in university teaching. This new edition builds upon the success of the first and contains major updates to the information on learning technologies and includes the implications of using technology for the university context - both campus and electronic - which suggests a new approach to managing learning at institutional level.

0-415-25679-8 288pp 2001 £22.99

Continued from page 59

I suspect that this second edition will be extremely well-received both by those new to the area and also by those who read the first edition over ten years ago. I would certainly class myself as one of the former and found it an invaluable book, enabling me to see 'the bigger picture' of the whole discipline of designing and integrating appropriate learning technologies into courses. It enabled half-thoughts I had about certain approaches to crystallise into fully-fledged ideas, whilst at the same time dispelling the misconceptions behind some half-baked ones. The updated presentation of research material and expansion of contemporary examples will ensure that there is plenty for first-edition readers to find useful. Having initially been drawn to the book by the subtitle, after reading I would say that this is primarily a book about (ways of thinking about) teaching and learning, not technology itself. The more we can do of that, the better. The author's aim, to enable universities to 'find an infrastructure that enables university teachers to be as professional in their teaching as they aspire to be in their research', should be one all those involved in higher educational curriculum design and delivery would approve of wholeheartedly.

Soft Condensed Matter

Subject area
Condensed Matter Physics.

Description
This book offers a coherent and clear introduction to the properties and behaviour of soft matter.

Authors
Richard A L Jones.

Publishers/Suppliers
Oxford University Press (http://www.oup.co.uk).

Date/Edition
2002.

ISBN
0-19-850589-2.

Level
Undergraduate, research.

Price
£22.50.

Summary Review

range: * poor to ***** good

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

Professor Jones is well known in the condensed matter branch of physics and writes a scientifically strong, accurate text targeted at an array of people involved in the physical sciences. The book is pitched at an appropriate level for newcomers to the area of soft condensed matter physics (SCMP). The piece covers ground in appropriate depth for end of degree program undergraduate and preliminary postgraduate requirements. The text is suitably enlivened with interesting anecdotes from Richard Jones' own SCMP research which makes the subject treatment even more interesting for new subject arrivals. Fundamentally essential topics covered include, liquid crystals, statistical mechanics, rheology, phase behaviour and examples of natural self-assemblies. I regard the notes, helpful study guides and problems as being particularly useful to students covering this area that may have had traditional physics and physical chemistry training but are increasingly likely to come to the subject from more diverse backgrounds such as chemical biology and biophysics.

The text is literally loaded with well-planned and carefully considered useful schematics and graphical representations that assist in creating a visual picture of complex processes to aid what at some points in the journey to fuller understanding of the subject matter can be rather abstract material. The student will no doubt find these particularly insightful. The book gives a more palatable rendering of a SCMP subject over other books[1,2], although these books provide more detailed information of a narrower range of subject matter. There are currently a number of new textbooks[3,4] on the market valued as course texts but none I can find that offer such a good mix of broad subject coverage and detailed information at the same time and come from a physics perspective.

Typically, for the subject, there are numerous references to the underlying thermodynamics and statistical mechanics behind, simplistic and co-dependant processes and the reader will require a degree of mathematical competence to fully understand the subject. Richard in most cases starts off in a descriptive simple style, ideal for a subject novice and then begins to explain the subject in a more elegant elaborative manner. In my university the book would be useful for students wanting to know more about polymers, colloids and some key techniques such as thermal analysis and rheology that are used to investigate soft matter in industrial, pharmaceutical and natural product preparations.

The Oxford Master Series text would be very useful for students on fundamental science degree programs with elective final year modules. The cost of the book is appropriate and not at all inhibitory for routine purchase and both students and researchers working in the field should contemplate purchase to aid study and for referential purposes. I think it would also be a useful acquisition for academics working in the field to have as a course reference text and teaching guide.

Dipak K Sarker
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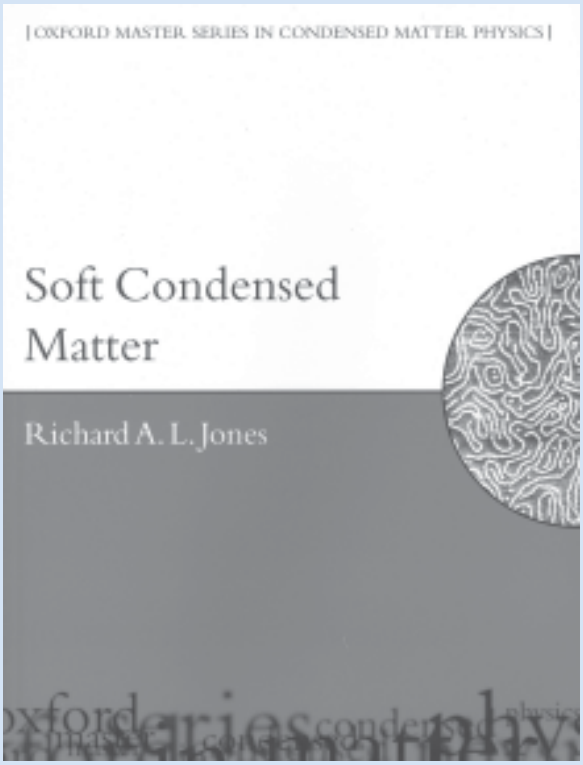
April 2005

Continued on page 62

Soft Condensed Matter



From the publisher...

Soft Condensed Matter

By Richard A L. Jones

This book offers a coherent and clear introduction to the properties and behaviour of soft matter. It begins with a treatment of the general underlying principles: the relation of the structure and dynamics of solids and liquids to intermolecular forces, the thermodynamics and kinetics of phase transitions, and the principles of self-assembly. Then the specific properties of colloids, polymers, liquid crystals and self-assembling amphiphilic systems are treated within this framework. A concluding chapter illustrates how principles of soft matter physics can be used to understand properties of biological systems. The focus on the essentials and the straightforward approach make the book suitable for students with either a theoretical or an experimental bias. The level is appropriate for final year undergraduates and beginning graduate students in physics, chemistry, materials science, and chemical engineering.

0-19-850589-2 206pp 2002 £22.50

Continued from page 61

A demonstration of the value of the text is provided in the exercises and there are usually three or four calculations or problems at the end of each section. These serve two functions, to test the readers understanding and to provide a better means to understand the subject by furnishing the reader of 'real world' examples of cases where appropriate formulae or principles are at work. The answers given provide formulae and an explanation of assumptions and application to the problems mentioned in the exercises. Richard also wherever possible, includes a suggestion for further reading, such as for percolation theory and small-molecule liquid crystals that are only mentioned in passing in the main body of the sectional text.

Richard Jones' style is suitably robust and discussional to mean the text is comprehensible to a range of readers. I particularly liked the diagrams included and worked examples where the answers and route to calculating the answers is provided, and in my experience this what many students want so they can learn how and why fundamental ideas are pivotal to key problems. It also provides students with an arsenal for knowing how to tackle similar problems by a combination of learning, intuition and experience. He also goes on to give numerous examples of the systems previously described, which is always crucial in getting a handle on complex notions. From the text, it is clear that Richard is an experienced communicator with a broad experience of talking to a range of inexperienced and experienced SCMP audiences and this comes across, as the style of the book is light yet packed with detail and information.

References

1. G Strobl, *Condensed Matter Physics: Crystals, Liquids, Liquid Crystals and Polymers* (translation by Steven P Brown), Springer: pp 379 (2003).
2. P J Collings and M Hird, *Introduction to Liquid Crystals: Chemistry and Physics*, Taylor & Francis: pp 298 (1997).
3. J Goodwin, *Colloid and Interfaces with surfactants and Polymers – An Introduction*, John Wiley & Sons: pp 285 (2004).
4. R M Pashley and M E Karaman, *Applied Colloid and Surface Chemistry*, John Wiley & Sons: pp 188 (2004).

Stereochemistry at a Glance

Subject area
Organic Chemistry.

Description
A succinct treatise of the subject of stereochemistry in a monographic form, treating the subject from an organic synthetic chemist's perspective.

Authors
Jason Eames and Josephine Peach.

Publishers/Suppliers
Blackwell Publishing (http://www.blackwellpublishing.com).

Date/Edition
2003.

ISBN
0-632-05375-5.

Level
Undergraduate.

Price
£27.50.

David Harwood
Institute for Science Education
University of Plymouth
Plymouth
PL4 8AA
April 2005

Summary Review

range: * poor to ***** good

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

This book is one of a series of Blackwell monographs on undergraduate level chemistry. "Stereochemistry at a Glance" does essentially 'what is says on the tin'. It is a succinct introduction to the subject of stereochemistry, aimed at first and second year undergraduates. Its approach is unconventional in the sense that formal courses in stereochemistry usually begin with a study of isomerism in its various forms. This text treats stereochemistry essentially from a synthetic organic chemistry point of view which has the advantage of seeing stereochemistry as an artefact or consequence of chemistry and hence contextualises the problems encountered. The text is supported by 49 fully worked problems as well as 98 supplementary problems, spread throughout the seven chapters. These, in my view, are critical in the development of a sound molecular understanding of a subject which many students find difficult. Although the use of models is suggested, the text is sufficiently well presented with plenty of very useful diagrams so that models ought not to be necessary after the first chapter, entitled 'shapes and orbitals'. Here, concepts and definitions such as chirality, E and Z isomers and R and S isomers, appear unambiguously in context.

It is interesting to note that absolute configuration is introduced first, with only a few notes on relative configuration. There is a potential problem here in that students are referred to a question set in chapter two and there is no clear explanation of the origin, context or nature of relative configuration. Hence, an inexperienced reader will need to refer to another text for this information in order to avoid confusion. This introductory chapter would need to be longer if this book was to be used as anything more than a supporting text. However, as a supplementary text for students with a firm grounding in the subject it is very good and serves as a handy reference or revision to boot.

The later chapters deal with nucleophilic substitution reactions at saturated carbon species, beta elimination reactions to form alkenes, electrophilic addition to unsaturated compounds, addition to the carbonyl group, the chemistry of enolates and polar re-arrangements. These chapters present a useful overview of each topic and the stereochemical consequences of the various mechanisms in as wide a variety of examples as a 136 page text will allow. Once again the text is well supported by diagrams and reaction schemes and there are very good problems and worked examples.

Overall this is a very good text for reference, revision and practice and as a supporting text for an undergraduate chemistry course it would be hard to better. It suffers from some disadvantages however, its black/white/grey format although adequate, does make some of the diagrams and schemes difficult to read - colour would have overcome most of these problems (although this is a decision of the publishers rather than the authors, I suspect). In addition, the print is rather small and for any student with poor sight or with reading difficulties, this might be a rather challenging format. That being said, "Stereochemistry at a Glance" is a practically useful, succinct text which distils the essential concepts rather well and develops a sound understanding of the fundamentals as well as some of the subtleties of the subject. As a result, this would be a useful book for any serious student of organic chemistry.

The Sciences: An Integrated Approach

Subject area
General science.

Description
This text integrates major concepts from physics, chemistry, astronomy, earth sciences, and biology to help anyone become science-literate.

Authors
J Trefil & R M Hazen.

Publishers/Suppliers
John Wiley and Sons Ltd (http://www.wiley.co.uk).

Date/Edition
2003.

ISBN
0-471-21963-0.

Level
A-level, access, undergraduate.

Price
£25.95.

Derek Raine
Department of Physics and Astronomy
University of Leicester
University Road
Leicester
LE1 7RH
April 2005

Summary Review

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

This is the fourth edition of this book: someone must like it. And I'll tell you the good things about it in a moment. But to begin let me get off my chest what it is I do not like.

First the use of mathematics, or its misuse. We are told that mathematics is important in science and therefore the text will contain equations. These are given in words first, to sugar the pill, and then in symbols. Fine. But then these equations are used only to substitute numbers and then often to calculate quite pointless quantities. (As an example, somewhat unfair because it's the worst I found, what is the momentum of a 0.3 kg baseball moving with speed 30 m/s?) So what does that show?

Then we have a discussion of why we should study science, even if we are not going to be professional scientists. It turns out that science is everywhere in our lives and therefore that we might be called upon to make decisions on scientific matters. Really? Where experts agree, who are 'we' to take a different decision, and if they disagree (the interesting possibility) why would we trust our own judgement on the basis of this smattering of scientific knowledge (especially as we are told elsewhere about the fallibility of science)? There is a section on the book on pseudo-science; perhaps there should be a section on pseudo-sociology.

Finally, the title seems to promise more than the book delivers. I do not see why it is described as integrated. For example, there is a chapter on cosmology. Of course this involves more than just physics – apparently it involves chemistry because helium (a chemical) was made in the early universe! And technology also because one uses telescopes! The rest of the text is even less integrated: we start with the standard physics (motion under constant acceleration, gravity, and so on up to quantum mechanics and nuclear and particle physics); then we move to chemistry (the chemical bond) and the structure of materials, astrophysics, geology (plate tectonics and geological cycles) and biology (ecosystems, molecular biochemistry, the cell, genetics and evolution). So the integration is largely in the binding.

However – and it's a big however – whenever I want to find out something of what our interdisciplinary science students here are studying in an area I know nothing about, such as the Linnaean classification or Milankovitch cycles, this book is my first source. I will not learn very much – the whole book is about half the size of a typical compendium physics or chemistry first year text – but I will find something readable and interesting. As one might guess, the content is well below the level of a UK university course, but if you are a physicist wanting to know about geology, or a chemist wanting to know about cosmology, this is a good place to start. And if you are a liberal arts student (or non-science major) who wants to know something about science there is probably no comparable source. What I would like to see is a book for such students taught through real problems in science that integrate the different disciplines, but this is not yet on offer.

Using ICT to enhance teaching and learning in chemistry

Subject area
General Chemistry.

Description
This text covers the use of ICT to develop and use a range of resources for chemistry teaching.

Authors
Steve Lewis.

Publishers/Suppliers
Royal Society of Chemistry (http://www.rsc.org).

Date/Edition
2004.

ISBN
0-85404-383-7.

Level
Teachers.

Price
£12.95.

Paul Chin
Physical Sciences Centre
Higher Education Academy
Subject Network
Department of Chemistry
University of Hull
Hull
HU6 7RX
March 2005

Summary Review

range: * poor to ***** good

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

My first impression of this publication was that it was designed more like a prospectus than a book, intended for flicking through its wire-bound pages. However, reading the back page explains the reason for this as it is described as 'guidelines' to be dipped into as and when the reader wishes. I think this sets the tone for the book as it makes you feel you don't have to read it all in one go but can pick and choose bits that interest you without feeling you are missing other bits.

The book title is "Using ICT to enhance teaching and learning in chemistry" but on closer inspection it is clear that it is more like 'Using Microsoft Office to enhance.' Although this may automatically turn some people off who are not big fans of Microsoft products I would say that this book has good reason to use Office and provides a wide range of innovative uses of Office for teaching chemistry. The book is clearly aimed at school teachers rather than primarily for use in Higher Education so the use of Microsoft Office is a good common denominator for software that most/all people will have access to. Not to alienate its benefit to HE however, there are other examples which would be useful to many lecturers.

The introduction says that 'the focus of these guidelines is to suggest some ways in which hardware and software resources already available to many chemistry teachers might be used to create materials.' and that 'it assumes no more technical skills than that currently possessed by most chemistry teachers'. To my mind then, this implies having basic word processing/IT skills. This is backed up by the fact that the guidelines include information on general skills such as toolbars, copying and pasting and screen prints. However, this is where I feel the focus of the book actually gets a little blurred.

In addition to this sort of information on how to create and edit simple resources in Microsoft Office, there are guidelines on the use of Flash animations, Java applets and drawing chemical structures with dedicated software. Both types of guidelines are clearly at opposite ends of the skills spectrum for teachers so the former (general skills) will not appeal to users capable of dealing with Java and vice versa. Readers would therefore need to give the contents table a close inspection in order to realise that the guidelines have something to offer all chemistry teachers.

One aspect of using ICT to support teaching is the 'little' problems that prevent a lot of us using technology in our teaching. This book does not shy away from these problems and is realistic about the things that can (and do) go wrong from time to time. This is no excuse for avoiding technology however and the book provides good, practical advice on what to do when things do go wrong and how to deal with such problems.

In terms of guidelines there are extensive examples of how to create, use and edit PowerPoint presentations to produce interactive resources for students, such as the step by step synthesis of organic compounds. In addition it demonstrates how to create electronic worksheets in PowerPoint, showing that there is more to PowerPoint than just boring presentations. You are also shown a range of Word examples that offer interesting and visually stimulating quizzes with drop down menu choices, or using drag and drop exercises for describing and setting up laboratory

Continued on page 66

Using ICT to enhance teaching and learning in chemistry

From the publisher...

Using ICT to Enhance Teaching and Learning in Chemistry

By S Lewis

This resource from the RSC gives teachers of chemistry the practical help needed to integrate ICT into their teaching and stimulate the enthusiasm of a new generation of scientists in the exciting new areas of chemistry that are opening up such as Nanoscience and Nanotechnology. Furthermore it will be highly effective in developing the new ethos of sustainability that will be a major driving force behind the next advances in chemistry that are vital if we are to survive the manifold problems confronting society in the next few decades. This resource is ideal for all secondary teachers of chemistry trainee teachers and university lecturers.

0-85404-383-7 142pp 2004 £12.95

Continued from page 65

equipment. A potential use here is the use of such exercises as pre-laboratory work for students. Other exercises include extensive quizzes in Excel with feedback and experimental models such as calorimetry experiment simulations.

Since chemistry is often a visual science the guidelines also include a range of resources for using images, animations and video clips. I found the support for incorporating images and video clips very useful partly because step by step instructions were given and partly because the resources were also available.

I wasn't so impressed by the inclusion of animations using Flash as it didn't really discuss the fact that you had to purchase the specific software or the learning curve involved in developing Flash animation skills. This was similar with the mention of Javascripting (a programming language) and Java applets (not created using Javascript), which would be beyond the capabilities of many users - even competent IT users.

The use of chemical structure drawing software was slightly different however. Although this requires additional skills, there were guidelines covering it and the software is readily available. Indeed, the software is actually provided with the guidelines.

One thing that really brought these guidelines to life for me was the inclusion of a CDROM. Each and every resource mentioned in the guidelines was provided on the CDROM for use in your own teaching. With the help of the guidelines you are also free to edit the resources as you see fit. This meant that you didn't read about a resource and think 'I could never develop that' because it was available for use already. The advanced resources (applets, Flash animations etc.) were all provided so even if development was beyond your capability, at least you have access to several good chemistry examples. Another feature of the CDROM is that the material is well presented and has an accompanying website hosted by the RSC so that the resources are all accessible and easy to locate.

In summary, I felt that some parts were very simplistic whilst others were too advanced for the intended audience. However, the benefits of this book clearly outweigh any shortcomings. Most of the resources can be developed without any specialist software or advanced IT skills and all the examples are provided as ready to use or editable software. Also, although aimed at school teachers I would recommend this book to lecturers as it provides a wide range of examples and ideas which would benefit any chemistry lecture or undergraduate resource. If nothing else, the resources are free, well presented and bring chemistry to life.

Absorb Chemistry for GCSE

Subject area
General chemistry.

Description
A multimedia chemistry course.

Authors
Lawrie Ryan.

Suppliers/Distributors
Crocodile Clips (http://www.crocodile-clips.com/index.htm).

Date/Version
2002.

Level
Secondary school level.

Type of package
Computer assisted learning.

Price
Site Licence £350-£650 depending on number of pupils.

Hardware required
Windows-compatible PC, Pentium processor or higher, 32MB RAM, 30MB free disk space.

Software required
Windows 98 or later, Internet Explorer 5 or later (compatible with Microsoft Class Server).

Cecilia V Almeda
Chem Dept CSM
MSU-IIT
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Philippines
April 2005

Summary Review

range: * poor to ***** good	
Ease of use	****
Ease of learning	****
Documentation quality	****
Academic content	****
Usefulness to student	****
Usefulness to teacher	****
Portability	****
Meets objectives	****
Accuracy	*****

The software is very helpful as a teaching aid for learning biology, chemistry, mathematics and physics at the elementary up to the secondary level.

Illustrations are well designed, simple and interactive. Although more examples or illustrations (eg the BONDING chapter in Chemistry) would be welcome.

The software is very easy to use. There is no problem with installation. There is no need for an introductory tutorial. It requires QuickView software to display some of the illustrations. QuickView does not run well with some Windows Operating System (such as Windows 98). It would be good if illustrations could be viewed other than with QuickView.

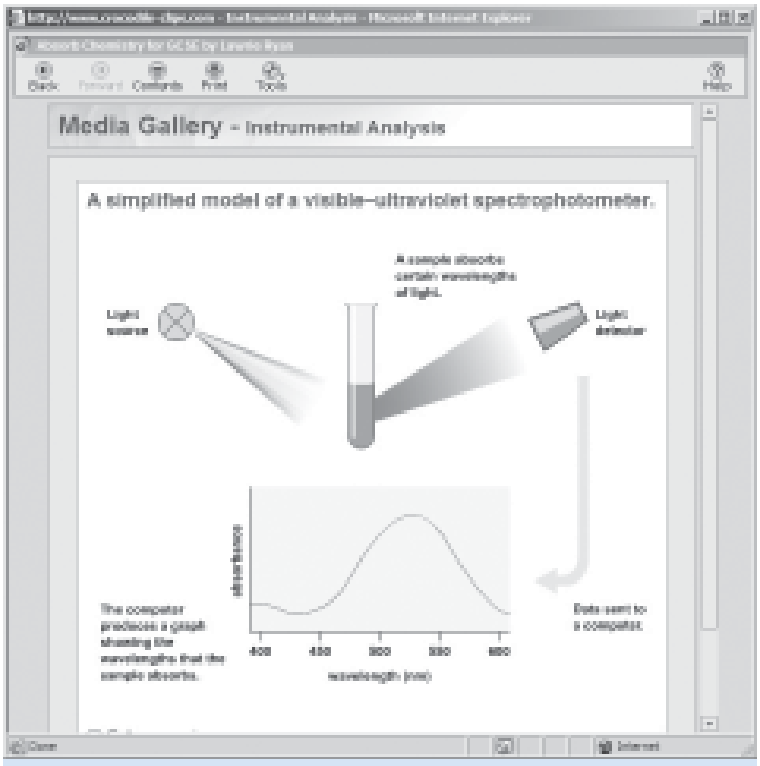

Figure 1: Example screen from Absorb Chemistry for GCSE

The software can run in the Windows 95 operating system and does not need a fast processor or a fast graphics card.

Crocodile Clips Chemistry

Subject area
General Chemistry.

Description
A virtual chemistry laboratory.

Authors
Crocodile Clips.

Suppliers/Distributors
Crocodile Clips (http://www.crocodile-clips.com/index.htm).

Date/Version
2003 build/version 309.

Level
Secondary school level.

Type of package
Computer assisted learning, simulation, teaching aid.

Price
Site Licence £190-£550 depending on number of pupils.

Hardware required
Windows-compatible PC, Pentium II 450 processor or higher, 64MB RAM, 30MB free disk space.

Software required
Windows 98 or later, Internet Explorer 5 or later (compatible with Microsoft Class Server).

Keith Wilkinson
Science Department
International School of Lusaka
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Lusaka
Zambia
November 2004

Crocodile Clips software offers teachers the opportunity to simulate chemical experiments of all varieties. It also offers students their own virtual laboratory in which they can try out experiments of their own, or follow the guidance of a worksheet telling them what to do next.

Summary Review

range: * poor to ***** good	
Ease of use	*****
Ease of learning	*****
Documentation quality	*****
Academic content	***
Usefulness to student	****
Usefulness to teacher	*****
Portability	*****
Meets objectives	****
Accuracy	**

Depending on your view of simulation software, this may sound very idealistic, or it may sound like an unwelcome replacement for genuine laboratory work and the skills we instil in students, such as how to observe, and what to observe, and if we admit it, of course, what not to observe.

Putting the ideological views of what constitutes an authentic science experience aside, for the user, the software is similar to a word processor, except that the menu bars and pull down menus allow the placement of glassware, metals, common bench reagents, and a reasonable range of compounds. These can be mixed, heated, dissolved in water and a whole range of options that will enable a teacher with a projector to perform rapid revision, with a stripped down set of observations that conform to what the students 'need to know'.

The dynamic nature of the software is impressive, and it's funny watching a perfectly drawn pencil diagram of an electrolysis cell with bubbles being released dynamically from the electrodes. The visual appeal of the apparatus is such that it can be cut and pasted into a word processor document to add visual appeal to any chemistry practical worksheet.

An entire laboratory is available in this software and students are keen to play around creating explosions with gunpowder, potassium powder and a range of other listed items in stock. On a serious level, the laboratory is well provisioned with a chemical stock-room including a range of common metals, a range of stock reagents including the common metal ions, and the usual bench acids and bases. The lack of QuickFit glassware limits the use of this software to inorganic chemistry pitched at GCSE level.

Most users, after familiarising themselves with the workings of the software, will want to try out their own experiments without the assistance of the numerous worksheets provided. I tried the software in a variety of contexts with Year 10 (first year GCSE) and Year 13 students (Upper Sixth), and all were keen to move directly from the worksheets chosen to introduce the software's features to their own creations under their own steam.

A distinction should be made between the software and its many capabilities, and the worksheets provided, of which more will be said later. The software has been well written, and enables very simple manipulation of laboratory apparatus using the mouse – a brilliant feat.

Clearly much programming effort has gone into making the experience as realistic as possible. However, departures from reality are numerous, and a selection of these are listed below, by way of example:

Crocodile Clips Chemistry

- heating white zinc oxide powder produces no observable colour change.
- mixing water and iodine produces a purple solution (instead of pale red/brown), as also does KI solution and iodine (instead of a red solution).
- the software maintains that there is no reaction on pouring potassium iodide solution into copper(II) sulfate solution.
- there is no reaction on pouring aqueous ammonia into copper(II) sulfate solution.
- sodium and potassium are not available in lump form, and only in fine and coarse powder form, which is to say the least, unexpected!
- soluble compounds dissolve immediately they are placed in water, and don't require stirring.

There are numerous foibles of this nature which suggest that the program was not developed with a chemistry teacher close at hand, which given the nature and purpose of the software is a major omission.

The reaction database is not viewable, and consequently there is no way to verify that a reaction will proceed as expected without trying it out, which is essential before using this in any learning environment. Unfortunately the encapsulation of the chemical reaction database within the main 2.5 MB program executable, means that there are no support data files that could be read or edited. This means the reactions are 'as is', and cannot be modified by the user and shared with other users through a usergroup, or Napster fashion through central reaction databases on the Net.

Whilst the software can be run in a class discussion session using a single PC and a projector, the software alternatively can be run on a more student centred basis with the student following a Crocodile worksheet (there are plenty provided), and following a procedure tailored to the learning objectives and the capabilities of the software. I would recommend small group work over individual working so students can discuss and argue ideas among themselves. I would also recommend creating small, single gender groups of two to three students. This avoids the scenario where the boys will adopt a stereotypical role and readily snatch the mouse from the girls, staging a 'take over'. Given the number of mistakes and misleading information in the worksheets, teachers would doubtless wish to create their own.

To add to the visual feedback there are a good selection of generic chemical sound effects including a human (albeit male!) scream.

One of the numerous potential strengths of the software is the kinetic simulation which seems to work for aqueous solutions, changes of state, some aqueous chemistry such as acids and metals. Some of the more interesting chemistry, the kinetic simulation doesn't want to know about, and this could be an area to improve on.

The worksheets provided seem not to have been near any teacher in their compiling. As a consequence, there are a good many mistakes, and poor explanations, among which are wrongly labelled electrodes, and a bizarre arrangement of distillation which clearly confuses fractional and simple distillation as a means of separating ethanol and water. These mistakes are a pity, since the content of the worksheets reflects unfairly on the capabilities of the software. The worksheets could be greatly improved, and their number expanded to incorporate a greater breadth and variety of chemistry. As they stand at present, the worksheets are aimed more at 'core GCSE', and could also be used to revise some chemistry at IB and A-level.

A neat piece of simulation is the increase of temperature of substances as they are heated, as well as the temperature changes that accompany exothermic and endothermic energy changes.

One glitch had me foxed for a few weeks before a student solved it for me. On choosing to open a blank simulation, the main sidebar appears to fail to work – i.e. clicking on the buttons has no effect. By curious default it is hidden, and there is no 'grab' bar symbol or texture to show that one can click and drag the edge, which is really a divider. However, if you run the cursor off the edge you can drag the panel divider to reveal the panel.

The license provided with this copy of the software allows five copies of the software to run simultaneously anywhere on the network, and this could be optimal for most purposes, allowing five PCs to be used for a class, and allowing other copies to be used at other times eg teacher writing a worksheet in the prep lab, student in the library working for their own interest, etc. As one would expect of such software there is a full screen periodic table available from a button click. The visual quality is excellent for projectors, and only marred by the lack of information obtained by clicking on an element - here limited to the atomic number and atomic mass - but this is aimed at GCSE, although even at GCSE a greater selection of data such as fixed points, crystal habit, and a visualisation of the atomic size, compared to that of other elements would be particularly useful for a start.

The software worked nippily on two XP machines running in excess of 2 GHz. However, testing it out on a Win98SE, running at 266 MHz and 98 MB RAM gave very poor results with responsiveness: a big problem, even though this is well above the software authors own minimum recommendations of a 486 with 16 MB of RAM.

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Crocodile Clips Chemistry

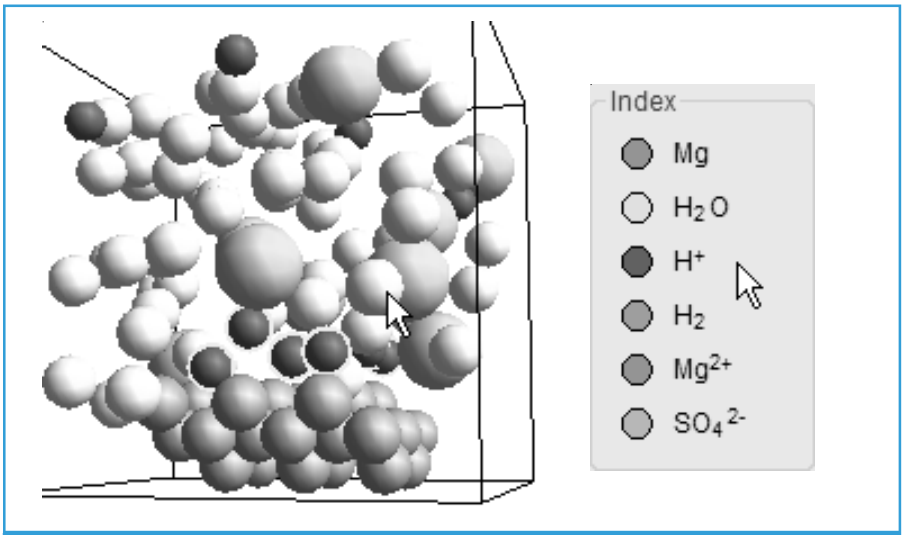

Figure 1: A kinetic simulation of magnesium dissolving in dilute sulfuric acid

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The five license 'in use at once' arrangement allows for the software to be installed on more than five PCs allowing for local network arrangements. For instance, a departmental setup might include five PCs in a computer lab plus a PC in a seminar room with projector, as well as a copy on a teachers prep room PC with printing facilities where worksheets can be printed for students' notebooks.

With careful guidance and use, steering through those parts of the simulated laboratory that give authentic feedback, and avoiding those parts that are erroneous or misleading, the student can benefit from a simplified representation that might assist their understanding and recall. In the hands of teachers with more time than is usually available, a set of worksheets could be produced that were tailored to both the students ability, and the curriculum requirements. Such a series of worksheets, if dovetailed with the student's practical work in the laboratory could be a permanent resource of immense value, enabling students to safely repeat experiments outside the laboratory.

As so much hangs on the user's ability to write new worksheets, the editing object provided is disappointing. It amounts to a plain vanilla text editor, instead of a rich text editing tool. This means that formulae are entered in a coded form. For instance, H_2!SO_4! as a notation in the raw text form for what will appear as formatted formulae for sulfuric acid on the final version. Whether teachers will be keen to write worksheets in this way, or whether they will be put off by such a notation is a moot point, but certainly a better and simpler editing tool would be more persuasive for teaching colleagues!

That students who would normally rate themselves as not 'naturally scientific' take on this software with a sense of adventure suggests that this could be a very useful tool with which to investigate cultural border crossing in science teaching. If it were to appeal to the wider audience of 'non-scientists', then with carefully written worksheets it could markedly change the way learners approach the subject, and broaden the range of approaches teachers could use to deliver chemical ideas.

DATAN

Subject area
Analytical chemistry, spectroscopy.

Description
PC-Windows software for analysis of spectroscopic and multidimensional data.

Authors
MultiD Analysis AB.

Suppliers/Distributors
MultiD Analysis AB (http://www.multid.se).

Date/Version
2004/v3.1.

Level
Research.

Type of package
Spectroscopic data analysis.

Price
€595.

Hardware required
PC with a Pentium processor of at least 200 MHz (500 MHz or better recommended) and 64 MB (128 MB recommended) RAM. Recommended screen resolution is 1024 x 768 or higher.

Software required
Windows.

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May 2005

DATAN (DATa ANalysis) is a package for Windows-based PCs, produced by the Swedish company MultiD Analysis AB, which the user's manual claims is 'the most powerful software for analysis of spectroscopic and multidimensional data'. DATAN should be run on a PC computer with a Pentium processor of at least 200 MHz (500 MHz or better recommended) and 64 MB (128 MB recommended) RAM. Recommended screen resolution is 1024 x 768 or higher.

Summary Review

range: * poor to ***** good

Ease of use	***
Ease of learning	*****
Documentation quality	*****
Academic content	***
Usefulness to student	**
Usefulness to teacher	*****
Portability	***
Meets objectives	*****
Accuracy	***

It should be stated at the outset that this reviewer has no significant expertise in spectroscopy, the primary target area of the software. With a background primarily in mathematics, physics and chemical engineering, I have been involved for a number of years in the development of efficient algorithms for the computation of chemical reaction equilibria in complex multi-species systems[1], In collaboration with some pharmaceutical scientists a number of years ago, I applied this technology to the determination of equilibrium constants for a system of reacting species underlying spectral data[2]. Since the main module of DATAN also addresses this problem, I volunteered to review the software; readers should be aware of this perhaps idiosyncratic view.

The company's web site, at http://www.multid.se, gives information about the company and the software. This review was conducted using version 3.1 of the software, dated April 2004, which is the most current version. DATAN may be purchased from the company web site at a cost of 595 Euros. A free fully functional version may be downloaded, valid for 45 days. The user's manual (in pdf format) can be downloaded at no cost from the web site. I recommend that those interested in the software should download the manual and install the free trial version before deciding upon its purchase. This review was conducted using the 45-day trial version.

The installation routine of DATAN gives a choice of languages, and installs the software and manual on the user's hard drive. According to the manual, DATAN has several analytical modules: 'Principal Component Analysis' (PCA), used to decompose the measurement data into orthogonal components; 'Chemical Equilibrium Analysis', used to calculate spectra, concentrations and thermodynamic parameters of chemical compounds in equilibrium; 'Trilinear Decomposition', used to resolve 3-dimensional data sets into component specific contributions; and 'Exponential Fitting', used to resolve 2-dimensional data sets into a sum of exponentials.

For the reasons noted above, the technical comments in this review are on the 'Equilibrium constraint analysis' module, described in Chapter 3 of the user's manual. The underlying idea is that a measured spectrum intensity a as a function of wavelength (λ) resulting from a set of r chemical species in equilibrium with each other is given by a linear combination of the responses of each species, via

$$a(\lambda) = \sum_{i=1}^{r} c_i \nu_i(\lambda) + \varepsilon(\lambda) \qquad \mathbf{1}$$

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where c_i is the concentration of species i, $\nu_i(\lambda)$ is the response of species i at wavelength (λ) and $\varepsilon(\lambda)$ is the experimental error.

In an equilibrium mixture, the concentrations c_i are related by a set of (unknown) equilibrium constants, denoted here by the vector **K**. In general[1,2], the number of such constants is given by the number of species minus the number of chemical elements, but any equilibrium model may be used in principle. When the spectrum is measured at a sequence of wavelengths $\{\lambda_j\}$, the resulting intensities may be expressed by

$$a_j \equiv a(\lambda_j) = \sum_{i=1}^{r} c_i(\mathbf{K})\nu_i(\lambda_j) + \varepsilon(\lambda_j) \qquad \mathbf{2}$$

Finally, for a spectrum measured at a sequence of pH values indexed by k, the above expression becomes

$$a_{jk} \equiv a(\lambda_{jk}) = \sum_{i=1}^{r} c_{ik}(\mathbf{K}, \mathrm{pH_k})\nu_i(\lambda_j) + \varepsilon(\lambda_j) \qquad \mathbf{3}$$

Given a sufficient number of data points (wavelengths and pH values), the data can be fitted to this expression by determining the values of the equilibrium constants $\{K_m, m=1,2,\ldots,M\}$ and the individual species responses, $\{\nu_i(\lambda)\}$ according to some criterion. One approach is to determine them to minimize the sum of squares of residuals from the observed spectral data, that is, by minimizing

$$S(\mathbf{K},\nu) = \sum_{j,k}\left[a_{jk}(\text{observed}) - a_{jk}(\mathbf{K},\nu)\right]^2 \qquad \mathbf{4}$$

where a_{jk}(observed) is the observed spectral intensity at wavelength j and pH k. The problem of minimizing $S(\mathbf{K},\nu)$ in equation 4 is one of nonlinear minimization.

This is the general approach used by DATAN.

DATAN allows for a discrete set of equilibrium models that can be employed: protolytic equilibria, oligomerization, isomerization and complexation. The basic approach is illustrated by the case of protolytic equilibria, for which DATAN allows up to 4 species, with the resulting equilibria

$$\mathrm{AH}_n^{z+} \rightleftharpoons \mathrm{AH}_{n-1}^{(z-1)+} + \mathrm{H}^+$$

$$\mathrm{AH}_n^{(z-1)+} \rightleftharpoons \mathrm{AH}_{n-2}^{(z-2)+} + \mathrm{H}^+$$

$$\mathrm{AH}_n^{(z-2)+} \rightleftharpoons \mathrm{AH}_{n-3}^{(z-3)+} + \mathrm{H}^+$$

corresponding to the 3 equilibrium constants

$$K_1 = \frac{[\mathrm{AH}_{n-1}^{(z-1)+}][\mathrm{H}^+]}{[\mathrm{AH}_n^{z+}]}$$

$$K_2 = \frac{[\mathrm{AH}_{n-2}^{(z-2)+}][\mathrm{H}^+]}{[\mathrm{AH}_{n-1}^{(z-1)+}]}$$

$$K_3 = \frac{[\mathrm{AH}_{n-3}^{(z-3)+}][\mathrm{H}^+]}{[\mathrm{AH}_{n-2}^{(z-2)+}]}$$

where [x] indicates the concentration of species x. For a given total concentration of the A-containing species and the pH, the concentrations of all species are readily calculated from the equilibrium-constant expressions, given the values of K_1, K_2, K_3. These values are adjusted by means of a nonlinear optimization algorithm to give a best fit to the intensity data in equation (4).

DATAN contains many sophisticated graphing routines for displaying the data, and the software seems to be of 'industrial-strength' quality. It also comes with built-in examples that illustrate the various problem types it considers.

Suggestions for improvement include the following:
1. The most significant shortcoming is the lack of indication of the precisions of the calculated equilibrium constants; only the values are given. Incorporation of precision calculations would require an input of the estimated experimental errors in the measured spectra, and the inclusion of an appropriate analysis algorithm after the constants were determined.
2. The particular equilibrium models could be generalized to require only an input of the chemical formulae of the set of chemical species assumed to be present in the mixture. The stoichiometry and the set of underlying equilibria can be calculated from such a set of formulae[1].
3. The details of the optimization algorithm used are not given. Such algorithms are now reasonably standard, and it would engender confidence in the results if reference were made to the approach used.

References

1. W R Smith and R W Missen, *Chemical Reaction Equilibrium Analysis: Theory and Algorithms*, Wiley-Interscience (ISBN 0-471-09347-5), 364 pp (1982); Spanish edition (1989); Reprinted, with corrections, by Krieger Publishing Co., Malabar, Florida, as ISBN 0-89464-584-6 (1991).
2. C A Royer, W R Smith, and J M Beecham, *Analysis of binding in macromolecular complexes: a generalized approach*, Analytical Biochem, **191**, 287-294 (1990).

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