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Reviews

A guide to publications in the Physical Sciences

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

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

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Editorial

This issue of *Reviews* has 39 reviews, commencing with an evaluation of the web site from one of our Development Projects - ChemTube3D.

There are also a good number of reviews covering Forensic Science (including one on Forensic Archaeology). This is encouraging as we recently started 'officially' supporting education in this area of the sciences.

Additionally, there is the usual mix of Chemistry, Physics and Education resources covered, so there should be something of interest for all readers!

Roger Gladwin
Editor

In this issue...

Web reviews...

Book reviews...

Organic Chemistry Animations: ChemTube3D

Subject area
Chemistry

Description
Animations of organic mechanisms

Authors
Nick Greeves, Alex Lawrenson and Kirsty Barnes

Last updated
Not known

Level
Undergraduate

Plugins required
None

Other features used
Java, JMol

Reviewed using
MacBook Pro, Mac OS X, Safari v3.1.2, Ethernet

Web address
<www.chemtube3d.com>

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May 2009

The ChemTube3D web-site <www.chemtube3d.com> provides a modular learning environment in which undergraduates (*inter alia*) can familiarise themselves with the topological intricacies of the mechanisms of organic chemistry. Given that a deficiency in 3D visualisation skills is frequently a problem for novices, this site promises much, and it does not disappoint.

Summary Review

range: * poor to ***** good	
Ease of navigation	*****
Speed of response	*****
Ease of learning	*****
Content	*****
Relevance	*****
Accuracy	*****
Usefulness to student	*****
Usefulness to teacher	****

The visitor is first greeted by a tidy interface, with the various sub-pages accessible via drop-down menus located to one side of the home page, and a bank of images at the foot of the page. To the practising, junior or novitiate chemist, these images are inherently attractive and their diversity piques the viewer's curiosity and encourages further investigation of the clearly labelled sub-menus. All-in-all, the mechanisms of (currently, *vide infra*) 17 reaction classes are described, with each section containing 2-6 examples of particular reactions belonging to the class. There are sections dealing with reactions of particular functional groups (carbonyls, alkenes, arenes, boranes and silanes) and with distinct reaction types (elimination, substitution, rearrangements, fragmentations and pericyclic reactions).

Within each sub-section, the viewer is confronted by a relatively simple (but ubiquitous) chemical transformation (from aldehyde to alcohol, for instance), in which the various intermediates and/or transition states are also illustrated (an alkoxide, in the example cited). Each compound (or transition state) can be visualised, with the structures shown with partial van der Waals radii. Upon clicking upon the reaction arrows, an animation of that step is shown, with mercifully little lag between click and action. Thus, every chemical species and all the mechanisms can easily and quickly be viewed by the visitor, and the overall learning process is straightforward.

In addition to the mechanistic information, which comprises the bulk of the material on offer, there are sections covering bond polarisation and electrostatics, orbital structure (both atomic and molecular orbitals are described), and spectroscopy. Thus, there are sub-pages describing dipole structure (including quantitative analyses) molecular vibrations (of small molecules, water, carbon dioxide, ammonia, boron trifluoride, etc), the relationship between orbital structure and UV, and an image gallery (consisting of still images of animations to be found elsewhere in the site).

The site is easy to navigate and the viewer is rarely far away from the home page, with a consistent menu structure at every sub-level. The speed of response to the various possible actions is good, with little waiting before pages and animations are available for viewing.

Organic Chemistry Animations: ChemTube3D

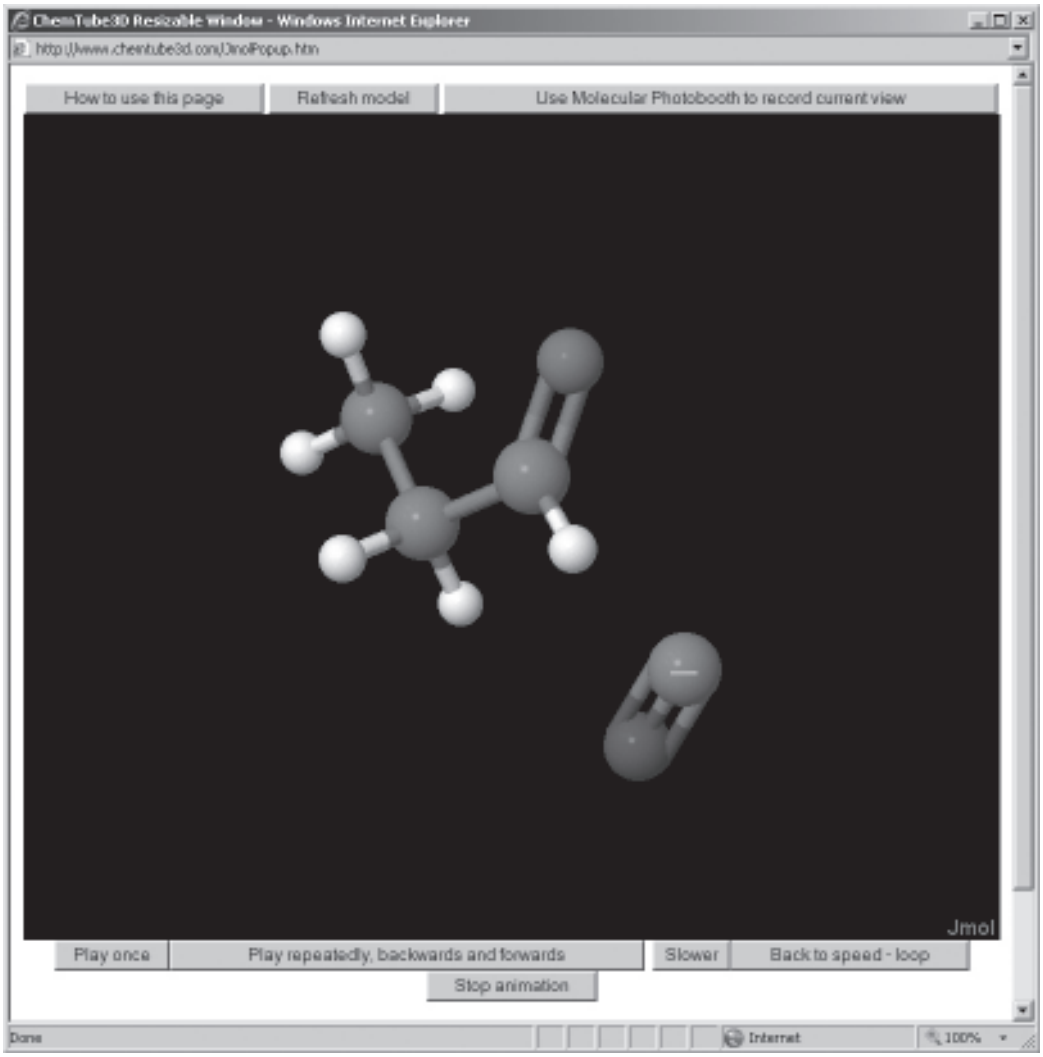

Figure 1: Example screen from ChemTube3D

New additions to the databank are made on a regular basis; there is already coverage of pretty much all of the main reaction types encountered at undergraduate level, and, though primarily targeted at undergrads, there is much in this resource which would be useful to junior post-grad students. From the pedagogic perspective, this site provides an outstanding additional resource as an aid to a plethora of undergraduate lecture courses; it could be regarded as a free-standing information source suitable for independent study, in association with lecture notes, and it will undoubtedly be a valuable resource for undergraduates receiving distance-learning materials (such as those provided to industrial placement students). The site is already well-known and popular, and is heartily recommended.

Chaos: a very short introduction

Subject area
Physical Sciences

Description
A wide-ranging discussion of chaos and its manifestation in economics, physics, and meteorology

Authors
Leonard Smith

Publishers/Suppliers
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2007/1st Edition

ISBN
978-0-19-285378-3

Level
A-level, access, foundation

Price
£7.99

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

Surely it only happens in 1950s science fiction films. A scientist races across the runway, luggage in hand, his charter flight 'prepped' for departure. The boarding stairs are quickly wheeled back out and he's on board the flight to a mountain retreat. The plane lands and he offers a lift in his hire car. Chaotic motion ensues as his attention seems less toward oncoming traffic and more on tuning the covertly placed radio. This was the first time I met Ed Spiegel, a man who transmits his love and understanding of nonlinear physics in a way that always makes me think of a documentary I once saw about Leonard Bernstein. Ed wrote a classic paper with Derek Moore in 1965 in which they uncovered an interesting attractor in the equations of motion of a convective parcel of gas in a stellar atmosphere. Now, one of Ed's former students - Leonard Smith, has written the best introduction to chaos I have ever read.

The danger in writing this review is that I share too much of what I enjoyed about this small book and steal the pleasure you should feel when you encounter this perfectly paced story for the first time – I started the book on a dreary train journey and had just about finished, having not noticed time pass, when we drew into Euston a few hours later. The book epitomises what the *Very Short Introduction* series from Oxford should be all about. A lot of thought has gone into the narrative stream, and fresh anecdotes and analogies make Leonard Smith an excellent guide to a subject that reaches across disciplinary borders. Indeed chaos theory is an established part of popular culture: Jeff Goldblum explained sensitivity to initial conditions to a wide-eyed Laura Dern as they set off on the ill-fated tour of Jurassic Park; the 'butterfly effect' has inspired an eponymous movie and, much better still, the havoc wreaked by Homer Simpson and a time machine that once toasted bread. So a clear description of its power and limitations should have a broad and receptive audience.

Smith starts with the evocative quote from Ray Bradbury's 1952 story *A Sound of Thunder* where the death of a butterfly crushed by a time-travelling hunter – "a small thing that could upset balances" – leads to a new and very different present for the hunting party when they return. This leads gracefully into a discussion of weather forecasting and, typical of the book, the illustration is fascinating – Galton's first forecast chart published in a newspaper, from March 31st 1875. I made a computer version of the Galton Board with a friend a few years ago – we called it binomial pinball – so again how refreshing it was to see Galton's original sketches sourced here. The discussion of the Burns Day storm of 1990 is gripping. The day before the storm hit the United Kingdom, two ships in mid-Atlantic sent in their routine weather reports. They just happened to sample opposite edges of the storm in the making. Forecasting programs without these data weren't predicting a storm. But if the data from the ships were included in the program, the danger of a storm making imminent landfall became clear. The storm was devastating but it had at least been expected and the lessons were clear. First, as Smith says "when our models are chaotic then small changes in our observations can have large impacts on the quality of our foresight". Second, we must be pragmatic and intelligent in interpreting imperfect models with limited constraints, which themselves have differing degrees of reliability. The program actually rejected the ships' data because it was

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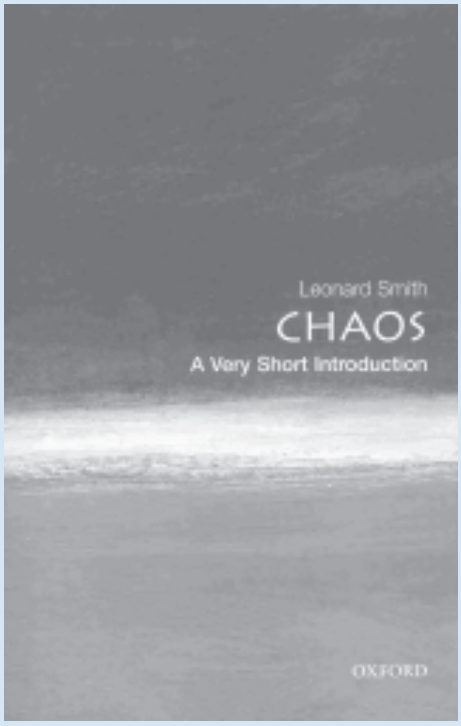
May 2009

Chaos: a very short introduction



From the publisher...

Chaos
A Very Short Introduction
By Leonard Smith

Leonard Smith shows that we all have an intuitive understanding of chaotic systems. He uses accessible maths and physics (replacing complex equations with simple examples like pendulums, railway lines, and tossing coins) to explain the theory, and points to numerous examples in philosophy and literature (Edgar Allen Poe, Chang-Tzu, Arthur Conan Doyle) that illuminate the problems. The beauty of fractal patterns and their relation to chaos, as well as the history of chaos, and its uses in the real world and implications for the philosophy of science are all discussed in this Very Short Introduction.

978-0-19-285378-3 190pp 2007 £7.99

inconsistent with its own forecast – only a human forecaster's realisation of the weight the observations deserved made sure the data were accepted by the computer and the forecast radically changed.

A good deal of the book is concerned with nonlinear mappings and whilst no mathematics beyond simple operations is expected, the resulting times series are presented as graphs, not unfamiliar to readers who have watched the recent effects of small and large impulses on their savings and pension funds. There's a nice personal anecdote about exponential growth and a chain e-mail and I don't know why, but I much prefer the idea of folding toffee to dough in describing the divergence of trajectories. There is an insightful discussion of the impact of noise on the limits of prediction – figure 15 with the application of this to the dissipative Lorenz equations is perhaps my favourite in the book, although figure 29 with its ensemble of model forecasts is incredibly powerful. I think the necessity of eliminating equations from the book has led the author to devise perhaps the clearest introduction to Lyapunov exponents you will ever read – thrilling!

Readers who warmed to the story of human intervention in the story of the Burns Day storm will also be pleased to read of the implicit limitations of computers in modelling chaos because of their finite state spaces, again illuminated by a fun discussion of card tricks. Some topics have small sections, but even when they do, for example Hamiltonian chaos, they are never perfunctory and there is something useful to be shared. The discussion of delay equations, useful in medicine and the study of epidemics, covers barely a page but I learnt that a cure for one oscillatory disease had been found through a study of these equations.

This book might be aimed at a general readership but it has many uses within specialist and interdisciplinary degrees. Perhaps, best of all, it is a model of how to write a brilliant and entertaining non-technical book, where one feels one's understanding has been advanced because of, rather than in spite of, the absence of a parallel mathematical argument.

Chemical Analysis of Firearms, Ammunition and Gunshot Residue

Subject area
Forensic Science

Description
This book covers the application of forensic chemistry to firearm investigations

Authors
James Smyth Wallace

Publishers/Suppliers
CRC Press - Taylor & Francis Group <www.crcpress.com>

Date/Edition
2008/1st Edition

ISBN
978-1-4200-6966-2

Level
Undergraduate, research, professional

Price
£63.99

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

Chemical Analysis of Firearms, Ammunition and Gunshot Residue is a book, which draws on the author's vast experience as a forensic scientist during the troubles in North Ireland. Indeed, there can be few better training grounds for investigators interested in firearms. In the Preface, the author sets out the context in which he and his colleagues had to work, and presents an intriguing backdrop for forensic work and the application of forensic chemistry to firearm investigations.

This book contains seven broad sections, which cover a variety of topics related to the history, investigation and detection of firearms and discharge residues. Section I provides a general introduction to firearms. Section II, presents a brief history of gunpowder, ignition systems, bullets, ammunition and firearms, respectively, so that the reader is brought up-to-date. In Section III, the chemical composition of cartridges, primers, propellants and ammunitions are discussed. Detailed information on the relative amounts of chemical constituents used in each component with an explanation on how each chemical influences the combustion behaviour and performance of primers, propellants and bullets are presented. In Section IV, the techniques, and methods used for the collection and analysis of firearm discharge residues (FDR) are introduced. Practical details for the analysis and procedures for sampling of FDR, and the interpretation of chemical analysis are presented in Section V. It is noteworthy that there is a discussion of the limitations of current practice, and useful recommendations for improvements. Section VI covers suspect processing procedures, the impact of time delays on the amount and quality of evidence collected, and contamination avoidance. Organic components of firearms, and sampling kits used on skin and clothing are addressed in Section VII.

The material presented in this book is undoubtedly very useful for the practitioner, and is certainly a very good reference for firearm investigations. The cursory historical accounts are interesting and provide good background information for the general reader. However, there are a number of flaws which hopefully can be put right in a subsequent edition. In its present form, the style in which information is presented is bitty, for example, chapters 1-6 can be combined into a single chapter. Similarly, others could be combined into coherent chapters so that the information appears more integrated. Of more concern to the academic reader, is the incomplete citation of literature and use of non peer reviewed sources. In addition, there are a few minor errors such as the use of cm instead of cm^3 to denote the unit of volume. These can be ratified by careful editing. Although, the book is aimed at audiences in the UK and US, it would be useful to provide conversion tables from imperial to metric units. These minor shortcomings detract from what is a good source of information on firearms, and in our opinion a very good attempt at embedding a scientific approach into firearm investigations.

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January 2009

Chemometrics: statistics and computer application in analytical chemistry

Subject area
Analytical Chemistry

Description
The text is based on the author's experience of teaching chemometrics to undergraduate students, and reflects the practical application of statistical and mathematical topics to the evaluation of experimental observations

Authors
Matthias Otto

Publishers/Suppliers
Wiley-VCH
<eu.wiley.com/WileyCDA>

Date/Edition
2007/2nd Edition

ISBN
978-3-527-31418-8

Level
Undergraduate, research

Price
£60.00

Mike Adams
School of Applied Sciences
(Applied Chemistry)
RMIT University
Melbourne
Vic 3001
Australia
December 2008

Summary Review

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

Matthias Otto has long been associated with the development and application of chemometric techniques in analytical science, and in this, the second edition of his text, he has provided an excellent practical introduction and review of the subject. The text is based on the author's experience of teaching chemometrics to undergraduate students, and reflects the practical application of statistical and mathematical topics to the evaluation of experimental observations.

The first two chapters provide an introduction to chemometrics, and computer-based information systems, and descriptive statistics. The more common distribution functions are described along with hypothesis testing. Analysis of variance completes these introductory sections.

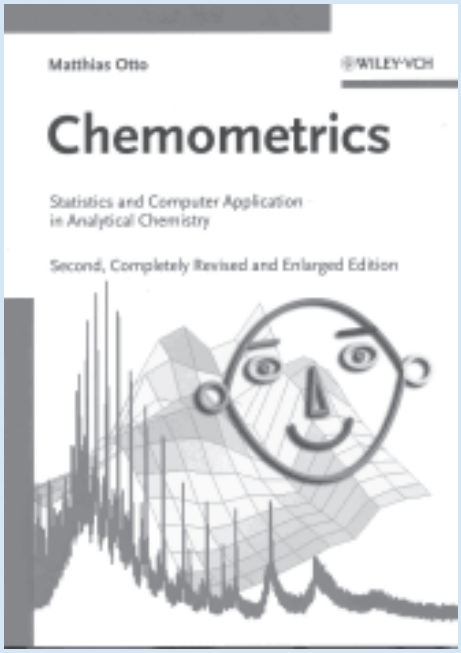
Chapter 3 discusses digital smoothing and filtering, differentiating and integrating data, and data transformations based on Fourier and Hadamard transforms. Wavelet analysis is a relatively new addition to the chemometrician's toolbox and is introduced here. Time series analysis is also covered in this section and is principally dealt with using autocorrelation and autocovariance functions.

The importance of experimental design and optimisation of experimental conditions is reflected in Chapter 4 with sections devoted to objective functions, experimental design and response surface methods, and sequential optimisation as exemplified by the Simplex method.

Chapter 5 is devoted to pattern recognition and classification, and represents the main section of the book dealing with multivariate data analysis based largely on the structure and nature of the covariance and correlation data matrices. Pre-processing analytical data prior to applying multivariate statistical analysis is an important task that can profoundly affect the quality and nature of the results of data analysis. Missing data, centring and scaling are discussed here. Pattern recognition is discussed in terms of unsupervised methods and supervised techniques. Unsupervised analysis includes not only cluster analysis but also data projection methods designed to achieve reduction of dimensionality in the data. It is here that factor analysis and principal components analysis are introduced, fundamental techniques in almost all chemometric applications. Factor analysis is often not intuitively clear to students and the author devotes considerable space to this important topic, and succeeds in providing an excellent account of the methodology, its theory and application. Target rotation and transformation are discussed, along with multivariate decomposition methods such as parallel factor analysis (PARAFAC) that are becoming increasingly popular. Supervised pattern recognition is discussed in terms of linear learning machines, discriminant analysis, SIMCA, and support vector machines.

Continued on page 8

Chemometrics: statistics and computer application in analytical chemistry



From the publisher...

Chemometrics: Statistics and Computer Application in Analytical Chemistry

By Matthias Otto

This new edition contains 10 percent more worked examples as well as the addition of modern chemometric developments, such as support vector machines, wavelet transformations and multi-way analysis. With its inclusion of statistics, fuzzy theory, databases, and quality assurance, this remains the textbook with the broadest coverage, and retains such proven features as additional information provided in the margin, a glossary of terms plus an overview of suitable chemometric software.

978-3-527-31418-8 343pp 2007 £60.00

Continued from page 7

The development and application of calibration modelling are the subjects of Chapter 6. Commencing with univariate linear regression, the chapter moves to multiple linear regression with ordinary least squares models, principal components regression and partial least squares regression. A very useful section on regression diagnostics is included. The chapter concludes with a review and discussion of non-linear modelling.

The final three chapters deal with material often not covered in other chemometric texts, but which add considerably to the value of this text for students and workers in the area. Analytical databases, including the representation of data and structure of common spectral databases are covered in Chapter 7, along with methods for coding chemical structure fragments. LIMS and library search techniques complete the chapter.

Chapter 8 focuses on artificial intelligence and expert systems in analytical science. The structure of expert systems and common development tools and computer languages for their implementation are discussed. Neural networks, their structure and learning paradigms are reviewed and several network models are introduced and their operation analysed. Fuzzy sets and genetic algorithms are introduced.

Finally, the book finishes with a chapter on quality assurance and good laboratory practice including regulatory and legal aspects of quality control.

This book of over 300 pages provides a valuable addition to the field of chemometrics and the education of scientists in this increasingly important field. The text is well written and presented. Each chapter declares its learning objectives, provides further reading in terms of other texts and suitable primary literature sources, and presents a short list of questions and problems for the reader. A major strength of the book is the frequent use of relevant examples and exercises in all chapters.

It is an excellent educational text and reference book for all interested in chemometrics and is a useful and valuable addition to any analyst's bookshelf.

Computational Organic Chemistry

Subject area
Organic Chemistry

Description
This book provides a practical overview of the ways in which computational modelling methods and applications can be used in organic chemistry to predict the structure and reactivity of organic molecules

Authors
Steven M Bachrach

Publishers/Suppliers
Wiley-Interscience
<eu.wiley.com/WileyCDA>

Date/Edition
2007

ISBN
978-0-471-71342-5

Level
Research, professional

Price
£86.95

Ian H Williams
Department of Chemistry
University of Bath
Bath
BA2 7AY
April 2009

The back cover describes this book as providing "a practical overview of the ways in which computational modelling methods and applications can be used…to predict the structure and reactivity of organic molecules" and as "presenting in-depth case studies that show how various computational methods have provided critical insight into the nature of organic mechanisms."
Does it do what it says on the tin?

Summary Review

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

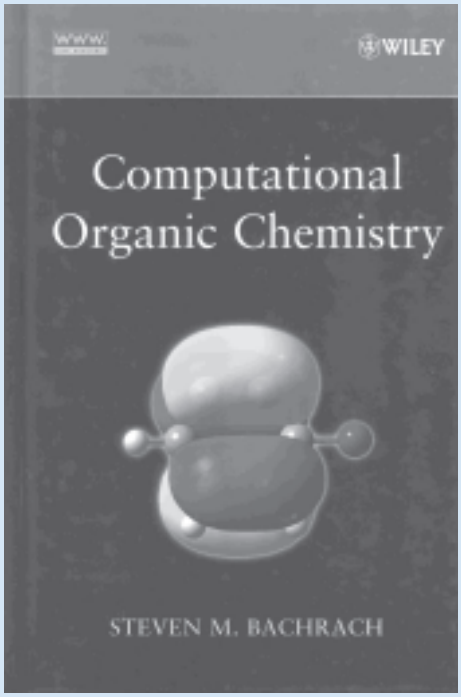
By and large, yes. And extra value is added by the supporting website at <www.trinity.edu/sbachrac/coc/> that gives links to other relevant materials and includes the author's very helpful and interesting blog that provides a continuing discussion of the topics introduced in the book. Of course this implies that the book itself does not provide the last word on any of those topics, but then computational organic chemistry is still very much a developing discipline. The book does not claim to be a comprehensive treatise and, indeed, a deliberate decision has been taken not to include semi-empirical methods. In this regard the author's intention is to provide a successor to *Ab Initio Molecular Orbital Theory* by Hehre, Radom, Schleyer and Pople[1], and this in turn points to the limited scope of the methods that are included in this book. Also excluded are molecular mechanics, classical molecular dynamics and statistical mechanics among other methods that could well be considered as part of today's computational methods for the study of organic chemistry.

The opening chapter (Quantum Mechanics for Organic Chemistry, 41 pp) provides a very good introduction within its own remit but the claim that upon completing it "the reader should be able to follow with ease a computational paper in any of the leading journals" is overstated and betrays a restricted vision of the breadth and depth of the subject. The closing chapter (Organic Reaction Dynamics, 50 pp) culminates with a perfectly fair suggestion that recent developments may necessitate a complete rethink of traditional concepts of reaction mechanisms. The argument depends upon the way we understand the nature of potential energy surfaces and their relationship with observable phenomena, but that is never properly addressed within the book, even though the methodology for exploring features of these surfaces is as fundamentally important for computational organic chemistry as is the methodology for generating them.

Apart from momentary asides in the first 350 pages, the author leaves any serious discussion of organic chemistry in solution until the penultimate chapter (63 pp), which contains a brief account of computational approaches to solvation. Why was this not included in chapter 1? Most of the book comprises in-depth discussions of the results of calculations that ignore solvent effects. No wonder then that comments emerge regarding the possible inadequacy of traditional views of reactivity and mechanism: but one might ask whether it is the views of the organic chemists (whose notions have derived from experimental observations of reactions in solution) or of the computational chemists (who hitherto have often blithely ignored significant features of the reactions they have modelled) that require revision?

Continued on page 10

Computational Organic Chemistry



From the publisher...

Computational Organic Chemistry

By Steven M. Bachrach

Computational Organic Chemistry provides a practical overview of the ways in which computational modeling methods and applications can be used in organic chemistry to predict the structure and reactivity of organic molecules. After a concise survey of computational methods, the book presents in-depth case studies that show how various computational methods have provided critical insight into the nature of organic mechanisms.

978-0-471-71342-5 496pp 2007 £86.95

Continued from page 9

Doubtless the answer is 'both', and this book should help to stimulate the process, not least because through the series of enlightening interviews that finish off each chapter it offers insight into what makes some real computational organic chemists tick. This personal touch is welcome, but it is disappointing to find many 'typos' in the names of chemists whose work is cited in the text.

I would recommend this book to postgraduate students as a useful resource along with others but not as a sole text. It is disconcerting to read on the first page of chapter 2 (Fundamentals of Organic Chemistry, 74 pp) that heterolysis creates radicals and homolysis creates ions! This howler vanishes after a few pages, but by then the reader is already deep into some rather esoteric topics under the guise of acidity, ring strain and aromaticity, the discussion of which invokes theoretical concepts that outstrip the level of the introductory chapter. Dive into the depths and enjoy the water, but don't expect to touch the bottom! The other discouraging feature of the book, unfortunately, is the price – unless, that is, you work or study at an institution that provides free access to the on-line version.

Reference

1. Hehre, W J, Radom, L, Schleyer, P v R and Pople, J A, *Ab Initio Molecular Orbital Theory*, Wiley, (1986).

Concepts of Modern Catalysis and Kinetics

Subject area
Surface Science, Chemical Engineering

Description
This book spans the full range from fundamentals of kinetics and heterogeneous catalysis via modern experimental and theoretical results of model studies to their equivalent large-scale industrial production processes

Authors
I Chorkendorff, J W Niemantsverdriet

Publishers/Suppliers
John Wiley & Sons, Inc
<eu.wiley.com/WileyCDA>

Date/Edition
2007/2nd Edition

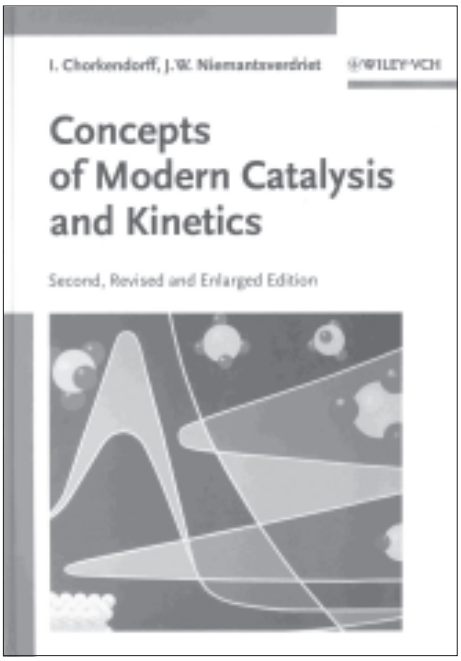
ISBN
978-3-527-31672-4

Level
Undergraduate, research

Price
£60.00

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

As a newcomer to the exciting field of catalysis (I originally trained as a chemical engineer at college - for nearly 15 years I have meandered through electrochemistry, materials science, surface science, surface chemistry, then suddenly found that I was asked to be in charge of a catalysis department in a technology university!), I was fortunate to review this book covering the first 'modern' encounter with the concepts of modern catalysis and kinetics, written by two internationally renowned scientists and teachers.



One of the authors wrote wisely about the success of a heterogeneous catalysis design, ie, "Having the right species" + "With the right coverages" + "At the right temperature" + "On the right surface". This book provides the conceptual framework for understanding of heterogeneous catalysis. Important topics included are kinetics, reaction rate theory, catalytic surfaces and characterisation techniques, surface reactivity, catalysis kinetics, and applied catalysis (H_2 related catalysis, oil refining and petrochemistry and environmental catalysis).

To give the reader a feel of how clearly and thoughtfully the authors treated a complex topic to render it fully accessible to freshmen (like me!), I just mention Figure 5.25. It gives a full and clear picture of various forms of alumina and their transformation, emphasising the catalysis application.

This book, 457 pages, including a large assembly of questions and carefully designed exercises (more than 200 together), will be an excellent textbook for students and teachers.

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May 2009

Digital Forensics: digital evidence in criminal investigation

Subject area
Forensic Science

Description
This book presents digital evidence as an adjunct to other types of evidence and discusses how it can be deployed effectively in support of investigations

Authors
Angus Marshall

Publishers/Suppliers
Wiley-Blackwell
<eu.wiley.com/WileyCDA>

Date/Edition
2008

ISBN
978-0-470-51775-8

Level
Undergraduate, research, professionals

Price
£24.95 (paperback): £70 (hardback)

Raul Sutton
Department of Forensic and Molecular Science
School of Applied Science
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Wulfruna Street
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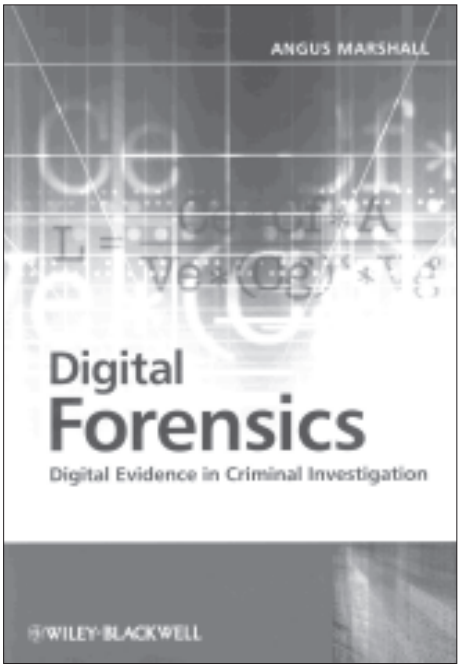
May 2009

I have reviewed this concise text from the standpoint of a complete non-specialist who wishes to gain a better understanding of digital forensics. The author/ publishers are aiming at such a market: as stated on their website the book provides, "investigators/SSMs/other managers with sufficient contextual and technical information to be able to make more effective use of digital evidence".

Summary Review

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



In this aspect, we all use digital tools every day, but most of us have little understanding of their operation or how to deal with such devices from a forensic standpoint. With this proviso, I found the book extremely easy to read with all of the aspects of the text well written with clear explanations and a wealth of diagrams and pictures to support the text.

This book is intended to provide; as the publishers cite, "the reader with a better understanding of how digital evidence complements 'traditional' scientific evidence and examines how it can be used more effectively and efficiently in a range of investigations."
The book is divided into sections covering: evidential potential, device handling, principles of examination, evidence creation, internet activity, mobile devices, intelligence, case studies and examples. Each chapter is of a suitable length and forms a coherent whole. The last chapters with illustrative case studies show the application of the described methodologies in a forensic context.

The author is clearly aware of both international and national guidelines on the handling of digital evidence and underpins the explanations by reference to these where necessary. There is a recommended further reading list at the end of the book that can take the interested reader beyond the scope of the text.

One area of omission is the lack of any self-testing questions with worked solutions. It seems that the authors and publishers had intended to produce these as the publisher's website states that the book includes worked case examples, test questions and review quizzes to enhance student understanding and solutions provided in an accompanying website. I could find no reference to the website in the text or any links on the publisher's website that led to this material. Persons attempting to purchase the book after reading the information provided by the publisher may feel that they have been short changed in this respect.

Elements of Physical Chemistry

Subject area
Physical Chemistry

Description
This is a text for students with varied amounts of background knowledge, with support ranging from succinct reminders of key principles and brief illustrations of how to use equations, to fully worked-out examples and annotated equations

Authors
Peter Atkins and Julio de Paula

Publishers/Suppliers
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2009/5th edition

ISBN
978-0-19-922672-6

Level
Undergraduate

Price
£29.99

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May 2009

Summary Review

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

This is an introductory book for the undergraduate student covering some important topics in physical chemistry. There are 22 chapters and 4 appendices. Initial chapters provide an introduction to basic concepts and properties of gases, (such as equation of state, the kinetic model of gases, real gases) with the help of easy to follow mathematical steps and state of the art illustrations. After that, the first law of thermodynamics has been introduced with the help of some useful basic equations, plots and examples, along with an introduction to internal energy and enthalpy. Then there is further explanation of thermochemistry and second law. The important parameter, entropy has been explained with attractive and useful figures and examples. The Gibb's free energy has also been explained in an excellent way. Furthermore there is more explanation about free energy, phase diagrams, phase rules, the molecular structures of liquids, etc.

The next chapter is about properties of mixtures, covering the thermodynamic description, partial molar quantities, spontaneous mixing, ideal solutions and colligative properties (with the help of excellent illustrations and mathematics). In the next chapter, there is further explanation of Gibb's energy with various useful easy mathematical steps, figures and examples. Chemical Equilibrium is the topic for the next chapter where important articles on Brønsted-Lowry theory, protonation and de-protonation, polyprotic acids, amphiprotic systems, acid base titration, buffer actions, indicators and solubility equilibria have been explained in a very easy to follow way.

Chapter 9 deals with electrochemistry describing the Debye-Huckel Theory, electrochemical cells, reaction in electrodes, the cell potential, cells at equilibrium, application of standard potential etc, using many coloured diagrams and simple mathematics. In the next chapter, there is some basic description of chemical kinetics, such as rate laws, reaction order, the Arrhenius parameters, collision theory and transition state theory, followed by reaction schemes, reaction in solutions, catalysis and chain reactions.

Chapter 12 is about Quantum Theory describing atomic and molecular spectra, the photoelectric effect, the Schrödinger wave equation, Born's interpretations, one and two dimensional problems, rotation in two and three dimensions and vibrational motions. After that, atomic structures are covered with the help of the spectra of hydrogen atoms, quantum numbers, and the wave functions of various orbitals, periodic trends in atomic properties and spectra of complexes.

Chapter 14 deals with the Chemical Bond describing introductory concepts, valence bond theory, molecular orbitals and computational chemistry, using many important energy diagrams, orbitals, equations and examples. After that we have molecular interactions (explained with Van Der Waals interactions) and hydrogen bonding.

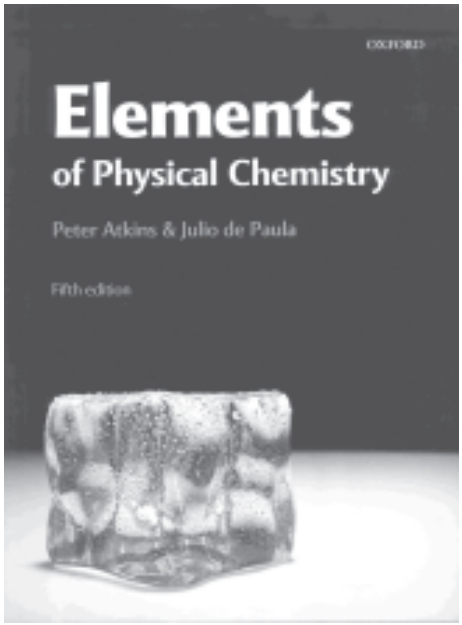
Continued on page 14

Elements of Physical Chemistry

Continued from page 13

Chapter 16 is about macromolecules where emphasis has been made on synthesis, size and shape, models of structure, random cells, polypeptides and polynucleotides, mechanical properties of polymers, mesophases and disperse systems, surface structure and stability, and liquid surfaces.

Chapter 17 deals with metallic, ionic and covalent solids, Band Theory of solids, ionic model of bonding lattice enthalpy and magnetic properties of solids. After that we have crystal structures described with the help of unit cells, crystal planes, Bragg's law and then some experimental techniques about crystallography. The next chapter is about solid surfaces describing surface growth and extent of adsorption, catalytic activity at surfaces, processes at electrodes and fuel cells.



Chapter 19, 20 and 21 deal with spectroscopy, describing rotational spectroscopy (rotational energy level, levels of molecules, rotational transition and line width) vibrational spectroscopy (vibrational energies and transitions, vibrational Raman spectra of diatomic molecules and polyatomic molecules). Additionally the electronic transition and photochemistry have been explained with the help of a description on UV/visible spectra, radiative and non radiative decay. After that there is some description of fluorescence and phosphorescence and lasers followed by quantum yield and photosynthesis supported by excellent illustrations where required.

Chapter 21 deals with magnetic resonance spectroscopy describing the principles and mathematical background of NMR and ESR spectroscopy. Also here is some description of basic instrumentation, interpretation using some simple examples followed by chemical shift, spin relaxation, proton decoupling, two dimensional NMR and solid state NMR. Then there is some brief description about EPR (ESR) spectroscopy, introducing g-tensor, hyperfine structure with the help of useful figures.

Lastly, Chapter 22 is about statistical thermodynamics. The important topics in this chapter are the partition function, Boltzmann's distribution, absolute entropy, the statistical equilibrium basis and chemical equilibrium.

This book will certainly provide maximum help to students, even with poor chemistry background. The authors have worked hard to make it one of the best basic books on physical chemistry. Overall this book provides many basic links towards advanced physical chemistry, especially the chapter related to thermodynamics which provides not only the basic information about thermodynamic function such as enthalpy, internal energy in the best possible, easy way, but then strengthening these concepts more with the help of excellent coloured diagrams, many useful equations and examples. The three laws of thermodynamics have also been described with the help of excellent illustrations, especially the figures showing the graphical calculations of entropy. There is enough material about thermodynamics of ideal and non-ideal systems with the help of easy mathematics, plots and good examples.

Gibb's free energy has been described along with its applications, and partial molar quantities. Chapters related to Quantum Chemistry also provide much information with the help of very well drawn figures and plots and then 3D coloured diagrams, which are normally not available in many texts. The 3D coloured diagrams of atomic and molecular orbitals and energy diagrams are a further bonus for students. Additionally the spectroscopy section provides not only theoretical background, but also experimental and interpretational detail of IR, UV/visible, NMR and ESR Spectroscopy. However there is a great need for a separate chapter on computational chemistry by the authors because many software discussions must be included in the book for undergraduate students.

Experiments and exercises in basic chemistry

Subject area
General Chemistry

Description
This book could be of benefit not only to beginner chemistry students, but to any other student of experimental sciences, or even life or health sciences, needing a thorough comprehension of basic chemistry

Authors
Steve Murov & Brian Stedjee

Publishers/Suppliers
John Wiley & Sons, Inc
<eu.wiley.com/WileyCDA>

Date/Edition
2009

ISBN
978-0470-42373-8

Level
Undergraduate

Price
£72.50

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April 2009

This new edition of Murov & Stedjee's **Experiments and Exercises in Basic Chemistry** improves earlier editions and is to be thoroughly recommended. As in previous editions, the authors take a hands-on approach that forces the student to think carefully about the different proposed experiments, in a way that follows rather closely the nature of the scientific method.

Summary Review

range: * poor to ***** good

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

This book could be of benefit not only to beginner chemistry students, but to any other student of experimental sciences, or even life or health sciences, needing a thorough comprehension of basic chemistry.

It proposes 27 different experiments that cover essentially all the typical fields considered in general chemistry books for beginners: basic concepts on units and physical properties, basic operations in the laboratory, chemical bonding and structure, fundamentals of analytical chemistry, thermochemistry, eletrochemistry, chemical properties of the elements, titrations, basic kinetics, equilibrium, fundamentals of organic chemistry, etc.

All the proposed experiments contain a so-called "Prelaboratory exercises" section that helps students concentrate on what is relevant about what they are going to do and, once the experiment is finished to have a feedback on this and check whether the most important points have been addressed and to what extent the experiment has been a success in this sense.

Furthermore, it contains 23 exercises to complement the experiments and reinforce the correct acquisition of concepts, some of which refer to questions that cannot be easily illustrated through an experiment. These exercises also help showing students that Chemistry is not only about mixing and cooking reagents, but also implies a lot of thinking.

The book also refers students to a very nice collection of webercises that may be downloaded in .pdf format.

The sequence in which the topics are treated can be altered almost in any way, giving the instructor a lot of freedom.

The authors are rather careful with safety matters, choosing reagents that are not harmful to persons or to the environment.

Throughout the book, there are several so-called "chemical capsules" that can be used for debate on hot topics, in an effort to bring out the relevance of chemistry for the whole of the society.

In summary, this book is ideal for recommendation for an experimental course on basic chemistry that is supported by and follows an additional lecture/tutorials-based course, in which the fundamental concepts should be treated in depth. Putting such concepts in practice in an enjoyable way is the main goal of this book.

Forensic Science: an introduction to scientific and investigative techniques

Subject area
Forensic Science

Description
This book provides good basic information on a range of forensic sciences

Authors
Stuart H James and J Nordby (editors)

Publishers/Suppliers
CRC Press
<www.crcpress.com>

Date/Edition
3rd edition

ISBN
978-1-4200-6493-3

Level
Undergraduate, professional

Price
£36.99

Allan Jamieson and Carrie Mullen
The Forensic Institute
Baltic Chambers
50 Wellington Street
Glasgow
G2 6HJ
May 2009

Summary Review

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

This book was informative and easy to read. It provides good basic information on a range of forensic sciences. Addressing a much greater range than most books it covers almost every aspect of scientific expert evidence. With such an array of subjects each chapter, as the title suggests, provides only a broad introduction, which the more experienced reader may find frustrating. All of the basic principles are covered although some chapters are lacking in detail (although the reader is sometimes referred to other sources). As many of the subjects described are evolving, providing detailed accounts of each subject would be difficult but the detail given is adequate as a foundation upon which students can base further research.

Students using the text should be aware that as an American source the approach described in some of the investigative chapters is slightly different to the general approach adopted in the UK. The underlying concepts however are alike and these chapters are informative.

This is an ideal text for undergraduate students who may have a varied study programme with an assortment of modules delivered from different schools (eg science and technology, social science, engineering). By referring to relevant chapters prior to attending lectures the student will already appreciate the fundamentals of the topic and could more rapidly achieve a greater appreciation of the subject matter from the detail delivered in lectures and practical sessions.

Chapters which could perhaps be more in-depth were those covering expansive topics such as DNA profiling, chemical analysis of drugs of abuse, fire analysis (ignitable liquid analysis is not included), etc. As these are such wide-ranging subjects however and this book only aims to provide an introduction this is perhaps a forgivable deficiency. There are many texts available dedicated to these subjects alone and the reader is referred to these.

The chapter titled ‘Microanalysis and Examination of Trace Evidence’ was particularly good. A sufficiently detailed account of microscopic techniques is provided and the chapter progresses to explain why these are important and how they are applied to the analysis of trace evidence. Most helpful in this chapter was that the authors had referred to sources of further information throughout the text rather than just providing a reading list at the end.

At the end of each chapter there is a set of questions which help to summarise and highlight the main points. It is unfortunate however that there is not an answers section to allow for quick checking of answers (although all of the answers can be found in the main body of the text).

All of the chapters provide case examples to demonstrate how the theories they have described are put into practice. These can be a source of motivation for the reader as they provide an insight into the investigation or real crime.

Overall, a worthwhile addition to a library. With such a spread of topics it is likely that few courses will cover all of the topics.

Four Laws that Drive the Universe

Subject area
Physical Sciences

Description
A fairly gentle conversational introduction to the laws of thermodynamics

Authors
Peter Atkins

Publishers/Suppliers
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2007/1st Edition

ISBN
978-0-19-923236-9

Level
A-level, access, foundation

Price
£10.99

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

Some popular books are outstanding – I lent my father a copy of the recent *Darwin – A Graphic Biography* and he read it in one sitting as his tea went cold. However anyone who has watched the evolution of the science section in their favourite bookstore will know that popular science is a ruthless and unruly predator, displacing many of the technical works for which it is supposed to provide a commentary. The other frustration is that these books, even the ones with titles like 'Entropy for Dummies' have glowing cover endorsements from academics who presumably aren't the intended readership: but then again. Is **Four Laws** by Peter Atkins a popular science book? It's certainly light on mathematics but I suspect it will never be sold at airports even if, for Atkins as for C P Snow, the laws of thermodynamics should be as much part of contemporary culture as Shakespeare's plays. No, this is thermodynamics presented in an unthreatening and corrective tutorial for those left cold (and therefore unable to do work) by formal first texts.

The book is divided into chapters covering each of the four laws taken in numerical order with one illuminating interlude to discuss availability – a straightforward though possibly dangerously seductive structure. Let's start with the zeroth law in chapter 1. Is it best to introduce the idea of thermal equilibrium before a discussion of the microscopic interpretation of heat? I'm not sure. Nevertheless, it's fun to find out that Celsius invented a reversed temperature scale (with 100 degrees at the freezing point of water) although given what follows, it could be confusing to round the freezing point to 273 K as is done here. As a collector of fun 'order of magnitudes', I enjoyed reading that 1 joule is roughly the energy expended by one pulse of the human heart. Atkins uses the analogy of tossing balls on vertically stacked shelves to give a picture of the Boltzmann distribution; the shelves are just a proxy for the energy levels but anyone meeting this for the first time might wonder why throwing balls onto the shelves leads repeatedly to (or towards) a particular distribution. We just have to accept it as we did the notion that there was a fixed set of shelves. I am also sure that without an equation many students will fail to see that the labelling in Figure 5 means you can consider one species at different temperatures or different species at the same temperature using the same schematic plots.

So to the first law. Now we are presented with a definition of heat, but again one that may cause some problems for the unwary. We really need to see how large numbers allow us to meaningfully distinguish systematic and random motion because our mental models may be underpopulated. Perhaps we could follow a molecular dynamics simulation to see how the effect of a moving piston is propagated into a dilute gas? There is a welcome mention for the fluctuation-dissipation theorem – it would be nice to see an experienced expositor like Atkins extend this into an accessible introduction to this deep and over-looked theorem. Given we are 'driving the universe' it is a good idea to be ambitious and describe how conservation laws are tied to symmetries of the Lagrangian describing a system's dynamics. However I was worried about the colloquial introduction to Noether's theorem. The statement "energy is conserved because time is uniform" doesn't help a student

Continued on page 18

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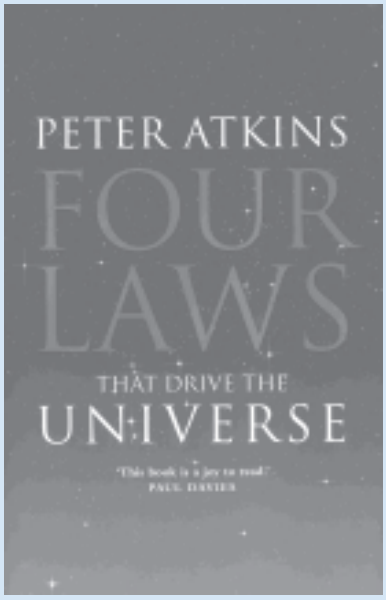
May 2009

Four Laws that Drive the Universe



From the publisher...

Four Laws That Drive the Universe

By Peter Atkins

Peter Atkins' powerful and compelling introduction explains what the laws are and how they work, using accessible language and virtually no mathematics. Guiding the reader from the Zeroth Law to the Third Law, he introduces the fascinating concept of entropy, and how it not only explains why your desk tends to get messier, but also how its unstoppable rise constitutes the engine of the universe.

978-0-19-923236-9 144pp 2007 £10.99

Continued from page 17

who remembers something about frictional forces and who may even think this implies that non-conservative systems have (in Atkin's terminology) "bunched up or stretched out" time.

The second law entails a discussion of the equivalence of various statements of this law: this is particularly clear and well-served by the illustrations. We then meet entropy and disorder. Atkins is right – how cleaner it would be to teach this subject if temperature were defined so that entropy became a pure number. Never mind, but on the same theme, I'm worried when popular accounts include unhelpful phrases such as "interpreting these wavelengths as energies" – why not embrace quantum mechanics early on and be done with it. However as soon as we encounter definite real examples, the book is at its best as in the comparison of the residual entropies of solid carbon monoxide and water ice.

For me, the chapter on availability is the highlight of the book. One page on the energy and entropy budget for the determination of the Helmholtz energy in the combustion of gasoline makes clear what abstract formalism cannot. Similarly the three examples to illuminate Gibbs energy are really well chosen: phase transitions (in water); metabolism; and reaction equilibrium points or put more practically, solubility for goldminers.

The final chapter on the third law looks at the impossibility of attaining absolute zero both (traditionally) from above and, having introduced negative temperatures and inverted states, from below. This was interesting and it reminded me that the negative specific heats of gravitating systems (classical black holes are ideal models) would be an interesting addition to earlier chapters as would a discussion of the thermodynamics of the universe as a whole. This is rather deceivingly suggested by an endorsement on the dust jacket and almost promised by the full title of the book. The book is not really pocket-sized so some (probably not free) expansion in future editions would not affect its portability.

There is no doubting that Peter Atkins' **Four Laws** is elegantly written and structured but I was left bemused at the end as to its function and audience. If it is aimed at undergraduates why not embed the genial thoughtful presentation within a larger book that also allows students to see some experimental results – the figures are largely heuristic - and undertake some problems. Would an undergraduate read it as a primer? I'm not convinced. This is high table popular science, most definitely not 'for Dummies', but a little bit more axle grease here and there would have been welcome.

Fundamentals of Analytical Toxicology

Subject area
Analytical Toxicology. Forensic Science

Description
The aim of the book is to provide the principles and practical information on the analysis of drugs, poisons and other substances of interest in biological samples, focusing on the clinical and forensic specimens

Authors
Robert Flanagan, Andrew Taylor, Ian Watson and Robin Whelpton

Publishers/Suppliers
John Wiley & Sons, Inc
<eu.wiley.com/WileyCDA>

Date/Edition
2008

ISBN
978-0-470-31935-2

Level
Undergraduate, professional

Price
£39.95

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

Fundamentals of Analytical Toxicology by Robert Flanagan, Andrew Taylor, Ian Watson and Robin Whelpton published by John Wiley and Sons, discusses analytical science and its application in toxicological analysis. The aim of the book is to provide the principles and practical information on the analysis of drugs, poisons and other substances of interest in biological samples, focusing on the clinical and forensic specimens.

The table of contents illustrates an impressive 17 chapters covering sampling procedures and preparation through to analysis, with chapters being devoted to specific analytical techniques used in toxicology. Although the authors assume a basic knowledge of analytical chemistry, the chapters are presented in such a way as to make the content easily accessible.

Chapter 1 provides an excellent overview, covering both historical and modern analytical toxicology. Quality control and quality assurance are also highlighted, and are mentioned throughout the book, which reinforces how important these concepts are in analytical science. Chapters 2 and 3 cover sampling and sample preparation, with an extensive range of sample types mentioned. A variety of sample preparation and extraction methods are covered as well as the detailed theory behind these procedures.

Chapter 4 looks at colour tests together with spectrophotometric and luiminescence techniques, leading into the analytical techniques chapters, with chapters 5, 6, 7 and 8 discussing chromatography. These chapters are very comprehensive covering all aspects of theory, separation with TLC, GC and HPLC, and the different types of detectors employed in analysis. Examples of applications of these techniques are also presented at the end of each chapter. Chapter 9 covers the capillary electrophoretic techniques and discusses the uses and limitations of the technique in analytical toxicology. The analysis of chiral compounds is highlighted in several of the chapters, with more detailed coverage on this subject in Chapter 8 (HPLC). Chapter 10 focuses on Mass spectrometry, in particular the use of hyphenated techniques like GC-MS and LC-MS, which are used extensively in toxicology. Atomic spectrometry, electrochemical methods, immunoassays and enzyme based assays are also covered in the following chapters. Point of care testing in chapter 13 provides information on the types of samples, the devices used for analysis and issues associated with this type of testing. Chapter 14 covers basic laboratory operations, looking at quality control and quality assurance, which are crucial to the successful operation of an analytical laboratory. The final chapters (15, 16, 17) deal with absorption, distribution and metabolism, pharmacokinetics and, crucially, the interpretation of the analytical results.

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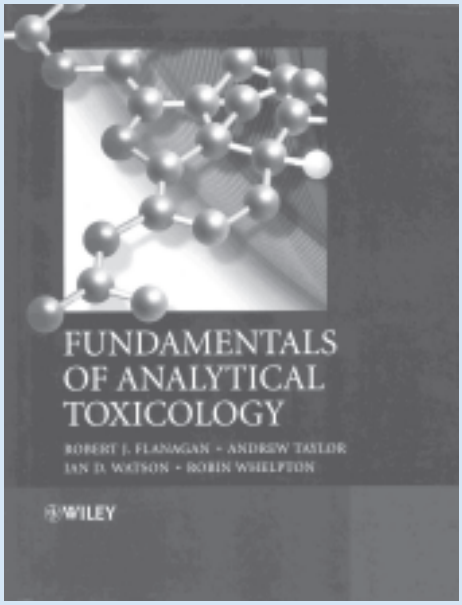
May 2009

Continued on page 20

Fundamentals of Analytical Toxicology



From the publisher...

Fundamentals of Analytical Toxicology

By Robert J. Flanagan, Andrew A. Taylor, Ian D. Watson, Robin Whelpton

After providing some background information the book covers aspects of sample collection, transport, storage and disposal, and sample preparation. Analytical techniques - colour tests and spectrophotometry, chromatography and electrophoresis, mass spectrometry, and immunoassay – are covered in depth, and a chapter is devoted to the analysis of trace elements and toxic metals. General aspects of method implementation/validation and laboratory operation are detailed, as is the role of the toxicology laboratory in validating and monitoring the performance of point of care testing (POCT) devices. The book concludes with reviews of xenobiotic absorption, distribution and metabolism, pharmacokinetics, and general aspects of the interpretation of analytical toxicology results.

978-0-470-31935-2 544pp 2008 £39.95

Continued from page 19

Each chapter contains a number of 'boxes' which highlight or summarise important points/concepts within the chapter. At the end of each chapter is a comprehensive list of references, mostly from the peer reviewed literature, showing that the topics presented are current and upto date. The book also has an accompanying website, which appears to be mandatory these days with many textbooks. At the time of writing, there were only 3 links to supplementary material, presented in the form of appendices. If more supplementary material is added, then this will be a good addition to complement the book.

This book will be an excellent text for those studying analytical science or forensic science courses. It is well presented and easy to read, and contains detailed information throughout. I would recommend this text to both students and professionals in the fields of analytical science and toxicology.

Galaxies: a very short introduction

Subject area
Astronomy

Description
A non-technical introduction to galaxies and their place in modern astrophysics

Authors
John Gribbin

Publishers/Suppliers
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2007/1st Edition

ISBN
978-0-19-923434-9

Level
A-level, access, foundation

Price
£6.99

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May 2009

Summary Review

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

Stacked side-by-side the attractive Oxford *Very Short Introductions* resemble the entries in a contemporary encyclopedia of ideas, culture and thought. As with the best encyclopedias, there are felicitous matches of author to subject – Michael Tanner on *Nietzsche*, Barry Cunliffe on *The Celts*, Stillman Drake on *Galileo*. As the series grows, overlaps occur; no bad thing perhaps, but the editors have new problems. We can imagine a ready and wide readership for a volume on modern cosmology - already written by Peter Coles - but a distinct conspectus of contemporary ideas about galaxies (or indeed stars) for a general audience needs a persuasive pitch. Or does it? Suppose you live so far from city lights that the Milky Way is as familiar a part of your night sky as the Moon. Then there would be striking and obvious questions to answer. Why this single shimmering band of light dividing the sky? What makes it shine, and yet in such a patchy uneven way that even the brightest area, toward the constellation of Sagittarius, has its mysterious carved dark rifts? Was it like this when the Earth was made; has it changed since; will it persist?

Because, we live inside the Milky Way galaxy, we face a similar problem in answering these questions to a nocturnal urban mapmaker who tries to make a street map based on the house lights visible from his attic window. We cannot step outside the Milky Way to see it better and, as John Gribbin relates in his opening chapter, we took some time to realise that other diffuse splashes of light on the sky were actually galaxies like our own - island universes in their own right but islands, it turns out, in a disturbingly empty sea. Innovation and improvisation may have characterised the Jazz Age but astronomers in the nineteen twenties still struggled to accept the true expanded scale of the Universe. We can still enjoy the debate on the shelves of secondhand book stores. In Hutchinson's *Splendour of the Heavens* from 1923, the view is sceptical: "on the whole the balance of evidence (for the island universe theory) is hostile" and the large recession velocities of the nebulae suggest they are made of material "specially susceptible to the radiation pressure of light"! Even with a vast picture-book of galaxy templates, it is still challenging today to find which most resemble our own – we have only established in the last twenty years that our galaxy has a rigidly rotating bar of stars near its centre, looking a little like the pipe of a lawn sprinkler.

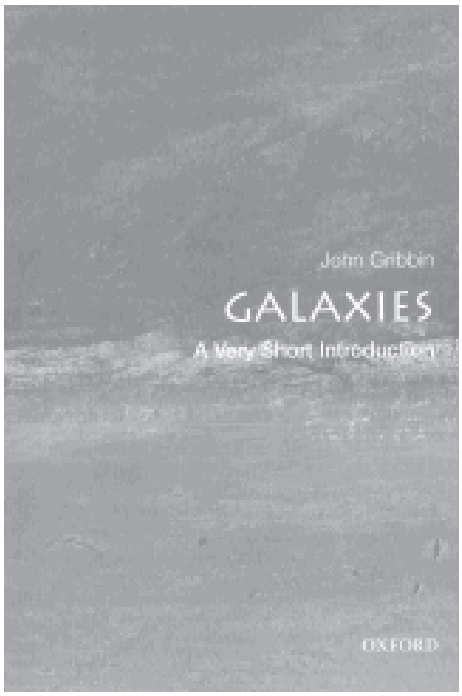
The quest to map our galaxy provides a great scientific narrative and there might be an argument that this story alone is better suited to the aim of this series of books (that stimulation should take precedence over coverage) than the more general and matter-of-fact description of galaxies in this volume. However, whatever the approach taken, there seem to be serious omissions here as a quick glance at the index will show. There is no mention of Jan Oort who studied the velocities of local stars and deduced the Galaxy was rotating. Nor of William W Morgan and his collaborators who discovered the locations of spiral arms by finding the distances to newly-formed bright young stars. The stars had not had time to venture far from their birth sites which delineated the compressed gas of the arms. Owen Gingerich has recalled elsewhere how Morgan's marvellous result was greeted by appreciative and unprecedented tribal stamping when he presented it to the American Astronomical Society in

Continued on page 22

Galaxies: a very short introduction

Continued from page 21

Cleveland in 1951 but there's not so much as a clap here. There is only a single reference to radio astronomy and no sign of the Leiden and Sydney map of the Milky Way which would have enlivened the rather anaemic choice of pictures. It is easy enough to find stunning images of galaxies on the internet and indeed some of those images reproduced here without the benefit of colour, such as the composite picture of M82 or the Ultra Deep Field, are deceptive or pointless. The image of M87 is the only elliptical pictured in the volume, so it is surprising it is not explicitly described as such in the accompanying caption. With figure space at a premium, I suspect practically every reader will be over-familiar with the Hubble Space Telescope: why not honour an instrument that has proved to be one of the finest clinical tools in galactic physics – the Sloan Digital Sky Survey – or one which promises to be – Gaia?



There is understandably little mathematics in the text but disappointing that editorial slips have allowed "the speed with which a planet moves is inversely proportional to the square of its distance from the centre of the Solar System" and "the lifetime of a star depends inversely on its mass". I would have liked the reader to have appreciated how understanding stellar motions in clusters and galaxies creates a fascinating dynamical challenge distinct to explaining the motion of a planet (a few-body problem) or an air molecule in a balloon (short-range forces, mixing of trajectories and the broad use of statistical methods). There is very brief mention of numerical simulation in the context of the collision between the Andromeda galaxy and Milky Way that will create an elliptical galaxy retirement home for an ageing Sun. I think readers would have enjoyed more than this. First, perhaps the story of Holmberg's ingenious analogue computer that used the intensity from a stellar array of small light bulbs to calculate gravitational force. Then how about the Toomre brothers' extraordinarily exciting reproduction of stellar tails and bridges in some very disturbed galaxies and their gnomic and prescient insights into the implications for galactic evolution?

My overall impression was that the author values galaxies for the part they play in cosmology rather than as objects in their own right. It as rather like an atlas of the ancient world where we see different states rise, grow merge and vanish over time but never really learn why the lines between the states existed in the first place. So of the eight chapters, four are cosmological dealing with the recession of the galaxies in the cosmic expansion, the birth and fate of galaxies and current cosmological models and speculation.

I'm afraid I didn't enjoy this book; perhaps I just got tired of hearing the Milky Way written-off as an average galaxy – if all things so mediocre could be so beautiful! To see how much can be achieved in a similar space, find a secondhand copy of the late Dennis Sciama's *The Unity of the Universe*: a thrilling inspiring read, from the ingenious way the Greeks gave us the first local steps on the distance scale to speculations on the origin of inertia – pitch-perfect, original and retaining the wonder that prompted the questions.

Guide to publishing a scientific paper

Subject area
Education

Description
This text provides researchers in every field of the biological, physical and medical sciences with all the information necessary to prepare, submit for publication, and revise a scientific paper

Authors
A M Körner

Publishers/Suppliers
Routledge - Taylor & Francis Group <www.routledge.com>

Date/Edition
2008/2nd edition

ISBN
978-0-415-45266-3

Level
Research

Price
£10.99

Summary Review

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

There are many guides to publishing in the professional literature. This book provides another useful overview of the decisions to be made when preparing to publish research in a scientific journal. The guidance offered reflects the considerable experience of the author, and encourages the reader to consider some of the options at each step in the process. The content is organised in a logical order, to encourage the new author to systematically work through the presentation of the introduction, methodology and findings of the research. Körner even offers advice to follow after the paper has been rejected or accepted with revisions, including some sample responses to reviewer's comments.

The attention given to grammar is well justified. Even experienced authors might benefit from the distinction between the use of 'that' and 'which', the active versus passive voice, and the use of 'this', offered by Körner. Acknowledging the challenges of writing in a 2nd language is important inclusion. New authors need to know that misunderstanding some the nuances of a language may make a paper awkward to read at best, or make some claims incomprehensible, leading to rejection of a paper. However, early career researchers and post graduate students often have difficulties with other aspects of writing. For instance, they often have trouble following instructions by editors about the tense in which sections are to be written. Some journals are quite specific about this. It may also have been worthwhile to explain the use of 1st, 2nd and 3rd person in scientific writing. Some examples included in the book use 1st person, when this is not always accepted as the norm by editors. Bringing to the readers' attention the tendency to use 3rd person in scientific writing would have been useful.

Several sections in this book are dedicated to the use of various punctuation marks, and Körner aptly describes examples of their misuse to warn the reader. However, recommending the semi-colon as the writer's 'friend' may encourage misuse of this form of punctuation, with new writers often using it to break excessively long sentences or when a colon may have been the appropriate mark. Despite the concise nature of this text, Körner finds space to highlight some of the different applications of punctuation marks used in journals, such as in the sub-headings.

Selecting suitable key words to describe a paper is often done as the last step before submitting a paper. Authors may not be aware of some of the conventions about key words that Körner explains, such as accepted abbreviations or punctuation marks separating them. However, a few more points could be made here. For instance, some journals provide a compendium of key words from which to choose and limit the number to be used to index the paper. Other journals are much less prescriptive.

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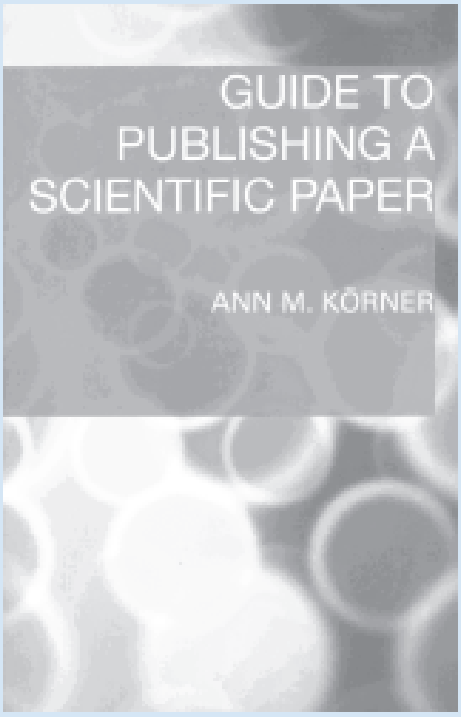
May 2009

Continued on page 24

Guide to publishing a scientific paper



From the publisher...

Guide to Publishing a Scientific Paper

By Ann M Körner

"Guide to Publishing a Scientific Paper" provides researchers in every field of the biological, physical and medical sciences with all the information necessary to prepare, submit for publication, and revise a scientific paper.
The book includes details of every step in the process that is required for the publication of a scientific paper.
The advice provided conforms to the most up-to-date specifications and even the seasoned writer will learn how procedures have changed in recent years, in particular with regard to the electronic submission of manuscripts.

978-0-415-45266-3 120pp 2008 £10.99

Continued from page 23

While the majority of published work refers to primary research, it seems an omission not to have at least considered alternative types of papers such a scientific review or concept papers, which are regularly included in many different journals. For many journals, a cover letter to the editor is not required. There may be some confusion about the term 'letter to the editor' used in this book. This is actually another type of submission which can be made to a journal, usually as a critique of another published paper. It should not be confused with the cover letter to the editor, a topic which Körner deals with over several sections.

Encouraging new authors to print a hard copy to allow ready and frequent reference to 'instructions for authors' is sound advice. It is also very appropriate to advise authors to follow directions of submission carefully. However, submitting an article electronically may not be so 'complicated', given the IT capabilities expected of most contemporary scientific researchers.

Körner places considerable emphasis on consistency and correctness in citing references in the text of the paper and the bibliography/reference list. She indicates the many different ways to acknowledge a reference. However, there is mention of only one conventional referencing system (APA), and only in the discussion about citation of electronic sources. Quite often, 'Instructions to authors' specifies a particular system such as Vancouver or Harvard, and variations of these. Manuals detailing these systems are now available online through libraries in academic and research institutions. New authors should be made aware of these online resources and be encouraged to use them.

Overall, the style of the book is chatty and friendly so it might encourage persistence with this sometimes tedious task by someone who is not yet confident or proficient in writing for the professional literature. The considerable attention to detail is warranted but may be at the expense of a more general discussion about writing styles appropriate for the professional literature. Referring to some older literary classics, as suggested, is unlikely to help here. Sometimes, style differences can be quite subtle but might be a reason for non-acceptance of a manuscript by a journal. The language style may even vary for headings, labelling and appending tables and figures, or acknowledgements. These aspects of style are often only evident when perusing a journal under consideration, as is recommended throughout this book. However, Körner probably realised that including a discussion about writing style might have added considerably to the size of the book, making it less appealing for a researcher just starting out along the publishing path.

Handbook of Asymmetric Heterogeneous Catalysis

Subject area
General Chemistry

Description
This book covers the most important approaches currently employed for the heterogenisation of chiral catalysts, including data tables, applications, reaction types and literature citations

Authors
Kuiling Ding and Yasuhiro Uozumi (editors)

Publishers/Suppliers
Wiley-VCH
<eu.wiley.com/WileyCDA>

Date/Edition
2008

ISBN
978-3-527-31913-8

Level
Research, professional

Price
£120.00

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Whiteknights,
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RG6 6AD
May 2009

Summary Review

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

The **Handbook of Asymmetric Heterogeneous Catalysis** is a substantial text consisting of a number of *review* style chapters, each approximately 50 pages in length. The subjects of the chapters range from Heterogeneous Enantioselective Catalysis using Inorganic, Organic, Polymer and Dendrimer supports, Catalysis in Aqueous and Ionic Liquids and Phase-Transfer Catalysis to Enantioselective Hydrogenation on Metal Surfaces as well as a final chapter by Hans-Ulrich Blaser on Industrial Applications. This book is firmly aimed at the research community in both academia and industry and, in my opinion, is not suitable for undergraduate teaching.

The first chapter is co-written by Zheng Wang along with the two editors, Ding and Uozumi, and serves as an overall introduction. A paragraph is dedicated to each technique or research area that the subsequent contributors (all experts in their respective fields) will discuss in more detail. As such the introduction chapter gives an accurate insight into the composition of the rest of the book.

The majority of the book is dedicated to the immobilisation of asymmetric homogeneous catalysts on different, usually inert, materials. Many researchers in the field consider *true* Asymmetric Heterogeneous Catalysis to be catalysis carried out at or near a reactive metal surface that may be considered intrinsically chiral or has been previously modified with a chiral reagent. Only two chapters, out of the twelve that make up this book, mention this class of reaction. The first, written by Takashi Sugimura, gives an overview of the well-known Cinchona Alkaloid-Modified Platinum and Palladium systems and that of Tartaric Acid-Modified Nickel before discussing some less common systems. The second such chapter, is that already mentioned by Blaser concerning Industrial Applications who, again mentions Cinchona Alkaloid-Modified Platinum and Palladium systems and Tartaric Acid-Modified Nickel and their applicability and problems when used in industry. Blaser also goes on to talk about Immobilised Chiral Metal Complexes and their uses in industry.

While the subject of immobilisation of metal complexes may not be what many would expect to find inside this book given its title, its inclusion is still worthwhile and well written. A broad range of complexes, supports and solvents are covered in the context of many asymmetric reactions. The distribution of referenced papers appears biased against groups from Europe and the United States, with a number of seminal pieces of work from these regions being overlooked in several chapters. This may reflect the imbalance in locations of the majority of contributors to this book who, with the only exceptions of Maurizio Benaglia and Gianluca Pozzi (Italy) and Hans-Ulrich Blaser and Benoit Pugin (Switzerland), are all based in Korea, China and Japan. This is not to say that the references given are incorrect - just that they should not be taken as a complete and definite representation of the available literature.

Overall, this is an informative and well-written reference book aimed firmly at the research sector. It is well laid-out and constructed and, so long as you are not expecting something different after considering the title, would be a great addition to the bookshelf of any researcher interested in Asymmetric Catalysis.

How we learn: learning and non-learning in school and beyond

Subject area
Education

Description
This text deals with the fundamental issues of the processes of learning, critically assessing different types of learning and obstacles to learning

Authors
Knud Illeris

Publishers/Suppliers
Routledge - Taylor & Francis Group <www.routledge.com>

Date/Edition
2007 (English edition)

ISBN
978-0-415-43847-6

Level
Teachers

Price
£19.99

Summary Review

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

Being a good teacher, at any level, draws upon three areas of knowledge. Knowledge of the subject being taught is clearly important, and in a Higher Education context is usually and rightly given a high priority. However, 'knowing the subject' is only ever likely to be a sufficient basis for effective teaching where our students are highly motivated and have both self-confidence and well developed study skills. Even when these conditions are met, it is unwise to see teaching as being simply the presentation of subject knowledge – something students can often get just as well from reading recommended texts.

Subject knowledge can only inform good teaching when it is allied to knowledge of the students being taught, and an appreciation of principles of subject pedagogy. The latter draws upon a range of topics. A good teacher understands, *inter alia*, something of the way learning takes place and so appreciates how to most effectively support learning by designing teaching inputs that both respect the structure of the curriculum knowledge being taught and take account of cognitive factors that determine what is learnt. Some aspects of subject pedagogy are closely tied to subject knowledge: to appreciate why some learners may struggle with particular scientific ideas requires us to relate our understanding of the scientific models to general principles about learning.

On this basis all teachers need to know something about how we learn: the focus of Knud Illeris's recent book. There are already many books available to inform teachers about aspects of the psychology of learning, so Illeris's book is an addition to the existing range. Moreover, Illeris's book is set up with a somewhat different market in mind, being described as a 'textbook' rather than primarily intended to inform teachers. **How we learn** offers a detailed look at a wide range of topics, and the author offers a particular perspective on how the different aspects of the field fit together. This may make it too involved for most higher education teachers looking for a simple guide to key ideas about learning. However, for anyone looking for something more in-depth, this volume should be considered. Illeris is based in the Danish University of Education, and this offers the advantage that he not only includes the ideas of workers commonly discussed in British or North American volumes, but also those of a wider range of scholars.

Illeris begins with a discussion of what learning actually is, which is clearly a sensible place to begin his exploration of the topic. Learning is probably best understood as a change in behavioural potential that results from some experience. Behaviour here includes verbal behaviours (eg offering an explanation): so learning may provide the potential – not present before the learning - to build a circuit, or to give an explanation of hyperconjugation sufficient to persuade an examiner that one has an understanding of the concept sufficiently similar to the target knowledge. In line with such an approach, Illeris refers to learning as a "permanent capacity change" not solely due to maturation effects.

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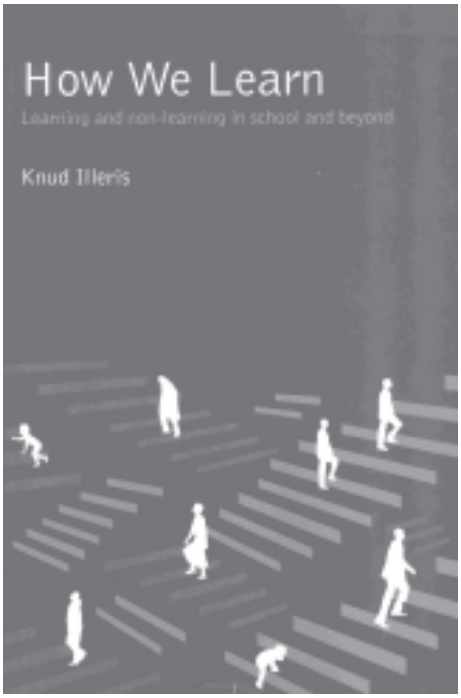
How we learn: learning and non-learning in school and beyond

Learning is much studied, and there are many distinct approaches considering different aspects of the topic. Illeris's account organises these with a framework of 'three dimensions' dealing with the content of learning, incentive to learn, and interaction (of the learner with the learning environment). He argues that in any learning context we need to consider these three 'dimensions'.



Within this framework, Illeris considers the various common approaches to thinking about learning. For example Illeris discusses theories focusing on the individual learner, including discussion of motivational issues as well as how learning is possible. However, Illeris also discusses social models for learning and considers the extent to which these offer a different perspective to, rather than a contradiction of, individual models. Illeris develops his topic to include learning within formal educational contexts, as well as outside; and at different stages through life. Concepts explored along the way include tacit learning, Kolb's learning cycle, memory, 'mislearning' and a great deal more. The book is therefore wide-ranging in its consideration. Despite the integrative intent of the author, the sheer range of ideas covered might make the book a difficult read for someone looking for a basic introduction to the topic. However, there is a liberal use of graphics representing many of the theories discussed that make a valuable counterpoint to the text.

Within science education, learning processes have commonly been considered within a constructivist frame to the extent that this has been considered the dominant theoretical frame in science education research for some decades(Taber[1]). Readers familiar with this area of scholarship will find interesting accounts considering, for example, the work of Piaget and Vygotsky. Whilst those wishing to understand the significance of the work of these theorists for teaching science can find more specific accounts (for example, Bliss[2], Scott[3], respectively), Illeris also discusses – as one example - the relevance of Freud's work, which is not commonly discussed within science education. Freud is just one of a range of other social theorists considered here but not widely mentioned in the science education literature.

The broad scope is very useful for giving an overview of a diverse field. However, this raises something of a problem for the university science teacher looking for a general introduction to learning theory as a background for reading research into teaching and learning in science. Common constructs used to discuss learning in science education – alternative frameworks, knowledge-in-pieces/cognitive resources, conceptual ecology, etc – are not used in the book. This would make it difficult to readily relate the account given here to the research literature most likely to inform teaching innovation in the physical sciences.

Overall then, this is a very interesting book, and one that can offer a great deal to the teacher looking to dig deeper into the learning theories that might inform research or practice into university teaching or learning. However, this volume is not very suitable for someone looking for a first introduction to the topic, or wishing to support professional reading of specific research into science learning. So this is certainly a useful book, but unlikely to be a 'must read' for most science lecturers.

References

1. Taber, K S *Progressing Science Education: Constructing the scientific research programme into the contingent nature of learning science*. Dordrecht: Springer (2009).
2. Bliss, J Piaget and after: the case of learning science. *Studies in Science Education, 25*, 139-172 (1995).
3. Scott, P Teacher talk and meaning making in science classrooms: a review of studies from a Vygotskian perspective. *Studies in Science Education, 32*, 45-80 (1998).

Human remains in archaeology: a handbook

Subject area
Archaeology and Forensic Anthropology

Description
This book provides the very latest guidance on all aspects of the recovery, handling and study of human remains

Authors
Charlotte A Roberts

Publishers/Suppliers
Council for British Archaeology <www.britarch.ac.uk/books>

Date/Edition
2009

ISBN
978-1-902771-75-5

Level
Undergraduate, professional, general reader

Price
£20.00

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

This is an excellent introductory book for students of forensic anthropology, archaeology and bioarchaeology, and for amateurs interested in these topics. It is clearly and concisely written, in a style that conveys enthusiasm for this fascinating subject. It is beautifully illustrated and well referenced, with a helpful glossary of terms at the end of the book. The book is organised well, with an intuitive structure and each chapter or major section is followed by a list of 'Key Learning Points' which form a basis for reflection on or discussion of the issues. Whilst this book is not explicitly designed for the forensic practitioner, there is much of interest here relating to archaeology, methods of excavation and the information present in the human skeleton which can help recreate life history.

The initial chapters lay the groundwork for the study of human remains from archaeological sites; why it is done and the history of research in this field. The second chapter reviews the ethics of working with human remains, drawing on recent developments in the social aspect and legalities of excavating and studying human remains. This chapter contains a very useful overview of recent developments pertaining to the recovery and retention of human remains from burial contexts.

The sections in Chapter 3 outlining the history of funeral practices is of necessity dense, but it does a good job in sensibly describing the variety and diversity of burials which have characterised different periods in the history of the United Kingdom. When discussing the fate of the body after death, a wider geographic view is taken to encompass modes of preservation uncommon in the UK, such as mummification. Treatment varies from the brief mention to a more in depth case study when this is appropriate, and this works very well. It is dense in information, but manages to be a good read too.

Chapter 4 gives a good and helpful brief review of excavation and processing best practice which would form a good starting point for students embarking on the excavation of human remains. It gives guidance and references for many of the analyses which can be performed, and conveys best practice without being particularly proscriptive. The needs, purposes and practices of different sectors of the archaeological community are dealt with. There is much helpful information about cleaning, preserving and curating human remains as well as examples of storage and documentation.

An introduction to the study of the human skeleton is given in Chapter 5, with a description of appropriate lab facilities and equipment. The basic biology and anatomy of the skeleton is provided in a good but not overwhelming level of detail. The reasons for and methods of common analyses, such as sex and age estimation are described. Palaeodemographic studies, and examinations of human variation are introduced as are estimations of stature and the recording of pathologies and non metric traits. These topics are dealt with relatively briefly as is appropriate for a book at this level, but references are provided for further research.

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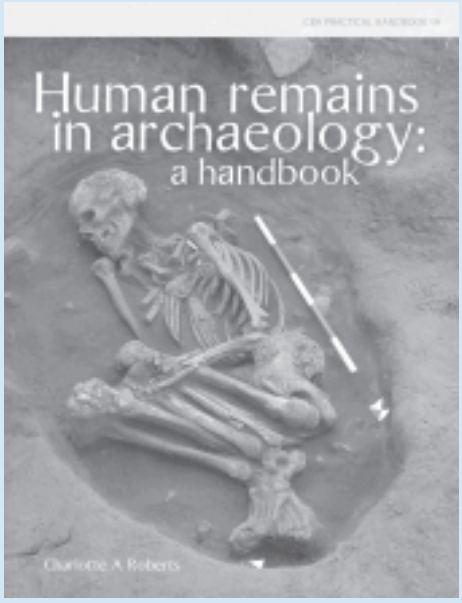
May 2009

Human remains in archaeology: a handbook



From the publisher...

Human Remains in Archaeology
A Handbook
By Charlotte A Roberts

This book, no 19 in the CBA Practical Handbook series, provides the very latest guidance on all aspects of the recovery, handling and study of human remains. It begins by asking why we should study human remains, and the ethical issues surrounding their recovery, analysis and curation, along with consideration of the current legal requirements associated with the excavation of human remains in Britain.

978-1-902771-75-5 200pp 2009 £20.00

The study of palaeopathology outlined in Chapter 6 is a real strength of this book. These analyses give us insight into the lives and deaths of past societies more than just knowing population structure or other demographic variables; this is a topic which my students love more than any other.

Chapter 7 investigates the tools that medical and archaeological science brings to the study of the human skeleton, from histology and radiography to stable isotope analysis and ancient DNA; all of which can enhance our understanding of the lives of people in the past.

A final chapter briefly discusses future directions in the study of human remains, especially in light of the ethical and legal considerations which are raised in the beginning of the book and the increasing numbers of students taking an interest and qualifications in the field.

There is very little to criticise in this book but some might appreciate it if the scales in photos were described in the captions. The enthusiasm of the writing sometimes leads to an overabundance of exclamations points (which students will surely appreciate). But these are very minor points indeed and in no way detract from the usefulness and quality of this book, which is a complete bargain at the price. It is introductory and not definitive, but there is more than enough material to encourage any reader who wishes to explore methods or issues more deeply. Archaeology is explored, as is the palaeobiology of human populations. It provides a synthetic and accessible approach to the process of studying human remains and can be highly recommended to researchers, students and amateurs alike.

Introduction to Elementary Particles

Subject area
Particle Physics

Description
A clearly written textbook balancing intuitive understanding and mathematical rigour, emphasisng elementary particle theory

Authors
David Griffiths

Publishers/Suppliers
Wiley - VCH
<eu.wiley.com/WileyCDA>

Date/Edition
2008/2nd revised edition

ISBN
978-3-527-40601-2

Level
Undergraduate

Price
£60.00

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University of St Andrews
St Andrews
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May 2009

Summary Review

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

Some instructors may be more familiar with David Griffiths' textbook on Electrodynamics, but Griffiths has also written authoritative texts on quantum mechanics and elementary particle physics. This is the second edition of a textbook that first appeared in 1986. Although Griffiths states "it is gratifying and distressing to reflect that [the text] remains, for the most part, reasonably up-to-date", there are several areas where particle physics has made substantial advances, and the new edition reflects this: there are two new chapters, one on neutrino oscillations and one on contemporary theoretical developments including grand unification, supersymmetry and (very briefly) dark energy.

The text assumes basic knowledge of special relativity, electromagnetism, quantum mechanics and the Lagrangian formulation of classical mechanics, but these topics are briefly reviewed. Knowledge in relativistic quantum mechanics and quantum field theory are not required, but developed as needed in the text.

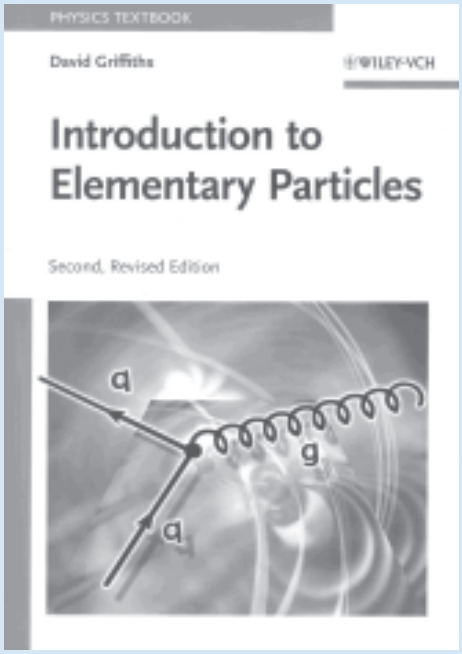
Many textbooks start by describing the Standard Model, listing the various kinds of elementary particles and their properties, presumably leaving the student wondering where all this comes from. Griffiths' introduction is much more appealing, adopting a historical perspective in the first chapter, explaining how each particle first came on the scene and how the theory came to be developed.

Excepting the introduction, chapter 1 (the historical introduction) and occasional brief accounts, the text is primarily concerned with elementary particle theory, with very little on experimental methods or instrumentation. Production and detection of particles are discussed only very briefly in five pages in the introduction. Thus, for students studying the subject in detail for the first time, this text should be complemented with a second text on experimental aspects of the subject.

Chapter 2 gives a qualitative account of fundamental forces, elementary particle interactions and Feynman diagrams. Feynman diagrams and interaction via exchange bosons is carefully introduced, avoiding common confused formulations in this area. It is stressed that Feynman diagrams are not spacetime diagrams. Griffiths labels antiparticles as particles, and lets the arrow denote that it is an antiparticle: this is consistent with a particle line running 'backward in time' as the corresponding antiparticle is going forward. The convention in most textbooks to use the antiparticle labels can be confusing, as a literal reading would then suggest that it is an antiparticle going backwards in time, which would be a particle. Many authors state that virtual processes violate energy. Griffiths finds this misleading, and instead stresses that energy is always conserved, but that virtual particles can have any mass.

Chapter 3 gives an introduction to relativistic kinematics, including four vectors and relativistic collisions. In successive chapters, the Feynman calculus is introduced in steps, starting from the Golden Rule for decays and scattering and neglecting spin, and then adding spin only after a discussion of the Dirac equation. The Feynman rules are simply stated and not derived. After developing quantum electrodynamics, the following chapters cover quantum chromodynamics and the theory of weak

Introduction to Elementary Particles



From the publisher...

Introduction to Elementary Particles

By David Griffiths

In Introduction to Elementary Particles, Second, Revised Edition, author David Griffiths strikes a balance between quantitative rigor and intuitive understanding, using a lively, informal style. The first chapter provides a detailed historical introduction to the subject, while subsequent chapters offer a quantitative presentation of the Standard Model. A simplified introduction to the Feynman rules, based on a "toy" model, helps readers learn the calculational techniques without the complications of spin. It is followed by accessible treatments of quantum electrodynamics, the strong and weak interactions, and gauge theories. New chapters address neutrino oscillations and prospects for physics beyond the Standard Model. The book contains a number of worked examples and many end-of-chapter problems.

978-3-527-40601-2 470pp 2008 £60.00

interactions. There is also a chapter on Gauge Theories, including a clear account of the Higgs mechanism.

Chapter 11 is a relatively brief, self-contained account of neutrino oscillations, starting from a historical perspective and including recent experimental results. All chapters, including the two new chapters in this edition, contain an updated list of further reading, and an impressive number of useful end-of-chapter problems. According to the preface, an instructor's solution manual is available free of charge from the publisher, but despite several attempts via email and phone with the publisher, it was not possible for me to get information on it or get hold of it.

Most chapters contain a number of worked examples, but students would presumably wish for more of them. The book uses Gaussian units throughout, and does not follow the common convention of setting hbar and c equal to 1. This is helpful, as students can then check for dimensional consistency throughout.

A real drawback of the book is its price. At £60, this book is almost twice the price of some other books on the subject. Hopefully, an ebook version of the text will become available in future, which could make it more accessible to students as the main reading in a course.

The publisher description claims "the author strikes a balance between quantitative rigor and intuitive understanding, using a lively, informal style" and in my view this is indeed the case. The account is very clear throughout with a careful introduction of difficult concepts, and detailed enough that students should be able to use it in self-study. Though the material in later chapters is too advanced for an introductory course on particle physics, I would highly recommend chapters 1 to 5 and parts of 6, 7, 11 and 12 for such a course. The full text can be used in follow-on courses that discuss the Feynman formalism in detail. Due to the clear text and the large number of excellent problems, the book can also be highly recommended for instructors.

Introduction to the Physics and Chemistry of Materials

Subject area
Materials Science

Description
This book provides the foundation needed for more advanced work in materials science

Authors
Robert J Naumann

Publishers/Suppliers
CRC Press
<www.crcpress.com>

Date/Edition
2008

ISBN
978-1-4200-6133-8

Level
Research, teachers

Price
£44.99

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

Robert J Naumann has a background in physics and mathematics which has led him from senior scientist work with NASA to his role as a professor of materials science. He has been a director of The Tricampus Materials Science PhD programme at the University of Alabama. This role inspired him to write this text book, which aims to prepare students whose primary degree might be from any of a diverse range of science or engineering programmes for postgraduate study in materials science.

Potential readers should be under no illusion that this is a text at introductory level as it would be daunting reading for early stage undergraduates. Although Professor Naumann states that it could be used for an advanced one semester undergraduate course, its primary intent and organisation is as a two semester introductory postgraduate course. The first semester broadly emphasises chemical bonding, crystal structure, mechanical properties, phase transformations, and a brief introduction to materials processing – with the objective of filling in any 'gaps' depending on the student's undergraduate studies. The second semester deals with the thermal, electronic, photonic, optical and magnetic properties of materials.

The book begins with a short historical perspective on the development of the materials science field and a summary guide to the classification of different materials. Chapter one ends with the inspirational statement: "the future of materials science is open, limited only by the imagination of the materials scientist and the 92 stable elements nature has given us to work with". In the context of a two semester course, the materials scientist's imagination will only be as vivid as his grasp of fundamental concepts in physics, chemistry and mathematics and their context for the properties and behaviour of materials.

To address the needs of students with little or no background in modern physics and quantum mechanics, the book introduces quantum concepts and wave mechanics through a simple derivation of the Schrödinger equation, the electron-in-a-box problem, and the wave functions of the hydrogen atom. The early chapters also set the tone in terms of the need for mathematical proofs for many of the concepts, with detailed derivations included, and the need for comprehension of fundamentals of atomic structure and bonding.

The topics which are dealt with in the chapters following the general introductory section include:

- Crystals and crystallography
- Structure of matter
- Reciprocal lattice and X-ray diffraction
- Theory of elasticity
- Defects in crystals
- Mechanical properties of materials
- Composites
- Phase equilibria and single component systems, and then in multi component systems
- Alloy solidification
- Transformation kinetics

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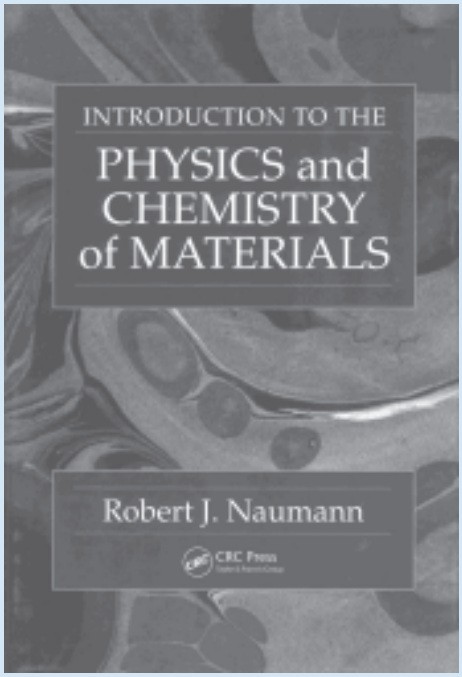
May 2009

Introduction to the Physics and Chemistry of Materials



From the publisher...

Introduction to the Physics and Chemistry of Materials

By Robert J. Naumann

Building on undergraduate students' backgrounds in mathematics, science, and engineering, Introduction to the Physics and Chemistry of Materials provides the foundation needed for more advanced work in materials science. Ideal for a two-semester course, the text focuses on chemical bonding, crystal structure, mechanical properties, phase transformations, and materials processing for the first semester. The material for the second semester covers thermal, electronic, photonic, optical, and magnetic properties of materials.

978-1-4200-6133-8 533pp 2008 £44.99

- Distribution functions: including the Bose–Einstein, Maxwell–Boltzmann, Planck, and Fermi–Dirac distribution functions.
- Lattice vibrations and phonons
- Thermal properties of solids
- Free electrons in metals
- Band theory of metals
- Semiconductors
- Theory and applications of junctions
- Transistors, quantum wells and superlattices
- Dielectrics and the dielectric function
- Optical properties of materials
- Magnetism and magnetic materials
- Superconductivity

Each chapter is divided into several sub units, and where relevant includes a brief historical account, and then ends with a summary, a short bibliography and a set of problems. This adds to the textbook's usefulness for instructors as well as students as the problems give a focus for the information being studied in the chapters. However, in the context of an introductory text many of the ideas in the chapters are merely introduced and not dealt with to any great depth. If we take chapter 25, Magnetism and Magnetic Materials, which is just 19 pages long and yet has ten subunits, so many of the concepts get no more than a paragraph to introduce them. The presentation is in black and white with minimalist diagrams where necessary to illustrate certain concepts.

I would recommend this text book for its intended audience, for instructors and as a reference book for library shelves. It assumes a level of knowledge which would not be cognisant with typical early stage undergraduate experience and so for them the term 'introduction' in the title might be misleading.

Investigating Science Communication in the Information Age:

Subject area
Science Communication and Public Engagement

Description
Part of materials for the Open University course SH804 *Communicating Science* - where it is taken by masters students on MSc in Science, MSc in Science and Society and Postgraduate Diploma in Science and Society programmes. There is a companion volume *Practising Science Communication in the Information Age: Theorising Professional Practices*

Authors
Richard Holliman, Elizabeth Whitelegg, Eileen Scanlon, Sam Smidt and Jeff Thomas

Publishers/Suppliers
Oxford University Press, The Open University
<ukcatalogue.oup.com>

Date/Edition
2009

ISBN
978-0-19-955266-5

Level
Research, teachers of science communication

Price
£19.99

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NG11 8NS
May 2009

I approached this book with a great deal of interest as director of a centre which engages in science outreach work. I came away from it challenged and better informed by a range of articles from experts in the field of science communication.

Summary Review

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

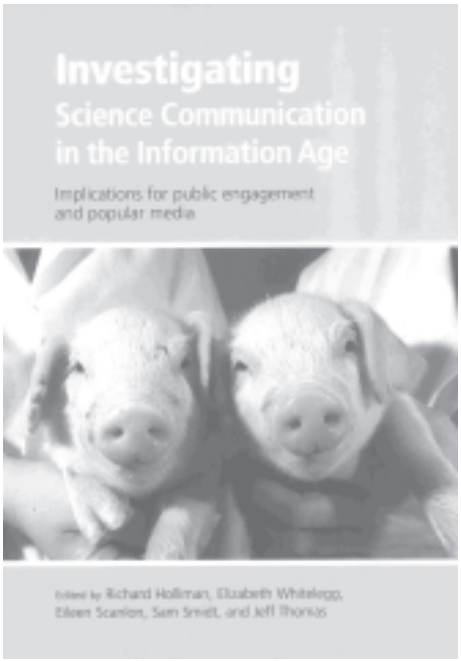
The authors are from a range of disciplinary backgrounds – science, sociology, media and communication studies, education – which is appropriate given the complex nature of the book's research area. Science communication and public engagement (SCOPE) is not a place for quick fixes – as the authors are keen to point out. Adopting two broad themes: public engagement and the popular media the book delivers 15 chapters in six sections - Engaging with public engagement; Researching public engagement; Studying Science in popular media; Mediating science news; Communicating science in popular media and Examining audiences for popular science. The book combines a blend of research results, reviews and introduction to methods and models, and is accessible to the non-specialist reader. Each chapter stands-alone – as a result there is some repetition of key themes but this is not an issue overall. For someone new to this area, I strongly recommend reading chapters 2.1 (introduction for scientists to social science research methodology) and 3.2 (models of how we communicate) first. There are excellent sets of references for each chapter with suggestions for further reading and useful web sites, which provided me with a number of avenues of further exploration. A resource to look at is the ISOTOPE (Informing Science Outreach and Public Engagement) project and its web portal.

One recurrent theme of the book is the change over the last ten years from a 'deficit' model (passive one-way communication eg the 'BSE fiasco') where science is 'transmitted' to the public (ie *Public Understanding of Science* - PUS) to a more 'dialogic two approach' that is better termed *Public Engagement with Science* (eg the experimental *GM Nation?* and *Nanodialogues).*

The early sections look at the impact of science communication on policy and politics. Will emotional public responses drive out reason and bring serious limitations to our socio-technical futures or do we look 'to bring out the *citizen* within the scientist'? One interesting example in this area is the work of the UK Alzheimer's Society and their *Quality Research in Dementia (QRD)* - an active forum where researchers learn from patients and carers gaining new insights on ways to improve their research. Thinking further ahead: Should dialogue based models of science communication, involve formal or informal dialogue (eg Café Scientifique or panel debates)? Is the next step to move from large scale-organisation level dialogue to the small scale? - where the focus is on producing outcomes and impact on the lives and experiences of those individuals/ small groups who participate, using imagination and creativity by harnessing social learning and mutual, multi-way dialogue?

...implications for public engagement and popular media

In chapter 2.3 a study of children's responses to interactive science exhibits throws up some unexpected support for using constructivist/inquiry based approaches in science activities for young people. Compared to 30 years ago, today's children have less concrete experience of materials. As a result, they are less successful at logico-mathematical tasks that require them to deal with concepts such as volume, weight and phenomena which rely on everyday experience. A lack of experience, for example, in how water flows, can then affect how you relate to more complex phenomena you can't directly observe, such as electricity. Today's young people have more experience of the virtual than the tactile –they can lack the life experience to construct scientific knowledge through models and representations. Surely this is a clarion call to allow children opportunities to 'mess about with science'?



This book also considers results from research into (science) communication and the media considering three pillars of their construction and impact: process; content; and audiences. However it does appear there are no simple models for linking media coverage and public opinion. Later chapters (4.1 and 4.2) deliver a critical assessment asking '*What is science journalism"*? New technologies are providing easy access for the public to a vast array of information and ideas are increasing scope for contributing to and influencing public debate. These technologies in turn create new research questions - can they 'democratise' science communication? Is science journalism ready to become a critical press engaging in story-telling rather than simply downloading facts - to throw light on now science really works with its uncertainties limitations and achievements? Will it grow to maturity or decline into passivity?

As a scientist, I found section 5's popular media analysis less engaging with its examination of the impact digital TV (in UK) has had on the changing role of science in public sector broadcasting given the interactive developments digital TV offers, taking as its example TV production from BBC's natural history unit. One area I felt this section could have been explored more fully was the role of fictional dramas and films (from *CSI* to *STAR TREK*) in popularising science and their impact on public understanding (or misunderstanding) of science. Forensic Science practitioners and those delivering HE Forensic Science programmes in this area find this a challenging area of debate.

I particularly liked Chapter 6.3 with its theme of gender representation of scientists technologists engineers & mathematicians (STEM Practitioners) on UK Children's TV and children's own images of scientists. This is a very interesting piece of research carried out *with* children rather than simply *about* children and young people. The *(In)visible Witnesses* Project found children can be active viewers and interpreters of media representations and not just passive recipients. They had sophisticated approaches when imagining themselves to be STEM practitioners - they saw some negatives but also gave positive characteristics such as independence in the work place, status and financial rewards and high job satisfaction related to solving problems of the environment, and disease.

In conclusion, if you are interested in communicating science to any a range of audiences, read this book and let it challenge your current approach.

Mathematics for Physical Chemistry: opening doors

Subject area
Mathematics, Physical Chemistry

Description
Provides the essential background in mathematics for chemistry students studying physical and theoretical chemistry

Authors
Donald A McQuarrie

Publishers/Suppliers
University Science Books <www.uscibooks.com>. Available in UK from Palgrave-Macmillan <www.palgrave.com>

Date/Edition
2008

ISBN
978-1-891389-56-6

Level
Undergraduate, research

Price
£32.99

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

When visiting schools to talk about chemistry degree courses, I sometimes end up talking about maths instead. The less mathematically-confident students like to be reassured that the maths in chemistry is not as challenging as that in physics or engineering. However, every competent chemist must get to grips with at least some maths, and the need for a level of mathematical competence is a worry for some students, especially those whose interests lie in the more descriptive parts of the subject. It is no surprise therefore that books aimed specifically at degree-level chemistry students find a ready market. Paul Monk's text[1] is a fairly recent arrival on the scene, and has now been joined by another new text, **Mathematics for Physical Chemistry, Opening Doors**, by Donald A McQuarrie.

A few science writers stand out for their ability to explain complex ideas in simple, clear language. Peter Atkins' name is recognised in chemistry departments worldwide because of the clarity of his writing (and also the large number of books in which it features!). McQuarrie's texts fall into the same category. Ten years have passed since the publication of his excellent book on Statistical Thermodynamics[2] and it is six years since the appearance of his substantial volume on mathematical methods[3]. The latter is a compendium packed with mathematical goodies, running to more than 1100 pages. While it is thick with useful information, it is aimed at the scientist who already has some understanding of the underlying maths, so is primarily a reference book. **Mathematics for Physical Chemistry**, however, is definitely a book from which students can learn.

The curious sub-title to the book ('Opening Doors') is explained in the preface in which James Caballero is quoted:

"I advise my students to listen carefully the moment they decide to take no more mathematics courses. They might be able to hear the sound of closing doors."

To keep those doors ajar, the 23 chapters cover topics of direct relevance to undergraduate chemists: functions of a single variable, integration and differentiation; series and limits; functions defined by integrals; complex numbers; ordinary differential equations; power series solutions of differential equations; orthogonal polynomials; Fourier Series; Fourier Transforms; operators; functions of several variables; vectors; plane polar coordinates and spherical coordinates; the classical wave equation; the Schrödinger equation; determinants; matrices; matrix eigenvalue problems; vector spaces; probability; statistics: regression and correlation; and numerical methods. Each chapter is brief, so could be tackled by students as a single piece of work.

With such a comprehensive menu, it is no surprise that the 345+ pages do not provide enough space for every topic to be dealt with in detail, but the explanations throughout are clear and precise and the selection of material for each chapter is well thought out.

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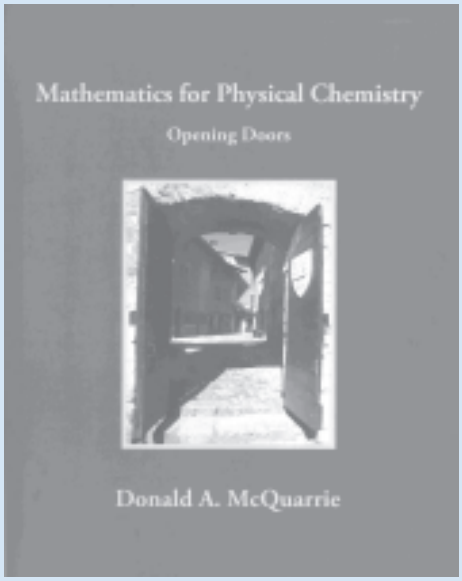
April 2009

Mathematics for Physical Chemistry: opening doors



From the publisher...

Mathematics for Physical Chemistry Opening Doors

By Donald A. McQuarrie

This text... is meant to keep doors open to undergraduate and even graduate chemistry students who need a quick review of the mathematical methods that are used throughout chemistry. It is the outgrowth of a collection of "MathChapters" from McQuarrie's famous texts, Physical Chemistry: A Molecular Approach and Quantum Chemistry Second Edition. These "MathChapters," now available to all, provide students with concise reviews of mathematical topics, discussing only the minimal amount that students need to know. By reading these reviews before the mathematics is applied to physical chemical problems, a student will be able to spend less time worrying about the math and more time learning the physical chemistry.

978-1-891389-56-6 368pp 2008 £32.99

The text draws heavily on the author's book on Mathematical Methods; some of the figures are identical, apart from the use of colour in the more advanced text. The chapters contain worked examples and each chapter ends with a set of problems, the answer to most of which (but not the methods of obtaining those answers) can be found at the end of the book.

This is an excellent text: it is directed to a precisely defined audience, is written with great clarity and illustrated with numerous, but simple figures. I have already recommended it to my students, alongside McQuarrie's text on Thermodynamics, and would encourage all those who teach chemistry at University or College level to browse through a copy in their nearest bookstore; prepare to be impressed.

References

1. Paul Monk, *Maths for Chemistry. A chemist's toolkit of calculations*, Oxford University Press, (2006).
2. Donald A McQuarrie and John D Simon, *Molecular Thermodynamics*, University Science Books, (1999).
3. Donald A McQuarrie, *Mathematical Methods for Scientists and Engineers*, University Science Books, (2003).

Molecular Modelling for Beginners

Subject area
Physical Sciences

Description
A useful and comprehensive introduction to the field of molecular modelling for those who wish to understand the theory behind many of the methods in use today

Authors
Alan Hinchliffe

Publishers/Suppliers
John Wiley & Sons, Inc
<eu.wiley.com/WileyCDA>

Date/Edition
2008/2nd Edition

ISBN
978-0-470-51314-9

Level
Undergraduate, research

Price
£34.95

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University of Reading
PO Box 224
Whiteknights,
Reading
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April 2009

Summary Review

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

Any book which includes 'for beginners' in the title is always going to have to tread a fine line between accessibility and theoretical rigour. Nevertheless, this book succeeds for the most part. In this case, a 'beginner' is probably going to be a final year undergraduate student or postgraduate in the physical sciences with a reasonably strong background in mathematics and physics. Indeed, Appendix A, a mathematical 'Aide Memoire', contains a concise summary of the mathematical tools required in order to benefit fully from this book. This includes: Scalars and Vectors, Vector Algebra, Vector Fields, Vector Calculus, Determinants, Matrices, Angular Momentum, Linear Operators and Angular Momentum Operators. With this background, a reader should have no problems in following the text. However, the learning curve for a typical chemistry student, for example, will be steep. The style of the writing, in the first person, helps to engage and draw the reader in, although it might surprise or irritate some.

The main material is covered thoroughly, with an approximate 40:60 split between classical and quantum modelling. A small number of references to key papers in the literature are included at the end of each chapter as a starting point for further reading. A nice touch was the frequent quotation of abstracts from papers in order to illustrate the various advances in theory and application. Hopefully this will encourage the reader to go back to the primary literature. A number of exercise sets (with answers) are available for some of the chapters on the accompanying web-site (openly available), providing a useful resource for both lecturers and students.

The classical modelling section could have been easily extended. After reaching the end of Chapter 10 (a brief, 15-page chapter on Molecular Dynamics simulations, and the end of the classical part of the book), an introduction to some of the more advanced simulation methodologies in widespread use by the modelling community, such as free energy simulations and umbrella sampling, would have been welcome. Perhaps this might be included in a third edition?

The second part of the book (on quantum modelling) gives a comprehensive introduction to the subject for serious students of the field. If the chapters are read in order, the material is logically and clearly presented. It is not a book, however, for someone who wants to be able to turn straight to Chapter 20 to find out what Density-Functional Theory is.

A minor criticism concerns some of the figures. Given that modern molecular modelling depends so heavily on computer graphics, it seems strange that many of the line drawings appear pixellated. On a more positive note, all of the figures are also available on the web-site and will provide a useful resource for preparation of lectures and computer-based practical sessions.

Overall, this new edition of **Molecular Modelling for Beginners** remains true to the principles of the first edition, namely a thorough introduction to the how and why of molecular modelling, while clearly explaining the underlying theory and avoiding the phrase 'it can be shown that...'. As a result, it will be a useful book for all those who are serious about using, and more importantly, understanding, many of the forms of molecular modelling in use today.

Molecular Symmetry

Subject area
General Chemistry

Description
This book introduces the subject by combining symmetry with spectroscopy in a clear and accessible manner

Authors
David Willock

Publishers/Suppliers
John Wiley & Sons, Inc
<eu.wiley.com/WileyCDA>

Date/Edition
2009

ISBN
978-0-470-85348-1

Level
Undergraduate

Price
£34.95

Summary Review

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

This is a very useful book which approaches the important topic of Molecular Symmetry from a structural perspective before going on to describe the rigorous theoretical underpinning of symmetry, which is less widely taught in contemporary science degree courses. Everyday objects are used as examples and the text is complemented throughout by photographs and diagrams which give the non-theoretician a strong visual basis for conceptual understanding. Having spent 2 chapters in this way, drawing the reader into the problem of symmetry, the third chapter discusses the possibilities for operations within the common point groups, together with the reasons why some operations are impossible. As well as providing good diagrams and photographs within the text, a set of appendices are provided which include plans for paper models. These are powerful tools for assisting students in visualising the operations suggested and there is a link to a Web site where more can be found.

From here, the author moves into group theory, a topic which again does not always figure in undergraduate chemistry syllabi. This is helpfully linked with classical stereochemical considerations, which are fundamental to any understanding of chemistry. There is a focus on vibrational spectroscopy with a strong emphasis on infra red and Raman. Plenty of good examples are provided for each technique using a wide range of molecules. NMR is also discussed in rather less detail in the earlier chapters but nevertheless in a very useful way.

Molecular shape and spectroscopic data are brought together very well with the physical origins of observed spectral bands explained, making this book excellent background reading for molecular spectroscopists. The final chapter considers symmetry in chemical bonding and hence molecular orbital theory but relates this to important concepts involving bond strength and the origins of electronegativity and how this links to bond polarity.

A major strength of this book is its accessibility to the practically and conceptually minded chemist; the reader is led into the subject through strong visual presentation of the ideas and although the mathematics is by no means ignored, it is presented within an applied context. Another strength is the inventive use of appendices; there are twelve no less, but short and very well linked into the main body of the book including not only some excellent plans for paper models but also useful background in stereochemistry and mathematics. This is a book which will help students to think more deeply about the consequences of molecular shape and symmetry and the profound influence these have on the physical and chemical properties of molecules. Hence, it is not only useful background for undergraduate chemists and physicists but will also be of great interest to post-graduates in the molecular sciences.

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May 2009

Molecules and Models

Subject area
General, Inorganic, Physical and Structural Chemistry

Description
This book provides a systematic description of the molecular structures and bonding in simple compounds of the main group elements with particular emphasis on bond distances, bond energies and coordination geometries

Authors
Arne Haaland

Publishers/Suppliers
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2008/1st edition

ISBN
978-0-19-923535-3

Level
Undergraduate, research

Price
£42.00

Summary Review

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

The three dimensional structure of a molecule is core information for which, because we cannot in any direct sense see a molecule, we rely on a variety of physical and mathematical techniques to model and rationalise. This book is a wonderfully comprehensive and systematic survey of the structures and models of over 300 main group molecules both familiar and unfamiliar, from one electron systems to quite complex dative Π-bonded complexes such as the pentameric $[H_3SiN(CH_3)_2]_5$ by a world expert on the subject. Arne's success is in bringing together in one slim volume a vast amount of covalent bond related data including, distances, angles, geometries and energies and in discussing the data with reference to the various models of covalent bonding and structure including Lewis electron pair, VSEPR, molecular orbital calculations, polarisable ion methods etc. The effort of searching and finding the information on these compounds is thus minimised and you are also provided with insightful comment on the data. Where else would you find such data as collected in the final table of the book of bond angles and valence electron counts in triatomic molecules as diverse as CO_2, FCN and Cl_2O which I am sure could form the basis of a tutorial discussion or examination question?

The earlier chapters range through the variety of physical and mathematical models we have for molecules and bonding within them but are not for the mathematically squeamish and this would tend to mitigate its usefulness as a typical undergraduate text. The publisher's blurb quotes from a review "a light and didactic reading ..." and whilst I'd go with the didactic as instructional and entertaining is it far from 'light' though it is enlightening. Target purchasers would include library reference collections, advanced undergraduates, graduate researchers and lecturers. Very positive features are the numerous problems throughout which could form the basis of challenging tutorial discussions in inorganic and physical chemistry.

To give an example of the analysis of the data and methods you only have to read the discussion of the dioxygen difluoride in which, in a little over page, no 'stone' of the bonding and structure is left unturned. The structure, with the shape and symmetry of hydrogen peroxide, but with unusually short O-O and long O-F bonds, is elucidated in terms of an 'anomeric effect' arising from interaction between the oxygen p_z lone pair and the O-F σ^*-orbital and is then seen as a specific example in the context of more general AOEX molecules.

There are many examples of facts that I was not personally aware of, eg, that dioxygen is the *only* main group element compound (sic) with two unpaired electrons that is stable in the gas phase under normal conditions though one would not refer to dioxygen as a compound.

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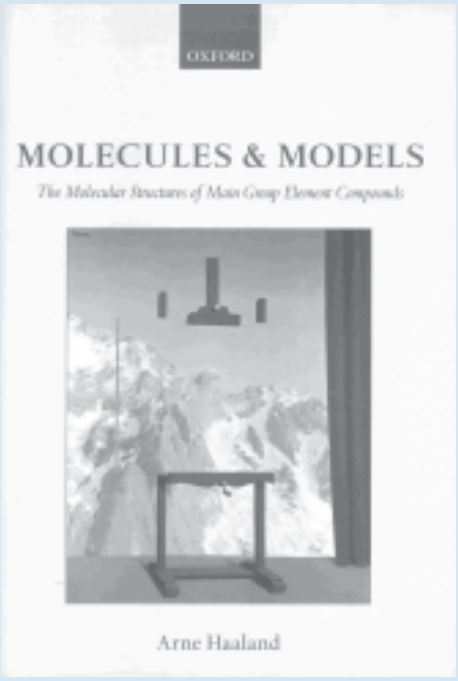
March 2009

Molecules and Models



From the publisher...

Molecules and Models

By Arne Haaland

This book provides a systematic description of the molecular structures and bonding in simple compounds of the main group elements with particular emphasis on bond distances, bond energies and coordination geometries. The description includes the structures of hydrogen, halogen and methyl derivatives of the elements in each group, some of these molecules are ionic, some polar covalent. The survey of molecules whose structures conform to well-established trends is followed by representative examples of molecules that do not conform. We also describe electron donor-acceptor and hydrogen bonded complexes.

978-0-19-923535-3 366pp 2008 £42.00

The text also reflects on 'non bonding' long distance interactions between atoms, eg, van der Waals forces, and discusses interactions between neon atoms, the helium dimer and many other molecular liquids, gently reminding us that condensation is not some sort of 'gravity' effect. Whilst on the subject of liquids there is a concise reflection on that very familiar liquid water and interesting reminder of 'polywater' a subsequently discredited form of water found and then lost in the 1960s: it is these little didactic sidelights that involve the reader.

Arne warns that 'authoritative' published data is often spurious, citing an example of standard enthalpy of formation of P_4O_6 and wisely advises the reader to take nothing on trust.

Although the problems are a positive feature of the text it might have enhanced the book to have the solutions or at least some clues to the solutions. I notice the book is available in online format which I have not seen but such a book as this would benefit from 3-D visualisations that paper based black and white text and image cannot provide but which computer based graphics can. To be able to manipulate, rotate, an accurate molecular model on screen is the nearest we can come to seeing and handling a molecule and such possibilities could enhance this text at some future date.

Personal gripes, well trimethylaluminum (sic) grates with this reviewer, in the interest of consistency why not then sodum, lithum and calcum? The significance of the cover image 'L'appel des cimes' or 'Call of the peaks' by the Belgian surrealist artist René Magritte defeats my imagination. Mindful that £40 is not an insignificant sum to pay for a book I was disappointed to report that several pages came wholly loose from the binding during the period of reading.

Whilst there are plenty of books looking at either the theoretical modelling of molecules or the chemistry of main group molecules this book is unique in its coverage so a warm welcome to this book which, if not quite a *vade mecum* (too big for the pocket!), should be found in every chemistry reference collection and on the shelves on any practising main group chemist with an interest in structure and bonding.

In his preface Arne writes "this is a book I wanted to write, and I should be delighted to learn that somebody has wanted to read it!" so I trust Arne will be delighted.

Organic Chemistry

Subject area
Organic Chemistry

Description
Organic Textbook designed for undergraduate students

Authors
T W Graham Solomons and Craig B Fryhle

Publishers/Suppliers
John Wiley & Sons, Inc
<eu.wiley.com/WileyCDA>

Date/Edition
2007/9th edition

ISBN
978-0-471-68496-1

Level
Undergraduate

Price
£44.99

Ryan Mewis
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April 2009

Summary Review

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

The ninth edition of **Organic Chemistry** by Solomons and Fryhle is a well written and presented textbook with an aim of being used as a supporting text for undergraduate chemistry courses. The book has twenty-five chapters in all, ranging from 'The Basics: Bonding and Molecular Structure' to 'Nucleic Acids and Protein Synthesis'. Also included are eight special topic sections which highlight particularly interesting chemistry which stems from one of the main chapters. These sections are designed to supplement the material already discussed whilst demonstrating how the conceptual ideas can be applied in further organic chemistry arenas. The text is also modernistic in its approach to the subject of organic chemistry; the subject of green chemistry is raised to emphasise current obstacles and challenges. This aspect is clearly discussed in the section on the structure of benzene and other aromatic compounds.

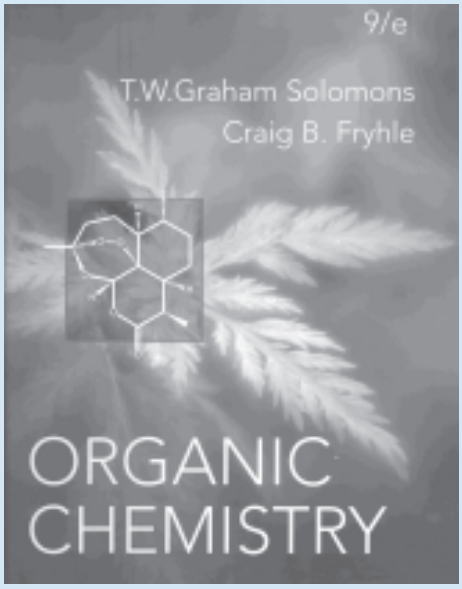
The text boasts several new features since the eighth edition, one of which is a new layout structure. The new structure incorporates a wider margin, which is intended to be used by students to add information alongside the text or to highlight areas of particular importance. The text itself uses this space to draw attention to fundamental concepts which must be understood prior to tackling new chemistry. The relevant section containing the background theory is highlighted thus enabling the section to be referred to with ease.

The chapter is structured in a way to actively engage the reader. Each chapter begins by focusing on a particular area of chemistry which is both relevant to the rest of the chapter and also highlights the chemistry about to be discussed. This is used, presumably, to draw the student into the forthcoming chapter. Interest throughout the chapter is maintained by the use of 'The Chemistry of...' boxes which give further background material, on for example, relevant industrial or biological processes to give the reader an appreciation of the wider context. Reference to Nobel Prize winners is also used to demonstrate the importance of organic chemistry.

Each chapter uses many colour pictures, including reaction mechanisms, which helps to break up the text whilst still supporting the theory and concepts being presented. One way in which this is achieved is by using Gaussian software. Electrostatic potential maps, molecular orbitals, and electron density surfaces prepared using the Gaussian software are vivid in their appearance whilst providing illustrative representations with which to visualise polarity and electron distribution. From a students' perspective this is highly advantageous as it provides a real insight into organic mechanisms - thus enabling better understanding to be gained. These Gaussian computer molecular models are viewable on-line using a cross-platform Jmol plug-in, which is both software and hardware compatible. Use of these models is integrated into end-of-chapter problems.

Stemming from this, reaction mechanisms throughout the text are all colour coordinated; this makes reaction schemes easier to follow. The consistent use of colour enables the reader to successfully navigate their way through a reaction mechanism by, for example, highlighting leaving groups early on in the mechanism. A further resource on the chemical nature of two key reaction types, nucleophilic substitution and elimination,

Organic Chemistry



From the publisher...

Organic Chemistry

By T. W. Graham Solomons, Craig B. Fryhle

The Ninth Edition of Organic Chemistry continues Solomons-Fryhle's tradition of excellence in teaching and preparing students for success in the organic classroom and beyond.
Students are often overwhelmed by the early rigors of organic chemistry. Solomons-Fryhle prepares students for these early rigors by introducing acids & bases--topics they know from general chemistry--early, followed by chapters on structure and stereochemistry. Next, a discussion of ionic reactions gives students a foundation for the vast majority of reactions that they will encounter. The Ninth Edition continues to introduce IR spectroscopy in chapter 2 (after functional groups) and Carbon-13 NMR spectroscopy in chapter 4, providing synergy with most lab courses and, again, reinforcing learning.

978-0-471-68496-1 1280pp 2007 £44.99

is included at the front of the book. This enables reference to both reaction types, thus providing the reader with a quick, easily accessible reference point.

Every chapter is concluded with an 'In This Chapter' section which highlights the chemistry discussed and what the required learning outcomes are, along with highlighting key terms and concepts. The inclusion of a schematic map within this section enables the student to follow the progression of concepts learned throughout the chapter. This concluding section is succeeded by an array of exercises and both individual and group problems. This enables the student to actively engage in student led learning, although only answers to selected problems are provided at the end of the book.

The text is designed to be used around the online support platform, WileyPlus. This has additional resources for not only the student but also the instructor. WileyPlus has a dedicated area associated with the text <www.wiley.com/college/solomons> which contains a robust assignment bank with structure-drawing/assessment functionality, integrated concept portals and guided online problems. For the instructor there are the tools to create online tasks and the ability to monitor student progression and performance. There are also Powerpoint slides which can be used to enhance lectures and can be tailored as desired. For the student there are further online study aids. In particular, the concept portals offer the student help in understanding critical concepts like resonance, stereochemistry and energy diagrams through animated mini-lectures, skill-building exercises, and office hour-style problem solving help. The videos can be downloaded and viewed through either personal computers or personal video players such as iPods.

One of the only criticisms with the text is the lack of a reading list at the end of each chapter. This would encourage the student to read further in to the chemistry and concepts that have been raised and discussed, leading to a greater scope of understanding, and more importantly, interest within the subject. To postgraduate students who may use the text as a point of reference, this would prove equally beneficial.

In summary, this new edition is a very suitable text book which can be used alongside lecture courses as part of an organic undergraduate course. It would also prove useful to any lecturer who runs an organic lecture course or to those who give tutorials on organic chemistry. Its suitability beyond the undergraduate level is most likely restricted to that of a reference text, and as such would still prove to be very useful to postgraduate students. However, postgraduate students seeking an advanced organic textbook should look elsewhere.

Organic Synthesis: the disconnection approach

Subject area
Organic Chemistry

Description
An organic chemistry textbook designed to teach the planning of organic synthetic reactions in a structured way

Authors
Paul Wyatt and Stuart Warren

Publishers/Suppliers
John Wiley & Sons, Inc
<eu.wiley.com/WileyCDA>

Date/Edition
2008/2nd edition

ISBN
978-0-470-71236-8

Level
Undergraduate, research, professional

Price
£24.95

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School of Applied Sciences
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May 2009

Summary Review

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

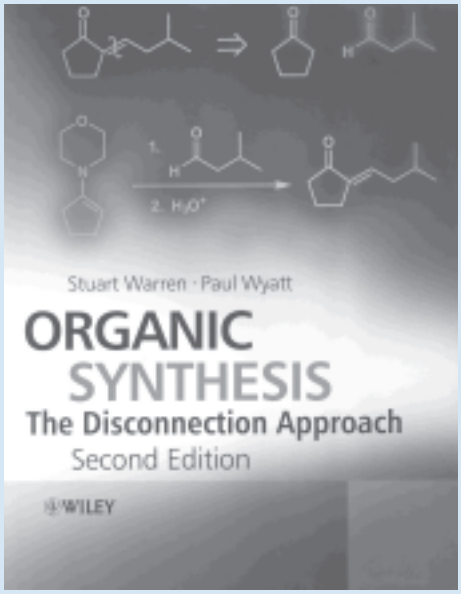
In the late 1970s and early 1980s Stuart Warren published a number of books on organic synthesis. Three of these covered the synthon method – a structured way developing organic synthetic pathways for complex organic molecules from readily available precursors. The process is more correctly called retrosynthetic analysis, where the desired product – the target molecule – is progressively disconnected into simpler intermediates and ultimately simple starting materials. This approach was initially proposed early in the last century, but not formalised until the work of E J Corey in the 1960s.

This new book is an updated edition of **Organic Synthesis: The Disconnection Approach**, first published in 1982. The book follows the structure of the previous edition – indeed the chapter headings are the same. Some of the chapters are essentially unchanged from the previous edition, while others have been extensively rewritten. There are forty chapters, with strategy chapters generally alternating with chapters introducing new material and concepts, developing the reader's understanding in a structured way. These chapters cover the synthesis of molecules from the extremely simple to the extremely complex, and includes aliphatic compounds, compounds with one or more functional groups, simple rings, heterocycles, aromatics and aromatic heterocycles. The strategy chapters cover key issues such as the order of the synthesis, protecting groups, stereoselectivity and regioselectivity, pericyclic reactions, free radical reactions and the use of reagents such as acetylenes, nitro compounds and ketenes. A number of tables in the text give useful lists of reagents or reactions where it is not possible to discuss each one individually. Particularly useful are the ones on stereospecific reactions and protecting groups. For almost every example both the disconnections and the forward reactions are given. Comments on the relative ease of the synthesis are generally given as well, with explanations of whether a reaction will proceed readily or if it will need activation.

Every chapter begins with a reference to the relevant chapters of *Organic Chemistry*, by Clayden, Greeves, Warren and Wothers (OUP, Oxford, 2000), necessary because the book assumes the reader is familiar with key synthetic organic reactions.

This book is suitable for advanced undergraduate students, researchers and professional chemists. Both the writing and the diagrams are simple and clear. As well, the book benefits by using a broad range of real-life examples - primarily natural products and industrial products such as agrochemicals, dyestuffs, pharmaceuticals and important synthetic intermediates - rather than just simple molecules designed to illustrate a point. However some of the industrial products were used as examples in the original edition, and have long since disappeared from the market. Because all the examples are real-life ones, there is comprehensive list of references to texts, journal articles and patent applications at the end of each chapter.

Organic Synthesis: the disconnection approach



From the publisher...

Organic Synthesis: The Disconnection Approach

By Stuart Warren, Paul Wyatt

Organic Synthesis: The Disconnection Approach is the long-awaited second edition of a classic textbook; the first to provide a structured course in retrosynthesis- now an important technique used by generations of organic chemists. Now fully revised and updated with a modern look, 25 years of advances in organic synthesis are reflected with the addition of new examples and synthetic pathways. Additional material has been added to take the student to the level required by the bestselling sequel, "Organic Synthesis: Strategy and Control" and the later chapters have extensive new material based on courses that the authors give to chemists in the pharmaceutical industry.

978-0-470-71236-8 344pp 2008 £24.95

In 2008 Paul Wyatt and Stuart Warren published the new text *Organic Synthesis: Strategy and Control,* (Wiley, Chichester, 2008) which has been recently been reviewed in this journal (Leaver, J., *Reviews*, (2008) Vol 9 (1) 43 – 44). This new edition of **Organic Synthesis: The Disconnection Approach** would be a suitable introduction to the new book.

In all this is a welcome update to an important book for anyone keen on learning organic synthesis in a structured fashion. An updated edition of the Workbook, which accompanied the previous edition of this book, has also been promised.

Partial Differential Equations: an introduction

Subject area
Mathematics

Description
An undergraduate textbook on partial differential equations: theory and physical applications

Authors
Walter A Strauss

Publishers/Suppliers
John Wiley & Sons, Inc
<eu.wiley.com/WileyCDA>

Date/Edition
2nd edition

ISBN
978-0-470-05456-7

Level
Undergraduate

Price
£122.00

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

A lot can be learned about how good a book is likely to be by reading its preface. In this case, the bar is set very high: the author intends "to provide for the student a broad perspective on the subject, to illustrate the rich variety of phenomena encompassed by it, and to impart a working knowledge of the most important techniques of analysis of the solutions of the equations". I would say that, by and large, the author lives up to his aim.

Impressively for a textbook on partial differential equations, the book is rarely turgid; furthermore, for those in a real hurry, the contents page marks with asterisks the essential parts. The author takes great care to make sure that the reader can follow both the detail and the logical structure of the material. The exemplary paragraphing, the identification of important steps in the argument by explicit labelling, and the various grades of section and subsection (each with its own font) all make the book delightfully easy to follow.

The most significant aid to comprehension overall, though, is the liberal and well thought out use of figures. At so many points in the book - the discussion of Green's functions (p194), shock waves (p385), bifurcation theory (p.405), and many more - a picture paints a thousand words (and several formulas). Very few of these figures are strictly necessary to the discussion, but their pedagogical value is immense. It has also been a pleasure to note the author's ability to avoid making heavy weather of the series solutions that inevitably turn up in the subject. For example, the solution of Schrödinger's equation for the l=0 states of the electron in the hydrogen atom (p254) is carried out in under three pages, from the statement of the equation to the derivation of the eigenvalues. The series solution is there, but it does not take centre stage, and as a result the reader is shown this interesting application of Frobenius' method with rare clarity.

There are just a few instances where the author uses notation that, to this reviewer, seems non-standard. For example, an arrow pointing downward and to the right appears to mean "approaches from above"; however, as far as I can see its first use is on p55, and it is defined neither there nor in the (otherwise excellent) Appendix.

Let me finally make special commendation of chapter 8, which deals with common methods for numerically approximating the solutions of partial differential equations, and discusses their pitfalls pithily and accurately. It seems to me that, despite the growth of the use of computers over the past twenty years, the kind of critical analysis of algorithms that this chapter exemplifies has become rarer, which is a shame. The author's discussion of this important topic, like so much of the rest of the book, is well planned, lucid, and terse. So let us end where we began: with the preface. In the author's words, "The presentation is based on the following principles. Motivate with physics but then do mathematics. Focus on the three classical equations: All the important ideas can be understood in terms of them. Do one spatial dimension before going on to two and three ... Do problems without boundaries before bringing in boundary conditions ..." Founded as it is on such excellent good sense, it is hard to see how the book could have turned out anything other than top-flight - and top-flight it certainly is.

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May 2009

Polymer Structure Characterization: from nano to macro organisation

Subject area
Materials Science, Biophysics, Physics, Chemistry, Engineering

Description
Overview, specialist and general text for stand-alone multidisciplinary topic (involves physics, chemistry, engineering)

Authors
Richard A Pethrick

Publishers/Suppliers
RSC Publishing
<www.rsc.org/Publishing/index.asp>

Date/Edition
2007

ISBN
978-0-84504-466-5

Level
Undergraduate, research

Price
£44.99

Summary Review

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

Although the book is weighty and gives the impression of substantial and intimidating specialised content (size is nice at about 24 x 16 x 3 cm) the presentation is smooth and comfortable. It manages to deal with detailed coverage across the topics that comprise the subject area of 'polymer science' in a manner that is done 'breezily' within twelve chapters and 345+ pages. Most students will find the volume comfortable to 'pocket' and to use as a more succinct universal guide during their study. The book is not particularly heavy reading for students (with appropriate background) with both a well-stated direction and the pleasant insertion of specialised methodologies for interrogation (eg secondary ion mass spectrometry; SIMS) and contemporary issues, such as biomaterials (chapter 12). The book places itself in the enveloping position of combining pieces of physics, chemistry and engineering neatly in the 'goody bag' that is polymer science[1] and from a nanotechnology perspective. The ease of usage for the lecturer or advanced researcher is clear. From a student point of view, it is nice to see a textbook that is written from a nano- and micro-structure perspective (and from a real colloid and polymer specialist) in an area customarily frequented by regular material scientists and physicists[2-4] and their matter-of-fact presentational style. The author does a superb job at contextualising the field and the reading is made ever more pleasant and unambiguous by the clever use of crystal-clear diagrams, cartoons and schematics.

The technological impact and thus, social value of 'nano-engineering' which, is embedded rather tidily and 'covertly' into the book means both the student and advanced-research readers will enjoy the text and see its value. The sections dealing with methods for investigating materials and their relevance of wider aspects of nanotechnology are swathed in an invaluable background on 'molecular organisation' versus state-of-the-art technical advances and the scope for innovation and production of novel materials[5-8]. There is a small diversion to Monte Carlo simulations (p 78; p151) that feature regularly in equivalently used (less universally valuable, perhaps) books in this area[2-4, 9]. However, in addition to dazzling images (p20; p48; p112; p119; p174; p222; p245; p246) the book quite rightly and in unbiased fashion deals with concerns of thermodynamic modelling, organo-metallic synthetic products and self-assemblies in this 'nanotech' and 'non-classical' new science (chapter 5 and chapter 11). The text doubles as supporting physics, engineering and (physical) chemistry courses at undergraduate (BA, BSc) and masters degree (MRes, MChem, MPhys, MSc, MA, etc) level (and above, MPhil, PhD, etc) and in this case it is an excellent investment for the price of £45.

A number of 'polymer' books exist on the market[1,3,4,9] and the content is in some sense similar, however, this 'core text' is particularly suitable by virtue of dealing with materials and theories covered in 'a scrappy form' elsewhere. One criticism of these books although excellent is that they never seem to contain everything desired by the student (and tutor). As with many books their lack of universal uptake by students on the targeted courses (and similar) could be put down to the fact that taught or desired elements are not presented under a single cover. If a student buys a book it must therefore be of substantial universal use on their course. In stark

Continued on page 48

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April 2009

Polymer Structure Characterization: from nano to macro organisation

Continued from page 47

contrast, this (valuable addition) book by Pethrick is a satisfyingly good read because of its diversity of topics, unambiguous explanatory text, simple diagrams (p180; p231; p254; p301), appealing images (eg p279) and that theoretical explanation and derivations are not excessive. The dozen sections are drawn together logically and themes covered seem of real value at the beginning of the 21st Century and the 'dawn' of widespread pragmatic application of nanomaterials science[5, 7, 10]. Themes covered include, organic synthesis, modelling, strategies for making new materials, physics and thermodynamic considerations, analytical chemistry and features of natural materials. The prerequisite knowledge and scientific armoury needed by the reader is one of a 'solid' lower-year university based training in chemistry and physics (or the equivalent). The text does make use of considerable (eg chapter 6), but entirely indispensable illustrative maths and yet discusses technologies that are not fundamental or petty. Consequently, this high-level of mathematical description and allusion to crucial physics 'as-a-given-knowledge' of the reader mean more of the 'time' in the text is devoted to more elegant technical descriptions[8] and a lack of marginal elements. Thus, the book is probably of greater value to later-stage degree (level-3) and M-level education.

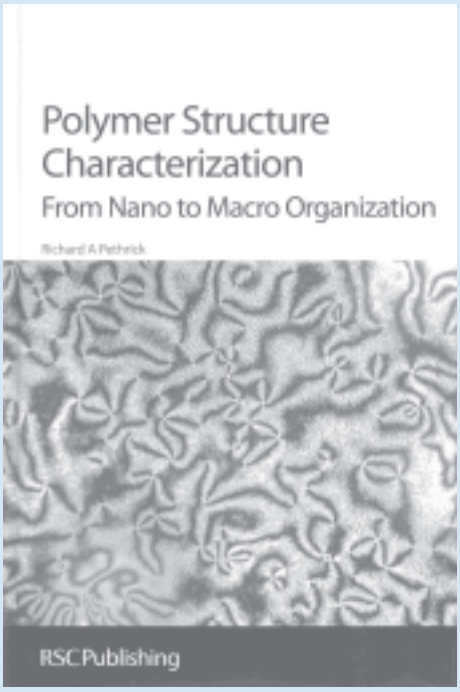
The book flits between subjects ranging from crystal growth (nucleation, etc) to colloids and molecular organisation and on to glasses and amorphous systems. The book is very interesting and with appropriate elements of hypothesising as it also raises notions of the 'nano-continuum' (throughout the text) and materials sourced from 'artificial' or synthetic[7] routes and that might be obtained from natural means and modified for use[6]. As with many books smartly devised against a paradigm constructed by an editor (Pethrick) or author and their interests, the book pays attention to themes considered important by contemporary authors[1-3] (experts in the field) and by 'polymer science' students alike and this works really well. Exemplary topic coverage is provided by helpful descriptions of a 'bucket load' of theories that will help students with problematic concepts such as, Derjaguin-Landau-Verwey-Overbeek stability, Avrami's description of crystallisation and morphology prediction.

The range of topics covered by Richard Pethrick mean its use for polymer science courses is the norm and expected uptake of the text and also perhaps for teaching purposes on materials science courses (or similar) at graduate level. The book covers areas of structure *versus* mechanical properties, crystal formation and growth, liquid crystals and colloids, plastics, methods for 'unravelling' structure and form (chapter 5 and throughout the book), polymerisation, polymer blending, phase separation, molecular and polymer surfaces, adsorption-coverage, molecular organisation and supramolecular-assembled materials. The methodological sections are covered extensively but might also be found sited at other locations throughout the text where intimately associated with the topic under discussion eg electron microscopy and optical methods (chapter 5), differential thermal analysis (p181) and atomic force microscopy (p244; chapter 10). A very insightful thematic coverage is the one dealing with scanning and transmission electron microscopy (ubiquitous within the book) and the related atomic force techniques presented at key points throughout the text. There is also extensive discussion of specialised types of spectroscopy and spectra obtained (chapter 9) and this is even more important as these techniques have changed to being used more routinely.

The crystal growth (chapter 6) section is written tidily and presents clear details of a range of theories and notions in light of continual new discoveries[7]. Themes such as supra-molecular structure (chapter 11) and association structures (micelles to nanogels) are written neatly with both clarity and elegance. The section on structure and crystallinity is dosed with liberal amounts of mechanistic description and thermodynamics (for example, p156-158; p161-169) just in tune with the detail needed by the 'masters' level reader. Functionalisation of interfaces and liquids another valued topic is dealt with swiftly, contemporaneously and cogently (eg polymer adsorption, chapters 10 and 11) in a way which is helpful to the student.

A textbook covering polymers would be incomplete without a section on plastics (p99) and the obvious 'platform technology' inclusion of treatment on composites (p308), which now features in areas as diverse as drug delivery[6, 10] and sensor use[5, 7, 9]. The book also navigates through the awkward conceptual areas of entanglement (p148), elasticity in liquid crystal systems (p75), the existence of glass-like phases (p179) and Kauzmann's Paradox (p198). The book does not cover copolymer capsules and conjugated molecules (p207; p217) and use of valuable techniques such as small angle neutron scattering (p147) in much detail but is suited ideally as a teaching aid in its description. These areas are significant branches of nanomaterials science that are now increasingly being actively-researched and targeted for adaptation each year[5, 6]. The section on polymer blends (chapter 8) is invaluable and essential to the fuller understanding of the importance of polymer-based materials that sit in nanotechnology, drug development, chemosensor technology (eg molecularly imprinted polymers[5]), building materials, lubricants, microelectronics, household products and many other technologies.

Polymer Structure Characterization: from nano to macro organisation



From the publisher...

Polymer Structure Characterization From Nano To Macro Organization

By Richard A Pethrick

Polymer Structure Characterization: From Nano to Macro Organization discusses in a systematic fashion the way in which molecular interactions influence observed morphologies. Topics include: organic crystals, liquid crystals, plastic crystals, polymer morphology, polymer crystallization, amorphous glassy materials, polymer surfaces, polymer phase separation and structure, and a brief introduction to organisation in naturally occurring materials.

978-0-85404-466-5 352pp 2007 £44.99

There are no apparent errors on perusal of the book. Although the accuracy and the content is excellent there may be considered to be a shortfall in terms of providing worked examples for students, now often seen as very useful for newcomers at degree level 1 and 2. However, at higher level it is not always appropriate or useful (and consumes valuable 'space') to include such practice tests. The reviewer feels some brief further discourse on an evaluation of the value of polymer science might have been useful to the student to enhance or contextualise the 'technologies' discussed further. This is particularly the case since polymer use has such a profound societal (and economic) impact, pervading virtually every type of scientific and technological medium. The most likely use for this text is for those graduates embarking on 'polymer science' or 'material science' study and research projects[5-7, 9]. This textbook and guide is recommended for primarily M-level study or above and for final year degree specialisation or optional modules as a referential guide.

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Practical Forensic Microscopy: a laboratory manual

Subject area
Forensic Science

Description
A comprehensive laboratory manual providing the student with a practical overview and understanding of the various microscopes and microscopic techniques used within the field of forensic science

Authors
Barbara P Wheeler and Lori J Wilson

Publishers/Suppliers
Wiley-Blackwell
<eu.wiley.com/WileyCDA>

Date/Edition
2008

ISBN
978-0-470-03176-6

Level
Undergraduate

Price
£37.50

Summary Review

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

This book is described by the authors as "a comprehensive lab manual that adapts microscopic procedures used in the forensic laboratory to practical experiments that can be taught in college laboratories." The book includes 40 experiments which cover a variety of microscopes beginning with stereomicroscopes and building up to Scanning Electron Microscopy and Fourier Transform Infrared Microspectrometry which, while present in many university forensic labs, are not routinely used by students.

Each of the first 5 chapters begins with an overview of the type of microscope to be used and the first experiment in each chapter is designed to familiarise the operator with the workings of that type of microscope. These chapters cover stereo-, compound, polarised light, fluorescence and contrast microscopes. Labelled photographs are used to illustrate the working parts of the microscope and these will be especially useful to students who have not used microscopes before. The glossary of terms at the end of the book will also prove useful to many students.

With the increasing intake of students onto forensic science courses with little prior science knowledge it is becoming increasingly common to encounter students who have never used a microscope before. These introductory experiments will be very useful for these students and will allow them to quickly grasp the basics of microscope usage.

The individual experiments include; a list of required equipment, information about safety, the experimental procedure and space to write results. The authors have made these worksheets available for download from a website address given in the preface to the book and they can therefore be given to students without the need to devise worksheets yourself. Each chapter also includes questions about the experiment undertaken which could be used as part of a student assessment or used by the student to self-assess their knowledge.

Throughout the book photographs are included to illustrate aspects of the text and where these would be better reproduced in colour they are included a second time on the colour plates in the centre of the book. I think it would have been more effective to have had the colour pictures where they needed to be in the text; furthermore the colour plate pictures are not numbered. I think numbering these photos and linking them to the text would have improved this book but can understand that it is not always cost effective to produce a book that way.

Chapters 6 to 21 are divided according to the forensic application they are addressing. These experiments cover a wide range of evidence types including hairs and fibres, light bulb filaments, tool marks, paint, botanical evidence etc. These experiments cover many of the topics which are currently taught in universities and illustrate that the authors have tried to ensure this book is widely applicable to UK university courses.

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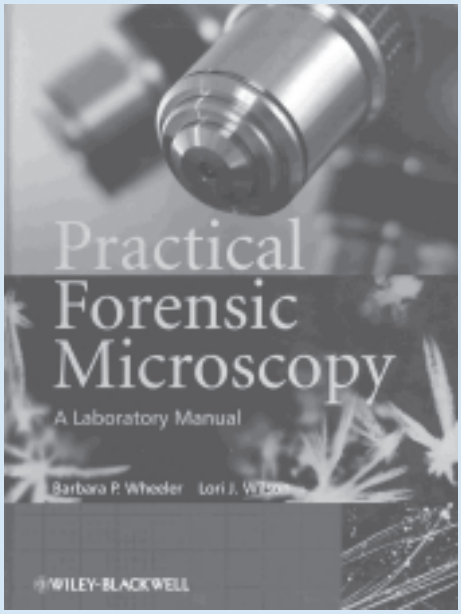
May 2009

Practical Forensic Microscopy: a laboratory manual



From the publisher...

Practical Forensic Microscopy: A Laboratory Manual

By Barbara Wheeler, Lori J. Wilson

Forensic Microscopy: A Laboratory Manual will provide the student with a practical overview and understanding of the various microscopes and microscopic techniques employed within the field of forensic science. Each laboratory experiment has been carefully designed to cover the variety of evidence disciplines within the forensic science field with carefully set out objectives, explanations of each topic and worksheets to help students compile and analyse their results.

978-0-470-03176-6 384pp 2008 £37.50

These chapters include, along with the information above, an introduction to the application being considered. These introductions are only a couple of pages or so but set the scene appropriately for the experiments. This information will act as an overview to topics which are likely to be covered in much more detail in lectures and identify the key points relating to the use of microscopes in the circumstances of the application.

Overall I think this is a well structured book and illustrates the use of different types of microscopes with clearly explained experiments that introduce students to many types of forensic evidence. The later chapters may not be so appropriate if the instrumentation is not readily available to students but they account for four of the forty experiments in the book leaving plenty of scope for student experiments using readily available equipment.

Principles of Environmental Chemistry

Subject area
Environmental Chemistry

Description
This book provides an in depth introduction to the chemical processes influencing the atmosphere, freshwaters, salt waters and soils

Authors
R M Harrison (editor)

Publishers/Suppliers
RSC Publishing
<www.rsc.org/Publishing/index.asp>

Date/Edition
2007

ISBN
978-0-85404-371-2

Level
Undergraduate

Price
£39.95

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

I reviewed the companion volume in this series (*An Introduction to Pollution Science*: RSC Publishing ISBN-10: 0-85404-829-4) in a previous edition of this Journal (Dec 2007). However, to restate the context for this volume it needs to be explained that it derives from the book *Understanding our Environment : A Introduction to Environmental Chemistry and Pollution* first published a decade ago. Since that time many major issues have changed that relate to both our understanding of the environment and also the way in which it is taught so the older book has been divided into two new ones and the individual sections expanded and enhanced. In both cases the multi author format has been retained with the benefits of subject specialists addressing what they know best about, but also the editorial problems of drawing it all together into a coherent and consistent format. In general I think the editor has been significantly more successful with this volume than the previous one and it works much better both within, and between, chapters.

The coverage of this volume can effectively be divided into four reservoir focused chapters (atmosphere, freshwater, seawater, solid Earth) and two process-focused ones (environmental organic chemistry and biogeochemical cycling). This is a perfectly reasonable approach and quite a helpful one to teachers of the subject. The level of the approach makes the book appropriate to possibly first year and certainly second year university students if they have some prior knowledge of basic chemistry. More advanced readers may also find useful material in sections where they have less specialised knowledge, though I'm not entirely convinced that it is sufficiently advanced to meet the declared aspiration of Masters level work.

The division of the former work into two has worked fairly well though there is not a particularly clean divide between 'natural' and 'pollutant' based issues between the books and many of the examples in the current volume relate to pollution (eg atmospheric ozone depletion, acid mine wastes, tributyltin and various persistent organic pollutants (POPs)) and are all used as examples or case studies in this book. With some reservations I do not think that this is a major problem because not all readers will have access to both volumes. However it does rather emphasise that separating 'natural' from 'pollutant' is much more of a publishing strategy than an environmental reality. The shortcomings of this approach are perhaps most apparent in the environmental organic chemistry and biogeochemical cycling chapters where there is a rather strong emphasis on pollutants as process exemplars which has led to the omission of a variety of natural chemicals/processes which might have been more appropriate in this context. Apart from this I find it hard to raise any particular criticisms of the individual chapters. They are all very competently written and are reasonably up to date with a few references dating from 2005 though most are from the past 10-20 years. Although most of what is covered is well established I would perhaps have felt more reassured by having a higher proportion of recent (post 2000) citations.

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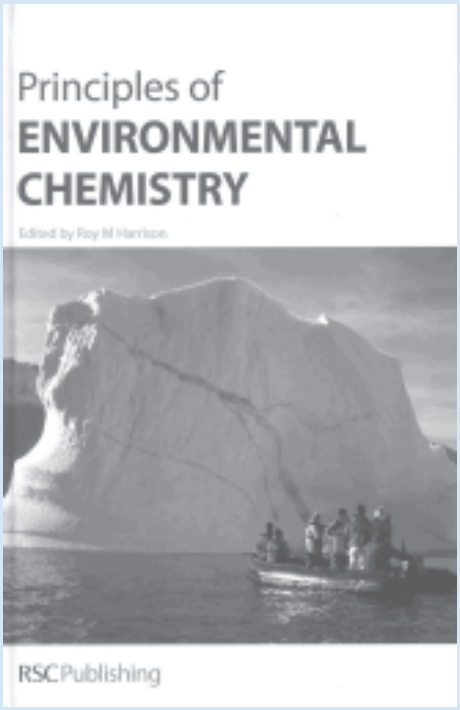
April 2009

Principles of Environmental Chemistry



From the publisher...

Principles of Environmental Chemistry

By R M Harrison (Editor)

Written by leading experts in the field, the book provides an in depth introduction to the chemical processes influencing the atmosphere, freshwaters, salt waters and soils. Subsequent sections discuss the behaviour of organic chemicals in the environment and environmental transfer between compartments such as air, soil and water. Also included is a section on biogeochemical cycling, which is crucial in the understanding of the behaviour of chemicals in the environment.

978-0-85404-371-2 374pp 2007 £39.95

Each chapter has a short series of questions at the end, but no answers. I am not entirely sure what these are supposed to achieve. I suppose that the qualitative ones might act as revision aids but a significant proportion are quantitative and the lack of answers significantly inhibits their usefulness because students have no way of checking whether they have adopted the correct approach, let alone obtained the correct answers. I would have thought that an answers section (or perhaps an on-line resource) would have been a useful enhancement here. Many publishers now use this strategy and it would have been beneficial in this case as well.

To get one previous gripe out of the way, in the companion volume I remember being irritated by what I saw as rather poor production standards. I am happy to report that few such problems occur with the current book which meets nearly all of the desired qualities of reproduction that could reasonably be expected. I didn't detect any significant problems over the accuracy of the science either.

So overall I see this as a solid, informative and generally useful piece of work. Whether it has enough to make it stand out from many other publications in this area, particularly at this price, I am rather less sure, but it will certainly be a useful addition to library shelves and may also find a home on a recommended book list for a university course if students can afford it.

Quanta, Matter and Change: a molecular approach to physical chemistry

Subject area
Physical Chemistry

Description
This text unravels a traditional course in physical chemistry and recasts it from this new molecular perspective

Authors
Peter Atkins, Julio de Paula, and Ronald Friedman

Publishers/Suppliers
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2008

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978-0-19-920606-3

Level
Undergraduate

Price
£39.99

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May 2009

Summary Review

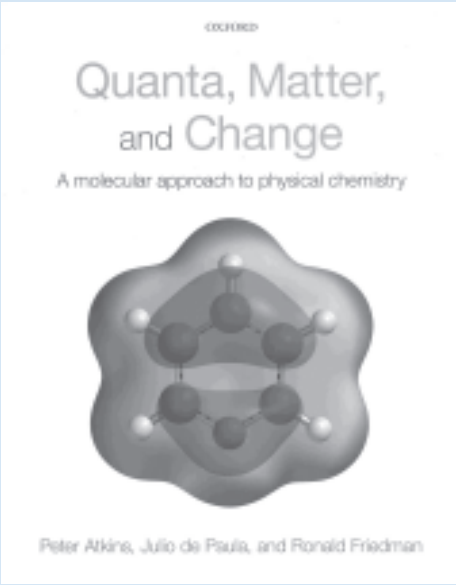
range: * poor to ***** good	
Academic content	*****
Usefulness to student	****
Usefulness to teacher	****
Meets objectives	****
Accuracy	****

The edition of Peter Atkins' *Physical Chemistry* found on an academic's bookshelf is usually a good indication of the academic's age, since it seems that this commendable text has supported teaching of physical chemistry in most Universities across the UK and beyond for many years. In their new book **Quanta, Matter and Change, a molecular approach to physical chemistry**, the authors state quite clearly that the premise for writing the book was to reconsider the traditional approach and order of subject matter as found in their *Physical Chemistry*, and endeavour to develop a text with quantum theory as its starting point. This is a welcome move from the authors, attempting to link the quantum world to the macroscopic world through statistical thermodynamics before introducing thermodynamics and its use in describing the bulk state of matter[1]. Indeed, throughout the text, great care has been taken to maintain this aim without falling into the trap of convolution.

The book is organised to include a fundamentals section to review the pre-requisite knowledge, which students could certainly use as a revision summary. The main body of the text is split into five parts, introducing quantum theory first and only much later on, in part four, dealing with molecular thermodynamics. Dispersed between chapters are eight 'mathematical background' sections to support readers with the high mathematical content of the main text. Unfortunately, despite this laudable effort, this support will not be enough for some students, although in the main text, the use of 'a brief comment' reminders, further attempts to bridge this gap. However, for the most intrepid student 'justifications' and 'further information' segments will satisfy. Undeniably, particular effort has been placed on supporting students' educational needs through features such as 'impact' sections, relating the application of a principle - eg electron microscopy is introduced after describing wave-particle duality, in the first chapter, although this in itself occurs also in the 8th edition of *Physical Chemistry*[2].

However, to suggest that **Quanta, Matter and Change** is a simple reordering and slimmed down version of *Physical Chemistry* would be an injustice. Overall, it is clear that the authors have revelled in challenging their own perceptions and approach to the common topics of an undergraduate physical chemistry course. In particular, chapters such as that on the Boltzmann distribution work well to offer a thorough account of the topic for students. Certainly, this is where the text excels and the inclusion of chapters on computational chemistry, molecular assemblies etc, emphasises how physical chemistry principles are relevant to the interdisciplinary research world. Again, putting physical chemistry at the centre of molecular spectroscopy, as is seen in part 3 with the necessary mathematical rigour, shows a well-merited confidence in the approach. Part five, chemical dynamics, continues this approach with chapters seamlessly moving from molecular motion through to catalysis.

Quanta, Matter and Change: a molecular approach to physical chemistry



From the publisher...

Quanta, Matter, and Change
A molecular approach to physical chemistry

By Peter Atkins, Julio de Paula, and Ronald Friedman

Quanta, Matter, and Change unravels a traditional course in physical chemistry and recasts it from this new molecular perspective. It provides the foundation for students to explore the subject from this new, intellectually engaging angle.
Beginning with quantum theory, the book establishes the link with the macroscopic world by introducing statistical thermodynamics, before showing how thermodynamics is used to describe the bulk properties of matter. Reformulating familiar concepts in new ways, the book also explores the latest practical tools, the most significant among them being computational chemistry.

978-0-19-920606-3 816pp 2008 £39.99

Overall, **Quanta, Matter and Change** will be a useful text for an undergraduate interested in developing their understanding of the physical chemistry principles discussed in lectures. Numerous end-of-chapter questions and exercises including questions involving the application of theory to, for example, biology, environmental science and chemical engineering, where appropriate, will support this endeavour.

References

1. Atkins, P, de Paula, J, Friedman, R, *Quanta, Matter and Change, a molecular approach to physical chemistry*, OUP, (2009), About the book, V.
2. Atkins, P, de Paula, J, *Physical Chemistry*, OUP, (2006).

Quantum Chemistry: a unified approach

Subject area
Quantum Chemistry

Description
A unified and consistent treatment of quantum chemistry across all types of bonding in organic, inorganic and physical chemistry

Authors
David B Cook

Publishers/Suppliers
Imperial College Press
<www.icpress.co.uk/index.html>

Date/Edition
2008

ISBN
978-1-84816-265-5

Level
Undergraduate

Price
£36.00

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

In this book David Cook sets out to achieve what many would consider impossible - a unified approach to quantum chemistry. The book requires the reader to have an understanding of atoms, molecules and interactions between them. It also requires the reader to have a sound mathematical understanding including calculus. The author starts by reinforcing these ideas in a straightforward manner which ensures that all readers start with a clear understanding of underpinning theories.

The text is written in an easy to access style that is broken down into clear chapters of progression. The style is one that has more in common with a discussion with a university tutor rather than the style of a text book. Each chapter begins with a summary of the main points covered in it, so that readers may pick and chose which sections they find the most relevant if they wish. Personally, I would not recommend this. To truly promote discussion and thought on the matter, the subject needs to be considered as a whole, not the sum of its parts. Chapters flow from one to another, drawing the reader in like the plot of good novel, and just like a good novel the work cannot truly be appreciated by a flick through a few chosen chapters.

On first glance the book appears to be a dry, academic text with little to offer for anyone except the theoretical chemist or post graduate student. This is not the case. On reading it was found to be quite the opposite, and a true rarity, a book that is genuinely accessible to the vast majority of chemists at all levels of education from degree onwards. Whether you agree with what the author has set out to do or not, it will make you question your own views and stimulate discussion on the subject. The author draws on aspects of chemical bonding from organic, inorganic and physical disciplines. I frequently found myself debating the matter and even went so far as to look at university level organic text books again for the first time in many years. Throughout the book the text is well set out with a good spread of prose and bullet points. There are frequent echoes back to points already made. These are not overt and they serve to cement ideas and prompt the reader's internal dialogue on the subject. The diagrams are used to good effect and complement the salient points being made. Some of the black and white line images could have been replaced by good quality digital images or colour diagrams, but the absence of these does not detract significantly from the reader's experience. All mathematical examples are well set out and take the reader through the steps in a logical and clear sequence. Not all mathematic proofs and working that are possible have been included, but this is not a text intended solely for the use of physical chemists. As a consequence of this, many may criticise the text; it must be read in the spirit of which it was written. It is intended as a unified approach that is for consideration by all chemists, no matter what their discipline. Whilst some of the more familiar mathematical support and proof is missing in this work, the author points readers to his other previous publications for these. No author or any one piece of writing is able to be the definitive work on such a diverse and often contentious topic, which embraces so many areas of chemistry. The author has accepted this. In the preface he acknowledges that he has made statements without proof and that some of the things he has said are controversial. The nature of this work was

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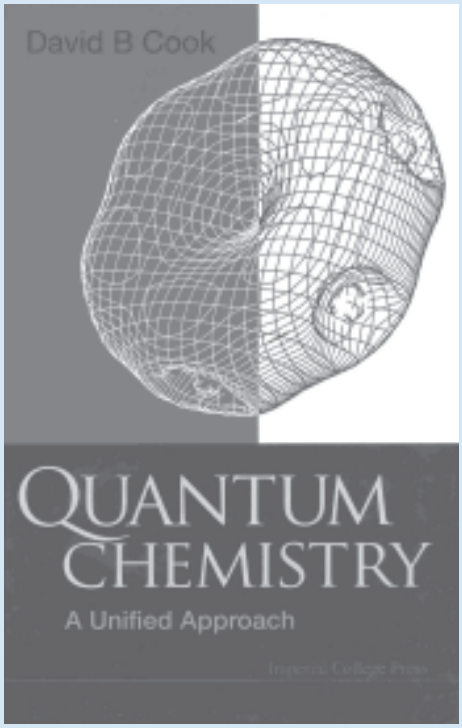
April 2009

Quantum Chemistry: a unified approach



From the publisher...

Quantum Chemistry
A Unified Approach
By David B Cook

This book is a presentation of a qualitative theory of chemical bonding stressing the physical processes which occur on bond formation. It differs from most (if not all) other books in that it does not seek to "rationalize" the phenomena of bonding by a series of mnemonic rules. A principal feature is a unified and consistent treatment across all types of bonding in organic, physical and inorganic chemistry.

978-1-84816-265-5 276pp 2008 £36.00

not to provide such a text; more to stimulate discussion and open debate on the matter. As an experienced chemist he has stepped forward to be counted and addressed the problems associated with an idea that has moved from a qualitative approach used by all, to three disparate and often conflicting approaches. He cites the classic example of the dative bond; inorganic chemistry is dominated by it and in organic chemistry it doesn't exist! The final word is a short chapter on omissions and final conclusions.

I would consider the book to be valuable reading for anyone on a chemistry degree, or a degree in a related subject. I would consider that first year students in particular would welcome this text as a valuable guide to navigating the fields of chemistry, as it addresses the eternal question of students encountering quantum chemistry for the first time, 'Why isn't it consistent?' For those further on in their academic career the book is still valuable as it will stimulate thought and discussion from all parties. It should be essential reading for anyone who wishes to become an educator in the field of chemistry.

David Cook has not achieved the impossible yet, but he has opened the door for others to follow. It remains to be seen whether this text becomes the precursor to great things or becomes a scientific 'coffee table' book. I rather hope that it is the former.

Solid State Physics: an introduction

Subject area
Physics

Description
A comprehensive, bachelor-level survey of the field of solid state physics

Authors
Philip Hofmann

Publishers/Suppliers
Wiley-VCH
<eu.wiley.com/WileyCDA>

Date/Edition
2008

ISBN
978-3-527-40861-0

Level
Undergraduate

Price
£45.00

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

A quick glance at the contents of **Solid State Physics: An Introduction**, by Philip Hofmann, impresses. The whole field of conventional solid state physics (soft condensed matter does not feature) appears to be covered comprehensively in just over 200 pages. Comprehensive is, of course, a relative term. The origins of solid state physics as we know it today go back to the earliest days of the twentieth century, and possibly before then, and the subject, like so many areas of physics, has burgeoned. However, a typical undergraduate will meet only the core elements of the subject; such things as crystal structures, band theory, magnetism, superconductivity, and dielectric phenomena, for example. Add chemical bonding, mechanical and thermal properties, and the basics of quantum confinement in low dimensional solids and you have the topics covered in this book.

There are eleven chapters in just over 200 pages of fairly small writing that cover all the topics, and more, that you would want to cover in a conventional solid state physics course. In my own course, for example, I concentrate principally on electronic phenomena, but magnetism, superconductivity, dielectrics, and what Hofmann refers to as “finite solids and nanostructure”’ are all covered in other modules.

This made the book seem attractive as students can cover a range of modules with a single purchase. Then I began to have doubts. When I first saw the contents list I was quite excited. Here is a book, I thought, that mirrors my own approach to teaching the subject. The four chapters in the middle covering phonons and heat capacity, the Drude model, the quantum approach of first Sommerfeld and then Bloch (the free and nearly-free electron models), and finally semiconductors and semiconductor devices impressed me, both for the level of the material and for the presentation.

I have taught the subject in precisely this order for a number of years. It mirrors the historical development and also happens to be the most logical way to cover the material. My first doubt about recommending the book to students arose when I checked the price. At around £40 from Amazon, it is somewhat steep for the size of the book. As I started reading in more depth another doubt started to gnaw at me. There is an undeniable breadth to the work, but this is achieved at the expense of detail. This is especially true of the last chapter. I think that any reader seeing a chapter entitled ‘finite solids’ would expect at the very least to see something about quantum wells in semiconductors and possibly something about quantum dots. The former have been well established for thirty years or so and the latter are now mainstream. However, this chapter is just a few pages long and the finite solids it describes are essentially thin metal films. This is just a small part of the book, however, and the other ten chapters are more extensive. They still lack detail and to be fair to the author, he acknowledges this at the outset. This is intended to be a “bachelor-level survey over the whole field without going into too much detail”, with “a lot of emphasis” on a didactic presentation. The reader is referred to more advanced texts listed in the appendix for a more in-depth treatment. It strikes me that Hofmann has written a book more suited to academic staff than for students. It is based on a third year lecture course and it reads like a set of lecture notes; somewhat

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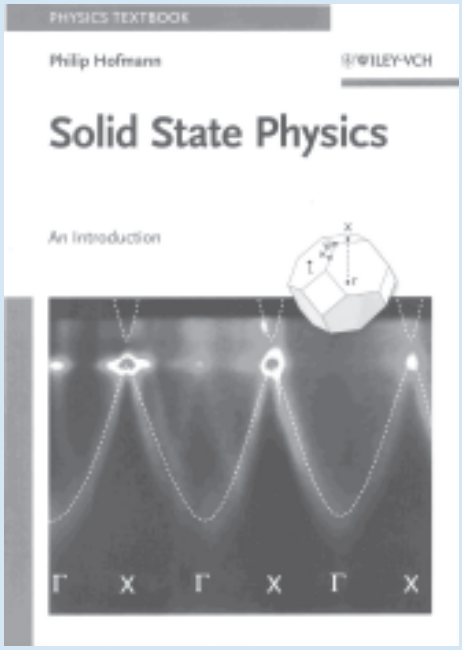
May 2009

Solid State Physics: an introduction



From the publisher...

Solid State Physics: An Introduction

By Philip Hofmann

Filling a gap in the literature for a brief course in solid state physics, this is a clear and concise introduction that not only describes all the basic phenomena and concepts, but also discusses such advanced issues as magnetism and superconductivity. This textbook assumes only basic mathematical knowledge on the part of the reader and includes more than 100 discussion questions and some 70 problems, with solutions as well as further supplementary material available free to lecturers from the Wiley-VCH website.

978-3-527-40861-0 233pp 2008 £45.00

expanded but still recognisable as lectures. I can imagine, for example, reading any part of any chapter as a lecture and having it work quite well.

The material is presented logically and at the right sort of level. There are plenty of equations, with appropriate discussion of the ideas behind them, as well as high quality line drawings to back up the written explanations. The book is very well presented. But, like a lecture, wherein some basic level of prior knowledge is always assumed and some detail is always omitted, this book leaves a lot unsaid. Just as a student wanting to get the best out of a lecture will have to read around the subject, so it is with this book.

The book's strength is undoubtedly the breadth of coverage. For anyone wanting to develop a lecture course on conventional solid state physics, here is a lecture course waiting to be delivered. And, as with so many texts these days, additional resources are available on the publisher's web site. It is easy to see that used this way the book could be very useful both for staff and for students. It will serve, in effect, as a comprehensive set of lecture notes. I find it more difficult to recommend it as a general text, however. The author has deliberately omitted a lot of detail, with good reason. A book such as this could easily be twice as long, which would probably have made it much more expensive, but it could also have contained the detail that students need if they are to work through the material to develop their own understanding. As it is I fear that many students will struggle if this is their principal source of additional information. There is both breadth and depth to the book, but many of the ideas seem quite condensed and I suspect many students would feel the need to consult additional texts.

Student Engagement in Higher Education:

Subject area
Education

Description
This book discusses current theory surrounding student engagement and goes on to detail practical approaches for addressing engagement barriers. Each chapter attempts to discuss the individual issues that may be encountered by specific student populations

Authors
Shaun R Harper & Stephen John Quaye (editors)

Publishers/Suppliers
Routledge - Taylor & Francis Group <www.routledge.com>

Date/Edition
2008

ISBN
978-0-415-98851-3

Level
HE Administrators/Managers

Price
£21.99

Chris Finlay
Development Officer
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April 2009

This book comprises 16 chapters, authored by numerous contributors who currently work within, mostly Californian, institutions. This text is aimed at student managers/administrators within Higher Education Institutions and, on the whole, is laid out in a very straight-forward way, allowing readers to quickly identify the sections most appropriate to them.

Summary Review

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

Chapter one, authored by the two editors, outlines the importance and need for engagement with students, the follow-on impact engagement has on student retention and how current theory and practice can be put into place.

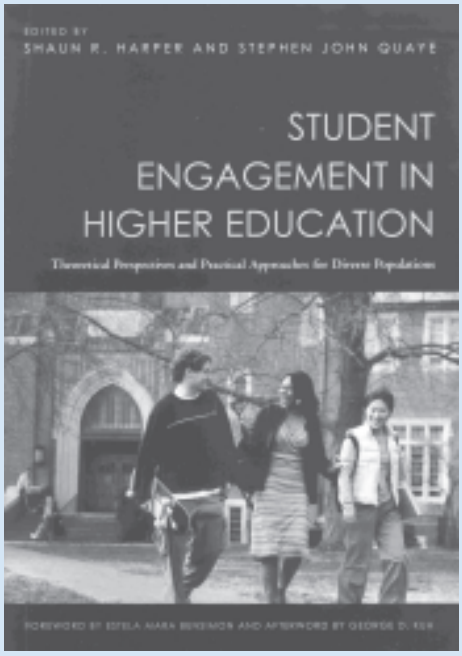
Each subsequent chapter then deals with a specific student population and identifies, at all times referring to research findings, the issues that have been shown to be most prevalent within each population. The chapters are broken down into: a background section allowing the reader to grasp the history of the topic before progressing to the 'Theoretical Framework' section which discusses the most relevant theories around the identified issues. This is followed by stand-alone, shaded boxes titled 'Engagement Strategies' which detail what strategies could be implemented to increase student engagement within the context of each chapter. A short conclusion giving the authors' overview of the preceding chapter is followed by an extensive reference section.

All definitions, policies and to a large extent the references are all American. A lot of the engagement barriers encountered by undergraduate students will be generic across Universities but readers need to be aware that some of the issues discussed may differ from those that might be encountered in HEI's within the UK, eg student finance – the ever changing face of University fees. It is worthwhile to compare the experiences (and details) of student engagement activities in America but the reader has to remain aware that UK students may encounter some alternative/variable barriers to engagement. However, the content is well structured, presented and gives a very clear account of student engagement issues.

As each chapter details the relevant strategies that could be implemented to assist specific student populations there is some repetition across chapters, eg student mentoring programmes/peer-assisted learning initiatives, feature several times throughout the book. However the reviewer recognises that the book is designed so that a reader can quickly identify and read the most relevant chapters without the need to digest the entire text.

In my opinion this is a fairly comprehensive book discussing undergraduate student engagement and is reasonably priced at £21.99. The content is based around an American prospective but highlights student populations that are present to some degree in most HEI's. The issues encountered by these populations may vary across different countries but with an ever changing student society the detail is interesting, relevant and allows the reader to compare experiences internationally.

...theoretical perspectives and practical approaches for diverse populations



From the publisher...

Student Engagement in Higher Education
Theoretical Perspectives and Practical Approaches for Diverse Populations
Edited by Shaun R Harper, Stephen John Quaye

Student Engagement in Higher Education is an important volume that fills a longstanding void in the higher education and student affairs literature. The editors and authors make clear that diverse populations of students experience college differently and encounter group-specific barriers to success. Informed by relevant theories, each chapter focuses on a different population for whom research confirms that engagement and connectivity to the college experience are problematic, including: low-income students, racial/ethnic minorities, students with disabilities, LGBT students, and several others.

978-0-415-98851-3 368pp 2008 £21.99

In summary this book gives the reader a good breadth of knowledge on barriers that might influence an undergraduate's engagement with their third-level education career. These barriers vary from institution to institution but the structure of the text is such that the reader can quickly pick out the most relevant detail.

The 'Engagement Strategies' section in each chapter allows the reader to identify what engagement activities have been shown to be useful and, more importantly, how they might be implemented. I would recommend this book as a good basis for identifying current engagement activities however further information on UK based initiatives and research would allow the reader to build on the content.

The Chemistry Maths Book

Subject area
Physical Sciences, Mathematics

Description
This book provides a course companion suitable for students at all levels. All the most useful and important topics are covered, with numerous examples of applications in chemistry and the physical sciences

Authors
Erich Steiner

Publishers/Suppliers
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2008/2nd edition

ISBN
978-0-19-920535-6

Level
Undergraduate

Price
£28.99

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November 2008

On the opening page of **The Chemistry Maths Book**, now in its second edition, author Dr Erich Steiner presents a 13th century quote of Roger Bacon - one of the founders of modern science:
"…without mathematics the sciences cannot be understood, nor made clear, nor taught, nor learned…"

Summary Review

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

This was a notion adopted by many eminent scholars century after century, and highlights the importance of understanding the mathematical basis of any experimental science. Steiner is an Honorary Fellow and former Senior Lecturer at the University of Exeter, UK. The text itself describes all the mathematics that is required by a university degree course in chemistry. It is "…designed as a text for courses in *mathematics for chemists*…" as stated in the preface. It would also be ideal for other physical science undergraduates wishing to consolidate their A-level maths knowledge.

The text is comprehensive and comprises twenty-one chapters distributed evenly across 668 pages. The work is organised in "…three largely independent parts…" and are listed as follows:

Chapters 1-15:	Algebra, Calculus, Differential Equations & Expansion in Series
Chapters 16-19:	Vectors, Determinants & Matrices
Chapters 20-21:	Introduction to Numerical Analysis & Statistics

The preface has documented both global and other principal changes as well as the structure of the text. The global changes include an overall reorganisation, a full set of worked solutions available online <www.oxfordtextbooks.co.uk/orc/steiner2e> under 'Solutions Manual' as well as text update for corrections and improvements since publication of the first edition in 1996. For 'adopting' lecturers, the Online Resource Centre (ORC) provides special access to the figures used within the text. The principal changes include the rewriting and revising of parts of some chapters and the addition of new examples and exercises closely related to the physical sciences.

The chapters are very well organised, each having an initial concept review of the chapter topic and ending with a series of short exercises. The solutions to these exercises can easily be located at the rear of the text. Almost all 21 concept reviews make some sort of reference to the physical sciences, usually by stating the types of physical models used in the sciences and how they relate to the standard mathematical models presented in the chapters. There is around 40% of physical science related coverage in the 'theory sub-sections' with some unevenness between the length of sub-sections in most chapters. In preparation for the exercises at the end of each chapter, Steiner has included 400 clearly placed examples throughout the text - with at least eleven examples in any one chapter (with the exception of Chapter 14 which includes a couple). Surprisingly, the 'physical science' examples make up for no more than 20% of the total. There are 'prompts' throughout each chapter as to when the reader should be making an attempt to answer one or more referenced exercise questions – this is usually after each example. This is an excellent method of pedagogy as it consolidates the learning process and widens the readership level. However, around 15% of these exercises are actually based on the

The Chemistry Maths Book

physical sciences. Steiner generally tends to use a handful of equations (eg equation of state of the ideal gas) to demonstrate its different features; ie use in differentiation, as a function, its constants and variables before providing a generalised solution to major topics. There is ample cross-referencing throughout the text with respect to different topic areas and formulae which can be very useful to both beginners and advanced readers. Steiner provides some excellent sources of references in the text. There are numerous instances where Steiner has placed anecdotal histories related to the concepts discussed and also clears ambiguities. Although it is a useful method to keep a reader engaged in any given topic - it was felt that the current location of the related 'historical' anecdotes as footnotes was a hindrance to the learning process. The reader should feel focused and comfortable with the array of information being presented. Hence it would be preferable, in my opinion, to have historical notes placed in the appendix.

The opening chapter on 'Numbers, variables and units' provides a fundamental basis for understanding the essence of mathematics. It includes tables on the 'seven' base physical quantities, SI derived units and prefixes and atomic units. The information in this chapter is very basic, informative and easy to follow. The following chapter on 'Algebraic functions' discusses inverse and rational functions, partial fractions, polynomials, simultaneous equations and tri-linear equations. There are 35 clear examples which are intuitive and most have well defined steps. The mathematical concepts are described using both description and formulae and are well balanced. There are also graphical plots to accompany some of the text – these can be useful for explaining the abstract concepts. The 'concept' reviews are useful as they provide a gentle introduction to the topic, together with a summary, its relation to the physical sciences and follows onto well grounded descriptions. The first part of the text is structured in such a way and includes several examples to ease understanding. They cover topics such as transcendental functions, differentiation, integration, sequences and series, complex numbers, Fourier analysis as well as first and second order differential equations.

There is a very useful conceptual representation of transcendental functions and description on trigonometric functions and relationships, polar coordinates, exponentials and logarithmic functions. Again, the descriptions are clear and well presented. Chapter 4 on Differentiation has a good concept review, a fair proportion of worked examples and useful tables on 'differentiation by type'. Chapters 5 to 15 contain descriptions that are easy to follow and methodical with sufficient examples to grasp the theory. There are plenty of useful tables and some illustrations to accompany the text. The first part is well structured, builds on each topic sequentially, lays down the principal rules and provides the reader with an opportunity to learn using a 'learning by doing' model. In general, the chapter structure across the text is very consistent and includes a concept review, theory, worked examples and related exercises. These processes provide the reader with the tools to understand the topic whilst also providing a good theoretical grounding.

The second and third part of the text is well explained and covers an array of sub-topics. Chapters 20 and 21 would be very useful for undergraduates as the concepts apply to all pieces of scientific work. They cover sub-topics such as errors, interpolation, statistical distributions, and techniques of fitting curves to data; eg simple least square, straight-line and chi-square. However, more diverse examples would have been useful especially when discussing curve fitting techniques in the last chapter.

The text seems to cover all of the mathematics required for undergraduate chemistry courses both in terms of depth and breadth. It includes the standard A-level mathematic topic areas which form the basis of the text; ie pure and further core, mechanics and statistics. There were however instances in later chapters where it appeared that the mathematical descriptions were short. It was felt that examples could have been placed in a shaded 'box' instead of being separated by dividing lines. Most importantly, there was almost an equal number of 'physics' related exercises and examples as there were of chemistry. For a text designed for chemists, it was felt that there should be plenty more 'chemistry-related' examples and exercises. It would also be advantageous to have more references to how the maths in *each* topic sub-section relates to the *relevant* area of the physical sciences commonly practised today.

Overall, the text is concise, intuitive, well illustrated and value for money. It has met the aims set in the preface and Steiner has done an excellent job in providing the many useful examples throughout the text. I would recommend this text to any physical science library, undergraduate student or professional requiring a good grounding in mathematics related to the *physical sciences*.

The Concepts and Practices of Lifelong Learning

Subject area
Education

Description
This book provides a research informed and multi-disciplinary introduction to lifelong learning in various educational settings

Authors
Brenda Morgan-Klein and Michael Osborne

Publishers/Suppliers
Routledge - Taylor & Francis Group <www.routledge.com>

Date/Edition
2007

ISBN
978-0-415-42861-3

Level
Teachers

Price
£19.99

Nancy El-Farargy
Centre for Science
James Watt College of Further and Higher Education
Finnart Campus
Greenock
PA16 8HF
April 2009

Morgan-Klein and Osbornes' **The Concepts and Practices of Lifelong Learning** covers broad themes such as: the concept of lifelong learning; its social and economic rationale; the varied sites of lifelong learning; and a discussion of future technological advances. The authors are well known in the field of lifelong learning and their contribution would be suitable to education professionals and students alike.

Summary Review

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

The 11 chapters are divided into two broad themes: (1) the concept, rationale and factors that affect lifelong learning and (2) the varied sites of lifelong learning.

Chapter one introduces the vision of a learning society in terms of the economy and politics of lifelong learning. Learner identities - with outcomes in learner responsibility, improvement, self-actualisation and emancipation - are then explored in chapter two. In terms of plasticity, neuroscientific research is briefly noted in that "it is reasonable to assume that there is no biological impediment to lifelong learning" (p12).

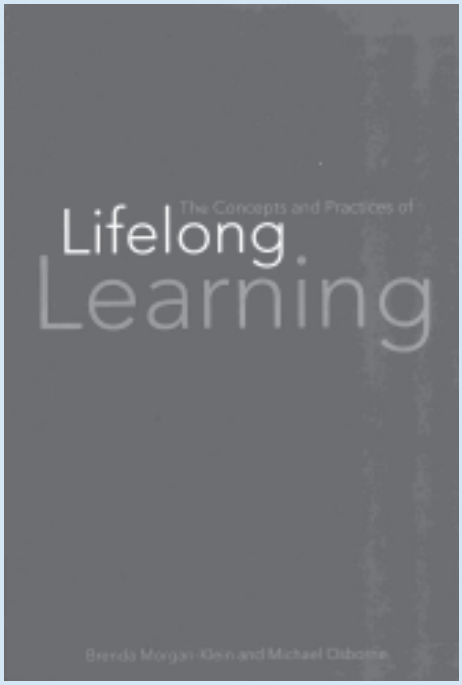
The social dimensions of learning are discussed in chapter three, whereby a debate on the social capital theory is covered. The authors argue that the social nature of learning is highly contextualised and is aptly followed by the "perceived and real economic benefits to individuals, organisations and national economies in investing in lifelong learning" (p39). The concern of the 'skills deficit' is noted alongside a discussion on the economic returns of various social groups. Furthermore, evidence is cited how learning in later life itself has individual health benefits and therefore contributing to a reduction in state costs.

A change of direction is offered in chapters five to ten in that the varied sites of lifelong learning are discussed. It is only recently that schooling has been identified and discussed in the adult education literature and much of the policies of lifelong learning are encouraging changes in schools. The case of personalised learning and greater continuity between schools is examined in light of the future learning society (chapter five). The chapter ends with the notion that "lifelong learning agendas are not simply about learning in 'later life'".

In chapter six, the changing focus of formal post-compulsory education (tertiary education) is discussed in relation to expansion and diversification of the sector. The change in student populations and widening access to education is explored in the context of various 'access' initiatives

The idea of learning for work, learning at work and learning through work is then considered in chapter seven. For instance, as quoted, "initial training and education are seen to be inadequate to meet the changing demands of the workplace and the workforce at all levels needs to access further education and training on a continuing basis" (p84). The explicit curricular links with employability, the skills shortages, career changes and continuing education are further examined and is a running theme throughout the book.

The Concepts and Practices of Lifelong Learning



From the publisher...

The Concepts and Practices of Lifelong Learning

By Brenda Morgan-Klein, Michael Osborne

This textbook gives a wide-ranging, research-informed introduction to issues in lifelong learning across a variety of educational settings and practices. Its very accessible approach is multi-disciplinary drawing on sociology and psychology in particular. In addition, issues are discussed within an international context. While there has been a proliferation of texts focussing on particular areas of practice such as higher education, there is little in the way of a broad overview.

978-0-415-42861-3 168pp 2007 £19.99

The significance of learning in the community and in the home is explored in chapter eight. It is illustrated that community learning is highly social specific and is strongly related to political change. Civic, economic, public and voluntary communities are investigated (chapter 9) in relation to learning cities and regions. The authors suggest that this "has considerable power to engage all potential stakeholders in collaborative activity based on partnership" (p125).

Delivering across space and time, the contribution of ICT in lifelong learning is evident and is well discussed in chapter ten. For example, distance learning is one key advance in the community and promotes the reality of autonomous self directed learning, where the locus of control is in the learner. Blended learning approaches are also discussed in enhancing the lifelong learning experience.

The discussions are drawn together in chapter 11 with the notion that "perhaps all generations believe that theirs is on the verge of, or responsible for, revolutionary change (perhaps they are)" (p142). Indeed the actual meaning of lifelong learning has changed considerably over the past years, in addition to the connections with economic, social and educational policies that lead towards the learning society.

Overall, this is a highly researched well written textbook, where the authors discuss the major factors that affect lifelong learning. It would be suitable to educational professionals, researchers and students alike.

The language of Physics: a foundation for university study

Subject area
Physics, Engineering

Description
An introduction to the supporting mathematics for those studying physics or engineering

Authors
John P Cullerne and Anton Machacek

Publishers/Suppliers
Oxford University Press
<ukcatalogue.oup.com>

Date/Edition
2008

ISBN
978-0-19-953380-0

Level
Undergraduate

Price
£19.99

Summary Review

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

This text sets out to give first year undergraduates, reading physics or engineering, an overview of the physical concepts they would have studied pre-university recast in mathematical language. The authors state that "the true language of physics is not English. It is mathematics." To this end the student is introduced to 'the language' and guided through, amongst other topics, vector calculus, complex exponentials and volume integrals.

The main text is based around six chapters addressing linear mechanics, fields, rotation, oscillations and waves, circuits and thermal physics. Hence, with the exception of special relativity (apart from a brief mention on page 21) and particle physics the vast majority of first year programmes will be catered for.

Within each of these six chapters students and tutors alike will welcome the gentle approach and clarity of explanation, especially as the mathematics in developed, which in my view is the only way pedagogically, within the context of the physical situation. This for me is the greatest asset of the book and in my view far surpasses that done in, for example, Fisher Cripps, *The Mathematical Companion: Mathematical Methods for Physicists and Engineers*[1], see *Physical Sciences Educational Reviews* volume 7 issue 2.

The conceptual demand in each chapter is pitched such that any student having studied GCE A-level physics or its equivalent will be able to concentrate on reviewing the material in terms of its mathematical description rather than having the dual battle of concept and mathematics found in many other texts. One assumes that a student reading this text will have also followed a course in mathematics to a similar level in order to take advantage of the explanations offered; indeed the authors also make a statement to this effect in their introduction. I would, however, suggest that an undergraduate physical science student having studied, for example, physics and chemistry but not mathematics would, with appropriate support, also be able to access the material given the clarity of presentation.

As a study guide this text also adds to the student experience in the form of 'workshops' within the chapters. Workshops revisit the material studied in the guise of structured questions which have very comprehensive solutions in the appendices. In addition to the six main chapters, chapter seven 'Miscellany' provides eleven more workshops which help develop mathematical understanding and include the topics, for example, of dimensional analysis, error analysis and centre of mass.

The final chapter, chapter eight, gives a handy summary of all the equations the student will use within the text and beyond.

Having painted a glowing picture of the book I have, unfortunately, a minor quibble with the text. Throughout the text the authors use, in my view, an excessive number of asterisked footnotes. These distract from the flow and if the authors think the points are important enough to include why, given their attention to clarity elsewhere, are they simply not made in the main text?

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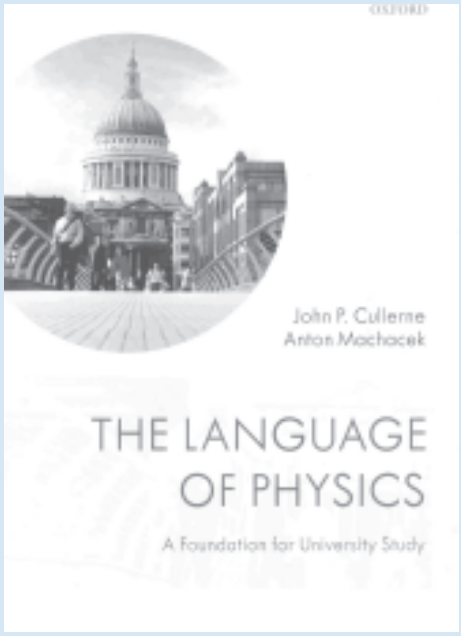
April 2009

The language of Physics: a foundation for university study



From the publisher...

The Language of Physics
A Foundation for University Study
By John P. Cullerne and Anton Machacek

This book introduces physics to a first year undergraduate in the language of mathematics. As such it aims to give a mathematical foundation to the physics taught pre-university, as well as extending it to the skills and disciplines approached during a first degree course in physical science or engineering. It bridges two gaps in modern education - between the level of difficulty in pre-university study and undergraduate study, and between mathematics and physics. Many of the concepts are revised or introduced in the course of 'workshop' questions which are an integral part of the text. Fully explained solutions to these workshops are given as a substantial appendix to the book. The student will be enabled to study classical mechanics in terms of vector calculus, fields in terms of line and surface integrals, oscillations and waves in terms of complex exponentials and so on.

978-0-19-953380-0 256pp 2008 £19.99

In conclusion I would recommend this text to all new undergraduate physics and engineering students for self study and to any tutor within these disciplines with a lecturing responsibility for 'mathematics for physics' or 'mathematics for engineering'.

Reference

1. Fischer-Cripps, Anthony Craig. *The Mathematical Companion: Mathematical Methods for Physicists and Engineers*, Institute of Physics, UK (2005).

The Lecturers Toolkit: a practical guide to assessment teaching and learning

Subject area
Education

Description
This is a resource for HE teachers seeking to improve their teaching skills. It is developed around detailed, practical guidance on the core elements of effective teaching in HE and is packed with accessible advice and common sense

Authors
Phil Race

Publishers/Suppliers
Routledge - Taylor & Francis Group <www.routledge.com>

Date/Edition
2006/3rd edition

ISBN
978-0-415-40382-5

Level
Teachers

Price
£26.99

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

Phil Race is well known within academia for delivering learning and teaching based workshops for lecturers, and for writing a series of texts on how to succeed for both lecturers and students. Recently he updated the *Designing Assessment to Improve Physical Sciences learning* for the HE Academy Physical Sciences Centre[1], most of which is taken directly from a chapter within this book. His clearly written and well structured toolkit offers a comprehensive overview of the main theories and activities of teaching and learning in the UK higher education sector, which he supports with a wide range of practical 'bite size' suggestions to make teaching and learning activities more efficient and effective.

A key strength of the text is that Race makes you clearly reflect upon your practices and effectiveness as an educator. Drawing upon his educational research and experiences he offers views on the different ways by which students actually learn, with the objective of making the learning process more successful for both the student and the lecturer. Consequently within the toolkit he advocates an inclusive and creative approach to the lecturer's role, using students more actively in the learning process, particularly through better use of learning outcomes, assessment and feedback to improve their motivation and engagement with course material. He further argues that more motivated students should provide the lecturer with more effective feedback so that you can have more confidence in their achievements (or increased awareness of their issues and problems) and your teaching.

The toolkit content is well presented and logically arranged using clearly defined sections and chapters to cover all the traditional aspects of teaching and learning; such as the many different forms of assessment (including their pros and cons), lecturing and small group teaching, alongside more contemporary issues such as online and resource based learning, workload and stress issues in both students and lecturers, and the legislative changes associated with disabled students. This means that rather than having to read all the book for specific guidance, the structure of the book makes it best suited toward 'dipping' into individual chapters or sections for suggestions and advice, making it ideal for lecturers with little experience to find 'quick fixes' to their problems. The illustrative hints and tips given throughout the text are generally clear, appropriate and based upon common sense and experience, although the number of them may appear a little overwhelming given the constraints upon lecturer's time; and the economics of higher education mean that some of these 'ideal' approaches to teaching may not be as practical as you'd wish them to be. However, as is common with the toolkit/bite size approach used in many textbooks of this type, some readers may also wish for a more depth or examples to further their understanding.

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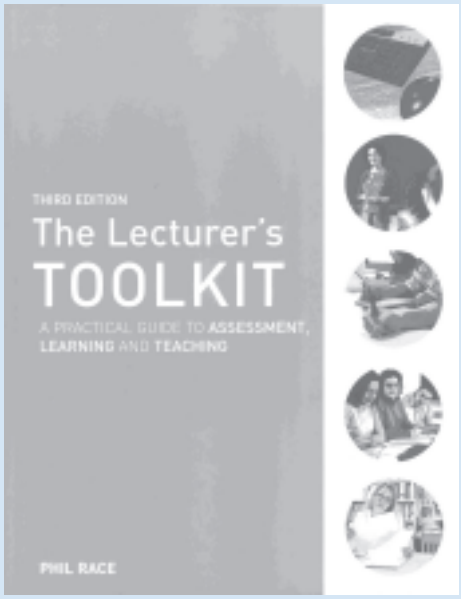
The Lecturers Toolkit: a practical guide to assessment teaching and learning



From the publisher...

The Lecturer's Toolkit
A Practical Guide to Assessment, Learning and Teaching
By Phil Race

The Lecturer's Toolkit is the primary resource for all teachers in higher education, whatever their experience, who are seeking to improve their teaching skills. Developed around detailed, practical guidance on the core elements of effective teaching in HE, it is packed full of accessible advice and helpful tips.

978-0-415-40382-5 248pp 2006 £26.99

Depending upon your own experiences as a lecturer it is unlikely that you will agree with all of Race's viewpoints and suggestions, although I doubt that Race would want you to 'blindly' agree with them all. However I found that the majority of his comments and suggested practices resonate with the current educational practices I regularly observe across the HE sector.

In conclusion, the book will be of most use for the newly appointed lecturer and can be strongly recommended to them. It offers clear, practical guidance on their chosen career, not just the 'routine' aspects such as preparing assessments and lectures but also clear advice on how to cope with the workload and stresses of the job. However even more experienced practitioners will find something of use within its pages, as it may encourage them to refresh some of their more entrenched modes of teaching and learning.

Reference

1. Race, P *Designing assessment to improve Physical Sciences learning* (2009) ISBN 978-903815-22-9 Available online at: <www.heacademy.ac.uk/assets/ps/documents/practice_guides/practice_guides/ps0069_designing_assessment_to_improve_physical_sciences_learning_march_2009.pdf>

Workbook for Organic Synthesis Strategy and Control

Subject area
Physical Sciences, Organic Chemistry

Description
Comprehensive set of Organic Chemistry problems linked to the main text book

Authors
Paul Wyatt and Stuart Warren

Publishers/Suppliers
Wiley-Blackwell
<eu.wiley.com/WileyCDA>

Date/Edition
2008

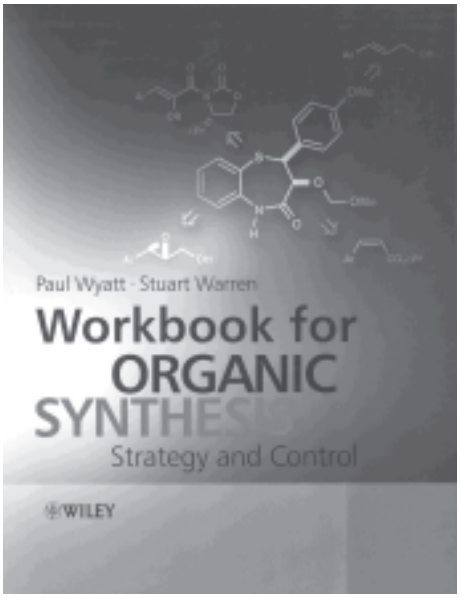
ISBN
978-0-471-92964-2

Level
Undergraduate

Price
£35.00

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

Organic chemistry is a term that lends itself very well to the term 'practice makes perfect'. This book facilitates practice in a very easy manner. There are numerous excellent textbooks for organic chemistry available today, pitched at all levels. There is no denying that a lot can be learned from reading but this book allows the student to *solve* problems. The book provides an array of problems linked to each of the chapters in the main textbook. More importantly each problem is accompanied by a fully explained solution and discussion. Most textbooks use examples decades old, and most reviews of modern chemistry make no attempt to put reactions and context and explain how and why you might use them. Furthermore this workbook is not just limited to problems in the main textbook, additional problems are also provided. As an added bonus each of the problems are 'real life' problems and details of recent developments in the relevant areas of chemistry are discussed in each chapter. This book manages to combine clear and engaging explanations with examples from well into the 21st century. The partnership of the text book with the workbook provides a comprehensive course in advanced organic synthesis.



This is a must-read for any final year undergrad or PhD student in organic chemistry, but it's more than that - it's a book for experienced chemists too.

Mark Glynn
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May 2009

The Physical Sciences Centre is one of the 24 Subject Centres in the Subject Network of the Higher Education Academy, a UK-wide initiative supported by the four Higher Education Funding Councils

www.heacademy.ac.uk/physsci

Reviewed in this issue...

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